

[illegible]

[illegible]

[illegible]

[illegible]


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8.31
8.31
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8.31
END
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Program : LAKET
Number : 03.7.292-2.2 O
Created : 11/18/2004 08:08:26

Page : 7
Date : 04/07/2006
Time : 13:54:23.56

Case 3b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104.0F, 1.5')

RUN 36 DAYS FROM 70100 TO 80500
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	81.350	341.400	73.210	307.200
689.000	79.750	260.800	71.780	234.700
688.000	78.150	181.900	70.340	163.700
687.000	29.700	102.200	26.730	92.000
686.000	22.220	60.000	20.000	54.000
685.000	13.420	43.800	12.080	39.400

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

18 LAKE TEMP NATURAL (F)
19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 102.86 98.36

WEATHER STATION ID 0.

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Program : LAKET
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Created : 11/18/2004 08:08:26

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Case 3b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104.0F, 1.5')

FPLANT				
70100 -	80500	R/I		86.000

[illegible]

[illegible]

Program : LAKET
 Number : 03.7.292-2.2 0
 Created : 11/18/2004 08:08:26

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 Date : 04/07/2006
 Time : 13:54:23.59

Case 3b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104.0F, 1.5')

SEASONAL SUMMARY FOR SUMMER (6/1900 - 8/1900)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.27	688.54	689.17
TOTAL AREA (ACRE)	0.00	80.18	79.02	80.02
TOTAL VOLUME (ACRE-FT)	0.00	282.78	224.66	274.71
EFFECTIVE AREA (ACRE)	0.00	72.17	71.12	72.02
EFFECTIVE VOL (ACRE-FT)	0.00	254.47	202.18	247.21
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.14	-0.16
EVAPORATION TOTAL (CFS)	0.00	-1.62	-1.33	-1.58
EVAPORATION NATURL (CFS)	0.00	-0.97	-0.76	-0.94
EVAPORATION FORCED (CFS)	0.00	-0.65	-0.56	-0.64
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR-FT2)	0.00	153.58	152.47	153.43
EVAP LOSS (BTU/HR-FT2)	0.00	64.65	51.78	62.87
COND LOSS (BTU/HR-FT2)	0.00	5.34	5.25	5.32
LAKE TEMP NATURAL (F)	0.00	90.92	89.93	90.78
LAKE TEMP @ INLET (F)	0.00	101.40	98.78	101.03
LAKE TEMP @ OUTLET (F)	0.00	91.58	90.55	91.43
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.33	-1.34	-11.67
TOTAL EVAP TOT (ACRE-FT)	0.00	-99.71	-13.15	-112.86
TOTAL EVAP NAT (ACRE-FT)	0.00	-59.60	-7.58	-67.18
TOTAL EVAP FOR (ACRE-FT)	0.00	-40.11	-5.57	-45.68
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

	1%	5%	50%
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LAKE TEMP NATURAL (F)	100.5	97.5	90.9
LAKE TEMP @ INLET (F)	132.0	110.4	100.8
LAKE TEMP @ OUTLET (F)	103.0	98.0	91.5

Program : LAKET
 Number : 03.7.292-2.2 0
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Case 3b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104.0F, 1.5')

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.27	688.54	689.17
TOTAL AREA (ACRE)	0.00	80.18	79.02	80.02
TOTAL VOLUME (ACRE-FT)	0.00	282.78	224.66	274.71
EFFECTIVE AREA (ACRE)	0.00	72.17	71.12	72.02
EFFECTIVE VOL (ACRE-FT)	0.00	254.47	202.18	247.21
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.14	-0.16
EVAPORATION TOTAL (CFS)	0.00	-1.62	-1.33	-1.58
EVAPORATION NATURL (CFS)	0.00	-0.97	-0.76	-0.94
EVAPORATION FORCED (CFS)	0.00	-0.65	-0.56	-0.64
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR-FT2)	0.00	153.58	152.47	153.43
EVAP LOSS (BTU/HR-FT2)	0.00	64.65	51.78	62.87
COND LOSS (BTU/HR-FT2)	0.00	5.34	5.25	5.32
LAKE TEMP NATURAL (F)	0.00	90.92	89.93	90.78
LAKE TEMP @ INLET (F)	0.00	101.40	98.78	101.03
LAKE TEMP @ OUTLET (F)	0.00	91.58	90.55	91.43
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.33	-1.34	-11.67
TOTAL EVAP TOT (ACRE-FT)	0.00	-99.71	-13.15	-112.86
TOTAL EVAP NAT (ACRE-FT)	0.00	-59.60	-7.58	-67.18
TOTAL EVAP FOR (ACRE-FT)	0.00	-40.11	-5.57	-45.68
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%
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LAKE TEMP NATURAL (F)	100.5	97.5	90.9
LAKE TEMP @ INLET (F)	132.0	110.4	100.8
LAKE TEMP @ OUTLET (F)	103.0	98.0	91.5

Program : LAKET
 Number : 03.7.292-2.2 O
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Case 3b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104.0F, 1.5')

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (7011900)	20.00 (7011900)	20.00
LAKE ELEVATION (FEET)	689.99 (7011900)	688.45 (8051900)	689.17
TOTAL AREA (ACRE)	81.33 (7011900)	78.86 (8051900)	80.02
TOTAL VOLUME (ACRE-FT)	340.63 (7011900)	216.86 (8051900)	274.71
EFFECTIVE AREA (ACRE)	73.20 (7011900)	70.98 (8051900)	72.02
EFFECTIVE VOL (ACRE-FT)	306.51 (7011900)	195.16 (8051900)	247.21
CIRCULATION TIME (HR)	0.00 (7011900)	0.00 (7011900)	0.00
PRECIPITATION (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
MAKEUP TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SEEPAGE (CFS)	-0.13 (8051900)	-0.20 (7011900)	-0.16
EVAPORATION TOTAL (CFS)	-0.24 (8051900)	-4.12 (7051900)	-1.58
EVAPORATION NATURL(CFS)	0.00 (7031900)	-2.72 (7051900)	-0.94
EVAPORATION FORCED(CFS)	-0.23 (7311900)	-1.86 (7011900)	-0.64
BLOWDOWN TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SOLAR GAIN (BTU/HR-FT2)	430.59 (7191900)	101.21 (7221900)	219.16
SURF LOSS (BTU/HR-FT2)	165.63 (7011900)	142.19 (7241900)	153.43
EVAP LOSS (BTU/HR-FT2)	179.35 (7051900)	0.00 (7031900)	62.87
COND LOSS (BTU/HR-FT2)	26.28 (7051900)	-30.81 (7251900)	5.32
LAKE TEMP NATURAL (F)	101.47 (7011900)	80.45 (7241900)	90.78
LAKE TEMP @ INLET (F)	137.71 (7011900)	89.71 (7241900)	101.03
LAKE TEMP @ OUTLET (F)	104.00 (7011900)	81.35 (7241900)	91.43
DISSOLVED SOLIDS (PPM)	0.00 (7011900)	0.00 (7011900)	0.00

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.03 (8051900)	-0.05 (7011900)	-11.67
TOTAL EVAP TOT (ACRE-FT)	-0.06 (8051900)	-1.02 (7051900)	-112.86
TOTAL EVAP NAT (ACRE-FT)	0.00 (7031900)	-0.68 (7051900)	-67.18
TOTAL EVAP FOR (ACRE-FT)	-0.06 (7311900)	-0.46 (7011900)	-45.68
TOTAL BLWD TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	100.5	97.5	90.9
LAKE TEMP @ INLET (F)	132.0	110.4	100.8
LAKE TEMP @ OUTLET (F)	103.0	98.0	91.5

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Date : 04/11/2006
Time : 15:49:35.51

Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

1
2 061854 071754 1 1 0 3 2
3 1 0 20.
4 1 0.2 5500. 0
5 6 2 690

690	81.35	341.4	73.21	307.2
689	79.75	260.8	71.78	234.7
688	78.15	181.9	70.34	163.7
687	29.70	102.2	26.73	92.0
686	22.22	60.0	20.00	54.0
685	13.42	43.8	12.08	39.4

7 1 0 3 18 19 20
8 102.3 97.8

999
FPLANT R/I 86.0
TPRISE S/I

35.48
28.95
16.79
16.39
15.42
15.06
14.61
14.36
13.95
13.52
13.36
13.36
13.36
13.30
12.79
12.79
12.50
12.50
12.30
12.09
12.09
12.09
12.09
12.08
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11.56
11.56

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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END

Program : LAKET
Number : 03.7.292-2.2 0
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Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

RUN 30 DAYS FROM 61854 TO 71754
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	81.350	341.400	73.210	307.200
689.000	79.750	260.800	71.780	234.700
688.000	78.150	181.900	70.340	163.700
687.000	29.700	102.200	26.730	92.000
686.000	22.220	60.000	20.000	54.000
685.000	13.420	43.800	12.080	39.400

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

18 LAKE TEMP NATURAL (F)
19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 102.30 97.80

WEATHER STATION ID 93822.

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Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

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Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

FPLANT
61854 - 71754 R/I 86.000

[illegible]

8.940	8.940	8.940	8.940
8.940	8.940	8.940	8.940
8.810	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.610	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.520

Program : LAKET
 Number : 03.7.292-2.2 0
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Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

SEASONAL SUMMARY FOR SUMMER (6/1954 - 8/1954)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.61	688.91	0.00	689.21
TOTAL AREA (ACRE)	80.72	79.61	0.00	80.09
TOTAL VOLUME (ACRE-FT)	309.79	253.94	0.00	278.14
EFFECTIVE AREA (ACRE)	72.65	71.65	0.00	72.08
EFFECTIVE VOL (ACRE-FT)	278.76	228.52	0.00	250.29
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.15	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.01	-1.69	0.00	-1.83
EVAPORATION NATURL(CFS)	-1.28	-1.13	0.00	-1.20
EVAPORATION FORCED(CFS)	-0.73	-0.56	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.11	145.43	0.00	146.59
EVAP LOSS (BTU/HR-FT2)	85.13	76.30	0.00	80.13
COND LOSS (BTU/HR-FT2)	4.10	0.93	0.00	2.30
LAKE TEMP NATURAL (F)	85.92	83.46	0.00	84.52
LAKE TEMP @ INLET (F)	98.17	93.25	0.00	95.38
LAKE TEMP @ OUTLET (F)	86.90	84.51	0.00	85.55
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.71	-5.12	0.00	-9.84
TOTAL EVAP TOT (ACRE-FT)	-51.84	-56.94	0.00	-108.78
TOTAL EVAP NAT (ACRE-FT)	-33.07	-38.13	0.00	-71.20
TOTAL EVAP FOR (ACRE-FT)	-18.77	-18.81	0.00	-37.58
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	100.0	93.3	84.1
LAKE TEMP @ INLET (F)	133.0	107.5	94.5
LAKE TEMP @ OUTLET (F)	104.0	94.0	85.2

Program : LAKET
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Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.61	688.91	0.00	689.21
TOTAL AREA (ACRE)	80.72	79.61	0.00	80.09
TOTAL VOLUME (ACRE-FT)	309.79	253.94	0.00	278.14
EFFECTIVE AREA (ACRE)	72.65	71.65	0.00	72.08
EFFECTIVE VOL (ACRE-FT)	278.76	228.52	0.00	250.29
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.15	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.01	-1.69	0.00	-1.83
EVAPORATION NATURL (CFS)	-1.28	-1.13	0.00	-1.20
EVAPORATION FORCED (CFS)	-0.73	-0.56	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.11	145.43	0.00	146.59
EVAP LOSS (BTU/HR-FT2)	85.13	76.30	0.00	80.13
COND LOSS (BTU/HR-FT2)	4.10	0.93	0.00	2.30
LAKE TEMP NATURAL (F)	85.92	83.46	0.00	84.52
LAKE TEMP @ INLET (F)	98.17	93.25	0.00	95.38
LAKE TEMP @ OUTLET (F)	86.90	84.51	0.00	85.55
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.71	-5.12	0.00	-9.84
TOTAL EVAP TOT (ACRE-FT)	-51.84	-56.94	0.00	-108.78
TOTAL EVAP NAT (ACRE-FT)	-33.07	-38.13	0.00	-71.20
TOTAL EVAP FOR (ACRE-FT)	-18.77	-18.81	0.00	-37.58
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

	1%	5%	50%
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LAKE TEMP NATURAL (F)	100.0	93.3	84.1
LAKE TEMP @ INLET (F)	133.0	107.5	94.5
LAKE TEMP @ OUTLET (F)	104.0	94.0	85.2

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Case 3c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.5')

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (6181954)	20.00 (6181954)	20.00
LAKE ELEVATION (FEET)	690.00 (6181954)	688.52 (7171954)	689.21
TOTAL AREA (ACRE)	81.34 (6181954)	78.98 (7171954)	80.09
TOTAL VOLUME (ACRE-FT)	341.13 (6181954)	222.77 (7171954)	278.14
EFFECTIVE AREA (ACRE)	73.21 (6181954)	71.09 (7171954)	72.08
EFFECTIVE VOL (ACRE-FT)	306.96 (6181954)	200.48 (7171954)	250.29
CIRCULATION TIME (HR)	0.00 (6181954)	0.00 (6181954)	0.00
PRECIPITATION (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
MAKEUP TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SEEPAGE (CFS)	-0.13 (7171954)	-0.20 (6181954)	-0.17
EVAPORATION TOTAL (CFS)	-0.48 (6291954)	-5.43 (6181954)	-1.83
EVAPORATION NATURL(CFS)	-0.24 (6291954)	-4.14 (6271954)	-1.20
EVAPORATION FORCED(CFS)	-0.15 (7171954)	-2.48 (6181954)	-0.63
BLOWDOWN TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SOLAR GAIN (BTU/HR-FT2)	451.13 (6191954)	90.18 (7071954)	223.80
SURF LOSS (BTU/HR-FT2)	165.58 (6181954)	134.89 (7071954)	146.59
EVAP LOSS (BTU/HR-FT2)	275.61 (6271954)	16.17 (6291954)	80.13
COND LOSS (BTU/HR-FT2)	37.15 (6271954)	-47.13 (7121954)	2.30
LAKE TEMP NATURAL (F)	101.42 (6181954)	73.38 (7071954)	84.52
LAKE TEMP @ INLET (F)	140.00 (6181954)	82.37 (7071954)	95.38
LAKE TEMP @ OUTLET (F)	104.65 (6181954)	73.45 (7071954)	85.55
DISSOLVED SOLIDS (PPM)	0.00 (6181954)	0.00 (6181954)	0.00
QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.03 (7171954)	-0.05 (6181954)	-9.84
TOTAL EVAP TOT (ACRE-FT)	-0.12 (6291954)	-1.35 (6181954)	-108.78
TOTAL EVAP NAT (ACRE-FT)	-0.06 (6291954)	-1.03 (6271954)	-71.20
TOTAL EVAP FOR (ACRE-FT)	-0.04 (7171954)	-0.62 (6181954)	-37.58
TOTAL BLWD TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.0	93.3	84.1
LAKE TEMP @ INLET	(F)	133.0	107.5	94.5
LAKE TEMP @ OUTLET	(F)	104.0	94.0	85.2

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 1
Date : 02/24/2011
Time : 10:27:07.17

Case 4a: LaSalle UHS (09:00, Worst Day Temp; To=104F, 1.0')

1
2 070100 073100 1 1 0 3 2
3 1 0 20.
4 1 0.2 5500. 0
5 6 2 690

690 82.15 381.9 73.94 343.7
689 80.55 300.6 72.49 270.5
688 78.96 220.8 71.06 198.7
687 77.33 142.7 69.60 128.4
686 29.70 71.74 26.73 64.57
685 14.75 50.79 13.28 45.71

7 1 0 3 18 19 20
8 102.74 98.24

999

FPLANT R/I 86.0

TPRISE S/I

35.48

28.95

16.79

16.39

15.42

15.06

14.61

14.36

13.95

13.52

13.36

13.36

13.36

13.30

12.79

12.79

12.50

12.50

12.30

12.09

12.09

12.09

12.09

12.08

11.56

11.56

11.56

11.56
11.56
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11.56
11.56
11.16
11.15

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Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

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Page : 2
Date : 02/24/2011
Time : 10:27:07.17

[illegible]

9.79
9.63
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9.63

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 3
Date : 02/24/2011
Time : 10:27:07.17

[illegible]

9.27
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```
Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26
```

Page : 4
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[illegible]

8.78
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8.61
8.57

Page : 5
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Time : 10:27:07.17

[illegible]

8.57
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Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 6
Date : 02/24/2011
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[illegible]

8.31
8.31
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8.31
8.31
END

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 7
Date : 02/24/2011
Time : 10:27:07.18

Case 4a: LaSalle UHS (09:00, Worst Day Temp; To=104F, 1.0')

RUN 31 DAYS FROM 70100 TO 73100
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	82.150	381.900	73.940	343.700
689.000	80.550	300.600	72.490	270.500
688.000	78.960	220.800	71.060	198.700
687.000	77.330	142.700	69.600	128.400
686.000	29.700	71.740	26.730	64.570
685.000	14.750	50.790	13.280	45.710

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

18 LAKE TEMP NATURAL (F)
19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 102.74 98.24

WEATHER STATION ID 0.

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Date : 02/24/2011
Time : 10:27:07.31

[illegible]

8.940	8.940	8.940	8.940
8.940	8.940	8.940	8.940
8.940	8.940	8.940	8.940
8.810	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.610	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.520
8.310	8.310	8.310	8.310
8.310	8.310	8.310	8.310

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

Page : 9
 Date : 02/24/2011
 Time : 10:27:07.40

Case 4a: LaSalle UHS (09:00, Worst Day Temp; To=104F, 1.0')

SEASONAL SUMMARY FOR SUMMER (6/1900 - 8/1900)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	0.00	689.34	0.00	689.34
TOTAL AREA (ACRE)	0.00	81.10	0.00	81.10
TOTAL VOLUME (ACRE-FT)	0.00	328.51	0.00	328.51
EFFECTIVE AREA (ACRE)	0.00	72.99	0.00	72.99
EFFECTIVE VOL (ACRE-FT)	0.00	295.63	0.00	295.63
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	0.00	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.40	0.00	-1.40
EVAPORATION NATURL (CFS)	0.00	-0.76	0.00	-0.76
EVAPORATION FORCED (CFS)	0.00	-0.63	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	204.97	0.00	204.97
SURF LOSS (BTU/HR-FT2)	0.00	151.30	0.00	151.30
EVAP LOSS (BTU/HR-FT2)	0.00	50.37	0.00	50.37
COND LOSS (BTU/HR-FT2)	0.00	6.88	0.00	6.88
LAKE TEMP NATURAL (F)	0.00	88.87	0.00	88.87
LAKE TEMP @ INLET (F)	0.00	99.69	0.00	99.69
LAKE TEMP @ OUTLET (F)	0.00	89.86	0.00	89.86
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.71	0.00	-10.71
TOTAL EVAP TOT (ACRE-FT)	0.00	-85.89	0.00	-85.89
TOTAL EVAP NAT (ACRE-FT)	0.00	-46.97	0.00	-46.97
TOTAL EVAP FOR (ACRE-FT)	0.00	-38.91	0.00	-38.91
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.0	88.3
LAKE TEMP @ INLET	(F)	132.0	110.0	98.7
LAKE TEMP @ OUTLET	(F)	103.0	97.0	89.4

Program : LAKET
 Number : 03.7.292-2.2 0
 Created : 11/18/2004 08:08:26

Page : 10
 Date : 02/24/2011
 Time : 10:27:07.40

Case 4a: LaSalle UHS (09:00, Worst Day Temp; To=104F, 1.0')

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	0.00	689.34	0.00	689.34
TOTAL AREA (ACRE)	0.00	81.10	0.00	81.10
TOTAL VOLUME (ACRE-FT)	0.00	328.51	0.00	328.51
EFFECTIVE AREA (ACRE)	0.00	72.99	0.00	72.99
EFFECTIVE VOL (ACRE-FT)	0.00	295.63	0.00	295.63
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	0.00	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.40	0.00	-1.40
EVAPORATION NATURL (CFS)	0.00	-0.76	0.00	-0.76
EVAPORATION FORCED (CFS)	0.00	-0.63	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	204.97	0.00	204.97
SURF LOSS (BTU/HR-FT2)	0.00	151.30	0.00	151.30
EVAP LOSS (BTU/HR-FT2)	0.00	50.37	0.00	50.37
COND LOSS (BTU/HR-FT2)	0.00	6.88	0.00	6.88
LAKE TEMP NATURAL (F)	0.00	88.87	0.00	88.87
LAKE TEMP @ INLET (F)	0.00	99.69	0.00	99.69
LAKE TEMP @ OUTLET (F)	0.00	89.86	0.00	89.86
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.71	0.00	-10.71
TOTAL EVAP TOT (ACRE-FT)	0.00	-85.89	0.00	-85.89
TOTAL EVAP NAT (ACRE-FT)	0.00	-46.97	0.00	-46.97
TOTAL EVAP FOR (ACRE-FT)	0.00	-38.91	0.00	-38.91
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.0	88.3
LAKE TEMP @ INLET	(F)	132.0	110.0	98.7
LAKE TEMP @ OUTLET	(F)	103.0	97.0	89.4

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

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 Date : 02/24/2011
 Time : 10:27:07.40

Case 4a: LaSalle UHS (09:00, Worst Day Temp; To=104F, 1.0')

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (7011900)	20.00 (7011900)	20.00
LAKE ELEVATION (FEET)	689.99 (7011900)	688.81 (7311900)	689.34
TOTAL AREA (ACRE)	82.14 (7011900)	80.24 (7311900)	81.10
TOTAL VOLUME (ACRE-FT)	381.31 (7011900)	285.29 (7311900)	328.51
EFFECTIVE AREA (ACRE)	73.93 (7011900)	72.22 (7311900)	72.99
EFFECTIVE VOL (ACRE-FT)	343.17 (7011900)	256.73 (7311900)	295.63
CIRCULATION TIME (HR)	0.00 (7011900)	0.00 (7011900)	0.00
PRECIPITATION (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
MAKEUP TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SEEPAGE (CFS)	-0.15 (7311900)	-0.20 (7011900)	-0.17
EVAPORATION TOTAL (CFS)	-0.26 (7161900)	-4.78 (7021900)	-1.40
EVAPORATION NATURL (CFS)	0.00 (7011900)	-3.60 (7031900)	-0.76
EVAPORATION FORCED (CFS)	-0.26 (7161900)	-2.08 (7011900)	-0.63
BLOWDOWN TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SOLAR GAIN (BTU/HR-FT2)	426.50 (7011900)	97.95 (7041900)	204.97
SURF LOSS (BTU/HR-FT2)	165.49 (7011900)	143.62 (7061900)	151.30
EVAP LOSS (BTU/HR-FT2)	234.70 (7031900)	0.00 (7011900)	50.37
COND LOSS (BTU/HR-FT2)	39.43 (7261900)	-6.87 (7261900)	6.88
LAKE TEMP NATURAL (F)	101.35 (7011900)	81.80 (7061900)	88.87
LAKE TEMP @ INLET (F)	138.41 (7011900)	92.47 (7251900)	99.69
LAKE TEMP @ OUTLET (F)	104.00 (7011900)	82.96 (7061900)	89.86
DISSOLVED SOLIDS (PPM)	0.00 (7011900)	0.00 (7011900)	0.00
QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.04 (7311900)	-0.05 (7011900)	-10.71
TOTAL EVAP TOT (ACRE-FT)	-0.06 (7161900)	-1.18 (7021900)	-85.89
TOTAL EVAP NAT (ACRE-FT)	0.00 (7011900)	-0.89 (7031900)	-46.97
TOTAL EVAP FOR (ACRE-FT)	-0.06 (7161900)	-0.51 (7011900)	-38.91
TOTAL BLWD TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.0	88.3
LAKE TEMP @ INLET	(F)	132.0	110.0	98.7
LAKE TEMP @ OUTLET	(F)	103.0	97.0	89.4

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 1
Date : 02/21/2011
Time : 14:25:17.25

Case 4b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104F, 1.0')

1
2 070100 080500 1 1 0 3 2
3 1 0 20.
4 1 0.2 5500. 0
5 6 2 690

690 82.15 381.9 73.94 343.7
689 80.55 300.6 72.49 270.5
688 78.96 220.8 71.06 198.7
687 77.33 142.7 69.60 128.4
686 29.70 71.74 26.73 64.57
685 14.75 50.79 13.28 45.71

7 1 0 3 18 19 20
8 103.02 98.52

999
FPLANT R/I 86.0
TPRISE S/I

35.48
28.95
16.79
16.39
15.42
15.06
14.61
14.36
13.95
13.52
13.36
13.36
13.36
13.30
12.79
12.79
12.50
12.50
12.30
12.09
12.09
12.09
12.09
12.08
11.56
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11.56
11.16
11.15

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 2
Date : 02/21/2011
Time : 14:25:17.25

11.15
11.15
11.15
10.95
10.94
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9.81
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9.63

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 3
Date : 02/21/2011
Time : 14:25:17.25

[illegible]

9.27
9.27
9.27
9.27
9.27
9.27

```
Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26
```

Page : 4
Date : 02/21/2011
Time : 14:25:17.25

[illegible]

8.78
8.78
8.78
8.78
8.61
8.57

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 5
Date : 02/21/2011
Time : 14:25:17.25

[illegible]

8.57
8.57
8.57
8.57
8.57
8.57

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 6
Date : 02/21/2011
Time : 14:25:17.25

[illegible]

8.31
8.31
8.31
8.31
8.31
8.31
END

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

Page : 7
Date : 02/21/2011
Time : 14:25:17.25

Case 4b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104F, 1.0')

RUN 36 DAYS FROM 70100 TO 80500
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	82.150	381.900	73.940	343.700
689.000	80.550	300.600	72.490	270.500
688.000	78.960	220.800	71.060	198.700
687.000	77.330	142.700	69.600	128.400
686.000	29.700	71.740	26.730	64.570
685.000	14.750	50.790	13.280	45.710

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

18 LAKE TEMP NATURAL (F)
19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 103.02 98.52

WEATHER STATION ID 0.

Page : 8
Date : 02/21/2011
Time : 14:25:17.25

[illegible]

[illegible]

Program : LAKET
 Number : 03.7.292-2.2 0
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Case 4b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104F, 1.0')

SEASONAL SUMMARY FOR SUMMER (6/1900 - 8/1900)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.27	688.54	689.17
TOTAL AREA (ACRE)	0.00	80.98	79.82	80.82
TOTAL VOLUME (ACRE-FT)	0.00	322.70	264.07	314.56
EFFECTIVE AREA (ACRE)	0.00	72.88	71.84	72.74
EFFECTIVE VOL (ACRE-FT)	0.00	290.40	237.63	283.07
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.14	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.64	-1.33	-1.59
EVAPORATION NATURL (CFS)	0.00	-0.98	-0.76	-0.95
EVAPORATION FORCED (CFS)	0.00	-0.65	-0.56	-0.64
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR-FT2)	0.00	153.68	152.29	153.49
EVAP LOSS (BTU/HR-FT2)	0.00	64.97	51.32	63.07
COND LOSS (BTU/HR-FT2)	0.00	5.42	5.16	5.38
LAKE TEMP NATURAL (F)	0.00	91.01	89.78	90.84
LAKE TEMP @ INLET (F)	0.00	101.58	98.83	101.20
LAKE TEMP @ OUTLET (F)	0.00	91.75	90.57	91.59
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.53	-1.41	-11.95
TOTAL EVAP TOT (ACRE-FT)	0.00	-100.60	-13.14	-113.75
TOTAL EVAP NAT (ACRE-FT)	0.00	-60.49	-7.59	-68.07
TOTAL EVAP FOR (ACRE-FT)	0.00	-40.12	-5.56	-45.67
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.2	90.9
LAKE TEMP @ INLET	(F)	132.0	110.6	100.9
LAKE TEMP @ OUTLET	(F)	103.0	98.1	91.7

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Case 4b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104F, 1.0')

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.27	688.54	689.17
TOTAL AREA (ACRE)	0.00	80.98	79.82	80.82
TOTAL VOLUME (ACRE~FT)	0.00	322.70	264.07	314.56
EFFECTIVE AREA (ACRE)	0.00	72.88	71.84	72.74
EFFECTIVE VOL (ACRE~FT)	0.00	290.40	237.63	283.07
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.14	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.64	-1.33	-1.59
EVAPORATION NATURL (CFS)	0.00	-0.98	-0.76	-0.95
EVAPORATION FORCED (CFS)	0.00	-0.65	-0.56	-0.64
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR~FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR~FT2)	0.00	153.68	152.29	153.49
EVAP LOSS (BTU/HR~FT2)	0.00	64.97	51.32	63.07
COND LOSS (BTU/HR~FT2)	0.00	5.42	5.16	5.38
LAKE TEMP NATURAL (F)	0.00	91.01	89.78	90.84
LAKE TEMP @ INLET (F)	0.00	101.58	98.83	101.20
LAKE TEMP @ OUTLET (F)	0.00	91.75	90.57	91.59
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE~FT)	0.00	-10.53	-1.41	-11.95
TOTAL EVAP TOT (ACRE~FT)	0.00	-100.60	-13.14	-113.75
TOTAL EVAP NAT (ACRE~FT)	0.00	-60.49	-7.59	-68.07
TOTAL EVAP FOR (ACRE~FT)	0.00	-40.12	-5.56	-45.67
TOTAL BLWD TOT (ACRE~FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.2	90.9
LAKE TEMP @ INLET	(F)	132.0	110.6	100.9
LAKE TEMP @ OUTLET	(F)	103.0	98.1	91.7

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Case 4b: LaSalle UHS (09:00, Worst 5/1/30 Day Temp; To=104F, 1.0')

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (7011900)	20.00 (7011900)	20.00
LAKE ELEVATION (FEET)	689.99 (7011900)	688.45 (8051900)	689.17
TOTAL AREA (ACRE)	82.13 (7011900)	79.67 (8051900)	80.82
TOTAL VOLUME (ACRE-FT)	381.11 (7011900)	256.19 (8051900)	314.56
EFFECTIVE AREA (ACRE)	73.93 (7011900)	71.69 (8051900)	72.74
EFFECTIVE VOL (ACRE-FT)	342.99 (7011900)	230.54 (8051900)	283.07
CIRCULATION TIME (HR)	0.00 (7011900)	0.00 (7011900)	0.00
PRECIPITATION (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
MAKEUP TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SEEPAGE (CFS)	-0.14 (8051900)	-0.20 (7011900)	-0.17
EVAPORATION TOTAL (CFS)	-0.29 (8051900)	-4.06 (7051900)	-1.59
EVAPORATION NATURL(CFS)	0.00 (7031900)	-2.73 (7051900)	-0.95
EVAPORATION FORCED(CFS)	-0.25 (7311900)	-1.84 (7011900)	-0.64
BLOWDOWN TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SOLAR GAIN (BTU/HR-FT2)	430.59 (7191900)	101.21 (7221900)	219.16
SURF LOSS (BTU/HR-FT2)	165.45 (7011900)	142.91 (7241900)	153.49
EVAP LOSS (BTU/HR-FT2)	178.35 (7051900)	0.00 (7031900)	63.07
COND LOSS (BTU/HR-FT2)	26.10 (7051900)	-31.35 (7251900)	5.38
LAKE TEMP NATURAL (F)	101.31 (7011900)	81.13 (7241900)	90.84
LAKE TEMP @ INLET (F)	137.91 (7011900)	90.55 (7241900)	101.20
LAKE TEMP @ OUTLET (F)	104.00 (7011900)	82.04 (7241900)	91.59
DISSOLVED SOLIDS (PPM)	0.00 (7011900)	0.00 (7011900)	0.00
QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL MKUP TOT(ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.03 (8051900)	-0.05 (7011900)	-11.95
TOTAL EVAP TOT(ACRE-FT)	-0.07 (8051900)	-1.01 (7051900)	-113.75
TOTAL EVAP NAT(ACRE-FT)	0.00 (7031900)	-0.68 (7051900)	-68.07
TOTAL EVAP FOR(ACRE-FT)	-0.06 (7311900)	-0.46 (7011900)	-45.67
TOTAL BLWD TOT(ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.5	97.2	90.9
LAKE TEMP @ INLET	(F)	132.0	110.6	100.9
LAKE TEMP @ OUTLET	(F)	103.0	98.1	91.7

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Case 4c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.0')

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689 80.55 300.6 72.49 270.5

688 78.96 220.8 71.06 198.7

687 77.33 142.7 69.60 128.4

686 29.70 71.74 26.73 64.57

685 14.75 50.79 13.28 45.71

7 1 0 3 18 19 20

8 102.74 98.24

999

FPLANT R/I 86.0

TPRISE S/I

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[illegible]

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Program : LAKET
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[illegible]

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Program : LAKET
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[illegible]

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END

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Case 4c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.0')

RUN 30 DAYS FROM 61854 TO 71754
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	82.150	381.900	73.940	343.700
689.000	80.550	300.600	72.490	270.500
688.000	78.960	220.800	71.060	198.700
687.000	77.330	142.700	69.600	128.400
686.000	29.700	71.740	26.730	64.570
685.000	14.750	50.790	13.280	45.710

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

18 LAKE TEMP NATURAL (F)
19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 102.74 98.24

WEATHER STATION ID 93822.

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[illegible]

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8.780	8.780	8.780	8.780
8.780	8.780	8.780	8.780
8.780	8.610	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
8.570	8.570	8.570	8.570
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Case 4c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.0')

SEASONAL SUMMARY FOR SUMMER (6/1954 - 8/1954)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.60	688.91	0.00	689.21
TOTAL AREA (ACRE)	81.52	80.40	0.00	80.89
TOTAL VOLUME (ACRE-FT)	349.69	293.35	0.00	317.77
EFFECTIVE AREA (ACRE)	73.37	72.36	0.00	72.80
EFFECTIVE VOL (ACRE-FT)	314.70	263.98	0.00	285.96
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.16	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.04	-1.70	0.00	-1.85
EVAPORATION NATURL (CFS)	-1.31	-1.14	0.00	-1.22
EVAPORATION FORCED (CFS)	-0.73	-0.56	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.36	145.47	0.00	146.72
EVAP LOSS (BTU/HR-FT2)	86.34	76.25	0.00	80.62
COND LOSS (BTU/HR-FT2)	4.41	0.97	0.00	2.46
LAKE TEMP NATURAL (F)	86.14	83.50	0.00	84.64
LAKE TEMP @ INLET (F)	98.38	93.35	0.00	95.53
LAKE TEMP @ OUTLET (F)	87.12	84.58	0.00	85.68
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.76	-5.29	0.00	-10.05
TOTAL EVAP TOT (ACRE-FT)	-52.66	-57.30	0.00	-109.95
TOTAL EVAP NAT (ACRE-FT)	-33.87	-38.48	0.00	-72.35
TOTAL EVAP FOR (ACRE-FT)	-18.78	-18.82	0.00	-37.60
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.0	94.0	84.0
LAKE TEMP @ INLET	(F)	133.0	108.0	94.5
LAKE TEMP @ OUTLET	(F)	104.0	94.0	85.1

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Case 4c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.0')

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.60	688.91	0.00	689.21
TOTAL AREA (ACRE)	81.52	80.40	0.00	80.89
TOTAL VOLUME (ACRE-FT)	349.69	293.35	0.00	317.77
EFFECTIVE AREA (ACRE)	73.37	72.36	0.00	72.80
EFFECTIVE VOL (ACRE-FT)	314.70	263.98	0.00	285.96
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.16	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.04	-1.70	0.00	-1.85
EVAPORATION NATURL (CFS)	-1.31	-1.14	0.00	-1.22
EVAPORATION FORCED (CFS)	-0.73	-0.56	0.00	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.36	145.47	0.00	146.72
EVAP LOSS (BTU/HR-FT2)	86.34	76.25	0.00	80.62
COND LOSS (BTU/HR-FT2)	4.41	0.97	0.00	2.46
LAKE TEMP NATURAL (F)	86.14	83.50	0.00	84.64
LAKE TEMP @ INLET (F)	98.38	93.35	0.00	95.53
LAKE TEMP @ OUTLET (F)	87.12	84.58	0.00	85.68
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.76	-5.29	0.00	-10.05
TOTAL EVAP TOT (ACRE-FT)	-52.66	-57.30	0.00	-109.95
TOTAL EVAP NAT (ACRE-FT)	-33.87	-38.48	0.00	-72.35
TOTAL EVAP FOR (ACRE-FT)	-18.78	-18.82	0.00	-37.60
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.0	94.0	84.0
LAKE TEMP @ INLET	(F)	133.0	108.0	94.5
LAKE TEMP @ OUTLET	(F)	104.0	94.0	85.1

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Case 4c: LaSalle UHS (12:00, Worst 30-day Evaporation; To=104F, 1.0')

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (6181954)	20.00 (6181954)	20.00
LAKE ELEVATION (FEET)	690.00 (6181954)	688.52 (7171954)	689.21
TOTAL AREA (ACRE)	82.14 (6181954)	79.78 (7171954)	80.89
TOTAL VOLUME (ACRE-FT)	381.62 (6181954)	261.88 (7171954)	317.77
EFFECTIVE AREA (ACRE)	73.94 (6181954)	71.80 (7171954)	72.80
EFFECTIVE VOL (ACRE-FT)	343.45 (6181954)	235.66 (7171954)	285.96
CIRCULATION TIME (HR)	0.00 (6181954)	0.00 (6181954)	0.00
PRECIPITATION (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
MAKEUP TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SEEPAGE (CFS)	-0.14 (7171954)	-0.20 (6181954)	-0.17
EVAPORATION TOTAL (CFS)	-0.49 (6291954)	-5.43 (6181954)	-1.85
EVAPORATION NATURL(CFS)	-0.26 (6291954)	-4.11 (6271954)	-1.22
EVAPORATION FORCED(CFS)	-0.16 (7171954)	-2.44 (6181954)	-0.63
BLOWDOWN TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SOLAR GAIN (BTU/HR-FT2)	451.13 (6191954)	90.18 (7071954)	223.80
SURF LOSS (BTU/HR-FT2)	165.64 (6181954)	136.01 (7071954)	146.72
EVAP LOSS (BTU/HR-FT2)	270.89 (6271954)	17.13 (6291954)	80.62
COND LOSS (BTU/HR-FT2)	37.53 (6271954)	-47.07 (7121954)	2.46
LAKE TEMP NATURAL (F)	101.48 (6181954)	74.48 (7071954)	84.64
LAKE TEMP @ INLET (F)	140.00 (6181954)	83.77 (7071954)	95.53
LAKE TEMP @ OUTLET (F)	104.84 (6181954)	74.79 (7071954)	85.68
DISSOLVED SOLIDS (PPM)	0.00 (6181954)	0.00 (6181954)	0.00
QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL MKUP TOT(ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.04 (7171954)	-0.05 (6181954)	-10.05
TOTAL EVAP TOT(ACRE-FT)	-0.12 (6291954)	-1.35 (6181954)	-109.95
TOTAL EVAP NAT(ACRE-FT)	-0.06 (6291954)	-1.02 (6271954)	-72.35
TOTAL EVAP FOR(ACRE-FT)	-0.04 (7171954)	-0.61 (6181954)	-37.60
TOTAL BLWD TOT(ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%

LAKE TEMP NATURAL	(F)	100.0	94.0	84.0
LAKE TEMP @ INLET	(F)	133.0	108.0	94.5
LAKE TEMP @ OUTLET	(F)	104.0	94.0	85.1

Program : LAKET

Number : 03.7.292-2.2 O

Created : 11/18/2004 08:08:26

Page : 1

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Time : 09:37:07.53

Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

1							
2	061854	071754	1	1	0	3	2
3	1	0	20.				
4	1	0.2	5500.	0			
5	6	2	690				

690	83.83	464.9	75.45	418.4
689	82.15	381.9	73.94	343.7
688	80.55	300.5	72.50	270.5
687	78.96	220.8	71.06	198.7
686	77.33	142.6	69.60	128.4
685	29.70	71.7	26.73	65.6

7	1	0	3	19	20	21
8	97.6	93.1				

999

FPLANT R/I 86.0

TPRISE S/I

35.26

28.79

16.68

16.28

15.32

14.97

14.53

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END

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

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Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

RUN 30 DAYS FROM 61854 TO 71754
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	83.830	464.900	75.450	418.400
689.000	82.150	381.900	73.940	343.700
688.000	80.550	300.500	72.500	270.500
687.000	78.960	220.800	71.060	198.700
686.000	77.330	142.600	69.600	128.400
685.000	29.700	71.700	26.730	65.600

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)
21 LAKE TEMP @ DAM (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 97.60 93.10

WEATHER STATION ID 93822.


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Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

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Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

FPLANT			
61854 -	71754	R/I	86.000

[illegible]

8.850	8.850	8.850	8.850
8.850	8.850	8.850	8.850
8.720	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.520	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.440

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

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Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

SEASONAL SUMMARY FOR SUMMER (6/1954 - 8/1954)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	83.19	82.04	0.00	82.54
TOTAL VOLUME (ACRE-FT)	433.37	376.32	0.00	401.04
EFFECTIVE AREA (ACRE)	74.88	73.84	0.00	74.29
EFFECTIVE VOL (ACRE-FT)	390.02	338.68	0.00	360.93
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.19	-0.17	0.00	-0.18
EVAPORATION TOTAL (CFS)	-2.03	-1.72	0.00	-1.85
EVAPORATION NATURL (CFS)	-1.31	-1.16	0.00	-1.23
EVAPORATION FORCED (CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.00	145.52	0.00	146.59
EVAP LOSS (BTU/HR-FT2)	84.28	76.16	0.00	79.68
COND LOSS (BTU/HR-FT2)	4.08	1.01	0.00	2.34
LAKE TEMP NATURAL (F)	85.84	83.56	0.00	84.55
LAKE TEMP @ INLET (F)	98.17	93.43	0.00	95.49
LAKE TEMP @ OUTLET (F)	86.96	84.72	0.00	85.69
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.84	-5.58	0.00	-10.42
TOTAL EVAP TOT (ACRE-FT)	-52.28	-57.83	0.00	-110.11
TOTAL EVAP NAT (ACRE-FT)	-33.73	-39.21	0.00	-72.94
TOTAL EVAP FOR (ACRE-FT)	-18.55	-18.62	0.00	-37.17
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	95.8	92.2	84.1
LAKE TEMP @ INLET (F)	128.0	106.5	94.5
LAKE TEMP @ OUTLET (F)	99.0	92.7	85.2

Program : LAKET
 Number : 03.7.292-2.2 0
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Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	83.19	82.04	0.00	82.54
TOTAL VOLUME (ACRE-FT)	433.37	376.32	0.00	401.04
EFFECTIVE AREA (ACRE)	74.88	73.84	0.00	74.29
EFFECTIVE VOL (ACRE-FT)	390.02	338.68	0.00	360.93
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.19	-0.17	0.00	-0.18
EVAPORATION TOTAL (CFS)	-2.03	-1.72	0.00	-1.85
EVAPORATION NATURL(CFS)	-1.31	-1.16	0.00	-1.23
EVAPORATION FORCED(CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	148.00	145.52	0.00	146.59
EVAP LOSS (BTU/HR-FT2)	84.28	76.16	0.00	79.68
COND LOSS (BTU/HR-FT2)	4.08	1.01	0.00	2.34
LAKE TEMP NATURAL (F)	85.84	83.56	0.00	84.55
LAKE TEMP @ INLET (F)	98.17	93.43	0.00	95.49
LAKE TEMP @ OUTLET (F)	86.96	84.72	0.00	85.69
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT(ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.84	-5.58	0.00	-10.42
TOTAL EVAP TOT(ACRE-FT)	-52.28	-57.83	0.00	-110.11
TOTAL EVAP NAT(ACRE-FT)	-33.73	-39.21	0.00	-72.94
TOTAL EVAP FOR(ACRE-FT)	-18.55	-18.62	0.00	-37.17
TOTAL BLWD TOT(ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

		1%	5%	50%

LAKE TEMP NATURAL	(F)	95.8	92.2	84.1
LAKE TEMP @ INLET	(F)	128.0	106.5	94.5
LAKE TEMP @ OUTLET	(F)	99.0	92.7	85.2

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Case 00ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (6181954)	20.00 (6181954)	20.00
LAKE ELEVATION (FEET)	690.00 (6181954)	688.54 (7171954)	689.23
TOTAL AREA (ACRE)	83.83 (6181954)	81.41 (7171954)	82.54
TOTAL VOLUME (ACRE-FT)	464.67 (6181954)	344.36 (7171954)	401.04
EFFECTIVE AREA (ACRE)	75.45 (6181954)	73.28 (7171954)	74.29
EFFECTIVE VOL (ACRE-FT)	418.19 (6181954)	309.94 (7171954)	360.93
CIRCULATION TIME (HR)	0.00 (6181954)	0.00 (6181954)	0.00
PRECIPITATION (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
MAKEUP TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SEEPAGE (CFS)	-0.15 (7171954)	-0.20 (6181954)	-0.18
EVAPORATION TOTAL (CFS)	-0.54 (6291954)	-5.33 (6271954)	-1.85
EVAPORATION NATURL(CFS)	-0.28 (6221954)	-4.07 (6271954)	-1.23
EVAPORATION FORCED(CFS)	-0.15 (6181954)	-1.92 (6181954)	-0.62
BLOWDOWN TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SOLAR GAIN (BTU/HR-FT2)	451.13 (6191954)	90.18 (7071954)	223.80
SURF LOSS (BTU/HR-FT2)	159.63 (6181954)	137.82 (7071954)	146.59
EVAP LOSS (BTU/HR-FT2)	262.99 (6271954)	17.98 (6221954)	79.68
COND LOSS (BTU/HR-FT2)	37.83 (6271954)	-46.87 (7121954)	2.34
LAKE TEMP NATURAL (F)	96.31 (6181954)	76.25 (7071954)	84.55
LAKE TEMP @ INLET (F)	134.81 (6181954)	85.65 (7071954)	95.49
LAKE TEMP @ OUTLET (F)	99.95 (6181954)	76.80 (7071954)	85.69
DISSOLVED SOLIDS (PPM)	0.00 (6181954)	0.00 (6181954)	0.00

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.04 (7171954)	-0.05 (6181954)	-10.42
TOTAL EVAP TOT (ACRE-FT)	-0.13 (6291954)	-1.32 (6271954)	-110.11
TOTAL EVAP NAT (ACRE-FT)	-0.07 (6221954)	-1.01 (6271954)	-72.94
TOTAL EVAP FOR (ACRE-FT)	-0.04 (6181954)	-0.48 (6181954)	-37.17
TOTAL BLWD TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

		1%	5%	50%

LAKE TEMP NATURAL	(F)	95.8	92.2	84.1
LAKE TEMP @ INLET	(F)	128.0	106.5	94.5
LAKE TEMP @ OUTLET	(F)	99.0	92.7	85.2

Created : 11/18/2004 08:08:26

Time : 09:41:26.34

Case 06ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate)

1								
2	061854	071754	1	1	0	3	2	
3	1	0	20.					
4	1	0.2	5500.	0				
5	6	2	690					
	690	82.99	423.5	74.69	381.2			
	689	81.35	341.4	73.21	307.2			
	688	79.75	260.8	71.78	234.7			
	687	78.15	181.9	70.34	163.7			
	686	29.70	102.2	26.73	92.0			
	685	22.22	60.0	20.00	54.0			
7	1	0	3	19	20	21		
8	97.4	92.9						

999

FPLANT R/I 86.0

TPRISE S/I

35.26

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END

Program : LAKET
Number : 03.7.292-2.2 0
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Case 06ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

RUN 30 DAYS FROM 61854 TO 71754
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	82.990	423.500	74.690	381.200
689.000	81.350	341.400	73.210	307.200
688.000	79.750	260.800	71.780	234.700
687.000	78.150	181.900	70.340	163.700
686.000	29.700	102.200	26.730	92.000
685.000	22.220	60.000	20.000	54.000

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)
21 LAKE TEMP @ DAM (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 97.40 92.90

WEATHER STATION ID 93822.

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[illegible]

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

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 Date : 04/07/2006
 Time : 09:41:26.35

Case 06ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

SEASONAL SUMMARY FOR SUMMER (6/1954 - 8/1954)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	82.37	81.24	0.00	81.73
TOTAL VOLUME (ACRE-FT)	392.37	335.79	0.00	360.30
EFFECTIVE AREA (ACRE)	74.13	73.11	0.00	73.55
EFFECTIVE VOL (ACRE-FT)	353.14	302.16	0.00	324.25
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.19	-0.16	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.00	-1.70	0.00	-1.83
EVAPORATION NATURL(CFS)	-1.28	-1.15	0.00	-1.21
EVAPORATION FORCED(CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	147.84	145.50	0.00	146.51
EVAP LOSS (BTU/HR-FT2)	83.54	76.20	0.00	79.38
COND LOSS (BTU/HR-FT2)	3.88	0.99	0.00	2.24
LAKE TEMP NATURAL (F)	85.70	83.53	0.00	84.47
LAKE TEMP @ INLET (F)	97.97	93.35	0.00	95.35
LAKE TEMP @ OUTLET (F)	86.77	84.64	0.00	85.57
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.81	-5.46	0.00	-10.27
TOTAL EVAP TOT (ACRE-FT)	-51.65	-57.47	0.00	-109.12
TOTAL EVAP NAT (ACRE-FT)	-33.10	-38.85	0.00	-71.95
TOTAL EVAP FOR (ACRE-FT)	-18.55	-18.62	0.00	-37.17
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

		1%	5%	50%

LAKE TEMP NATURAL	(F)	95.8	92.2	84.0
LAKE TEMP @ INLET	(F)	128.0	106.0	94.4
LAKE TEMP @ OUTLET	(F)	99.0	92.3	85.1

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Case 06ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	82.37	81.24	0.00	81.73
TOTAL VOLUME (ACRE~FT)	392.37	335.79	0.00	360.30
EFFECTIVE AREA (ACRE)	74.13	73.11	0.00	73.55
EFFECTIVE VOL (ACRE~FT)	353.14	302.16	0.00	324.25
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.19	-0.16	0.00	-0.17
EVAPORATION TOTAL (CFS)	-2.00	-1.70	0.00	-1.83
EVAPORATION NATURL(CFS)	-1.28	-1.15	0.00	-1.21
EVAPORATION FORCED(CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	147.84	145.50	0.00	146.51
EVAP LOSS (BTU/HR-FT2)	83.54	76.20	0.00	79.38
COND LOSS (BTU/HR-FT2)	3.88	0.99	0.00	2.24
LAKE TEMP NATURAL (F)	85.70	83.53	0.00	84.47
LAKE TEMP @ INLET (F)	97.97	93.35	0.00	95.35
LAKE TEMP @ OUTLET (F)	86.77	84.64	0.00	85.57
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE~FT)	-4.81	-5.46	0.00	-10.27
TOTAL EVAP TOT (ACRE~FT)	-51.65	-57.47	0.00	-109.12
TOTAL EVAP NAT (ACRE~FT)	-33.10	-38.85	0.00	-71.95
TOTAL EVAP FOR (ACRE~FT)	-18.55	-18.62	0.00	-37.17
TOTAL BLWD TOT (ACRE~FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	95.8	92.2	84.0
LAKE TEMP @ INLET (F)	128.0	106.0	94.4
LAKE TEMP @ OUTLET (F)	99.0	92.3	85.1

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Case 06ev: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprat

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (6181954)	20.00 (6181954)	20.00
LAKE ELEVATION (FEET)	690.00 (6181954)	688.54 (7171954)	689.23
TOTAL AREA (ACRE)	82.99 (6181954)	80.61 (7171954)	81.73
TOTAL VOLUME (ACRE-FT)	423.27 (6181954)	304.09 (7171954)	360.30
EFFECTIVE AREA (ACRE)	74.69 (6181954)	72.55 (7171954)	73.55
EFFECTIVE VOL (ACRE-FT)	381.00 (6181954)	273.64 (7171954)	324.25
CIRCULATION TIME (HR)	0.00 (6181954)	0.00 (6181954)	0.00
PRECIPITATION (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
MAKEUP TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SEEPAGE (CFS)	-0.15 (7171954)	-0.20 (6181954)	-0.17
EVAPORATION TOTAL (CFS)	-0.52 (6291954)	-5.34 (6271954)	-1.83
EVAPORATION NATURL(CFS)	-0.27 (6221954)	-4.09 (6271954)	-1.21
EVAPORATION FORCED(CFS)	-0.14 (6181954)	-1.97 (6181954)	-0.62
BLOWDOWN TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SOLAR GAIN (BTU/HR-FT2)	451.13 (6191954)	90.18 (7071954)	223.80
SURF LOSS (BTU/HR-FT2)	159.72 (6181954)	137.02 (7071954)	146.51
EVAP LOSS (BTU/HR-FT2)	266.48 (6271954)	17.56 (6221954)	79.38
COND LOSS (BTU/HR-FT2)	37.73 (6271954)	-46.97 (7121954)	2.24
LAKE TEMP NATURAL (F)	96.39 (6181954)	75.47 (7071954)	84.47
LAKE TEMP @ INLET (F)	134.78 (6181954)	84.76 (7071954)	95.35
LAKE TEMP @ OUTLET (F)	99.96 (6181954)	75.91 (7071954)	85.57
DISSOLVED SOLIDS (PPM)	0.00 (6181954)	0.00 (6181954)	0.00

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL MKUP TOT(ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.04 (7171954)	-0.05 (6181954)	-10.27
TOTAL EVAP TOT(ACRE-FT)	-0.13 (6291954)	-1.32 (6271954)	-109.12
TOTAL EVAP NAT(ACRE-FT)	-0.07 (6221954)	-1.01 (6271954)	-71.95
TOTAL EVAP FOR(ACRE-FT)	-0.04 (6181954)	-0.49 (6181954)	-37.17
TOTAL BLWD TOT(ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

	1%	5%	50%
LAKE TEMP NATURAL (F)	95.8	92.2	84.0
LAKE TEMP @ INLET (F)	128.0	106.0	94.4
LAKE TEMP @ OUTLET (F)	99.0	92.3	85.1

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Case 18e: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate

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4	1	0.2	5500.	0					
5	6	2	690						
	690	81.35	341.4	73.21	307.2				
	689	79.75	260.8	71.78	234.7				
	688	78.15	181.9	70.34	163.7				
	687	29.70	102.2	26.73	92.0				
	686	22.22	60.0	20.00	54.0				
	685	13.42	43.8	12.08	39.4				
7	1	0	3	19	20	21			
8	96.8	92.3							
999									
FPLANT	R/I	86.0							
TPRISE	S/I								
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END

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Case 18e: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate

RUN 30 DAYS FROM 61854 TO 71754
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	81.350	341.400	73.210	307.200
689.000	79.750	260.800	71.780	234.700
688.000	78.150	181.900	70.340	163.700
687.000	29.700	102.200	26.730	92.000
686.000	22.220	60.000	20.000	54.000
685.000	13.420	43.800	12.080	39.400

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)
21 LAKE TEMP @ DAM (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 96.80 92.30

WEATHER STATION ID 93822.

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[illegible]

8.850	8.850	8.850	8.850
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8.720	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.700	8.700	8.700
8.700	8.520	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
8.490	8.490	8.490	8.490
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Case 18e: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate

SEASONAL SUMMARY FOR SUMMER (6/1954 - 8/1954)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	80.75	79.64	0.00	80.12
TOTAL VOLUME (ACRE-FT)	311.10	255.47	0.00	279.57
EFFECTIVE AREA (ACRE)	72.67	71.68	0.00	72.11
EFFECTIVE VOL (ACRE-FT)	279.94	229.90	0.00	251.58
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.15	0.00	-0.17
EVAPORATION TOTAL (CFS)	-1.95	-1.68	0.00	-1.80
EVAPORATION NATURL (CFS)	-1.23	-1.13	0.00	-1.18
EVAPORATION FORCED (CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	147.50	145.43	0.00	146.33
EVAP LOSS (BTU/HR-FT2)	81.97	76.30	0.00	78.76
COND LOSS (BTU/HR-FT2)	3.45	0.93	0.00	2.02
LAKE TEMP NATURAL (F)	85.38	83.46	0.00	84.29
LAKE TEMP @ INLET (F)	97.62	93.16	0.00	95.09
LAKE TEMP @ OUTLET (F)	86.44	84.50	0.00	85.34
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	-4.73	-5.15	0.00	-9.89
TOTAL EVAP TOT (ACRE-FT)	-50.36	-56.78	0.00	-107.14
TOTAL EVAP NAT (ACRE-FT)	-31.83	-38.14	0.00	-69.97
TOTAL EVAP FOR (ACRE-FT)	-18.53	-18.64	0.00	-37.17
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	96.0	91.7	84.1
LAKE TEMP @ INLET (F)	128.0	105.5	94.4
LAKE TEMP @ OUTLET (F)	99.0	92.6	85.2

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Case 18e: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	20.00	20.00	0.00	20.00
LAKE ELEVATION (FEET)	689.62	688.93	0.00	689.23
TOTAL AREA (ACRE)	80.75	79.64	0.00	80.12
TOTAL VOLUME (ACRE~FT)	311.10	255.47	0.00	279.57
EFFECTIVE AREA (ACRE)	72.67	71.68	0.00	72.11
EFFECTIVE VOL (ACRE~FT)	279.94	229.90	0.00	251.58
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	-0.18	-0.15	0.00	-0.17
EVAPORATION TOTAL (CFS)	-1.95	-1.68	0.00	-1.80
EVAPORATION NATURL (CFS)	-1.23	-1.13	0.00	-1.18
EVAPORATION FORCED (CFS)	-0.72	-0.55	0.00	-0.62
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	226.40	221.82	0.00	223.80
SURF LOSS (BTU/HR-FT2)	147.50	145.43	0.00	146.33
EVAP LOSS (BTU/HR-FT2)	81.97	76.30	0.00	78.76
COND LOSS (BTU/HR-FT2)	3.45	0.93	0.00	2.02
LAKE TEMP NATURAL (F)	85.38	83.46	0.00	84.29
LAKE TEMP @ INLET (F)	97.62	93.16	0.00	95.09
LAKE TEMP @ OUTLET (F)	86.44	84.50	0.00	85.34
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE~FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE~FT)	-4.73	-5.15	0.00	-9.89
TOTAL EVAP TOT (ACRE~FT)	-50.36	-56.78	0.00	-107.14
TOTAL EVAP NAT (ACRE~FT)	-31.83	-38.14	0.00	-69.97
TOTAL EVAP FOR (ACRE~FT)	-18.53	-18.64	0.00	-37.17
TOTAL BLWD TOT (ACRE~FT)	0.00	0.00	0.00	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

	1%	5%	50%

LAKE TEMP NATURAL (F)	96.0	91.7	84.1
LAKE TEMP @ INLET (F)	128.0	105.5	94.4
LAKE TEMP @ OUTLET (F)	99.0	92.6	85.2

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Case 18e: LaSalle UHS (Updated Worst 30-Day Evap; Ti=97.6F @ 1200; power uprate

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (6181954)	20.00 (6181954)	20.00
LAKE ELEVATION (FEET)	690.00 (6181954)	688.54 (7171954)	689.23
TOTAL AREA (ACRE)	81.35 (6181954)	79.01 (7171954)	80.12
TOTAL VOLUME (ACRE-FT)	341.18 (6181954)	224.36 (7171954)	279.57
EFFECTIVE AREA (ACRE)	73.21 (6181954)	71.11 (7171954)	72.11
EFFECTIVE VOL (ACRE-FT)	307.00 (6181954)	201.91 (7171954)	251.58
CIRCULATION TIME (HR)	0.00 (6181954)	0.00 (6181954)	0.00
PRECIPITATION (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
MAKEUP TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SEEPAGE (CFS)	-0.14 (7171954)	-0.20 (6181954)	-0.17
EVAPORATION TOTAL (CFS)	-0.48 (6291954)	-5.39 (6271954)	-1.80
EVAPORATION NATURL (CFS)	-0.24 (6291954)	-4.14 (6271954)	-1.18
EVAPORATION FORCED (CFS)	-0.14 (6181954)	-2.08 (6181954)	-0.62
BLOWDOWN TOTAL (CFS)	0.00 (6181954)	0.00 (6181954)	0.00
SOLAR GAIN (BTU/HR-FT2)	451.13 (6191954)	90.18 (7071954)	223.80
SURF LOSS (BTU/HR-FT2)	159.94 (6181954)	134.94 (7071954)	146.33
EVAP LOSS (BTU/HR-FT2)	275.39 (6271954)	16.21 (6291954)	78.76
COND LOSS (BTU/HR-FT2)	37.16 (6271954)	-47.13 (7121954)	2.02
LAKE TEMP NATURAL (F)	96.58 (6181954)	73.43 (7071954)	84.29
LAKE TEMP @ INLET (F)	134.67 (6181954)	82.31 (7071954)	95.09
LAKE TEMP @ OUTLET (F)	99.96 (6181954)	73.50 (7071954)	85.34
DISSOLVED SOLIDS (PPM)	0.00 (6181954)	0.00 (6181954)	0.00

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.03 (7171954)	-0.05 (6181954)	-9.89
TOTAL EVAP TOT (ACRE-FT)	-0.12 (6291954)	-1.34 (6271954)	-107.14
TOTAL EVAP NAT (ACRE-FT)	-0.06 (6291954)	-1.03 (6271954)	-69.97
TOTAL EVAP FOR (ACRE-FT)	-0.03 (6181954)	-0.52 (6181954)	-37.17
TOTAL BLWD TOT (ACRE-FT)	0.00 (6181954)	0.00 (6181954)	0.00

TEMPERATURE FREQUENCY OF OCCURENCES

		1%	5%	50%

LAKE TEMP NATURAL	(F)	96.0	91.7	84.1
LAKE TEMP @ INLET	(F)	128.0	105.5	94.4
LAKE TEMP @ OUTLET	(F)	99.0	92.6	85.2

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Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

1								
2	070100	080500	1	1	0	3	2	
3	1	0	20					
4	1	0.2	5500.	0				
5	6	2	690					

690	82.99	423.5	74.69	381.2
689	81.35	341.4	73.21	307.2
688	79.75	260.8	71.78	234.7
687	78.15	181.9	70.34	163.7
686	29.70	102.2	26.73	92.0
685	22.22	60.0	20.00	54.0

7	1	0	3	19	20	21
8	97.5	93.0				

999

FPLANT R/I 86.0

TPRISE S/I

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[illegible]

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END

Program : LAKET
Number : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26

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Date : 04/07/2006
Time : 09:56:32.71

Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

RUN 36 DAYS FROM 70100 TO 80500
PLOT FILE OPTION : 1 CYCLE FLAG: 1 CIRCULATION TIME FLAG: 0
TIME INCREMENT : 3 TIME UNITS: 2

WEATHER FILE OPTION: 1 ANEMOMETER HEIGHT OPTION: 0 ANEMOMETER HEIGHT 20.00

DENSITY: 62.40 SEEPAGE: 0.20 LAKE LENGTH: 5500.00

LAKE ELEVATION OPTION = 2 INITIAL LAKE ELEVATION = 690.00

DRAWDOWN CURVE

ELEVATION	TOTAL AREA	TOTAL VOLUME	EFF AREA	EFF VOLUME
690.000	82.990	423.500	74.690	381.200
689.000	81.350	341.400	73.210	307.200
688.000	79.750	260.800	71.780	234.700
687.000	78.150	181.900	70.340	163.700
686.000	29.700	102.200	26.730	92.000
685.000	22.220	60.000	20.000	54.000

PLOT FILE FREQUENCY 1 (NUMBER OF TIME STEPS)
PLOT FILE FORMAT 0 (0-EXCEL/1-ACGRACE)
NUMBER OF VARIABLES FOR PLOT FILE: 3

PLOT VARIABLES:

19 LAKE TEMP @ INLET (F)
20 LAKE TEMP @ OUTLET (F)
21 LAKE TEMP @ DAM (F)

INITIAL FORCED/NATURAL LAKE TEMPS. = 97.50 93.00

WEATHER STATION ID 0.

```
Program : LAKET
Number  : 03.7.292-2.2 0
Created : 11/18/2004 08:08:26
```

Page : 8
Date : 04/07/2006
Time : 09:56:32.71

Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

FPLANT			
70100 -	80500	R/I	86.000

[illegible]

[illegible]

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

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 Date : 04/07/2006
 Time : 09:56:32.75

Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

SEASONAL SUMMARY FOR SUMMER (6/1900 - 8/1900)

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.29	688.57	689.19
TOTAL AREA (ACRE)	0.00	81.83	80.66	81.67
TOTAL VOLUME (ACRE-FT)	0.00	365.53	306.60	357.34
EFFECTIVE AREA (ACRE)	0.00	73.65	72.59	73.50
EFFECTIVE VOL (ACRE-FT)	0.00	328.96	275.90	321.59
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.15	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.62	-1.32	-1.58
EVAPORATION NATURL (CFS)	0.00	-0.97	-0.77	-0.94
EVAPORATION FORCED (CFS)	0.00	-0.64	-0.55	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR-FT2)	0.00	153.43	152.11	153.24
EVAP LOSS (BTU/HR-FT2)	0.00	63.62	50.87	61.85
COND LOSS (BTU/HR-FT2)	0.00	5.18	5.08	5.16
LAKE TEMP NATURAL (F)	0.00	90.79	89.62	90.63
LAKE TEMP @ INLET (F)	0.00	101.45	98.76	101.08
LAKE TEMP @ OUTLET (F)	0.00	91.70	90.57	91.54
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.76	-1.48	-12.23
TOTAL EVAP TOT (ACRE-FT)	0.00	-99.48	-13.08	-112.56
TOTAL EVAP NAT (ACRE-FT)	0.00	-59.82	-7.60	-67.42
TOTAL EVAP FOR (ACRE-FT)	0.00	-39.66	-5.48	-45.14
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

		1%	5%	50%
LAKE TEMP NATURAL	(F)	97.0	95.9	90.9
LAKE TEMP @ INLET	(F)	128.0	109.4	100.9
LAKE TEMP @ OUTLET	(F)	99.0	97.1	91.9

Program : LAKET
 Number : 03.7.292-2.2 O
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 Time : 09:56:32.75

Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

CUMULATIVE SEASONAL SUMMARY: SUMMER

QUANTITY	MONTHLY AVERAGES			AVERAGE VALUE
	JUN	JUL	AUG	
ANEMOMETER HEIGHT (FT)	0.00	20.00	20.00	20.00
LAKE ELEVATION (FEET)	0.00	689.29	688.57	689.19
TOTAL AREA (ACRE)	0.00	81.83	80.66	81.67
TOTAL VOLUME (ACRE-FT)	0.00	365.53	306.60	357.34
EFFECTIVE AREA (ACRE)	0.00	73.65	72.59	73.50
EFFECTIVE VOL (ACRE-FT)	0.00	328.96	275.90	321.59
CIRCULATION TIME (HR)	0.00	0.00	0.00	0.00
PRECIPITATION (CFS)	0.00	0.00	0.00	0.00
MAKEUP TOTAL (CFS)	0.00	0.00	0.00	0.00
SEEPAGE (CFS)	0.00	-0.17	-0.15	-0.17
EVAPORATION TOTAL (CFS)	0.00	-1.62	-1.32	-1.58
EVAPORATION NATURL (CFS)	0.00	-0.97	-0.77	-0.94
EVAPORATION FORCED (CFS)	0.00	-0.64	-0.55	-0.63
BLOWDOWN TOTAL (CFS)	0.00	0.00	0.00	0.00
SOLAR GAIN (BTU/HR-FT2)	0.00	219.94	214.31	219.16
SURF LOSS (BTU/HR-FT2)	0.00	153.43	152.11	153.24
EVAP LOSS (BTU/HR-FT2)	0.00	63.62	50.87	61.85
COND LOSS (BTU/HR-FT2)	0.00	5.18	5.08	5.16
LAKE TEMP NATURAL (F)	0.00	90.79	89.62	90.63
LAKE TEMP @ INLET (F)	0.00	101.45	98.76	101.08
LAKE TEMP @ OUTLET (F)	0.00	91.70	90.57	91.54
DISSOLVED SOLIDS (PPM)	0.00	0.00	0.00	0.00

QUANTITY	MONTHLY TOTALS			TOTAL VALUE
	JUN	JUL	AUG	
TOTAL PRECIP (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00	0.00	0.00	0.00
TOTAL SEEPAGE (ACRE-FT)	0.00	-10.76	-1.48	-12.23
TOTAL EVAP TOT (ACRE-FT)	0.00	-99.48	-13.08	-112.56
TOTAL EVAP NAT (ACRE-FT)	0.00	-59.82	-7.60	-67.42
TOTAL EVAP FOR (ACRE-FT)	0.00	-39.66	-5.48	-45.14
TOTAL BLWD TOT (ACRE-FT)	0.00	0.00	0.00	0.00

TEMPERATURE

FREQUENCY OF OCCURENCES

	1%	5%	50%
<hr/>			
LAKE TEMP NATURAL (F)	97.0	95.9	90.9
LAKE TEMP @ INLET (F)	128.0	109.4	100.9
LAKE TEMP @ OUTLET (F)	99.0	97.1	91.9

Program : LAKET
 Number : 03.7.292-2.2 O
 Created : 11/18/2004 08:08:26

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 Time : 09:56:32.75

Case 0609: LaSalle UHS (Updated Worst 36-Day Temp; Ti=97.7F @0900; power uprate

TOTAL CUMULATIVE SUMMARY

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	AVERAGE VALUE
ANEMOMETER HEIGHT (FT)	20.00 (7011900)	20.00 (7011900)	20.00
LAKE ELEVATION (FEET)	689.99 (7011900)	688.47 (8051900)	689.19
TOTAL AREA (ACRE)	82.98 (7011900)	80.50 (8051900)	81.67
TOTAL VOLUME (ACRE-FT)	422.94 (7011900)	298.69 (8051900)	357.34
EFFECTIVE AREA (ACRE)	74.68 (7011900)	72.45 (8051900)	73.50
EFFECTIVE VOL (ACRE-FT)	380.69 (7011900)	268.78 (8051900)	321.59
CIRCULATION TIME (HR)	0.00 (7011900)	0.00 (7011900)	0.00
PRECIPITATION (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
MAKEUP TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SEEPAGE (CFS)	-0.15 (8051900)	-0.20 (7011900)	-0.17
EVAPORATION TOTAL (CFS)	-0.32 (8051900)	-4.06 (7051900)	-1.58
EVAPORATION NATURL(CFS)	0.00 (7031900)	-2.67 (7051900)	-0.94
EVAPORATION FORCED(CFS)	-0.26 (7311900)	-1.53 (7011900)	-0.63
BLOWDOWN TOTAL (CFS)	0.00 (7011900)	0.00 (7011900)	0.00
SOLAR GAIN (BTU/HR-FT2)	430.59 (7191900)	101.21 (7221900)	219.16
SURF LOSS (BTU/HR-FT2)	161.26 (7041900)	143.56 (7241900)	153.24
EVAP LOSS (BTU/HR-FT2)	172.30 (7051900)	0.00 (7031900)	61.85
COND LOSS (BTU/HR-FT2)	24.99 (7051900)	-31.64 (7251900)	5.16
LAKE TEMP NATURAL (F)	97.72 (7041900)	81.75 (7241900)	90.63
LAKE TEMP @ INLET (F)	132.96 (7011900)	91.00 (7241900)	101.08
LAKE TEMP @ OUTLET (F)	99.98 (7011900)	82.51 (7241900)	91.54
DISSOLVED SOLIDS (PPM)	0.00 (7011900)	0.00 (7011900)	0.00

QUANTITY	MAXIMUM VALUE (DATE)	MINIMUM VALUE (DATE)	TOTAL VALUE
TOTAL PRECIP (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL MKUP TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00
TOTAL SEEPAGE (ACRE-FT)	-0.04 (8051900)	-0.05 (7011900)	-12.23
TOTAL EVAP TOT (ACRE-FT)	-0.08 (8051900)	-1.01 (7051900)	-112.56
TOTAL EVAP NAT (ACRE-FT)	0.00 (7031900)	-0.66 (7051900)	-67.42
TOTAL EVAP FOR (ACRE-FT)	-0.07 (7311900)	-0.38 (7011900)	-45.14
TOTAL BLWD TOT (ACRE-FT)	0.00 (7011900)	0.00 (7011900)	0.00

TEMPERATURE		FREQUENCY OF OCCURENCES		
		1%	5%	50%
LAKE TEMP NATURAL	(F)	97.0	95.9	90.9
LAKE TEMP @ INLET	(F)	128.0	109.4	100.9
LAKE TEMP @ OUTLET	(F)	99.0	97.1	91.9

11.0 PURPOSE/OBJECTIVE

The purpose of this attachment is to evaluate the UHS transient analyses with an allowable plant intake temperature of 104°F and an increased allowable plant intake temperature of 107°F for MUR PU and EPU power levels. Additionally, new weather data from January 1995 to September 2010 is considered in prediction of the UHS temperature response. The initial lake temperature is adjusted such that the plant intake temperature remains below 104°F or 107°F during the accident scenario.

12.0 METHODOLOGY AND ACCEPTANCE CRITERIA

The S&L LAKET-PC computer program [Ref. I5.2] is utilized to determine the combined impact of decay heat, initial UHS temperature, and allowable sediment accumulation in the UHS. The maximum allowable UHS temperature is determined for average sediment accumulations of zero (0), six (6), twelve (12), and eighteen (18) inches.

12.1 Methodology

- 12.1.1 Selection of Weather Data - The selection of the most limiting weather data is done in Attachment M. The worst weather day was determined to be 7/25/2001 ending at 6:00 AM and the worst weather month runs from 7/21/1995 4:00PM to 8/20/1995 3:00PM. The most limiting net evaporation month was determined to be from 6/18/1954 to 7/18/1954, which is unchanged from previous revisions of this calculation.
- 12.1.2 Lake Area and Volume - The initial lake elevation is 690-ft, which corresponds to the top water elevation of the UHS per the UFSAR [Ref. I5.1]. However, UFSAR Section 9.2.6.3 [Ref. I5.1] states that 440,400 gallons of water from the UHS must be available for fire fighting following an accident (Design Input I4.3). Assuming that this inventory is removed from the UHS immediately following an accident (Assumption I3.2) leads to a decrease in the initial lake elevation of 690-ft and lake volume and area. 440,400 gallons corresponds to 1.35 acre-ft of water and a 0.02-ft drop in lake elevation. The initial lake level in the LAKET file is modified to incorporate these changes as shown in Table I2-1. The volume at an elevation of 689.98-ft is determined by subtracting the 1.35 acre-ft used in fire-fighting from the lake volume at 690-ft. The surface area is determined by interpolation using the information given in Table 7.1 of the main body of this calculation. The effective volume and effective area are determined by multiplying the volume and surface area by the effective volume and effective area percentages determined in Attachment J (effective volume is 63.4% of total volume and effective area is 57.9% of total area).

Table I2-1: Initial Lake Level

Sediment Level	Lake Elevation (ft)	Area (acre)	Volume (acre-ft)	Effective Area (acre)	Effective Volume (acre-ft)
18-in	689.98	81.32	340.0	47.08	215.59
12-in	689.98	82.12	380.5	47.55	241.24
6-in	689.98	82.96	422.1	48.03	267.64
0-in	689.98	83.80	463.5	48.52	293.89

The remainder of the drawdown curve (from a lake elevation of 689-ft through 685-ft) remains the same as given in Table 7.1 of the main body of this calculation with respect to the total lake volume and surface area. The effective volume and effective area are updated using the percentages determined in Attachment J.

- 12.1.3 Plant Temperature Rise - The UHS heat load is increased due to an increase in power level. In addition, the core decay heat is changed as a result of EPU [Ref. I5.3] The new heat load on the UHS for EPU operation is determined in L-002453 [Ref. I5.4]. The plant temperature rise is dependent on the UHS heat load, and the calculation of the new plant temperature rise at MUR PU and EPU is documented in Attachment L.
- 12.1.4 LAKET Case Runs - For the worst weather cases (cases ending with the letter a), the initial temperature for each case is iteratively set until the lake outlet temperature is equal to the maximum allowable lake outlet temperature (either 104°F or 107°F). The net evaporation cases use the same input file as the corresponding worst weather case, but are run with the most limiting net evaporation month weather file. A list of all cases run for this analysis is shown below:

Table I2-2: List of LAKET Cases

Case	Type	Power Level (MW _e)	Sediment Level	Design Criteria
1a	Worst Weather	4067 (EPU)	0"	Plant Inlet Temp = 107°F
1c	Worst Net Evaporation	4067 (EPU)	0"	Initial Temp of Case 1a
2a	Worst Weather	4067 (EPU)	6"	Plant Inlet Temp = 107°F
2c	Worst Net Evaporation	4067 (EPU)	6"	Initial Temp of Case 2a
3a_12am	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_3am	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_6am	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_9am	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_12pm	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_3pm	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_6pm	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3a_9pm	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 107°F
3c	Worst Net Evaporation	4067 (EPU)	18"	Initial Temp of Case 3a at 6AM
4a	Worst Weather	4067 (EPU)	12"	Plant Inlet Temp = 107°F
4c	Worst Net Evaporation	4067 (EPU)	12"	Initial Temp of Case 4a
1a_104F	Worst Weather	4067 (EPU)	0"	Plant Inlet Temp = 104°F
1c_104F	Worst Net Evaporation	4067 (EPU)	0"	Initial Temp of Case 1a_104F
2a_104F	Worst Weather	4067 (EPU)	6"	Plant Inlet Temp = 104°F
3a_104F	Worst Weather	4067 (EPU)	18"	Plant Inlet Temp = 104°F
4a_104F	Worst Weather	4067 (EPU)	12"	Plant Inlet Temp = 104°F
1a_MUR	Worst Weather	3559 (MUR PU)	0"	Plant Inlet Temp = 107°F
1c_MUR	Worst Net Evaporation	3559 (MUR PU)	0"	Initial Temp of Case 1a_MUR
2a_MUR	Worst Weather	3559 (MUR PU)	6"	Plant Inlet Temp = 107°F
3a_MUR	Worst Weather	3559 (MUR PU)	18"	Plant Inlet Temp = 107°F
4a_MUR	Worst Weather	3559 (MUR PU)	12"	Plant Inlet Temp = 107°F
1a_MUR_104F	Worst Weather	3559 (MUR PU)	0"	Plant Inlet Temp = 104°F

Case	Type	Power Level (MW _e)	Sediment Level	Design Criteria
1c_MUR_104F	Worst Net Evaporation	3559 (MUR PU)	0"	Initial Temp of Case 1a_MUR_104F
2a_MUR_104F	Worst Weather	3559 (MUR PU)	6"	Plant Inlet Temp = 104°F
3a_MUR_104F	Worst Weather	3559 (MUR PU)	18"	Plant Inlet Temp = 104°F
4a_MUR_104F	Worst Weather	3559 (MUR PU)	12"	Plant Inlet Temp = 104°F

Cases are run at varying times for the most limiting case, Case 3a. The purpose of this is to determine at which time an accident would provide the most limiting results. For all other cases besides Case 3a, only the time determined to be the most limiting will be used.

For EPU power level and a maximum allowable lake temperature of 107°F, the worst net evaporation cases are run for all levels of sediment. The worst case in terms of UHS drawdown is determined from the four different sediment levels, and the remainder of the worst evaporation cases are run at this sediment level only.

I2.2 Acceptance Criteria

I2.2.1 Acceptance Criterion #1 - Peak Temperature - The maximum plant inlet temperature from the UHS shall remain equal to or less than 104°F or 107°F.

I2.2.2 Acceptance Criterion #2 - UHS Drawdown - There are no specific acceptance criteria for maximum UHS lake drawdown. However, for the worst 30-day evaporation period, the maximum lake drawdown is determined for input to calculation L-001355 [Ref. I5.6].

I2.3 Limitations

Same as main body of calculation.

I2.4 Identification of Computer Programs

Postprocessing of the LAKET-PC results is done using Microsoft Excel® 2003 [Ref. I5.5], which is commercially available. The validation of Excel is implicit in the detailed review of all spreadsheets used in this analysis. All computer runs were performed using PC No. ZD6661 under the Windows XP operating system.

LAKET-PC Version 2.2 [Ref. I5.2] was used to perform the lake transient analysis contained in this evaluation. This was run on S&L PC No. ZD6661 on Windows XP operating system.

13.0 ASSUMPTIONS

- 13.1 Fuel Pool Heat Load – It is assumed that the fuel pool emergency makeup pumps provide required makeup flow to the fuel pools. Including fuel pool heat loads is not realistic because it is improbable that the required operator actions to align the fuel pool emergency makeup pumps to the RHR system could be performed in the post-LOCA reactor building environment [Ref. I5.3]. Therefore, the 600 gpm emergency fuel pool makeup flow rate (See Design Input I4.1) is added to the UHS seepage rate.
- 13.2 UHS Inventory for Fire Fighting – It is assumed that all UHS inventory for fire fighting is used immediately following an accident. This is conservative as it decreases the volume of water in the UHS.
- 13.3 Effective Area and Volume at Different Sediment Levels - The effective area and volume percentages determined in Attachment J are determined for 18-in of sediment. It is assumed that these percentages apply to the other sediment levels analyzed in this evaluation. Since changes in sediment level change the depth of the lake evenly throughout the entire lake (see Section 6.2 of the main body of this calculation), the percentages of effective area and volume will negligibly change with sediment level.
- 13.4 Other - All other assumptions are the same as the assumptions in the main body of calculation.

I4.0 DESIGN INPUT

- I4.1 Spent Fuel Pool Makeup Flow – The emergency fuel pool makeup flow rate is 600 gpm, which corresponds to 300 gpm per unit [Ref. I5.3].
- I4.2 General Seepage Rate – A seepage rate of 0.2 cfs is retained from Design Input 4.3 of the main body of this calculation. This will be added to the spent fuel pool makeup flow (See Assumption I3.1) to determine the total seepage rate of the UHS.
- I4.3 UHS Inventory for Fire Fighting Following an Accident – Following an accident, 440,400 gallons of water from the UHS must be available for fire fighting [Ref. I5.1, Section 9.2.6.3].
- I4.4 Anemometer Height – For the worst net evaporation weather data, which is from the Peoria weather data spanning from 1948 to 1996, the anemometer height is 20-ft (as taken from input files for the worst net evaporation cases in previous revisions). For the worst weather data, which is taken from the LaSalle Station weather data spanning from 1995 to 2010, the anemometer is at a height of 33-ft (See Attachment K).
- I4.5 Other - All other design inputs are the same as the design inputs in the main body of calculation.

15.0 REFERENCES

- 15.1 LaSalle County Station Updated Final Safety Analysis Report (UFSAR), Rev. 19.
- 15.2 LAKET-PC Computer Program, Version 2.2, S&L Program No. 03.7.292-2.2, 12/09/2004. Controlled File Path: \\SNLVS5\SYS3\OPS\$\LAK29222\
- 15.3 SEAG #12-000098, "DIR for LAS-EPU-U1/2-DIR-T0608-1," 4/18/2012.
- 15.4 "UHS Heat Load," Calculation L-002453, Rev. 3, June 2012.
- 15.5 Microsoft® Office Excel 2003 (11.8120.8122) SP2, Copyright 1985-2003 Microsoft Corporation.
- 15.6 L-001355, "LaSalle County Station CSCS Hydraulic Model," Rev. 005A.

I6.0 CALCULATIONS

I6.1 Calculation of Plant Temperature Rise

The CSCS temperature rise across the plant is computed in Attachment L. Changes from the determination of the plant temperature rise in previous revisions of this calculation included a change in the decay heat ratio as a result of EPU, the removal of fuel pool heat loads, and a one-hour time interval between calculations. See Appendix L9.2 of Attachment L for the results of the plant temperature rise at MUR PU and Appendix L9.4 of Attachment L for the plant temperature rise at EPU.

I6.2 Seepage Rate

The seepage rate is determined from a UHS seepage of 0.2 cfs (Design Input I4.2) and a constant flow of 600 gpm for spent fuel pool makeup (See Design Input I4.1). This gives a total seepage rate of 1.537 cfs, which is constant for all cases.

I6.3 Maximum Allowable Lake Temperature

For this analysis, cases are run at MUR PU and EPU power levels. Each case is run with a limiting plant intake temperature of 104°F and 107°F, allowing for a comparison of the maximum allowable UHS temperature at the differing plant intake temperatures. Limiting weather data is determined from two sets of weather data (See Attachment M).

The time of day which the transient is assumed is critical when determining the maximum allowable initial temperature of the UHS. To account for the time of day at which the UHS transient may start, eight start times are used for the limiting sediment depth of 18-in. As seen in Table I7.1, the most limiting time is 6AM (as it results in the lowest allowable initial temperature). Therefore, the remaining worst weather cases are run beginning at 6AM.

In order to determine the limiting amount of sediment, the worst net evaporation case was run at four different sediment levels at EPU power level (Cases 1a, 2a, 3a, and 4a) for a maximum plant inlet temperature of 107°F. The case with no sediment (Case 1a) was determined to be the most limiting (as it resulted in the highest drawdown). Therefore, the remaining worst evaporation cases were run with a sediment level of 0-in.

I6.4 LAKET-PC Files

The S&L LAKET-PC computer program [Ref. I5.2] was utilized to determine the combined impact of decay heat, initial UHS temperature, and allowable sediment accumulation in the UHS. The files used in this analysis are shown in Table I6.1, below.

Table I6.1: LAKET Files

Name	Type	Modified	Size	Ratio	Packed
Case 1a.dat	DAT File	6/21/2012 10:21 AM	5,134	91%	470
Case 1a.out	OUT File	6/21/2012 11:16 AM	104,201	97%	3,159
Case 1a.plt	PLT File	6/21/2012 11:16 AM	435,708	73%	118,789
Case 1a.pltX	PLTX File	6/21/2012 11:16 AM	44,640	78%	9,967
Case 1a_104F.dat	DAT File	6/21/2012 10:22 AM	5,138	91%	472
Case 1a_104F.out	OUT File	6/21/2012 11:18 AM	104,201	97%	3,168
Case 1a_104F.plt	PLT File	6/21/2012 11:18 AM	435,708	73%	118,774
Case 1a_104F.pltX	PLTX File	6/21/2012 11:18 AM	44,640	78%	9,873
Case 1a_MUR.dat	DAT File	5/17/2012 4:29 PM	5,069	91%	475
Case 1a_MUR.out	OUT File	5/17/2012 4:32 PM	104,201	97%	3,175
Case 1a_MUR.plt	PLT File	5/17/2012 4:32 PM	435,708	73%	118,813
Case 1a_MUR.pltX	PLTX File	5/17/2012 4:32 PM	44,640	78%	9,946
Case 1a_MUR_104F.dat	DAT File	5/17/2012 4:30 PM	5,074	91%	480
Case 1a_MUR_104F.out	OUT File	5/17/2012 4:35 PM	104,201	97%	3,176
Case 1a_MUR_104F.plt	PLT File	5/17/2012 4:35 PM	435,708	73%	118,807
Case 1a_MUR_104F.pltX	PLTX File	5/17/2012 4:35 PM	44,640	78%	9,879
Case 1c.dat	DAT File	6/21/2012 10:21 AM	5,143	91%	478
Case 1c.out	OUT File	6/21/2012 11:17 AM	103,572	97%	3,358
Case 1c.plt	PLT File	6/21/2012 11:17 AM	421,692	73%	115,779
Case 1c.pltX	PLTX File	6/21/2012 11:17 AM	52,560	77%	12,348
Case 1c_104F.dat	DAT File	6/21/2012 10:22 AM	5,145	91%	481
Case 1c_104F.out	OUT File	6/21/2012 11:18 AM	103,541	97%	3,349
Case 1c_104F.plt	PLT File	6/21/2012 11:18 AM	421,692	73%	115,769
Case 1c_104F.pltX	PLTX File	6/21/2012 11:18 AM	43,200	76%	10,197
Case 1c_MUR.dat	DAT File	5/22/2012 5:50 PM	5,079	90%	484
Case 1c_MUR.out	OUT File	5/22/2012 5:50 PM	103,572	97%	3,359
Case 1c_MUR.plt	PLT File	5/22/2012 5:50 PM	421,692	73%	115,753
Case 1c_MUR.pltX	PLTX File	5/22/2012 5:50 PM	52,560	76%	12,358
Case 1c_MUR_104F.dat	DAT File	5/22/2012 5:50 PM	5,081	90%	487
Case 1c_MUR_104F.out	OUT File	5/22/2012 5:50 PM	103,541	97%	3,333
Case 1c_MUR_104F.plt	PLT File	5/22/2012 5:50 PM	421,692	73%	115,783
Case 1c_MUR_104F.pltX	PLTX File	5/22/2012 5:50 PM	43,200	76%	10,244
Case 2a.dat	DAT File	6/21/2012 10:21 AM	5,137	91%	474
Case 2a.out	OUT File	6/21/2012 11:17 AM	104,201	97%	3,154
Case 2a.plt	PLT File	6/21/2012 11:17 AM	435,708	73%	118,896
Case 2a.pltX	PLTX File	6/21/2012 11:17 AM	44,640	78%	9,985
Case 2a_104F.dat	DAT File	6/21/2012 10:22 AM	5,140	91%	475
Case 2a_104F.out	OUT File	6/21/2012 11:18 AM	104,201	97%	3,187
Case 2a_104F.plt	PLT File	6/21/2012 11:18 AM	435,708	73%	118,835
Case 2a_104F.pltX	PLTX File	6/21/2012 11:18 AM	44,640	78%	10,007
Case 2a_MUR.dat	DAT File	5/17/2012 4:30 PM	5,072	91%	478
Case 2a_MUR.out	OUT File	5/17/2012 4:32 PM	104,201	97%	3,176
Case 2a_MUR.plt	PLT File	5/17/2012 4:32 PM	435,708	73%	118,932
Case 2a_MUR.pltX	PLTX File	5/17/2012 4:32 PM	44,640	78%	10,011
Case 2a_MUR_104F.dat	DAT File	5/17/2012 4:31 PM	5,077	90%	483
Case 2a_MUR_104F.out	OUT File	5/17/2012 4:35 PM	104,201	97%	3,183
Case 2a_MUR_104F.plt	PLT File	5/17/2012 4:35 PM	435,708	73%	118,914
Case 2a_MUR_104F.pltX	PLTX File	5/17/2012 4:35 PM	44,640	78%	9,969

Table I6.1: LAKET Files (cont.)

Name ▲	Type	Modified	Size	Ratio	Packed
Case2c.dat	DAT File	6/21/2012 10:21 AM	5,144	91%	482
Case2c.out	OUT File	6/21/2012 11:17 AM	103,541	97%	3,346
Case2c.plt	PLT File	6/21/2012 11:17 AM	421,692	73%	115,828
Case2c.pltX	PLTX File	6/21/2012 11:17 AM	43,200	76%	10,261
Case3a_104F.dat	DAT File	6/21/2012 10:23 AM	5,133	91%	469
Case3a_104F.out	OUT File	6/21/2012 11:18 AM	104,201	97%	3,174
Case3a_104F.plt	PLT File	6/21/2012 11:18 AM	435,708	73%	118,968
Case3a_104F.pltX	PLTX File	6/21/2012 11:18 AM	44,640	77%	10,133
Case3a_12am.dat	DAT File	6/22/2012 10:15 AM	5,137	91%	474
Case3a_12am.out	OUT File	6/22/2012 10:16 AM	104,201	97%	3,181
Case3a_12am.plt	PLT File	6/22/2012 10:16 AM	435,708	73%	119,012
Case3a_12am.pltX	PLTX File	6/22/2012 10:16 AM	44,640	77%	10,115
Case3a_12pm.dat	DAT File	6/21/2012 9:49 AM	5,137	91%	476
Case3a_12pm.out	OUT File	6/21/2012 9:50 AM	104,201	97%	3,161
Case3a_12pm.plt	PLT File	6/21/2012 9:50 AM	435,708	73%	119,003
Case3a_12pm.pltX	PLTX File	6/21/2012 9:50 AM	44,640	77%	10,143
Case3a_3am.dat	DAT File	6/21/2012 9:47 AM	5,134	91%	472
Case3a_3am.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,161
Case3a_3am.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,996
Case3a_3am.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,133
Case3a_3pm.dat	DAT File	6/21/2012 9:47 AM	5,134	91%	472
Case3a_3pm.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,159
Case3a_3pm.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,909
Case3a_3pm.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,126
Case3a_6am.dat	DAT File	6/21/2012 9:48 AM	5,135	91%	474
Case3a_6am.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,158
Case3a_6am.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,984
Case3a_6am.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,112
Case3a_6pm.dat	DAT File	6/21/2012 9:48 AM	5,136	91%	475
Case3a_6pm.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,162
Case3a_6pm.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,984
Case3a_6pm.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,088
Case3a_9am.dat	DAT File	6/21/2012 9:48 AM	5,136	91%	473
Case3a_9am.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,166
Case3a_9am.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,983
Case3a_9am.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,082
Case3a_9pm.dat	DAT File	6/21/2012 9:48 AM	5,136	91%	475
Case3a_9pm.out	OUT File	6/21/2012 9:49 AM	104,201	97%	3,163
Case3a_9pm.plt	PLT File	6/21/2012 9:49 AM	435,708	73%	118,954
Case3a_9pm.pltX	PLTX File	6/21/2012 9:49 AM	44,640	77%	10,105
Case3a_MUR.dat	DAT File	5/17/2012 4:30 PM	5,067	91%	478
Case3a_MUR.out	OUT File	5/17/2012 4:33 PM	104,201	97%	3,166
Case3a_MUR.plt	PLT File	5/17/2012 4:33 PM	435,708	73%	118,981
Case3a_MUR.pltX	PLTX File	5/17/2012 4:33 PM	44,640	77%	10,145
Case3a_MUR_104F.dat	DAT File	5/17/2012 4:38 PM	5,070	91%	478
Case3a_MUR_104F.out	OUT File	5/17/2012 4:38 PM	104,201	97%	3,172
Case3a_MUR_104F.plt	PLT File	5/17/2012 4:38 PM	435,708	73%	118,942
Case3a_MUR_104F.pltX	PLTX File	5/17/2012 4:38 PM	44,640	77%	10,124

Table I6.1: LAKET Files (cont.)

Name ▲	Type	Modified	Size	Ratio	Packed
<input checked="" type="checkbox"/> Case3c.dat	DAT File	6/21/2012 10:21 AM	5,138	91%	478
<input checked="" type="checkbox"/> Case3c.out	OUT File	6/21/2012 11:17 AM	103,541	97%	3,327
<input checked="" type="checkbox"/> Case3c.plt	PLT File	6/21/2012 11:17 AM	421,692	72%	115,987
<input checked="" type="checkbox"/> Case3c.pltX	PLTX File	6/21/2012 11:17 AM	43,200	76%	10,334
<input checked="" type="checkbox"/> Case4a.dat	DAT File	6/21/2012 10:22 AM	5,133	91%	467
<input checked="" type="checkbox"/> Case4a.out	OUT File	6/21/2012 11:17 AM	104,201	97%	3,171
<input checked="" type="checkbox"/> Case4a.plt	PLT File	6/21/2012 11:17 AM	435,708	73%	118,931
<input checked="" type="checkbox"/> Case4a.pltX	PLTX File	6/21/2012 11:17 AM	44,640	77%	10,066
<input checked="" type="checkbox"/> Case4a_104F.dat	DAT File	6/21/2012 10:23 AM	5,136	91%	470
<input checked="" type="checkbox"/> Case4a_104F.out	OUT File	6/21/2012 11:18 AM	104,201	97%	3,178
<input checked="" type="checkbox"/> Case4a_104F.plt	PLT File	6/21/2012 11:18 AM	435,708	73%	118,884
<input checked="" type="checkbox"/> Case4a_104F.pltX	PLTX File	6/21/2012 11:18 AM	44,640	77%	10,046
<input checked="" type="checkbox"/> Case4a_MUR.dat	DAT File	5/17/2012 4:30 PM	5,068	91%	477
<input checked="" type="checkbox"/> Case4a_MUR.out	OUT File	5/17/2012 4:33 PM	104,201	97%	3,176
<input checked="" type="checkbox"/> Case4a_MUR.plt	PLT File	5/17/2012 4:33 PM	435,708	73%	118,927
<input checked="" type="checkbox"/> Case4a_MUR.pltX	PLTX File	5/17/2012 4:33 PM	44,640	77%	10,111
<input checked="" type="checkbox"/> Case4a_MUR_104F.dat	DAT File	5/17/2012 4:39 PM	5,071	91%	480
<input checked="" type="checkbox"/> Case4a_MUR_104F.out	OUT File	5/17/2012 4:40 PM	104,201	97%	3,188
<input checked="" type="checkbox"/> Case4a_MUR_104F.plt	PLT File	5/17/2012 4:40 PM	435,708	73%	118,868
<input checked="" type="checkbox"/> Case4a_MUR_104F.pltX	PLTX File	5/17/2012 4:40 PM	44,640	77%	10,102
<input checked="" type="checkbox"/> Case4c.dat	DAT File	6/21/2012 10:22 AM	5,139	91%	475
<input checked="" type="checkbox"/> Case4c.out	OUT File	6/21/2012 11:18 AM	103,541	97%	3,332
<input checked="" type="checkbox"/> Case4c.plt	PLT File	6/21/2012 11:18 AM	421,692	73%	115,829
<input checked="" type="checkbox"/> Case4c.pltX	PLTX File	6/21/2012 11:18 AM	43,200	76%	10,333

I7.0 RESULTS AND CONCLUSIONS**I7.1 Summary**

Table I7.1 provides a summary of the limiting maximum initial lake temperature for the worst weather cases. Table I7.2 provides a summary of the maximum lake drawdown for the worst net evaporation cases.

Table I7.1a: MUR PU (3559 MW_e) Overall Summary for Maximum Temperature

Case	Weather Data	Sediment Level (in.)	Initial Lake Temp. (°F)	Max Plant Inlet Temp. (°F)
1a_MUR	1/30	0	103.63	107.0
2a_MUR	1/30	6	103.32	107.0
3a_MUR	1/30	18	102.46	107.0
4a_MUR	1/30	12	102.93	107.0
1a_MUR_104F	1/30	0	100.30	104.0
2a_MUR_104F	1/30	6	99.95	104.0
3a_MUR_104F	1/30	18	91.68	104.0
4a_MUR_104F	1/30	12	89.54	104.0

Table I7.1b: EPU (4067 MW_e) Overall Summary for Maximum Temperature

Case	Weather Data	Sediment Level (in.)	Initial Lake Temp. (°F)	Max Plant Inlet Temp. (°F)
1a	1/30	0	103.63	107.0
2a	1/30	6	103.32	107.0
3a_12am	1/30	18	104.95	107.0
3a_3am	1/30	18	103.14	106.8 ¹
3a_6am	1/30	18	102.42	107.0
3a_9am	1/30	18	103.61	107.0
3a_12pm	1/30	18	105.80	107.0
3a_3pm	1/30	18	106.97	107.0
3a_6pm	1/30	18	107.00	107.0
3a_9pm	1/30	18	107.00	107.0
4a	1/30	12	102.93	107.0
1a_104F	1/30	0	100.30	104.0
2a_104F	1/30	6	96.80	104.0
3a_104F	1/30	18	87.01	104.0
4a_104F	1/30	12	85.47	104.0

(1) Due to a discontinuity in LAKET, this is as close to 107°F that can be reached.

Table I7.2a: MUR PU Overall Summary for Maximum Evaporation

Case	Weather Data	Sediment Level (in.)	Maximum Drawdown (ft) ¹
1c_MUR	Worst 30-day Evaporation	0	2.24
1c_MUR_104F	Worst 30-day Evaporation	0	2.22

1) Determined from initial lake elevation of 689.98-ft.

Table I7.2b: EPU Overall Summary for Maximum Evaporation

Case	Weather Data	Sediment Level (in.)	Maximum Drawdown (ft) ¹
1c	Worst 30-day Evaporation	0	2.27
2c	Worst 30-day Evaporation	6	2.25
3c	Worst 30-day Evaporation	18	2.20
4c	Worst 30-day Evaporation	12	2.23
1c_104F	Worst 30-day Evaporation	0	2.26

1) Determined from initial lake elevation of 689.98-ft.

Figures I7.1 through I7.8, below, show the plant outlet temperature and plant inlet temperature over the entire 31 day period for the 107°F maximum plant inlet temperature case at MUR PU and EPU. Figures I7.9 and I7.10 show the maximum lake drawdown over the worst 30 days of evaporation weather.

I7.2 Compliance with Acceptance Criteria

I7.2.1 Acceptance Criterion #1 - Peak Temperature – Acceptance Criterion #1 is met provided the plant is operated, monitored, and maintains UHS initial temperatures below the applicable limits per the results listed in Table I7.1.

I7.2.2 Acceptance Criterion #2 - UHS Drawdown – The maximum expected lake drawdown for the cases evaluated is given in Table I7.2. This will be used in calculation L-001355 [Ref. I5.6].

Figure I7.1: Plant Outlet Temperature (MUR PU)

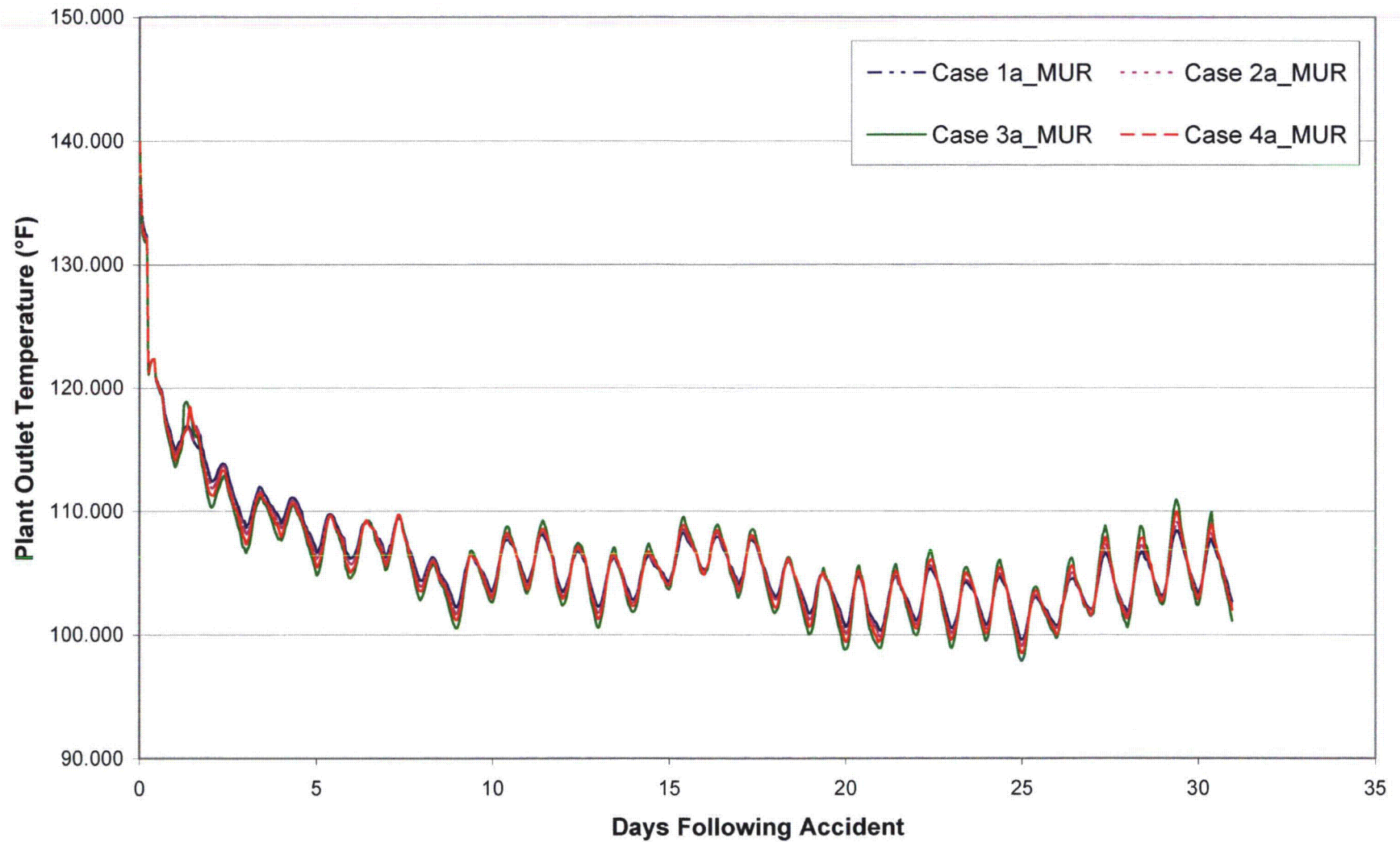


Figure I7.2: Plant Outlet Temperature (EPU)

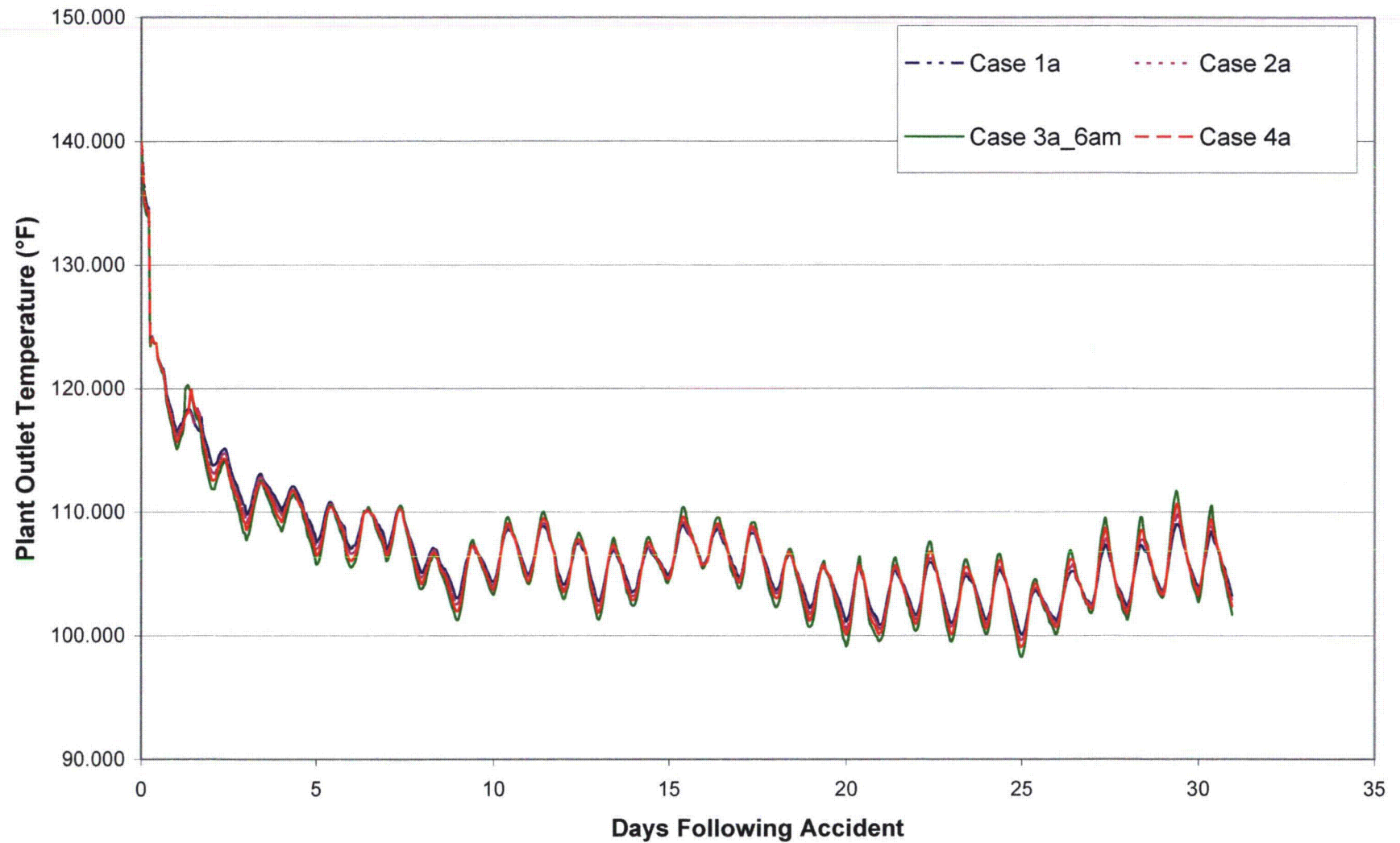


Figure I7.3: Plant Inlet Temperature (MUR PU)

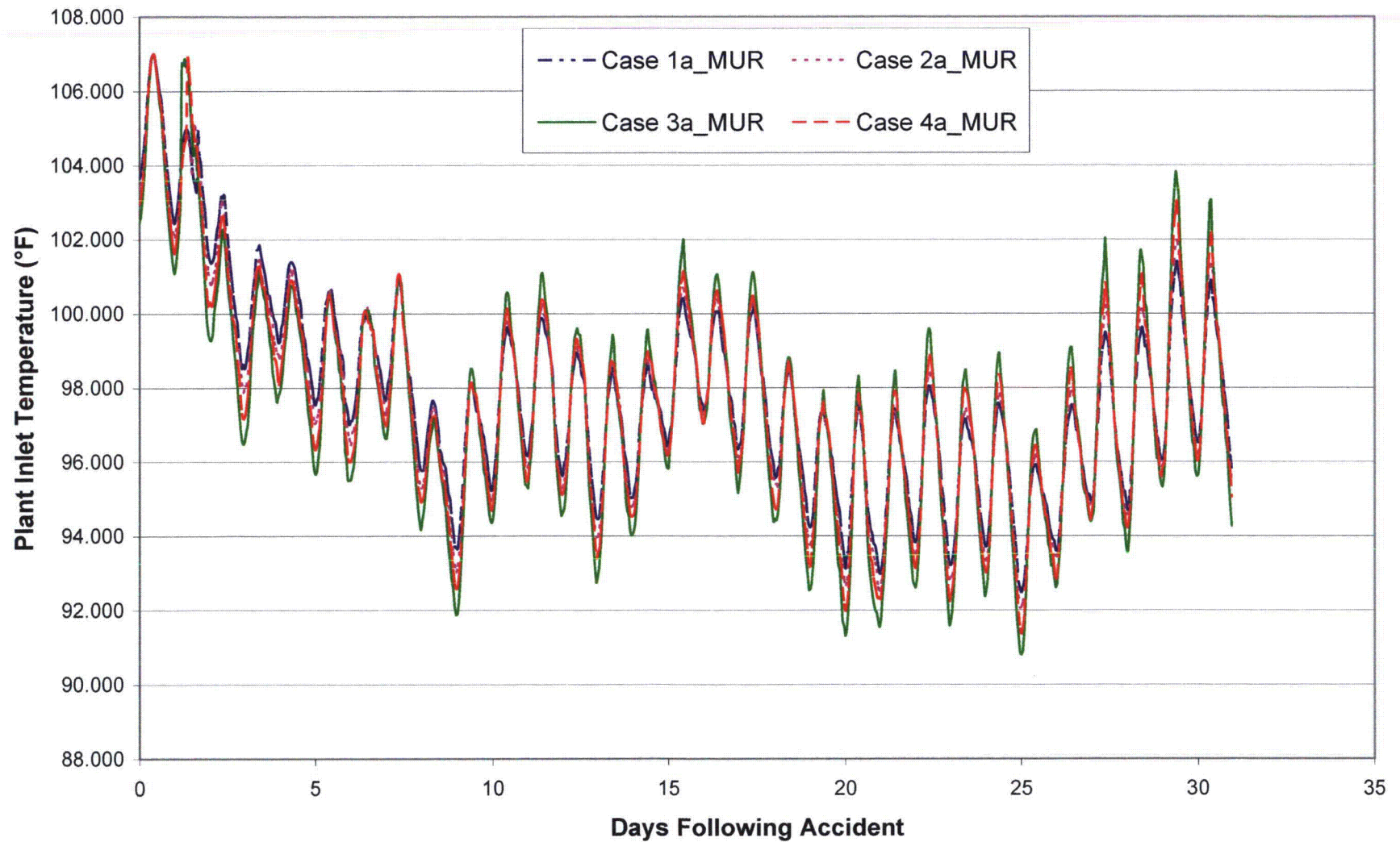


Figure I7.4: Plant Inlet Temperature (EPU)

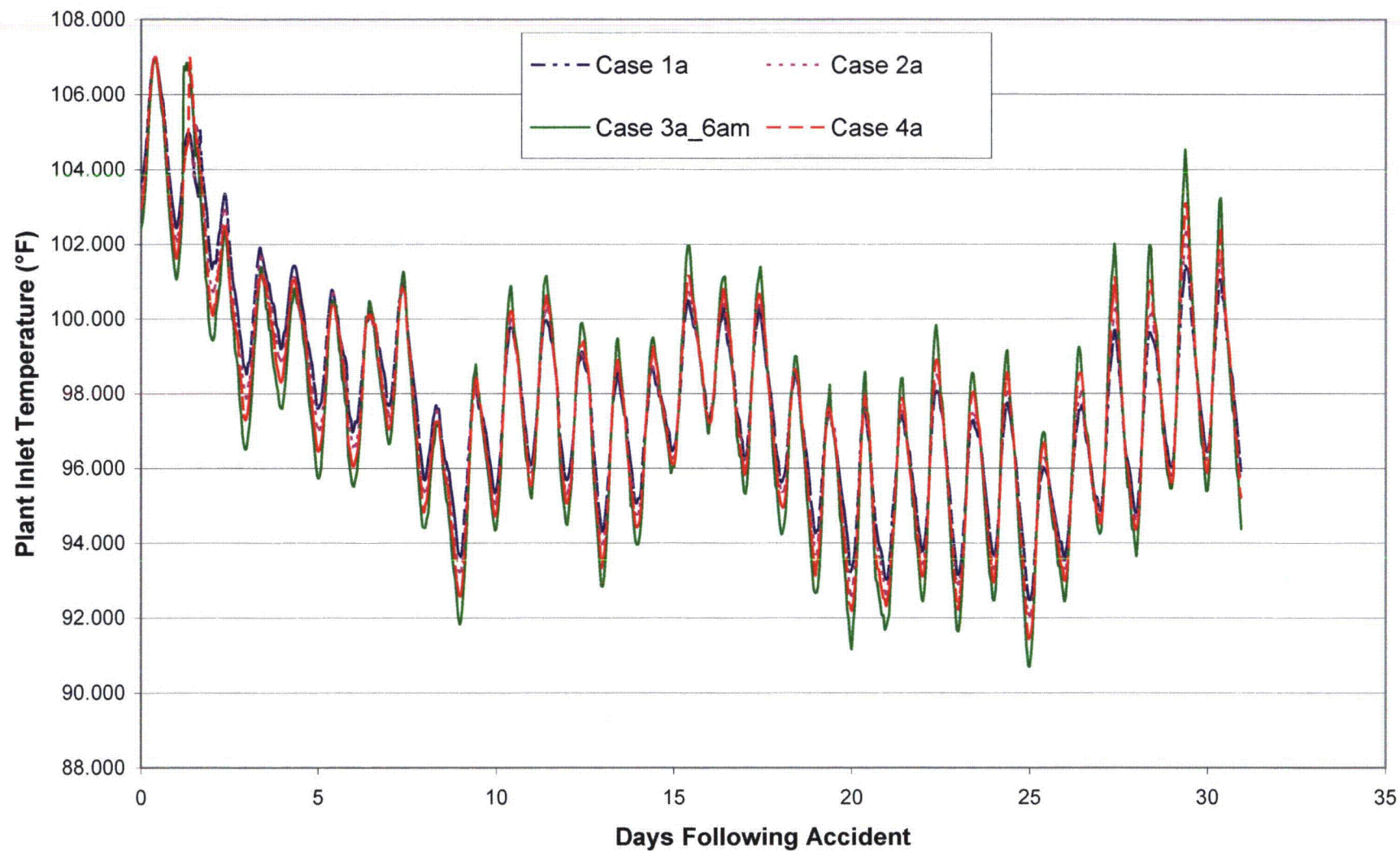


Figure I7.5, Case 3a_MUR: UHS LOCA Temperature Transient
Worst 31-Day Temperature Period
(d = 18", t = 0600 hrs, T_i = 102.46°F)

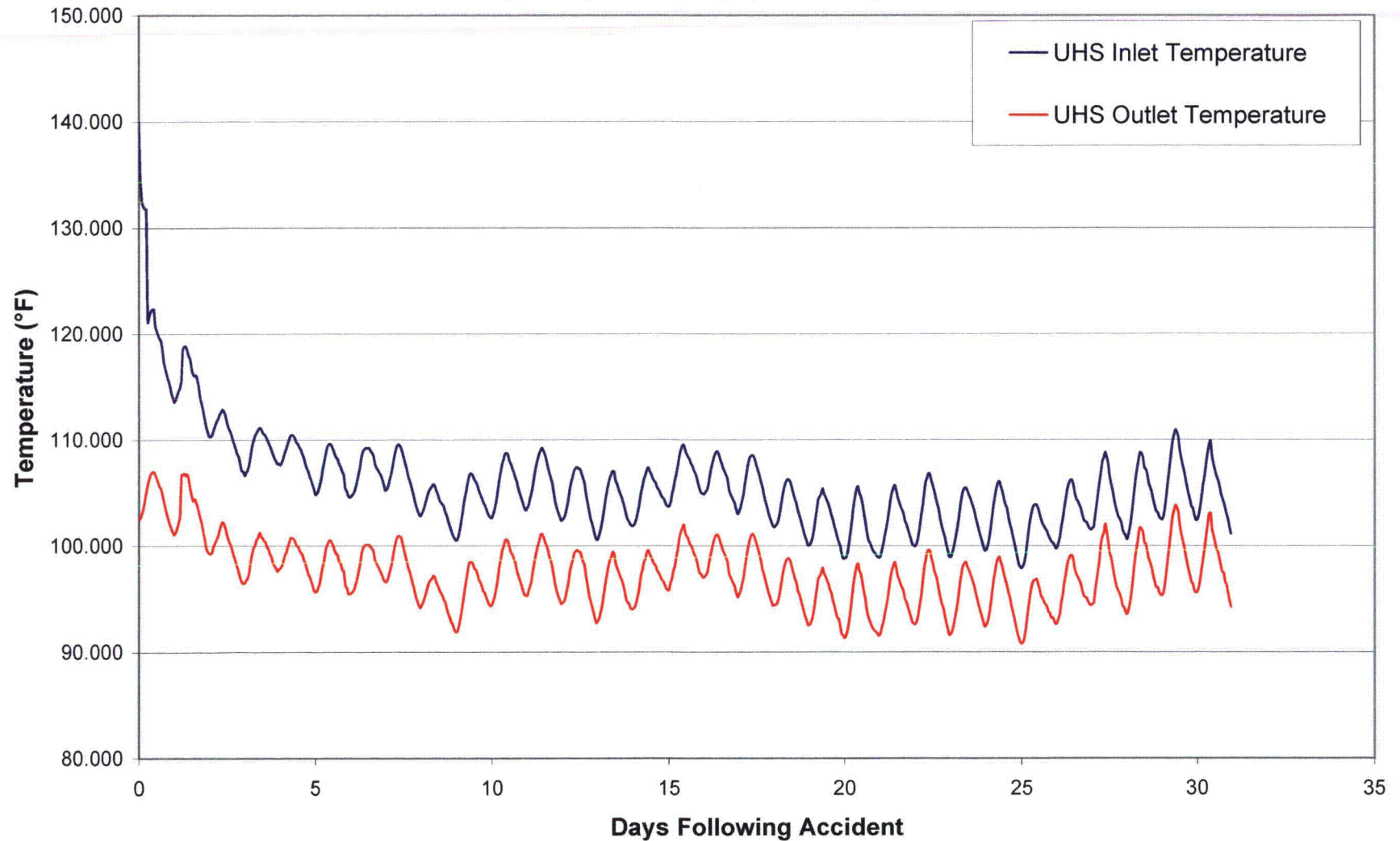


Figure I7.6, Case 4a_MUR: UHS LOCA Temperature Transient
Worst 31-Day Temperature Period
(d = 12", t = 0600 hrs, T_i = 102.93°F)

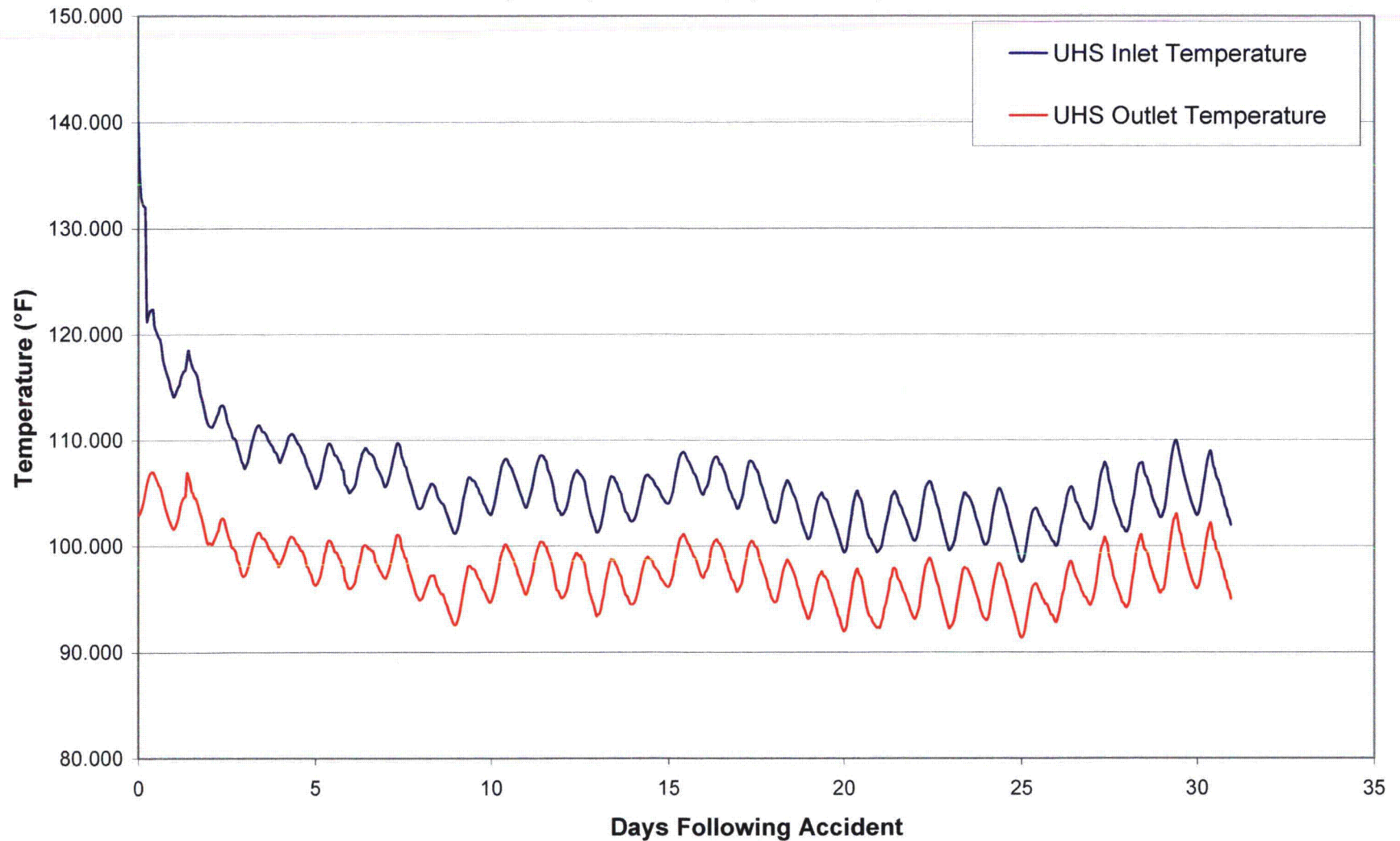


Figure I7.7, Case 3a: UHS LOCA Temperature Transient
Worst 31-Day Temperature Period
(d = 18", t = 0600 hrs, $T_i = 102.43^\circ\text{F}$)

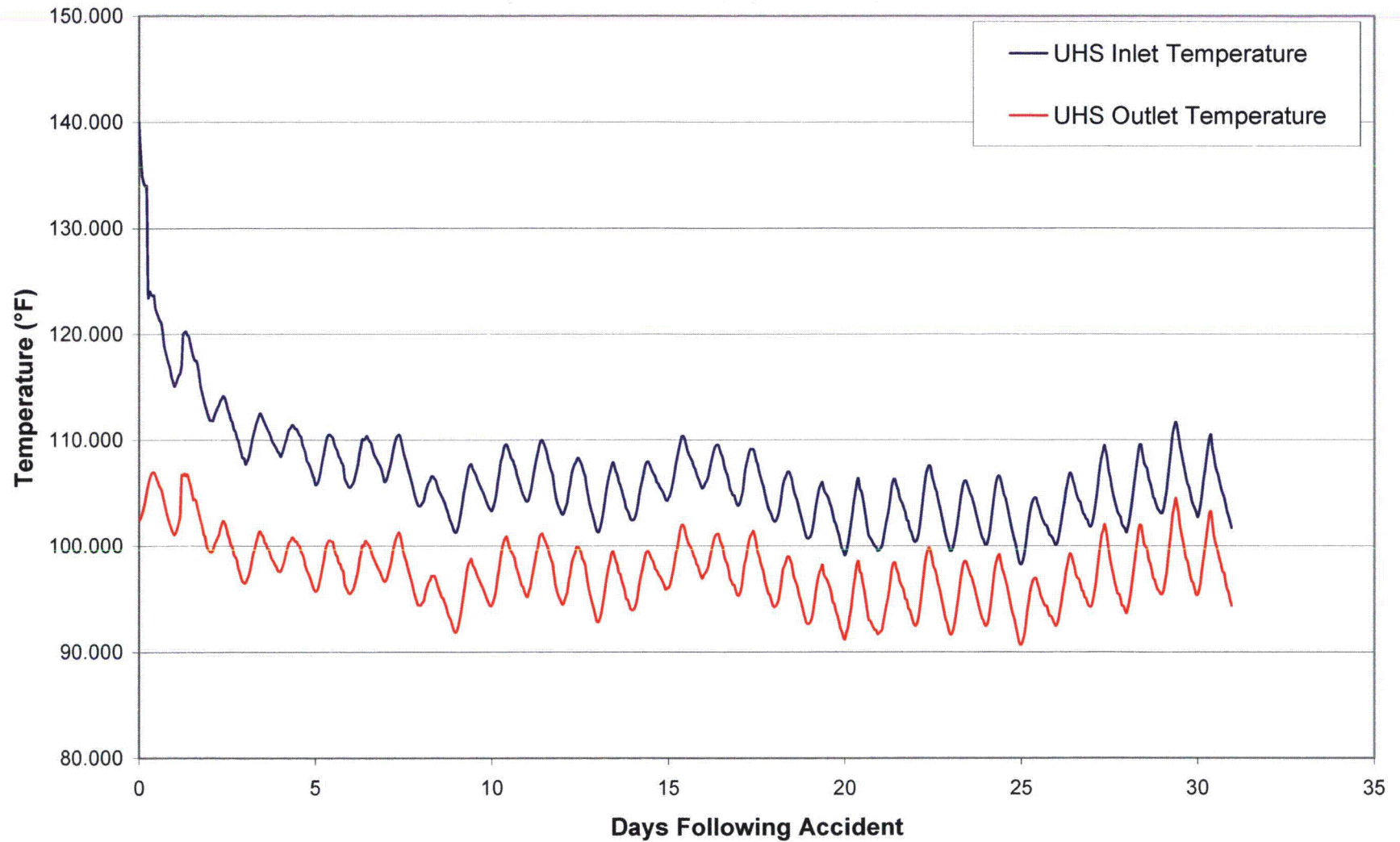
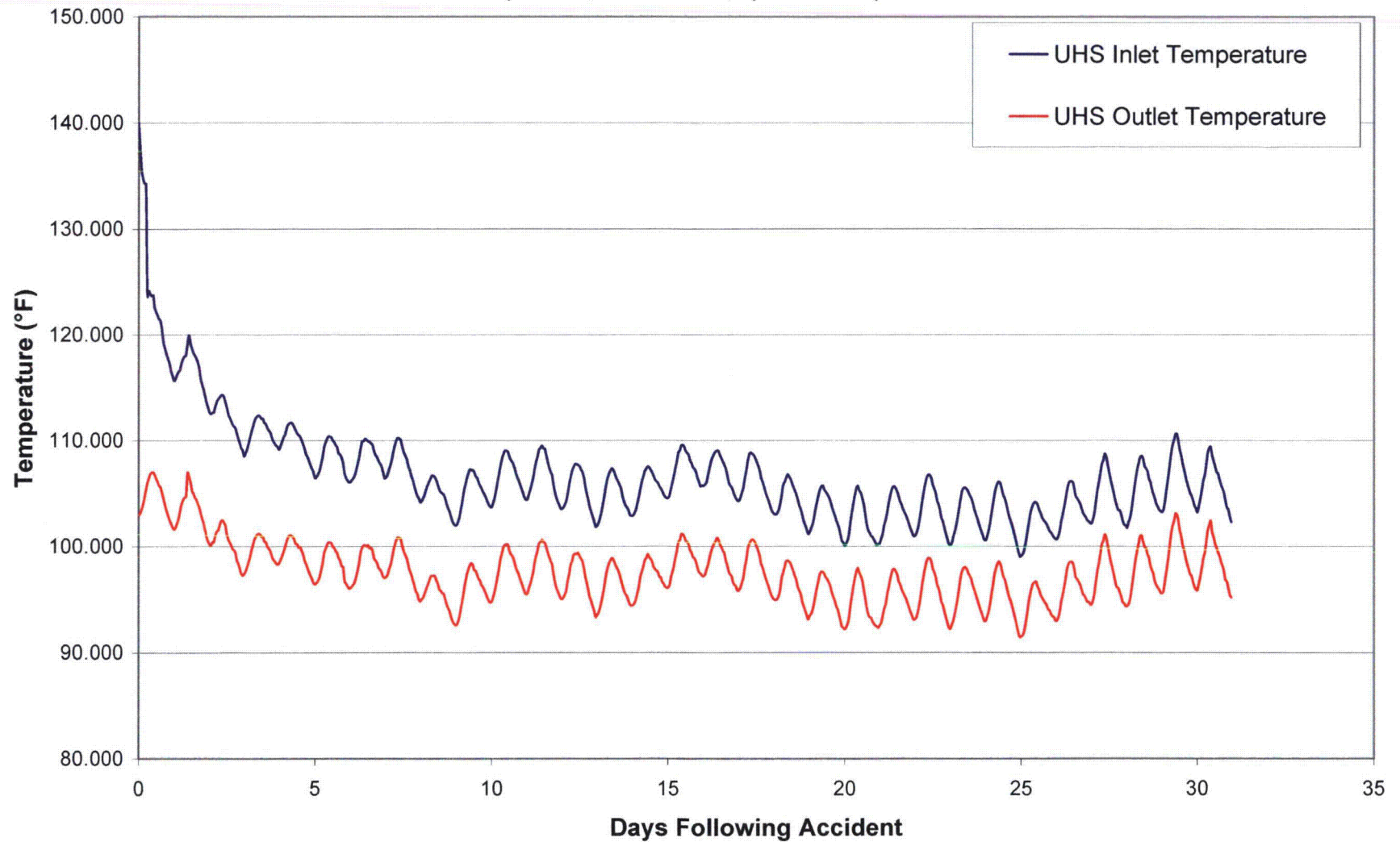
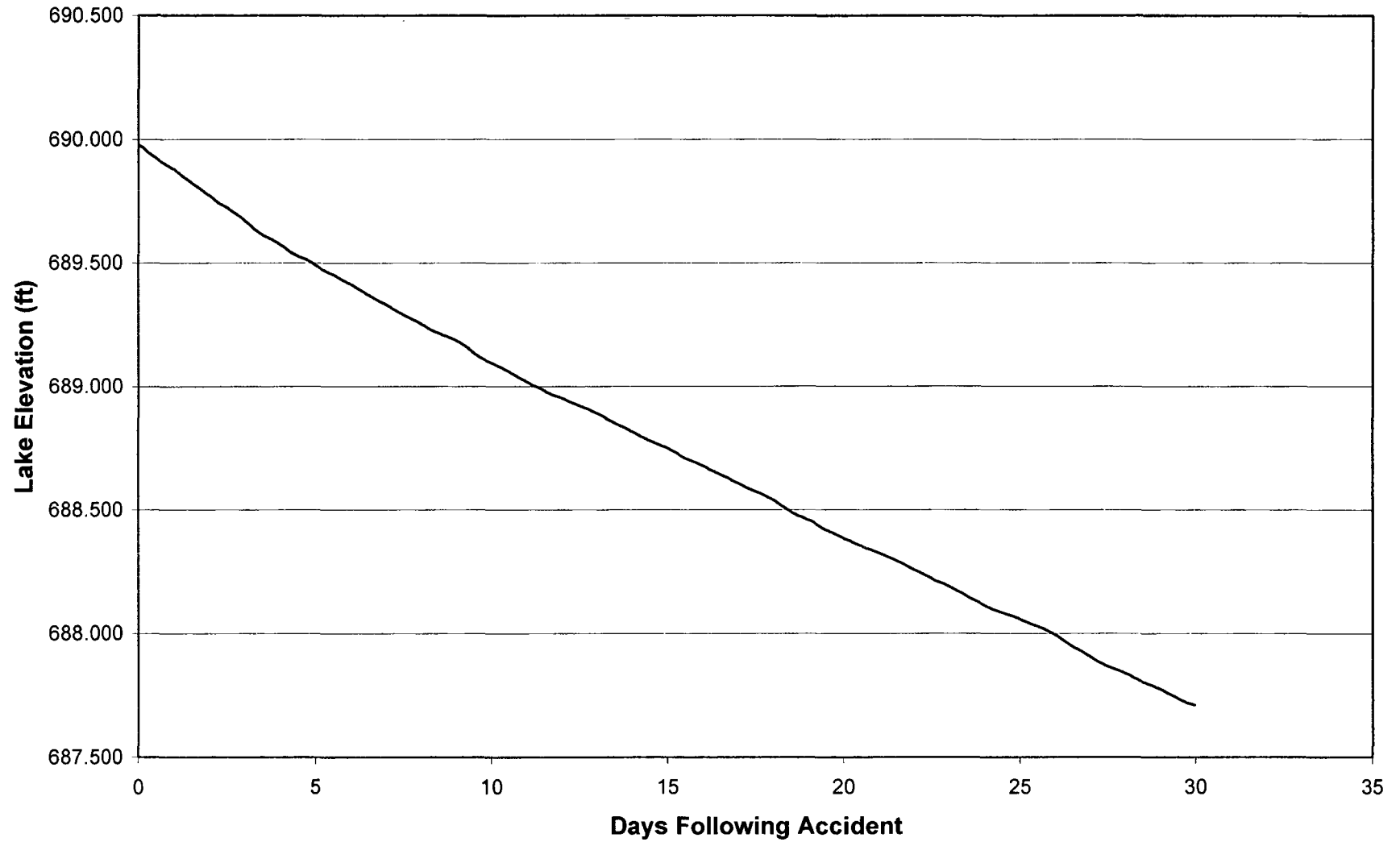


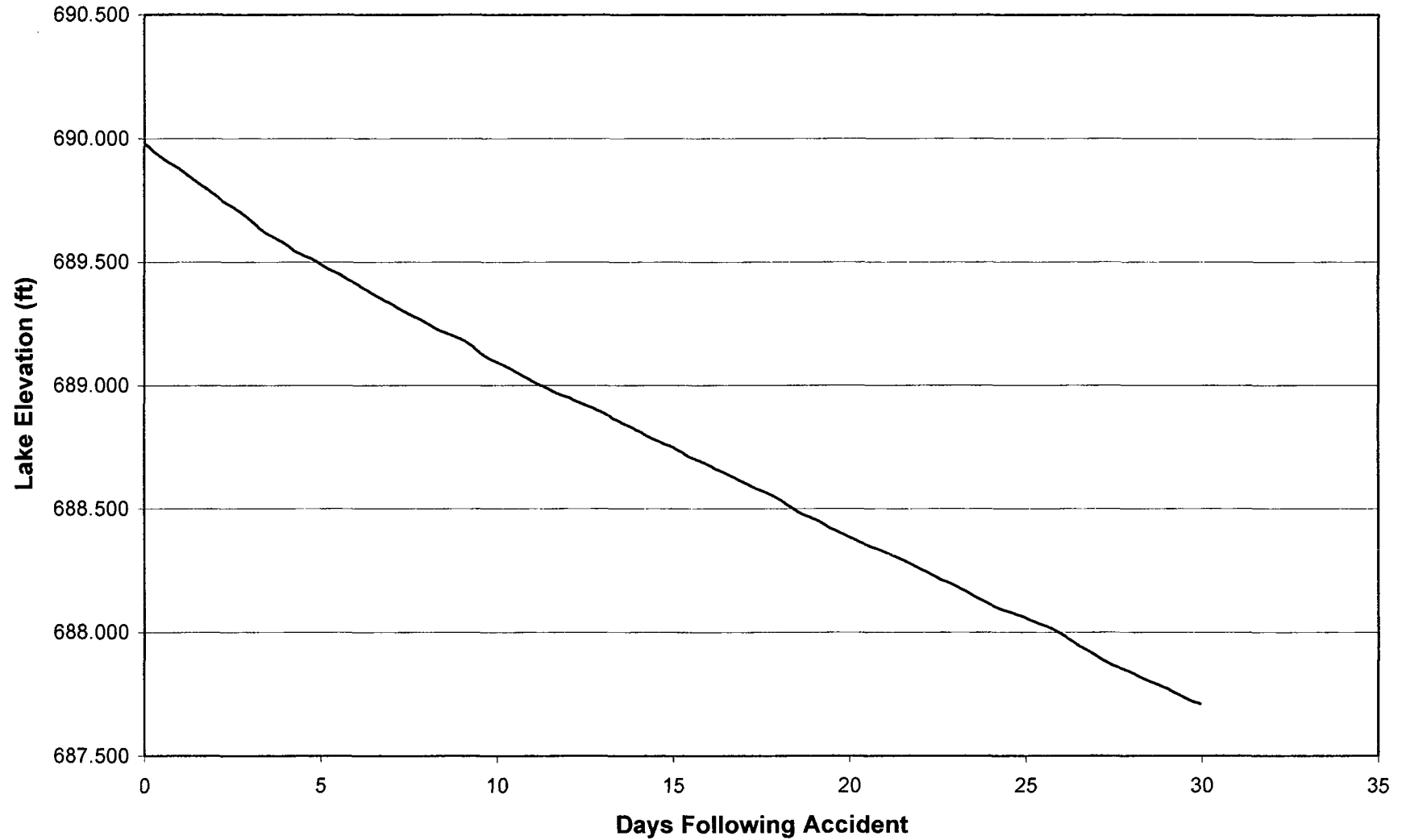
Figure I7.8, Case 4a: UHS LOCA Temperature Transient
Worst 31-Day Temperature Period
(d = 12", t = 0600 hrs, $T_i = 102.93^\circ\text{F}$)



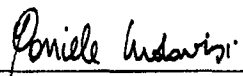
**Figure 17.9, Case 1c_MUR: UHS LOCA Drawdown
Worst 30 Day Evaporation Weather Period
Sediment Level = 0-in**




**Figure 17.10, Case 1c: UHS LOCA Drawdown
Worst 30 Day Evaporation Weather Period
Sediment Level = 0-in**



Attachment J – UHS Flow Path Analysis

Prepared:  Date October 1st, 2013
Daniele Ludovisi - Sargent & Lundy^{LLC}

Reviewed:  Date 10-01-2013
Pawel Kut - Sargent & Lundy^{LLC}

Revision 8 of this attachment adds Appendix J8.6 (pages J33 to J40).

J1.0 PURPOSE

The purpose of this attachment is to evaluate the water flow pattern in the man-made Ultimate Heat Sink (UHS) at LaSalle County Generating Station with the water depth at its minimum, that the water level is at elevation 690 ft [Ref. J5.1] and the UHS bottom is covered with approximately 1.5 ft of silt [Ref. J5.8]. The analysis is carried by means of computational fluid dynamics (CFD). The recirculation areas in the UHS are identified and the UHS volume actively involved in the main water flow is estimated along with and the associated surface area. The output of this evaluation is to provide effective lake volume and surface area for use in the S&L LAKET-PC computer program.

J1.1 Background

The UHS is designed to provide sufficient cooling water to permit the safe shutdown and cool down of the station for both normal and accident conditions. In the unlikely event that the main dike is breached, there is a submerged pond within the cooling lake for the LaSalle County Station that is designed to hold water. This remaining water constitutes the ultimate heat sink for the station. It has a depth of approximately 5 feet and a top water elevation established at 690 feet [Ref. J5.1].

Considering approximately 1.5 ft of silt at the bottom of the UHS, a CFD analysis is performed to predict the water main flow pattern and estimate the volume of water contained in the active zones of the UHS and the corresponding surface area. These inputs are used in main report to determine the combined impact of power uprate and allowable sediment accumulation in the UHS on the maximum plant inlet temperature and evaporative drawdown by use of the S&L LAKET-PC computer program.

J2.0 METHODOLOGY AND ACCEPTANCE CRITERIA

J2.1 Methodology

J2.1.1 Effective volume and effective surface area

Figure J-3 shows a top view of the UHS computational domain. As shown, water enters the UHS in one of the UHS side branches and exits from the intake flume. Zones of recirculation are expected in the other branch of the UHS, which is a dead leg, and in proximity of the UHS inlet. LAKET-PC is a one-dimensional lake thermal prediction computer program [Ref. J5.10]. The one-dimensional assumption coerces the water body into an idealized rectangular channel. In this idealization, water entering the channel displaces an equal amount of water out of the back end (see Figure J-1). At some time (t_n) after the start of flow (t_o), the volume of displaced water is equal to $Q \cdot (t_n - t_o)$, where Q is the flow rate of the water flowing into the channel. Indicating the total volume of the channel with V_{channel} , all of the water is considered to have swept out of the channel at time $t = t_o + V_{\text{channel}}/Q$. However, if the lake being modeled has stagnant volumes, the water in those volumes would not be swept out of the exit as idealized in the LAKET-PC modeling. For more accurately conforming the real lake to the idealized channel, these stagnant volumes and the corresponding surfaces must be removed from the active volume.

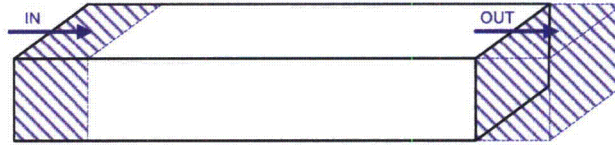


Figure J-1. Reference water flow.

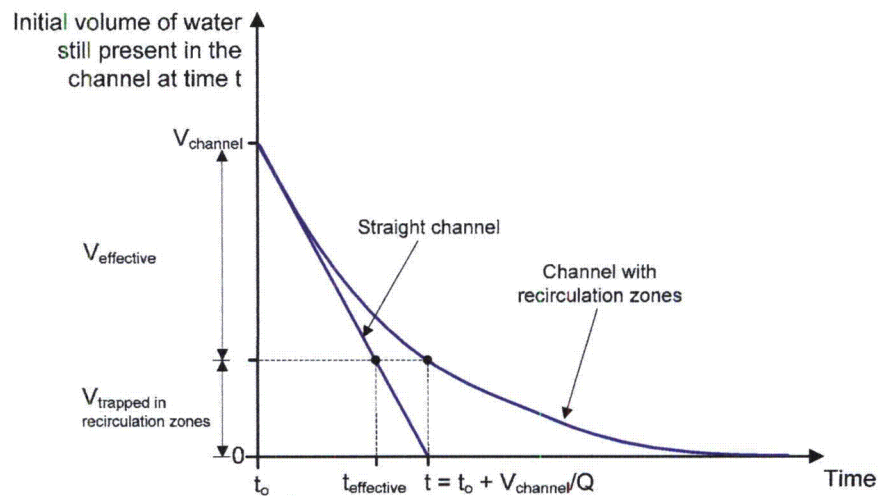


Figure J-2. Water displaced in the reference straight channel and in channel with recirculation zones.

Figure J-2 shows both the idealized and actual amount of water displaced from a lake with recirculating (stagnant) volumes. If we could differentiate between water that was initially in the lake from new water entering the lake, we could use the concentration of initial water remaining in the lake at time t to find the fraction of water that was not swept out at time t . This is the fraction of the lake not actively participating in the channel flow. This volume and the corresponding surface area should be removed from the lake total dimensions to provide more accurate and conservative results.

The amount of water initially in the channel at time t_0 and still present in the channel, trapped in the recirculation zones, at time $t = t_0 + (V_{\text{channel}}/Q)$ is calculated as follows (with $t_0 = 0$):

$$V_{\text{trapped in the recirculation zones}}(t) = \int_{V_{\text{channel}}}^V c^V_{\text{initial water in the channel}}(t) dV \quad (\text{J2.1-1})$$

where V_{channel} is the total volume of the channel and $C^V_{\text{initial water in the channel}}(t)$ is the volumetric distribution of water initially in the channel at time t_0 and still present in the channel at time t . The effective volume is calculated as follows:

$$\begin{aligned}
 V_{\text{effective}} &= V_{\text{channel}} - V_{\text{trapped in the recirculation zones}}(t) = \\
 &= V_{\text{channel}} \left(1 - \frac{\int_{V_{\text{channel}}} C^V_{\text{initial water in the channel}}(t) dV}{V_{\text{channel}}} \right) = \quad (J2.1-2) \\
 &= V_{\text{channel}} (1 - \bar{C}^V_{\text{initial water in the channel}}(t))
 \end{aligned}$$

where the term $\bar{C}^V_{\text{initial water in the channel}}(t) = \int_{V_{\text{channel}}} C^V_{\text{initial water in the channel}}(t) dV / V_{\text{channel}}$ is equal to

the volume average concentration of the amount of water initially in the channel at time t_0 and still present in the channel at time t . The effective surface area is calculated in manner similar to the effective volume. At the surface of the channel, the amount of water initially in the channel at time t_0 and still present in the channel, trapped in the recirculation zones, at time $t = (V_{\text{channel}}/Q)$ is calculated as follows:

$$S_{\text{trapped in the recirculation zones}}(t) = \int_{S_{\text{channel}}} C^S_{\text{initial water in the channel}}(t) dS \quad (J2.1-3)$$

where S_{channel} is the total surface of the channel and $C^S_{\text{initial water in the channel}}(t)$ is the surface distribution of water initially in the channel at time t_0 and still present in the channel at time t . The effective surface is calculated as follows:

$$\begin{aligned}
 S_{\text{effective}} &= S_{\text{channel}} - S_{\text{trapped in the recirculation zones}}(t) = \\
 &= S_{\text{channel}} \left(1 - \frac{\int_{S_{\text{channel}}} C^S_{\text{initial water in the channel}}(t) dS}{S_{\text{channel}}} \right) = \quad (J2.1-4) \\
 &= S_{\text{channel}} (1 - \bar{C}^S_{\text{initial water in the channel}}(t))
 \end{aligned}$$

where the term $\bar{C}^S_{\text{initial water in the channel}}(t) = \int_{S_{\text{channel}}} C^S_{\text{initial water in the channel}}(t) dS / S_{\text{channel}}$ is equal to

the surface average concentration of the amount of water initially in the channel at time t_0 and still present in the channel at time t .

J2.1.2 Calculation strategy

As indicated in Section J2.1.1, the volume and surface averaged concentrations of the water initially in the UHS at $t_0 = 0$ sec still present in the UHS at time $t = V_{\text{UHS}}/Q$ are necessary in order to calculate the effective UHS volume and surface.

The analysis of the water flow in the UHS is carried out through the use of the commercially available CFD code STAR-CCM+ [Ref. J5.2]. The calculation is performed in two steps:

1. The first step is employed to find the steady state flow distribution in the UHS. This solution is used as initial condition for the transient multi-component fluid mixture in the second step.
2. During this second step, newly introduced water in the UHS is specified to be a different liquid but with the same properties of the water already present in the UHS. The flow pattern and mixing of these liquids are calculated and tracked over time from time $t_0 = 0$ sec to $t = V_{\text{UHS}}/Q$. At the end of the transient analysis, the surface average concentration of the amount of water initially in the UHS and still present in the UHS at time $t = V_{\text{UHS}}/Q$ are calculated to find the effective volume and surface.

J2.1.3 Geometrical domain

The CFD analysis is carried out in three-dimensions. For the computations, the water domain is considered from the outlet of the inlet chute into the UHS to the exit of the intake flume. Figure J-3 shows a top view of the computational domain while Figures J-4 and J-5 show the inlet and outlet boundaries, respectively. Figure J-6 shows the bottom view of the UHS. Design Input J4.1 reports the dimensional information used to generate the model. Assumption J3.1 is used to evaluate the UHS thickness. The main dimensions are indicated in Figures J-1 to J-3. Figures J-4 to J-7 also show, in quotations, names associated to each of the boundaries in the numerical model. Note that this evaluation reports the fraction of active volume and surface area. Therefore, slight variations in the lake dimensions will not significantly affect the final results.

J2.1.4 Mesh

The computational domain is discretized by using polyhedral cells with a base size of 12 ft, and six thin layers through the thickness of the UHS. Where necessary, the cell size is reduced down to 6 ft and, in proximity of the inlet boundary, down to 1.5 ft. Figures J-5 to J-8 show the mesh employed for the computations, which consists of 1,761,870 nodes for a total of 748,386 cells. Appendix J8.1 provides the STAR-CCM+ report of the mesh quality.

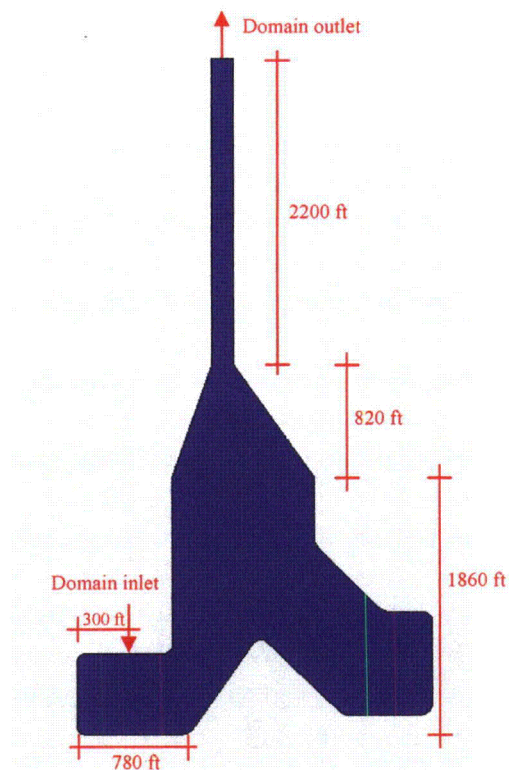


Figure J-3. UHS computational domain: Top view.

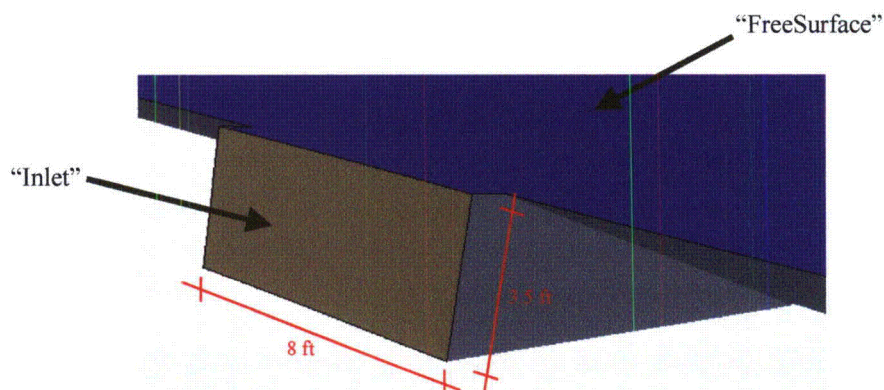


Figure J-4. UHS computational domain: Inlet boundary.

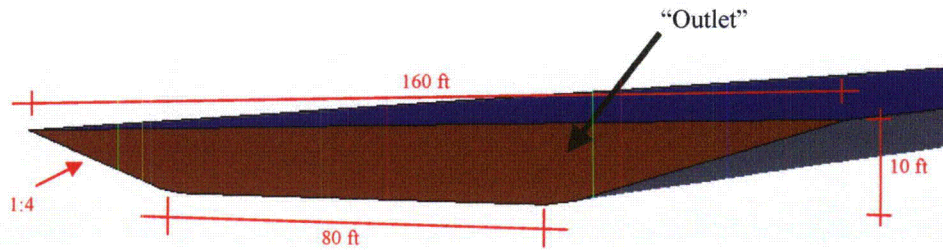


Figure J-5. UHS computational domain: Outlet boundary.

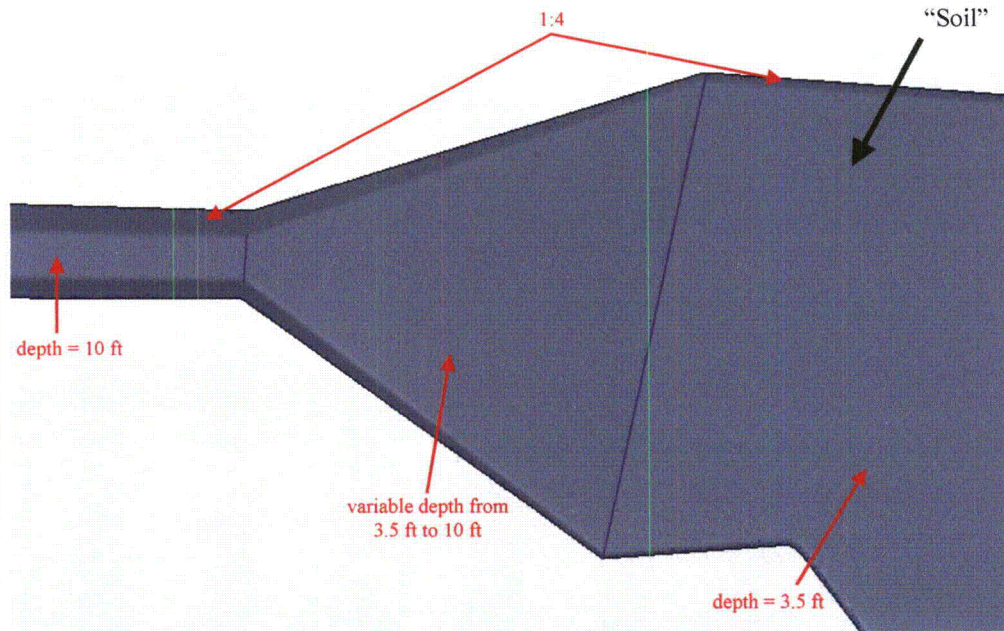


Figure J-6. UHS computational domain: Bottom view.

Note: The indicated depths are net values; the silt layer of 1.5 ft (see Design Input J4.3) is already considered in the indicated values.

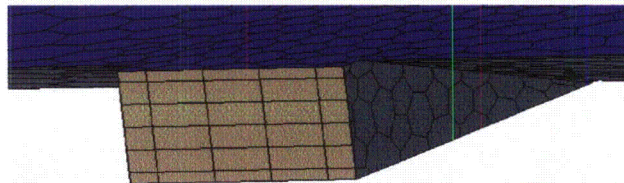


Figure J-7. UHS computational domain: Mesh detail of the inlet boundary.

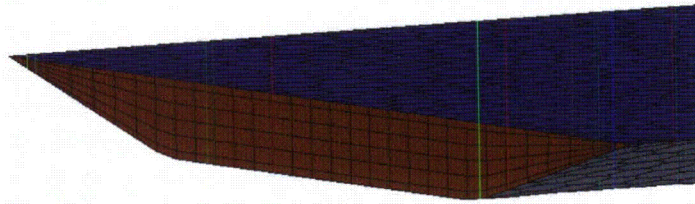


Figure J-8. UHS computational domain: Mesh detail of the outlet boundary.

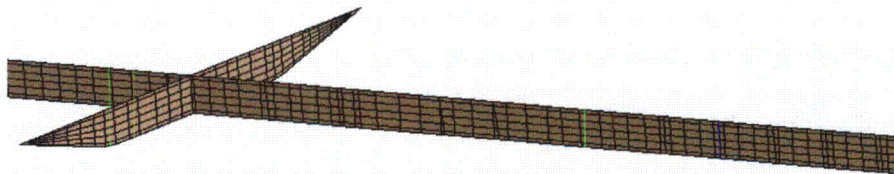


Figure J-9. UHS computational domain: Cross section of the outlet boundary mesh both along and across the axis.

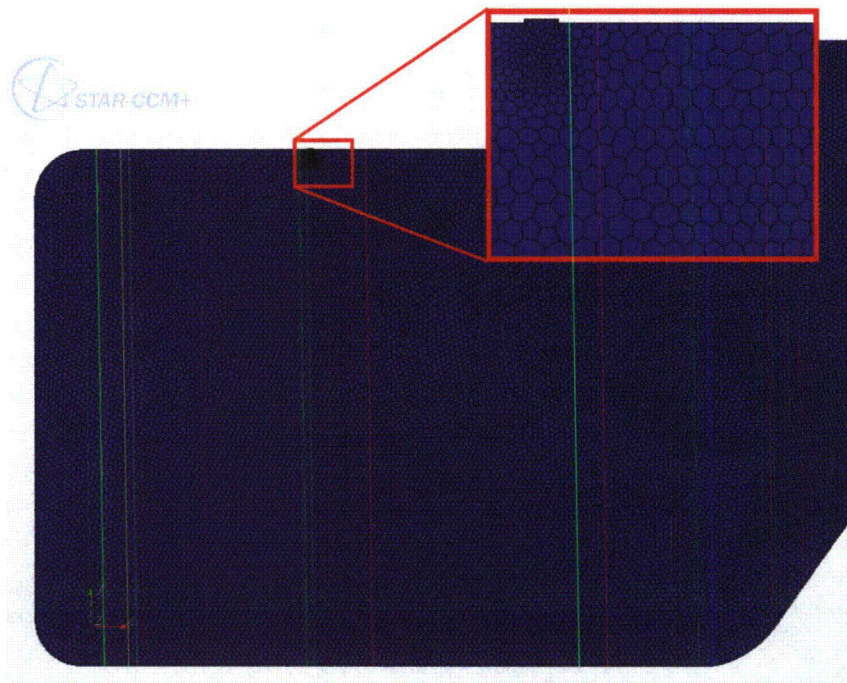


Figure J-10. UHS computational domain: Mesh detail of the free surface boundary.

J2.1.5 Numerical model

As indicated in Section J2.1.2, the calculation is carried out in two steps.

Step One: Steady State Single-Fluid Analysis

The numerical analysis is carried out using the segregated SST (Menter) $k-\omega$ model with the all y^+ wall treatment. The shear stress transport (SST) formulation is a blend of a $k-\omega$ formulation, which is used near walls, and a $k-\epsilon$ formulation, which is used in regions far from walls. The use of a $k-\omega$ formulation in the inner parts of the boundary layer makes the model directly usable all the way down to the wall through the viscous sub-layer without additional modifications. Hence, the SST $k-\omega$ model can be used as a low Reynolds turbulence model without any extra damping functions. The SST formulation also switches to a $k-\epsilon$ behavior in the free-stream and thereby avoids the common $k-\omega$ problem of being too sensitive to the inlet free-stream turbulence properties. This model is fairly robust, it demonstrated superior performance for wall bounded problems and low Reynolds number flows, it showed potential for predicting transition regions and it also is often found to do a better job at capturing recirculation regions than other models [Ref. J5.2].

Therefore, the SST (Menter) $k-\omega$ model with the all y^+ wall treatment is particularly suited for the geometry analyzed in this calculation which presents a confined flow with very extensive surface associated to an extremely small thickness, and a uniform mesh through the thickness of the domain as generated by the thin mesher generator.

A constant-density single-fluid is specified as working liquid with the properties of water at 100°F (see Assumption J3.2) with a density of approximately 62 lb/ft³ and a dynamic viscosity of $6.727 \cdot 10^{-9}$ atm-s [Ref. J5.7].

The following boundary conditions are applied:

- “FreeSurface” - This boundary represents the free surface of the lake. As a simplification, this boundary is considered to be rigid in order to reduce the computational time. This simplification does not significantly impact the results of the calculation since the water velocity is small and very small or no waves are expected to form (tranquil flow). Furthermore, this boundary is specified to be a symmetry plane in order to guarantee a zero shear stress (free surface flow).
- “Inlet” - This boundary represents the inlet to the UHS. It is specified to be a mass flow inlet boundary with an inlet flow rate of 86 ft³/sec, which is approximately equal to 5333.7 lb/sec [Ref. J5.8].
- “Outlet” - This boundary represents the outlet to the UHS. It is specified to be a simple pressure outlet boundary.

- “Soil” - This boundary represents the bottom and sloped sides of the UHS. It is specified to be a rough no-slip wall boundary with a roughness of 5.0 in (see Assumption J3.3).

The system is initialized with constant zero velocity and pressure and let to evolve to final steady state solution.

Step Two: Transient Two-Fluid Analysis

The results of Step One are used as initial condition to the calculation performed in this second phase. The following changes are made to the model:

1. Transient solver - The solver is specified to be implicit unsteady with maximum number of inner iteration per time step equal to 20. The time step is adjusted through the computation for an initial minimum value of 0.1 sec to a final maximum value of 100 sec. The transition from one time step to the other is normally performed after ensuring that the residuals are always small and the solution is converged at each time step.
2. Two-fluid specification - The solver is changed to account for a two fluid mixture. Both fluids have the properties of water at 100°F and the are labeled “WaterLake” for the water initially present in the UHS at the beginning of the transient analysis (from Step One) and “WaterCirculating” for the water injected from the “Inlet” boundary. For the two-fluid mixture, the code can compute the mixture properties based on the local concentration of the two base fluids and their molecular weight. Since there is no difference between the “WaterLake” and “WaterCirculating”, the properties of the mixture are specified to be constant and equal to that of water at 100°F.

In order to compute the diffusion of one liquid into the other, the Schmidt number and the turbulent Schmidt number need to be specified for the mixture. The Schmidt number is a dimensionless parameter defined as the ratio of momentum diffusivity and mass diffusivity as [Ref. J5.2]:

$$\text{Schmidt} = \frac{\mu}{\rho D_{im}} \quad (\text{J2.1-5})$$

where μ is the dynamic viscosity, ρ is the density and D_{im} is the molecular diffusivity of component-i into the mixture. The Schmidt number used in this analysis is equal to 219.8 (see Appendix J8.2). The turbulent Schmidt number is taken as the default value in STAR-CCM+ which is equal to 0.9. This implies that the turbulent mass diffusivity is proportional to the turbulent viscosity, which is an unknown a-priori variable and it is locally computed by the code. Note that the computed solution is fairly insensitive to the choice of the Schmidt number and the turbulent Schmidt number within the range of realistic values. The molecular weight for both fluids, which is another input required to compute the mass diffusivity, is specified to be 18.0153 lb/lbmol [Ref. J5.9].

3. Boundary conditions - The boundary conditions are kept the same as for the steady-state analysis. However, the fluid entering the “Inlet” surface is specified to the 100% “WaterCirculating” and, in case of backflow at the “Outlet” surface, the re-entering fluid is specified to the 100% “WaterLake”. This last condition is specified only to complete the STAR-CCM+ input file for this analysis but it is not used during the computation.
4. Initial conditions - The results of steady state analysis are used as initial conditions for the transient calculation. The liquid present in the UHS at the beginning of the transient simulation ($t = 0$ sec) is specified to be 100% “WaterLake”.
5. Simulation time - The calculation is performed from time $t_{\text{start}} = 0$ sec to time $t_{\text{end}} = V_{\text{UHS}}/Q$. The total volume of the UHS is manually requested and printed out by STAR-CCM+ after the generation of the computational domain and it is equal to $V_{\text{UHS}} = 1.454446 \cdot 10^7 \text{ ft}^3$. The flow entering the UHS is equal to $86 \text{ ft}^3/\text{sec}$ [Design Input J4.2]. Therefore, $t_{\text{end}} = V_{\text{UHS}}/Q = (1.454446 \cdot 10^7 \text{ ft}^3)/(86 \text{ ft}^3/\text{sec}) = 169,122 \text{ sec} = 47 \text{ hrs}$.

After the completion of the transient simulation, the volume and surface average concentrations of “WaterLake” are computed and the results are used to manually calculate the UHS effective volume and surface as percentages respectively of the total UHS volume and surface by applying equations J2.1-2 and J2.1-4 as follows:

$$\frac{V_{\text{effective}}}{V_{\text{UHS}}} = 1 - \overline{C}^V_{\text{LakeWater}}(t = 47 \text{ hr}) \quad (\text{J2.1-6})$$

$$\frac{S_{\text{effective}}}{S_{\text{UHS}}} = 1 - \overline{C}^S_{\text{LakeWater}}(t = 47 \text{ hr}) \quad (\text{J2.1-7})$$

Appendix J8.3 provides the STAR-CCM+ summary report of the model including physics and boundary conditions.

J2.2 Computer Programs and Software

The analysis performed herein utilizes:

1. STAR-CCM+ 6.04.014, S&L Program No. 03.7.863-6.04.014. Controlled folder on Sargent & Lundy STARCCM server: C:\Program Files\CD-adapco (see code file listing in Appendix J8.4).

All runs are executed on Sargent & Lundy server STARCCM with 64-bit Windows Server Standard 2007 operating system. The code has been validated under the Sargent & Lundy Quality Assurance Program.

2. MathCad 14.35, S&L Program No. 03.7.548-1435. Controlled folder on Sargent & Lundy PC: C:\Program Files\ MathCad\ MathCad14 (see code file listing in Appendix J8.5).

All runs are executed on Sargent & Lundy PC ZL5581 with 32-bit Windows XP SP3 operating system. The code has been validated under the Sargent & Lundy Quality Assurance Program

3. Microsoft Excel, Microsoft® Office Professional 2003 SP-2 including Excel, S&L Program No. 03.2.286-1.0.

All runs are executed on Sargent & Lundy PC ZL5581 with 32-bit Windows XP SP3 operating system. The validation of Excel is implicit in the detailed review of all spreadsheets used in this analysis.

J2.3 Acceptance Criteria

There are no specific acceptance criteria for the effective volume and surface values estimated in this calculation. This information is gathered to support thermal analysis of the UHS performed in the main report.

For the CFD analysis, the computational mesh must be of acceptable quality, as verified by Appendix J8.1. Furthermore, the calculated results must be converged as verified by the plot of the residuals in Appendix J8.3 (page J31).

J3.0 ASSUMPTIONS

- J3.1 Silt thickness – The depth of the silt layer at the bottom of the UHS is assumed to be 1.5 ft (see Design input 5.3). The use of 1.5 ft silt thickness (maximum allowed value) causes the calculation of a reduced UHS effective volume.
- J3.2 Water temperature – The water in the UHS is assumed to be at a constant temperature of 100°F. This input is used to estimate the density, viscosity and self-diffusivity of water in the UHS. This input does not significantly impact the results of this calculation.
- J3.3 Soil roughness – The roughness of the bottom of the UHS (including the silt layer) is assumed to be 5 in. Since this calculation determines the UHS inactive volumes rather than pressure losses, based on the calculated UHS low water velocities, this input does not significantly impact the results of this calculation.

J4.0 DESIGN INPUTS

- J4.1 UHS dimensions – The UHS dimensions are obtained from References J5.3 to J5.6 as follows:
- i. The nominal elevation of the UHS cooling pond bottom is approximately 685 ft [Ref. J5.5].
 - ii. The elevation of the bottom of the intake flume is approximately 678.5 ft [Ref. J5.5].
 - iii. The bottom of the UHS between the cooling pond and intake flume is approximately flat and its depth varies from 678.5 ft to 685 ft in a linear manner [Refs. J5.3 to J5.6].
 - iv. The slope of the UHS side is approximately 1:4 all around its perimeter [Refs. J5.3 to J5.6].
 - v. The width of the water inlet chute is 8 ft [Ref. J5.4].
 - vi. The width of the intake flume bottom is approximately 40 ft [Ref. J5.6].
 - vii. The dimensions of the UHS that are not listed above are scaled from Reference J5.3.
 - viii. The elevation of the UHS free surface is 690 ft [Ref. J5.1].
- J4.2 UHS flow – The mass flow rate through the UHS is equal to 86 ft³/s [Ref. J5.8].
- J4.3 UHS sediment level – The sediment level in the intake flume and cooling pond must remain less than or equal to 1.5 ft [Ref. J5.8]. The use of maximum silting reduces the

UHS volume, and therefore the residence time. This reduces the effectiveness of the UHS and it is thus conservative.

- J4.4 Properties of water - Water at 100°F has the following properties: density $\approx 62 \text{ lb/ft}^3$; dynamic viscosity $\approx 6.727 \cdot 10^{-9} \text{ atm-s}$ [Ref. J5.7].

J5.0 REFERENCES

- J5.1 LSCL-UFSAR, Section 9.2.6 "Ultimate Heat Sink", Rev. 19
- J5.2 CD-adapco, User Guide, STAR-CCM+ Version 6.04.014, 2011
- J5.3 Exelon Nuclear – LaSalle Station Drawing No. S-16B Rev. B, "Composite Lake Drawing, Sheet 2"
- J5.4 Exelon Nuclear – LaSalle Station Drawing No. S-79 Rev. H, "CSCS Pond Water Inlet Chutes Plan and Sections" |
- J5.5 Exelon Nuclear – LaSalle Station Drawing No. 97ES083.1 Rev. 0, "Contours Hydrographic Survey"
- J5.6 Exelon Nuclear – LaSalle Station Drawing No. 97ES083.2 Rev. 0, "Profiles Hydrographic Survey"
- J5.7 Frank Kreith, "Principles of Heat Transfer", 3rd Ed. 1976, IEP, New York, NY
- J5.8 LSCL Calculation No. L-002457, Rev. 5
- J5.9 T.L. Brown, H.E. LeMay Jr., B.E. Bursten, J.R. Burdge, "Chemistry", 9th Ed. 2003, Prentice Hall, Upper Saddle River, NJ
- J5.10 LAKET-PC User Manual, S&L Program Number 03.7.292-2.2, Rev. 0, October 30, 2004

J6.0 EVALUATIONS

Step One: Steady State Analysis

The steady state simulation is run until convergence for approximately 6,000 iterations [see Residual graph in Appendix J8.3]. Figure J-11 shows the velocity magnitude distribution and stream lines at the free surface. As seen, the right leg of the UHS presents two large recirculation cells which are not expected to participate significantly to the main water flow. Additional two smaller recirculation areas are visible in proximity to the UHS inlet created by the inlet water stream.

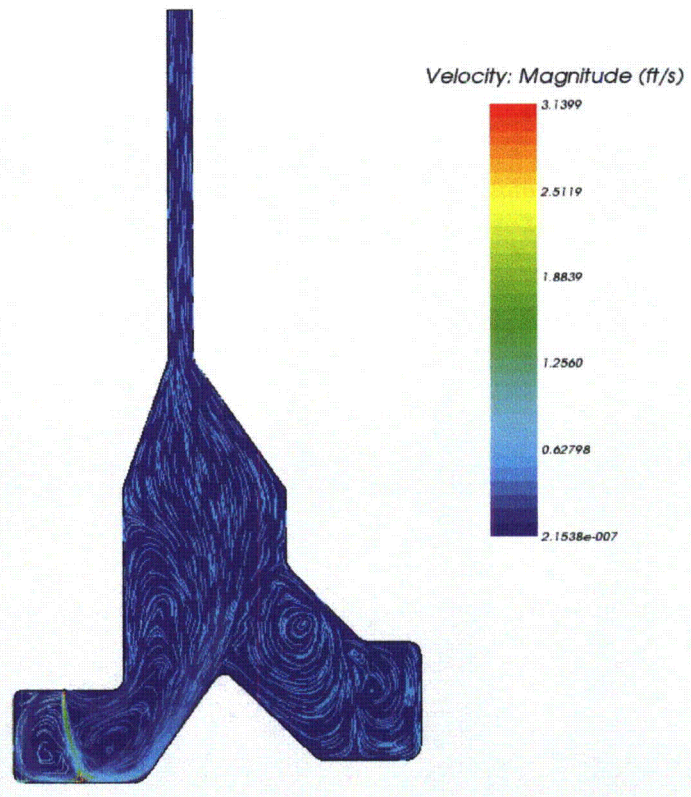


Figure J-11. UHS computation – Step One: Velocity magnitude and stream lines on the UHS free surface.

Step Two: Transient Analysis

After applying the changes indicated in Section J2.1.5 to the steady state model, the transient simulation is run for approximately 40,000 iterations from time $t_{\text{start}} = 0$ sec to time $t_{\text{end}} = 47$ hrs [see Residual graph in Appendix J8.3]. Figure 12 shows the surface concentration distribution for the “WaterLake”. As expected, the velocity distribution is practically unchanged with respect to the steady-state solution (see Figure J-13).

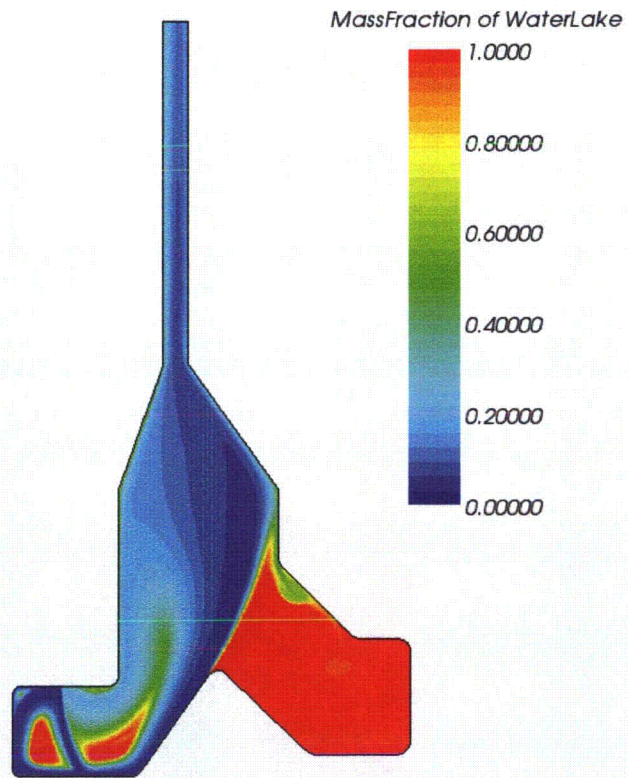


Figure J-12. UHS computation – Step Two: Surface concentration for "WaterLake" at 47 hrs.

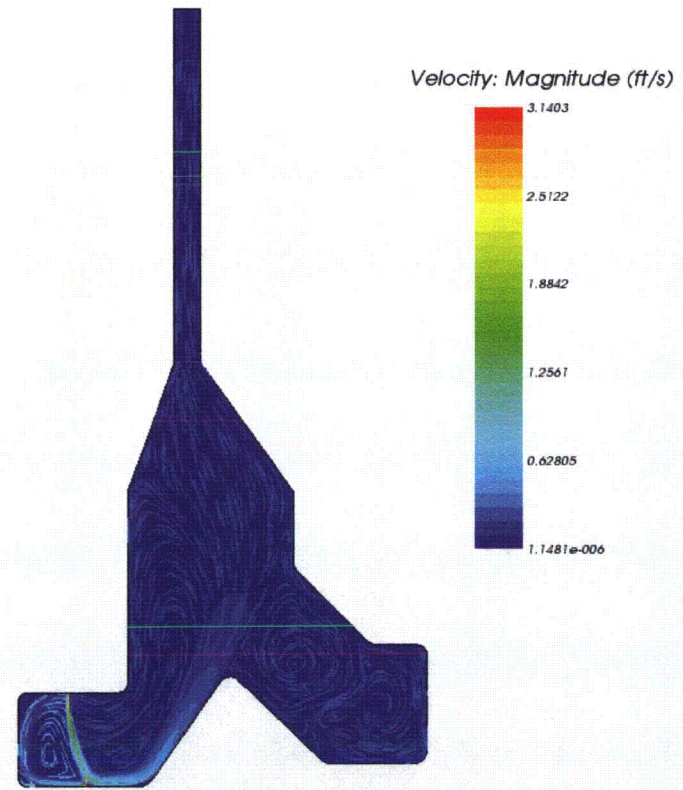


Figure J-13. UHS computation – Step Two: Velocity magnitude and stream lines on the UHS free surface.

The numerical computation of both Step One and Two is considered to be successful upon evaluation of the relative residual (unitless) plot shown in Appendix J8.3 (see page 31). The residuals of the fluid dynamics variables are very well behaved and with a magnitude, at the end of each main iteration, small enough to ensure a sufficiently converged solution. Therefore, the acceptance criteria in Section J2.3 are satisfied.

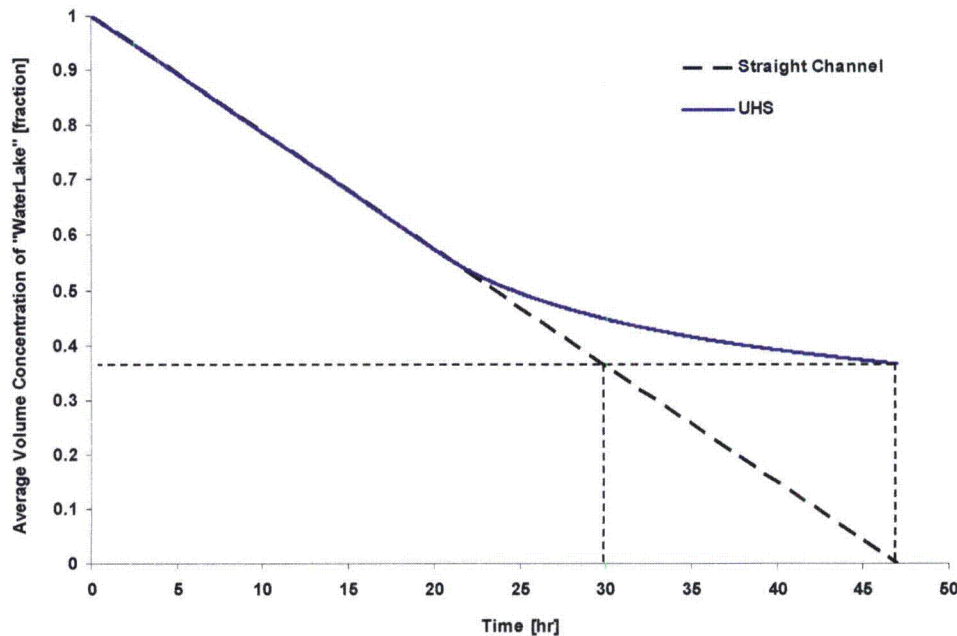


Figure J-14. UHS computation – Time variation of the “WaterLake” volume average concentration in the UHS.

Figure J-14 shows the trend over time of the “WaterLake” volume average concentration. As seen, the concentration decreases linearly at the beginning since the incoming water displaces the water in the UHS. After about 20 hrs, some the incoming water is already exiting the UHS and thus “WaterLake” volume average concentration change is no longer linear: some of the incoming water is being trapped in the areas of recirculation and it cannot efficiently displace the “WaterLake” out of the UHS.

After 47 hrs, the volume average concentration is computed to be 36.59 %. Therefore, the UHS effective volume percentage as compute by Equation J2.1.6 is equal to (see Appendix J8.3):

$$\frac{V_{\text{effective}}}{V_{\text{UHS}}} = 1 - 0.3659 = 63.4\% \quad (\text{J2.1-8})$$

After 47 hrs, the surface average concentration is computed to be 42.09 %. Therefore, the UHS effective surface percentage as compute by Equation J2.1.7 is equal to (see Appendix J8.3:

$$\frac{S_{\text{effective}}}{S_{\text{UHS}}} = 1 - 0.4209 = 57.9\% \quad (\text{J2.1-9})$$

J7.0 CONCLUSION

The UHS effective volume as percentage of the UHS total volume is 63.4 %.

The UHS effective surface as percentage of the UHS total free surface is 57.9 %.

J8.0 APPENDICES

J8.1 STAR-CCM+ mesh quality report [see Page J19]

J8.2 Calculation of the Schmidt number [see Pages J20 to J23]

J8.3 Summary Report of STAR-CCM+ Analysis [see Pages J24 to J32]

J8.4 STAR-CCM+ 6.01.014, S&L Prog. No. 03.7.863-6.04.014, Controlled folder file listing

Electronically attached:

File name: EAppendix J8.4.pdf

Size: 22,128 KB; Type: Adobe Acrobat Document; Date 5/23/2012 3:25 PM

J8.5 MathCad 14.35, S&L Program No. 03.7.548-1435, Controlled folder file listing

Electronically attached:

File name: EAppendix J8.5.pdf

Size: 2,068 KB; Type: Adobe Acrobat Document; Date 5/23/2012 3:27 PM

J8.6 Additional information requested by the U.S. Nuclear Regulatory Commission on June 27th 2013 [see Page J33 to J40]

Boundaries of region Lake:
Boundary Soil: 126832 faces (7 triangular, 236 quadrilateral, 126589 polygonal)
Extents:
x: [-4.2672000000e+000, 7.8150720000e+002] m
y: [-4.2672000000e+000, 1.4874240000e+003] m
z: [-1.9812000000e+000, 1.0668000000e+000] m
surface area: 3.2716753125e+005 m²
maximum boundary skewness angle = 1.2161578369e+002 deg in cell with Prostar Cell Index 754941
Boundary FreeSurface: 126581 faces (1 triangular, 201 quadrilateral, 126379 polygonal)
Extents:
x: [-4.2672000000e+000, 7.8150720000e+002] m
y: [-4.2672000000e+000, 1.4874240000e+003] m
z: [1.0668000000e+000, 1.0668000000e+000] m
surface area: 3.2625790625e+005 m²
maximum boundary skewness angle = 8.5943321228e+001 deg in cell with Prostar Cell Index 158035
Boundary Inlet: 30 quadrilateral faces
Extents:
x: [9.0220800000e+001, 9.2659200000e+001] m
y: [1.7526000000e+002, 1.7526000000e+002] m
z: [0.0000000000e+000, 1.0668000000e+000] m
surface area: 2.6012849808e+000 m²
maximum boundary skewness angle = 2.4523153305e+001 deg in cell with Prostar Cell Index 372457
Boundary Outlet: 176 faces (174 quadrilateral, 2 polygonal)
Extents:
x: [2.9565600000e+002, 3.4442400000e+002] m
y: [1.4874240000e+003, 1.4874240000e+003] m
z: [-1.9812000000e+000, 1.0668000000e+000] m
surface area: 1.1132573700e+002 m²
maximum boundary skewness angle = 2.8035736084e+001 deg in cell with Prostar Cell Index 739634

Region Lake:
43 tetrahedral cells
25 hexahedral cells
2 wedge cells
2 pyramid cells
748314 polyhedral cells
748386 cells total
2880831 interior faces (5724 triangular, 2249993 quadrilateral, 625114 polygonal)
1761870 vertices

Extents:
x: [-4.2672000000e+000, 7.8150720000e+002] m
y: [-4.2672000000e+000, 1.4874240000e+003] m
z: [-1.9812000000e+000, 1.0668000000e+000] m
Maximum interior cell index delta: 2296, average: 7.8781478469e+002
Maximum cell face index delta: 9001, average: 5.6040540283e+003
Volume range: [4.2707888497e-005, 3.1967809200e+000] m³
Minimum volume in cell with Prostar Cell Index 747962
Minimum distance between centroids of neighbor cells = 1.9749755266e-002
between cells with Prostar Cell Index 452140 and 576394
Maximum skewness angle = 1.7942733765e+002 deg in cell with Prostar Cell Index 718600

Face validity:
Minimum Face Validity: 8.4159338474e-001
Maximum Face Validity: 1.0000000000e+000

Face Validity <	Count	Percentage
0.50	0	0.000%
0.50 <= Face Validity < 0.60	0	0.000%
0.60 <= Face Validity < 0.70	0	0.000%
0.70 <= Face Validity < 0.80	0	0.000%
0.80 <= Face Validity < 0.90	24	0.003%
0.90 <= Face Validity < 0.95	94	0.013%
0.95 <= Face Validity < 1.00	357	0.048%
1.00 <= Face Validity	747911	99.937%

Volume change:
Minimum Volume Change: 1.052741e-003
Maximum Volume Change: 1.000000e+000

Volume Change <	Count	Percentage
0.000000e+000	0	0.000%
0.000000e+000 <= Volume Change < 1.000000e-006	0	0.000%
1.000000e-006 <= Volume Change < 1.000000e-005	0	0.000%
1.000000e-005 <= Volume Change < 1.000000e-004	0	0.000%
1.000000e-004 <= Volume Change < 1.000000e-003	0	0.000%
1.000000e-003 <= Volume Change < 1.000000e-002	166	0.022%
1.000000e-002 <= Volume Change < 1.000000e-001	685	0.092%
1.000000e-001 <= Volume Change <= 1.000000e+000	747535	99.886%

Maximum boundary skewness angle in region = 1.216158e+002 deg

Overall Face Validity:
Minimum Face Validity: 8.415934e-001
Maximum Face Validity: 1.000000e+000

Face Validity <	Count	Percentage
0.50	0	0.000%
0.50 <= Face Validity < 0.60	0	0.000%
0.60 <= Face Validity < 0.70	0	0.000%
0.70 <= Face Validity < 0.80	0	0.000%
0.80 <= Face Validity < 0.90	24	0.003%
0.90 <= Face Validity < 0.95	94	0.013%
0.95 <= Face Validity < 1.00	357	0.048%
1.00 <= Face Validity	747911	99.937%

Overall Volume Change:
Minimum Volume Change: 1.052741e-003
Maximum Volume Change: 1.000000e+000

Volume Change <	Count	Percentage
0.000000e+000	0	0.000%
0.000000e+000 <= Volume Change < 1.000000e-006	0	0.000%
1.000000e-006 <= Volume Change < 1.000000e-005	0	0.000%
1.000000e-005 <= Volume Change < 1.000000e-004	0	0.000%
1.000000e-004 <= Volume Change < 1.000000e-003	0	0.000%
1.000000e-003 <= Volume Change < 1.000000e-002	166	0.022%
1.000000e-002 <= Volume Change < 1.000000e-001	685	0.092%
1.000000e-001 <= Volume Change <= 1.000000e+000	747535	99.886%

Appendix B8.2

Calculation of the Schmidt number

References

1. Frank Kreith, "Principles of Heat Transfer", 3rd Ed. 1976, IEP, New York, NY
2. R.S. Smith, Z. Dohnalek, G.A Kimmel, K.P. Stevenson, B.D. Kay, "The self-diffusivity of amorphous solid water near 150 K", Chemical Physics Vol. 258, Page 291-305, 2000

Water fluid dynamics properties as function of temperature [Ref. 1]

$i := 0..4$

$$T_{\text{data.water},i} := \begin{pmatrix} 70^\circ\text{F} \\ 80^\circ\text{F} \\ 90^\circ\text{F} \\ 100^\circ\text{F} \\ 150^\circ\text{F} \end{pmatrix} \quad \text{Temperature}$$

$$\rho_{\text{data.water},i} := \begin{pmatrix} 62.3 \\ 62.2 \\ 62.1 \\ 62.0 \\ 61.2 \end{pmatrix} \frac{\text{lb}}{\text{ft}^3} \quad \text{Density}$$

$$\mu_{\text{data.water},i} := \begin{pmatrix} 0.658 \\ 0.578 \\ 0.514 \\ 0.458 \\ 0.292 \end{pmatrix} \cdot 10^{-3} \frac{\text{lb}}{\text{ft} \cdot \text{sec}} \quad \text{Dynamic viscosity}$$

Based on these values, the water density and dynamic viscosity are defined as function of temperature using a linear interpolation procedure:

$$\rho_{\text{water}}(\text{Temp}) := \text{interp}(T_{\text{data.water},i}, \rho_{\text{data.water},i}, \text{Temp})$$

$$\mu_{\text{water}}(\text{Temp}) := \text{interp}(T_{\text{data.water},i}, \mu_{\text{data.water},i}, \text{Temp})$$

Water self-diffusivity as function of temperature [Ref. 2]

Reference 2 plots self-diffusivity values for water in liquid state for temperature from 273.15 K (32 °F) to 373.15 K (212 °F). The data below are extracted from Figure 7 of Ref. 2:

		$j := 0 \dots 8$	
$T_{\text{data,water.2}} :=$	$\begin{pmatrix} 277.0 \\ 282.2 \\ 286.4 \\ 291.1 \\ 295.7 \\ 299.4 \\ 318.6 \\ 334.1 \\ 364.2 \end{pmatrix}$	· K	Temperature
$D_{\text{WW,data,water.2}} :=$	$\begin{pmatrix} 1.23\text{E-}05 \\ 1.49\text{E-}05 \\ 1.69\text{E-}05 \\ 1.92\text{E-}05 \\ 2.05\text{E-}05 \\ 2.33\text{E-}05 \\ 3.65\text{E-}05 \\ 4.71\text{E-}05 \\ 7.85\text{E-}05 \end{pmatrix}$	· $\frac{\text{cm}^2}{\text{s}}$	Self-diffusivity

Based on these values, the water self-diffusivity is defined as function of temperature using a linear interpolation procedure:

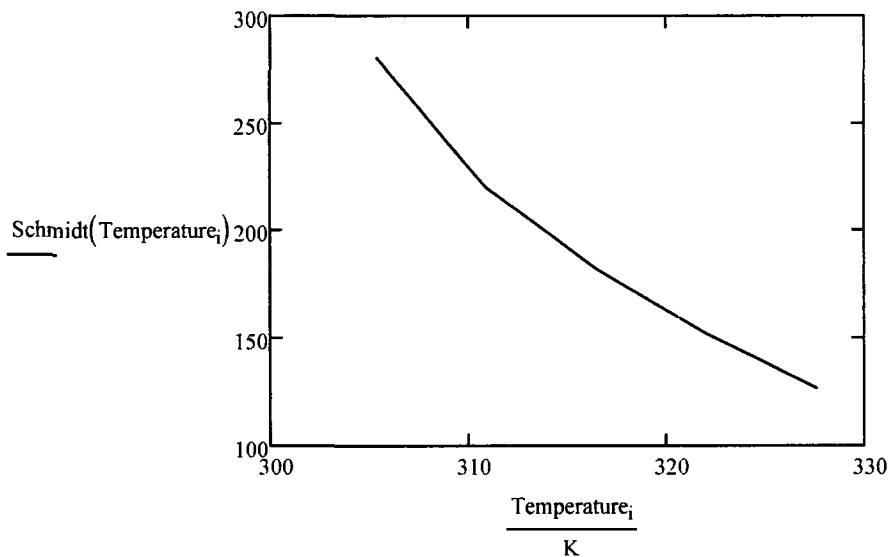
$$D_{\text{ww}}(\text{Temp}) := \text{linterp}(T_{\text{data,water.2}}, D_{\text{WW,data,water.2}}, \text{Temp})$$

The Schmidt number is defined as [Ref. B5.2]:

$$\text{Schmidt}(\text{Temp}) := \frac{\mu_{\text{water}}(\text{Temp})}{\rho_{\text{water}}(\text{Temp}) \cdot D_{\text{ww}}(\text{Temp})}$$

A plot of the Schmidt number between 90°F and 130°F is shown below:

$$\text{Temperature} := \begin{pmatrix} 90^\circ\text{F} \\ 100^\circ\text{F} \\ 110^\circ\text{F} \\ 120^\circ\text{F} \\ 130^\circ\text{F} \end{pmatrix} \quad \text{Schmidt}(\text{Temperature}_i) = \begin{pmatrix} 280.6 \\ 219.8 \\ 182.1 \\ 151.8 \\ 126.9 \end{pmatrix}$$



At 100°F, the Schmidt number is equal to 219.8.

Summary Report: UHS step two

Session Summary

Date Mar 29, 2012 6:16:13 PM
Simulation C:\Users\0n7590\Desktop\UHS.sim
File size 2.9e+02 MB
Number of Partitions 1
Number of Restored Partitions 1

Software Summary

Version BuildArch: win64
BuildEnv: intel11.1
ReleaseDate: Fri Jun 3 18:25:06 UTC 2011
ReleaseNumber: 6.04.014

Hardware Summary

Hosts Controller: STARCCM
Number of Workers: 0

Simulation Properties

```

1 UHS
+-1 Filters
+-2 Parts
|  +-1 Lake
|  |
|  | Region
|  | Contacts
|  | Face count
|  | Tags
|  | Meta Data
|  |
|  +-1 Surfaces
|  | +-1 FreeSurface
|  | |
|  | | Boundary
|  | | Tags
|  | | Meta Data
|  | +-2 Inlet
|  | |
|  | | Boundary
|  | | Tags
|  | | Meta Data
|  | +-3 Outlet
|  | |
|  | | Boundary
|  | | Tags
|  | | Meta Data
|  | +-4 Soil
|  | |
|  | | Boundary
|  | | Tags
|  | | Meta Data
|  +-2 Curves
|  +-1 Edges
|  |
|  | Tags
|  | Feature Curve
|  |
+-3 3D-CAD Models
+-4 Tags
+-5 Operations
+-6 Continua
|  +-1 Mesh 1
|  |
|  | OOC translation
|  | Verbose Output
|  | Per-Region Meshing
|  | Use Parallel Meshing
|  | Interpolation Option
|  | interfaces
|  | Regions
|  |
|  +-1 Models
|  | +-1 Surface Remesher
|  | |
|  | | Do curvature refinement
|  | | Do proximity refinement
|  | | Do compatibility refinement
|  | | Retain geometric features
|  | | Create aligned meshes
|  | | Minimum face quality
|  | | Enable automatic surface repair
|  | +-2 Thin Mesher
|  | |
|  | | Polyhedral Cells Type
|  | | Run Optimizer
|  | | Automatic Correction
|  | | Customize Thickness Threshold
|  | | Customize Surface Size Ratio
|  | | Threshold
|  |
|  +-2 Reference Values
|  | +-1 Base Size
|  | +-2 CAD Projection
|  | +-3 Surface Curvature
|  | | +-1 Basic Curvature
|  | +-4 Surface Growth Rate
|  | +-5 Surface Proximity
|  | |
|  | +-6 Surface Size
|  | |
|  | | +-1 Absolute Minimum Size
|  | | +-2 Absolute Target Size
|  | +-7 Thin Mesher Layers
|  | +-8 Thin Solid Thickness
|  | | +-1 Absolute Size
|  | +-3 Volumetric Controls
|  | | +-1 Volumetric Control 1
|  | |
|  | +-1 Mesh Conditions

```

Lake
 {}
 572
 {}
 {}
 Lake: FreeSurface
 {}
 {}
 Lake: Inlet
 {}
 {}
 Lake: Outlet
 {}
 {}
 Lake: Soil
 {}
 {}
 Lake: Edges
 2
 false
 false
 false
 false
 Nearest neighbor
 {}
 [Lake]
 true
 true
 false
 true
 false
 0.05
 false
 Polygonal prisms
 false
 true
 true
 false
 Value
 12.0 ft
 true
 false
 36.0
 1.3
 2.0
 0.0 ft
 Absolute
 Min and Target
 6.0 ft
 Value
 12.0 ft
 6
 Absolute
 11.0 ft
 {}
 [Block 1]

-1 Surface Remesher	Customize surface remesher	Enabled
-2 Mesh Values		
-1 Custom Size	Size type	Absolute
-1 Absolute Size	Value	1.5 ft
-2 Physics 1	Interfaces	[]
-1 Models	Regions	[Lake]
-1 All y+ Wall Treatment		
-2 Constant Density		
-3 Implicit Unsteady		
-4 K-Omega Turbulence		
-5 Multi-Component Liquid		
-1 Liquid Mixture		
-1 Liquid Components		
-1 WaterLake	ID	1
-1 Component Properties	Database Material	H2O (Water) [Standard/Liquids]
-1 Molecular Weight	Method	Constant
-1 Constant	Value	18.0153 lb/lbmol
-2 WaterCirculating	ID	2
-1 Component Properties	Database Material	Hg (Mercury) [Standard/Liquids]
-1 Molecular Weight	Method	Constant
-1 Constant	Value	18.0153 lb/lbmol
-2 Mixture Properties		
-1 Density	Method	Constant
-1 Constant	Value	62.0 lb/ft^3
-2 Dynamic Viscosity	Method	Constant
-1 Constant	Value	6.727E-9 atm-s
-3 Molecular Diffusivity	Method	Schmidt Number
-1 Schmidt Number	Schmidt Number	219.8
-4 Molecular Weight	Method	Mixture
-1 Mixture		
-5 Turbulent Schmidt Number	Method	Constant
-1 Constant	Value	0.9
-6 Non-reacting		
-7 Reynolds-Averaged Navier-Stokes		
-8 Segregated Flow	Minimum Absolute Pressure	0.009869232667160128 atm
	Flow Boundary Diffusion	true
	Secondary Gradients	On
	Convection	2nd-order
-9 Segregated Species	Flow Boundary Diffusion	true
	Secondary Gradients	On
	Convection	2nd-order
-10 SST (Menter) K-Omega	a1	0.31
	Kappa	0.41
	BetaStar	0.09
	Beta1	0.075
	Sigma_k1	0.85
	Sigma_w1	0.5
	Beta2	0.0828
	Sigma_k2	1.0
	Sigma_w2	0.856
	Secondary Gradients	On
	Convection	2nd-order
	Realizability Option	Durbin Scale Limiter
	Compressibility Correction	true
	Low Re Damping Modification	false
	Normal Stress Term	false
	Tke Minimum	1.0E-10
	Sdr Minimum	1.0E-10
	Zeta_Star	1.5
-1 Compressibility Parameters	Realizability Coefficient	0.6000000238418579
-2 Realizability Coefficient		
-11 Three Dimensional		
-12 Turbulent		
-2 Reference Values		
-1 Reference Pressure	Value	1.0 atm
-2 Minimum Allowable Wall Distance	Value	3.280839895013123E-6 ft
-3 Initial Conditions		
-1 Pressure	Method	Constant
-1 Constant	Value	0.0 atm
-2 Species Mass Fraction	Method	Constant
-1 Constant	Value	[1.0, 0.0]
-3 Species Specification	Method	Mass fraction
-4 Turbulence Intensity	Method	Constant
-1 Constant	Value	0.01
-5 Turbulence Specification	Method	Intensity + Viscosity Ratio
-6 Turbulent Velocity Scale	Method	Constant
-1 Constant	Value	3.280839895013123 ft/s
-7 Turbulent Viscosity Ratio	Method	Constant
-1 Constant	Value	10.0
-8 Velocity	Coordinate System	Laboratory
	Method	Constant
-1 Constant	Value	[0.0, 0.0, 0.0] ft/s
-7 Regions	Regions	1
-1 Lake	Index	0
	Physics Continuum	Physics 1
	Type	Fluid Region
	Mesh Continuum	Mesh 1
	Parts	[Lake]
-1 Boundaries	Boundaries	4
-1 FreeSurface	Index	2

		Type	Symmetry Plane
		Interfaces	
		Part Surfaces	[Lake.FreeSurface]
	+~1 Mesh Conditions		
	+~1 Custom Surface Curvature	Custom curvature	Use Continuum Values
	+~2 Custom Surface Proximity	Custom proximity	Use Continuum Values
	+~3 Custom Surface Size	Custom surface size	Disabled
	+~4 Customize Surface Remeshing	Disable Surface Remeshing	Disabled
	+~2 Inlet	Index	3
		Type	Mass Flow Inlet
		Interfaces	
		Part Surfaces	[Lake.Inlet]
	+~1 Mesh Conditions		
	+~1 Custom Surface Curvature	Custom curvature	Use Continuum Values
	+~2 Custom Surface Proximity	Custom proximity	Use Continuum Values
	+~3 Custom Surface Size	Custom surface size	Disabled
	+~4 Customize Surface Remeshing	Disable Surface Remeshing	Disabled
	+~2 Physics Conditions		
	+~1 Flow Direction Specification	Method	Boundary-Normal
	+~2 Mass Flow Option	Specification Option	Mass Flow Rate
	+~3 Species Specification	Method	Mass fraction
	+~4 Turbulence Specification	Method	Intensity + Viscosity Ratio
	+~3 Physics Values		
	+~1 Mass Flow Rate	Method	Constant
	+~1 Constant	Value	5333.7 lb/s
	+~2 Species Mass Fraction	Method	Constant
	+~1 Constant	Value	[0.0, 1.0]
	+~3 Turbulence Intensity	Method	Constant
	+~1 Constant	Value	0.01
	+~4 Turbulent Viscosity Ratio	Method	Constant
	+~1 Constant	Value	10.0
	+~3 Outlet	Index	4
		Type	Pressure Outlet
		Interfaces	
		Part Surfaces	[Lake.Outlet]
	+~1 Mesh Conditions		
	+~1 Custom Surface Curvature	Custom curvature	Use Continuum Values
	+~2 Custom Surface Proximity	Custom proximity	Use Continuum Values
	+~3 Custom Surface Size	Custom surface size	Disabled
	+~4 Customize Surface Remeshing	Disable Surface Remeshing	Disabled
	+~2 Physics Conditions		
	+~1 Backflow Direction Specification	Method	Boundary-Normal
	+~2 Species Specification	Method	Mass fraction
	+~3 Target Mass Flow Option	Target Mass Flow Option	Disabled
	+~4 Turbulence Specification	Method	Intensity + Viscosity Ratio
	+~3 Physics Values		
	+~1 Pressure	Method	Constant
	+~1 Constant	Value	0.0 atm
	+~2 Species Mass Fraction	Method	Constant
	+~1 Constant	Value	[1.0, 0.0]
	+~3 Turbulence Intensity	Method	Constant
	+~1 Constant	Value	0.01
	+~4 Turbulent Viscosity Ratio	Method	Constant
	+~1 Constant	Value	10.0
	+~4 Soil	Index	1
		Type	Wall
		Interfaces	
		Part Surfaces	[Lake.Soil]
	+~1 Mesh Conditions		
	+~1 Custom Surface Curvature	Custom curvature	Use Continuum Values
	+~2 Custom Surface Proximity	Custom proximity	Use Continuum Values
	+~3 Custom Surface Size	Custom surface size	Disabled
	+~4 Customize Surface Remeshing	Disable Surface Remeshing	Disabled
	+~2 Physics Conditions		
	+~1 Shear Stress Specification	Method	No-Slip
	+~2 Tangential Velocity Specification	Method	None
	+~1	Reference Frame	Relative To Mesh
	+~3 Wall Species Option	Method	Impermeable
	+~4 Wall Surface Specification	Method	Rough
	+~3 Physics Values		
	+~1 Blended Wall Function	Kappa	0.42
	+~1	E	9.0
	+~2 Roughness Height	Method	Constant
	+~1 Constant	Value	5.0 in
	+~3 Wall Roughness Parameters	B	0.0
		C	0.253
		RplusSmooth	2.25
		RplusRough	90.0
		Feature Curves	1
	+~2 Feature Curves	Part Curves	[Lake.Edges]
	+~1 Edges		
	+~1 Mesh Conditions		
	+~1 Custom Surface Size	Custom surface size	Disabled
	+~3 Mesh Conditions		
	+~1 Customize Thin Mesher Parameters	Customize Thin Mesher Parameters	Use Default Values
	+~4 Physics Conditions		
	+~1 Initial Condition Option	Option	Use Continuum Values
	+~2 Momentum Source Option	Momentum Source Option	None
	+~3 Species Source Option	Species Source Term	Disabled
	+~4 Turbulence Source Option	Turbulence Source Option	None
	+~5 Physics Values		
	+~1 Axis	Direction	[0.0, 0.0, 1.0]
		Coordinate System	Laboratory

		Origin	[0.0, 0.0, 0.0] ft
		Motion	Stationary
		Reference Frame	Lab Reference Frame
		Derived Parts	6
		Coordinate System	Laboratory
		Origin	[700.0, 1000.0, -1.4999999999999998] ft,ft,ft
		Normal	[0.0, 1.0, 0.0] ft,ft,ft
		Section Mode	Single Section
		Displayed Index	-1
		Parts	[Lake]
		Offset	0.0
		Coordinate System	Laboratory
		Origin	[500.0, 500.0, -1.4999999999999998] ft,ft,ft
		Normal	[0.0, 1.0, 0.0] ft,ft,ft
		Section Mode	Single Section
		Displayed Index	-1
		Parts	[Lake]
		Offset	0.0
		Coordinate System	Laboratory
		Origin	[1050.0, 4000.0, -1.4999999999999998] ft,ft,ft
		Normal	[0.0, 1.0, 0.0] ft,ft,ft
		Section Mode	Single Section
		Displayed Index	-1
		Parts	[Lake]
		Offset	0.0
		Seed Type	Part
		Rotation Scale	1.0
		Integration Solver	2nd-Order RK
		Vector Field	Cell Relative Velocity
		Parts	[Lake: FreeSurface]
		Seed Parts	[Lake: FreeSurface]
		On Ratio	281
		Randomize	false
		N Grid Points	[30, 30]
		Integration Direction	Both
		Initial Integration Step	0.5
		Maximum Propagation	20.0
		Max Steps	2000
		Coordinate System	Laboratory
		Origin	[1050.0, 2433.00000000000005, - 1.4999999999999998] ft,ft,ft
		Normal	[1.0, 0.0, 0.0] ft,ft,ft
		Section Mode	Single Section
		Displayed Index	-1
		Parts	[Lake]
		Offset	0.0
		Coordinate System	Laboratory
		Origin	[300.0, 1000.0, -1.4999999999999998] ft,ft,ft
		Normal	[1.0, 0.0, 0.0] ft,ft,ft
		Section Mode	Single Section
		Displayed Index	-1
		Parts	[Lake]
		Offset	0.0
		Time-Step	11.0 s
		Freeze Time	false
		Temporal Discretization	1st-order
		Solver Frozen	false
		Verbosity	0
		Parallel memory optimization scaling factor	1.0
		Solver Frozen	false
		Reconstruction Frozen	false
		Reconstruction Zeroed	false
		Temporary Storage Retained	false
		Solver Frozen	false
		Under-Relaxation Factor	0.7
		Ramp Method	No Ramp
		Verbosity	None
		Max Cycles	30
		Parallel Migration Limit	25
		Extra partition-boundary sweeps	0
		Enable direct-solver	false
		Maximum direct-solver equations	32
		Convergence Tolerance	0.1
		Epsilon	0.0
		Cycle Type	Flex Cycle
		Group Size Control	Auto
		Group Size	4
		Relaxation Scheme	Gauss-Seidel
		Acceleration method	None
		Scaling	Disabled
		Restriction Tolerance	0.9
		Prolongation Tolerance	0.5
		Sweeps	1
		Under-Relaxation Factor	0.3
		Pressure Reference Location	Automatic Selection
		Ramp Method	No Ramp
		Verbosity	None

		Max Cycles	30
		Parallel Migration Limit	25
		Extra partition-boundary sweeps	0
		Enable direct-solver	false
		Maximum direct-solver equations	32
		Convergence Tolerance	0.1
		Epsilon	0.0
		Cycle Type	V Cycle
		Group Size Control	Auto
		Group Size	4
		Relaxation Scheme	Gauss-Seidel
		Acceleration method	Conjugate Gradient
		Scaling	Auto
	~-1 V Cycle	Pre-Sweeps	1
		Post-Sweeps	1
		Max Levels	50
	+~4 Segregated Species	Under-Relaxation Factor	0.9
		Reconstruction Frozen	false
		Reconstruction Zeroed	false
		Temporary Storage Retained	false
		Solver Frozen	false
	+~1 Under-Relaxation Factor Ramp	Ramp Method	No Ramp
	~-2 AMG Linear Solver	Verbosity	None
		Max Cycles	30
		Parallel Migration Limit	25
		Extra partition-boundary sweeps	0
		Enable direct-solver	false
		Maximum direct-solver equations	32
		Convergence Tolerance	0.1
		Epsilon	0.0
		Cycle Type	V Cycle
		Group Size Control	Auto
		Group Size	4
		Relaxation Scheme	Gauss-Seidel
		Acceleration method	None
		Scaling	Disabled
	~-1 V Cycle	Pre-Sweeps	1
		Post-Sweeps	1
		Max Levels	50
	+~5 K-Omega Turbulence	Under-Relaxation Factor	0.8
		Reconstruction Frozen	false
		Reconstruction Zeroed	false
		Temporary Storage Retained	false
		Solver Frozen	false
	+~1 Under-Relaxation Factor Ramp	Ramp Method	No Ramp
	~-2 AMG Linear Solver	Verbosity	None
		Max Cycles	30
		Parallel Migration Limit	25
		Extra partition-boundary sweeps	0
		Enable direct-solver	false
		Maximum direct-solver equations	32
		Convergence Tolerance	0.1
		Epsilon	0.0
		Cycle Type	Flex Cycle
		Group Size Control	Auto
		Group Size	4
		Relaxation Scheme	Gauss-Seidel
		Acceleration method	None
		Scaling	Disabled
	~-1 Flex Cycle	Restriction Tolerance	0.9
		Prolongation Tolerance	0.5
		Sweeps	1
	~-6 K-Omega Turbulent Viscosity	Under-Relaxation Factor	1.0
		Maximum Ratio	100000.0
		Solver Frozen	false
+~10 Stopping Criteria			
	+~1 Maximum Inner Iterations	Maximum Inner Iterations	20
		Enabled	true
		Criterion Satisfied	true
		Logical Rule	Or
	+~2 Maximum Physical Time	Maximum Physical Time	169122.0 s
		Enabled	true
		Criterion Satisfied	true
		Logical Rule	Or
	+~3 Maximum Steps	Maximum Steps	1000000000
		Enabled	true
		Criterion Satisfied	false
		Logical Rule	Or
	~-4 Stop File	Stop Inner Iterations	true
		Path	ABORT
		Enabled	true
		Criterion Satisfied	false
		Logical Rule	Or
+~11 Reports		Reports	8
	+~1 ConcentrationSurfaceLakeWater	Scalar Field Function	MassFraction of WaterLake
		Parts	[Lake: FreeSurface]
		Smooth Values	false
		Units	
	+~2 ConcentrationVolumeLakeWater	Scalar Field Function	MassFraction of WaterLake
		Parts	[Lake]
		Smooth Values	false
		Units	
	+~3 MassFlow_inlet	Parts	[Lake: Inlet]

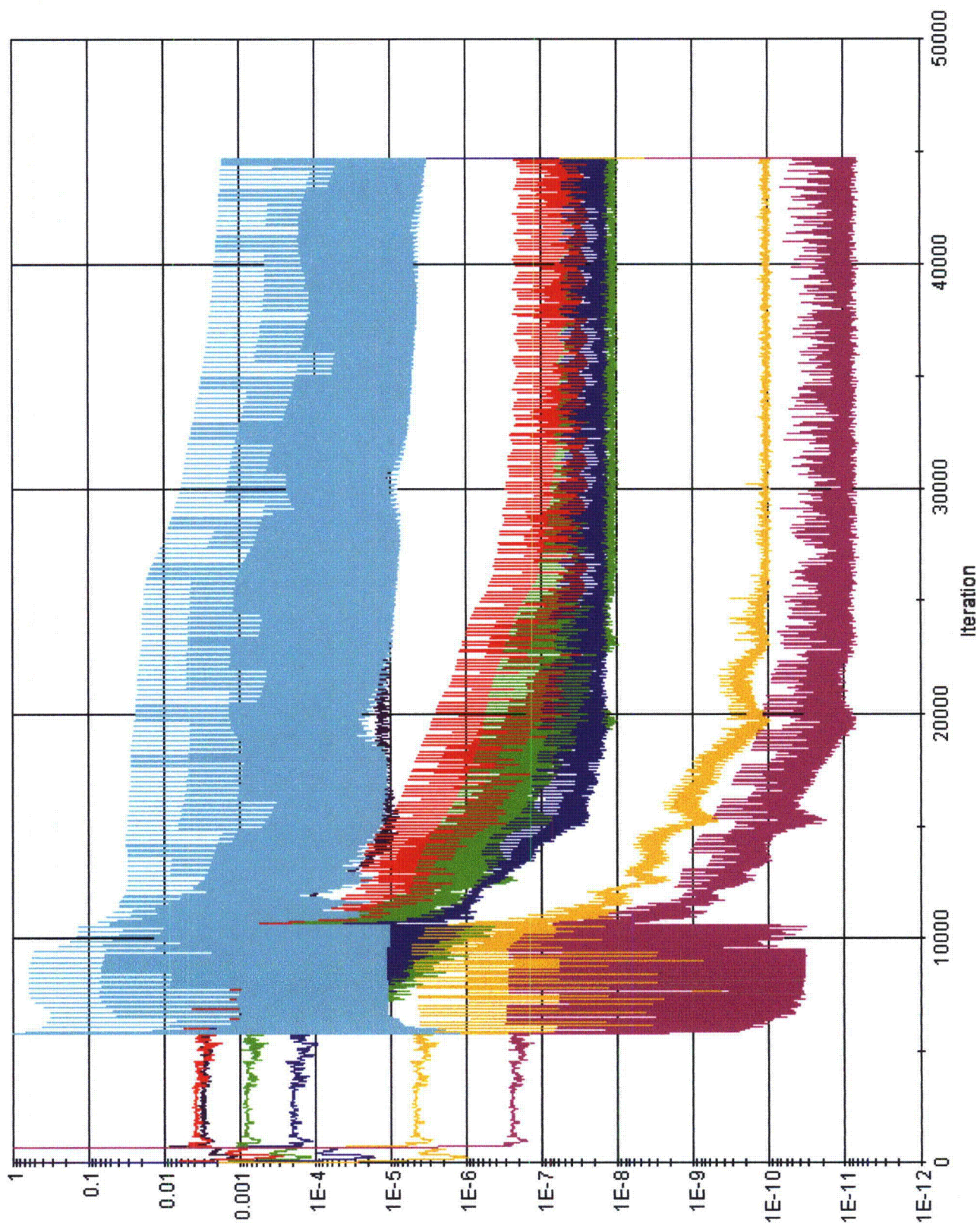
		Smooth Values	false
		Units	lb/s
	+--4 MassFlow_Outlet	Parts	[Lake: Outlet]
		Smooth Values	false
		Units	lb/s
	+--5 MassFlow_Total	Parts	[Lake: FreeSurface, Lake: Inlet, Lake: Outlet, Lake: Soil]
		Smooth Values	false
		Units	lb/s
	+--6 Velocity_Plane4AveVel	Scalar Field Function	Velocity: Magnitude
		Parts	[HorizontalCenter]
		Smooth Values	false
		Units	ft/s
	+--7 Velocity_Plane4MaxVel	Scalar Field Function	Velocity: Magnitude
		Parts	[HorizontalCenter]
		Smooth Values	false
		Units	ft/s
	+--8 Velocity_Plane4MinVel	Scalar Field Function	Velocity: Magnitude
		Parts	[HorizontalCenter]
		Smooth Values	false
		Units	ft/s
	+--12 Monitors	Monitors	18
		Monitors To Print	[Z-momentum, WaterLake, Sdr, Tke, Y-momentum, X-momentum, Continuity, Inlet Monitor, Outlet Monitor, Total Monitor, Plane4AveVel Monitor, Plane4MinVel Monitor, Plane4MaxVel Monitor, ConcentrationSurfaceLakeWater Monitor, ConcentrationVolumeLakeWater Monitor]
		Output Direction	Horizontal
		Heading Print Frequency	10
	+--1 ConcentrationSurfaceLakeWater Monitor	Report	ConcentrationSurfaceLakeWater
		Trigger	Time Step
		Maximum Plot Samples	100000
		Normalization Option	Off
		Frequency	1
	+--2 ConcentrationVolumeLakeWater Monitor	Report	ConcentrationVolumeLakeWater
		Trigger	Time Step
		Maximum Plot Samples	100000
		Normalization Option	Off
		Frequency	1
	+--3 Inlet Monitor	Report	MassFlow_Inlet
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--4 Outlet Monitor	Report	MassFlow_Outlet
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--5 Plane4AveVel Monitor	Report	Velocity_Plane4AveVel
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--6 Plane4MaxVel Monitor	Report	Velocity_Plane4MaxVel
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--7 Plane4MinVel Monitor	Report	Velocity_Plane4MinVel
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--8 Total Monitor	Report	MassFlow_Total
		Trigger	Iteration
		Maximum Plot Samples	5000
		Normalization Option	Off
		Frequency	1
	+--13 Representations		
	+--1 Geometry		
	+--2 Initial Surface	Faces	572
		Edges	154
	-1 Regions		
	-1 Lake	Faces	572
		Edges	154
	+--1 Boundaries		
	+--1 FreeSurface	Faces	142
	+--2 Inlet	Faces	2
	+--3 Outlet	Faces	2
	+--4 Soil	Faces	426
	-2 Feature Curves		
	-1 Edges	Edges	154
	+--3 Remeshed Surface	Faces	493496
		Edges	2460
	-1 Regions		
	-1 Lake	Faces	493496
		Edges	2460

+-1 Boundaries		
+-1 FreeSurface	Faces	250750
+-2 Inlet	Faces	32
+-3 Outlet	Faces	94
+-4 Soil	Faces	242620
+-2 Feature Curves		
+-1 Edges	Edges	2460
+-4 Volume Mesh	Cells	748386
	Interior Faces	2880831
	Vertices	1761870
+-1 Finite Volume Regions		
+-1 Lake	Cells	748386
	Interior Faces	2880831
	Vertices	1761870
+-1 Finite Volume Boundaries		
+-1 FreeSurface	Faces	126581
+-2 Inlet	Faces	30
+-3 Outlet	Faces	176
+-4 Soil	Faces	126832
+-2 Cell Sets		
+-14 Coordinate Systems		
+-15 Tables		
+-16 Units	Preferred System	United States Customary System
+-17 Field Functions		
+-18 Volume Shapes		
+-1 Block 1	Coordinate System	Laboratory
	Corner1	[295.00000120147945, 558.9999802156383, - 1.4999999696501283] ft,ft,ft
	Corner2	[304.9999897874246, 576.0, 5.000000159571489] ft,ft,ft
+-19 User Code		
+-20 Data Set Functions		
+-21 Layouts		
+-1 default		
+-22 Data Mappers		
+-23 Motions		
+-1 Stationary		
+-24 Reference Frames		
+-1 Lab Reference Frame		

Solution

Accumulated CPU Time over all processes (s) 641294.4330000208
Elapsed Time (s) 641294.4820000213
Time Level 1947
Solution Time 169122.0

Residuals



Volume Average of MassFraction of WaterLake

Part	Value
Lake	3.658991e-01
Total:	3.658991e-01

Surface Average of MassFraction of WaterLake

Part	Value
Lake: FreeSurface	4.209259e-01
Total:	4.209259e-01

Appendix J8.6

**Additional information requested by the U.S. Nuclear Regulatory
Commission on June 27th 2013.**

References:

1. U.S. N.R.C. letter, "Subject: LaSalle County Station, Units 1 and 2 – Request for additional information related to license amendment request to technical specification 3.7.3 Ultimate Heat Sink (TAC. NOS. ME9076 and ME9077)", June 27, 2013.

This appendix is added in response to the U.S. N.R.C. request for additional information for the review of CFD and entrance mixing conclusions [Sec. 6, Ref. 1].

Request "a":

The dimensions of the inlet channel are shown in Figure J-4 in the main body of the calculation. As seen, the channel cross-section is modeled as a rectangular area 8 feet wide and 3.5 feet high, which is an accurate representation of the actual inlet channel. The inlet velocity of the water is equal to approximately 3.07 ft/s, which corresponds to 86 ft³/s (see Section J.2.1.5 in the main body of the calculation). This is an accurate modeling of the inlet water velocity based on the dimensions of the discharge channel. The roughness of the bottom of the UHS (including the silt layer) is assumed to be 5 in. As indicated in Assumption J3.3 in the main body of the calculation, this value does not significantly affect the result of the analysis which is the overall water flow pattern and speed within the UHS.

Figures J.8.6-1 to J.8.6-3 show the nodalization used at the inlet region of the UHS model (see also Section J2.1.4 in the main body of the calculation). Figure J.8.6-1 shows a to-scale perspective side view of the UHS inlet channel. The dimensions the channel are show in Figure J-4 in the main body of the calculation. Figure J.8.6-2 shows a to-scale perspective bottom view of the same region, while Figure J.8.6-3 shows the mesh at the mid-level plane of the UHS.

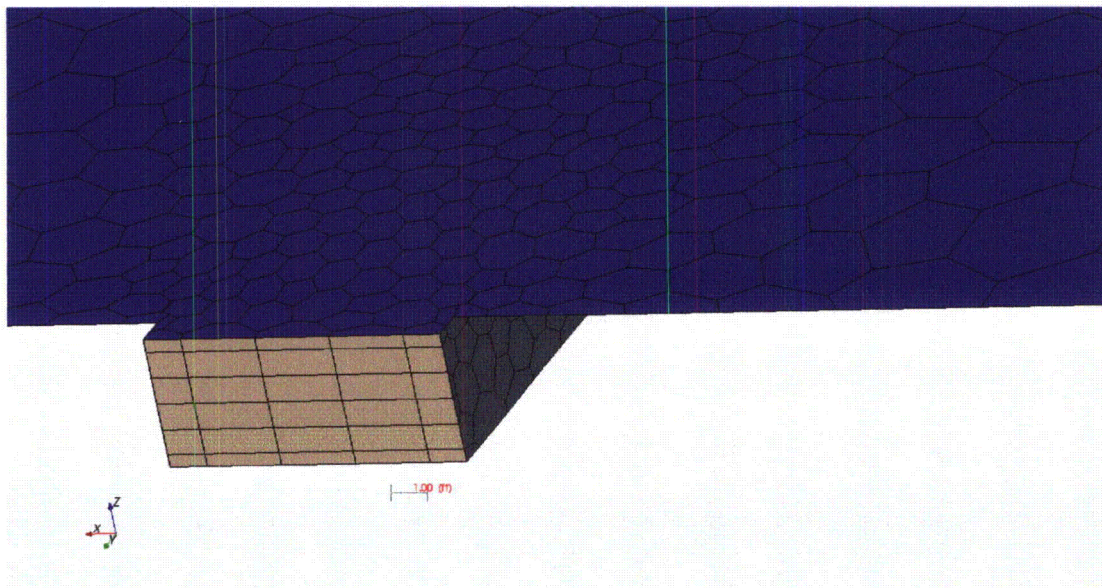


Figure J8.6-1. Detail of the mesh at the inlet boundary (perspective side view)

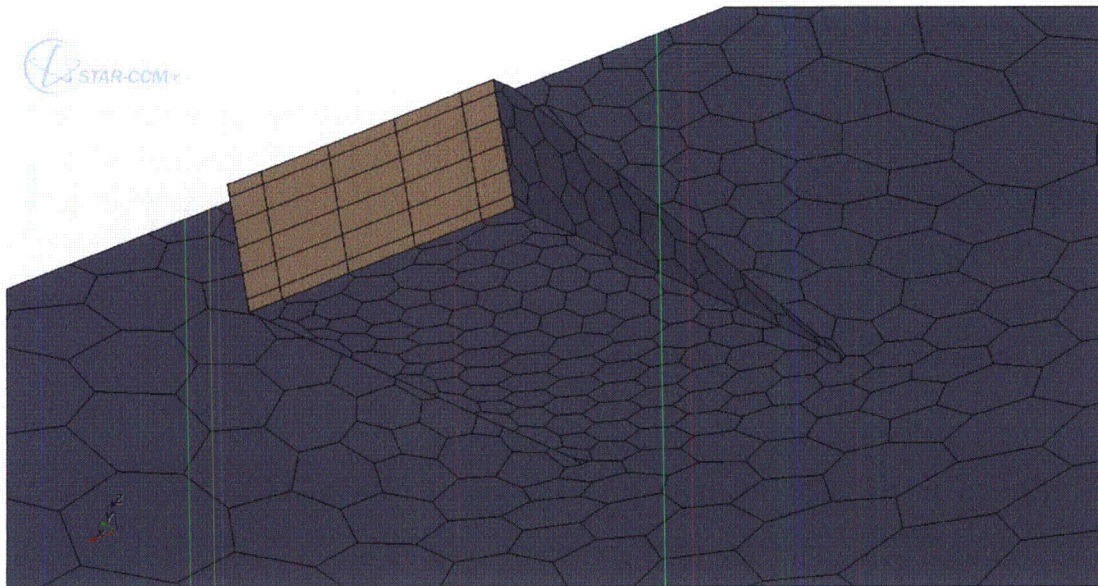


Figure J8.6-2. Detail of the mesh at the inlet boundary (perspective bottom view)

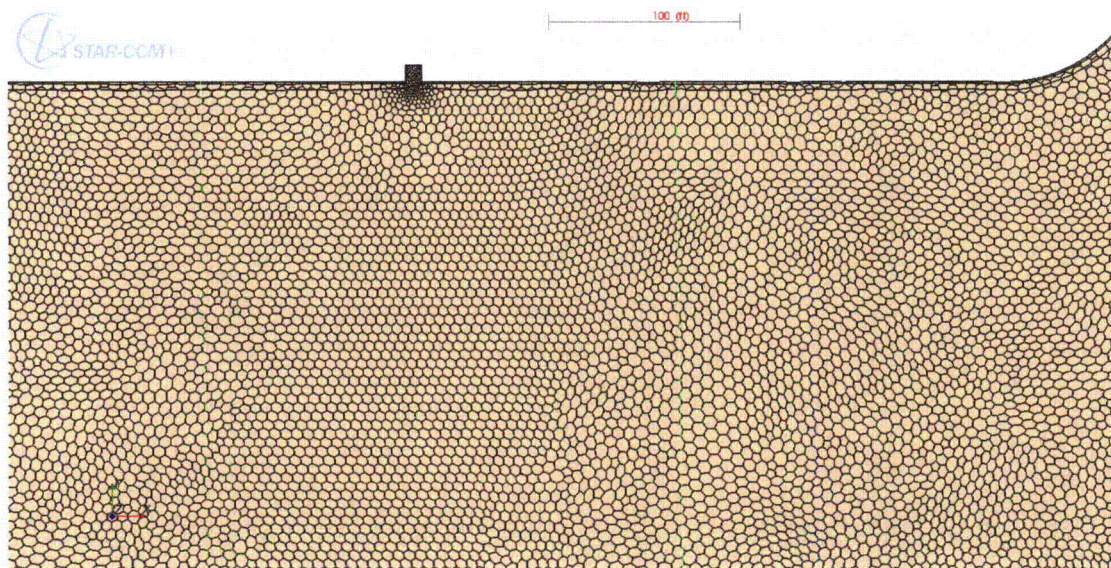


Figure J8.6-3. Detail of the mesh at the inlet boundary (top view of the mid-level plane)

Request "b":

Figures J8.6-4 to J8.6-9 show the fluid velocity at the inlet region (images are to scale) including the top surface, horizontal mid-elevation plane and a vertical cross-section along the inlet channel and UHS (with details of the mesh).

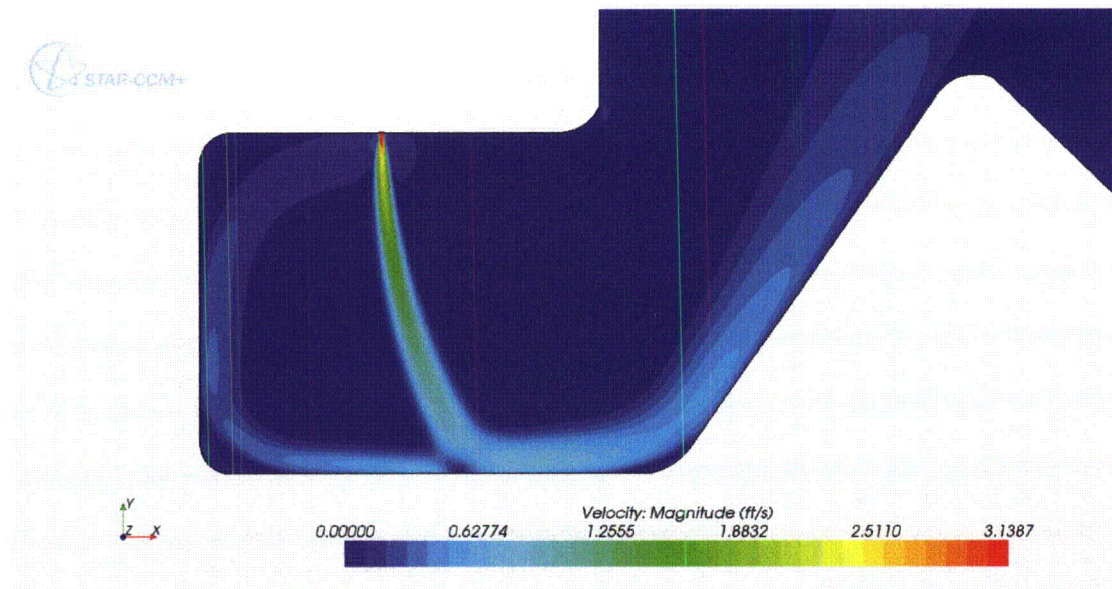


Figure J8.6-4. Water velocity on the free surface at inlet region

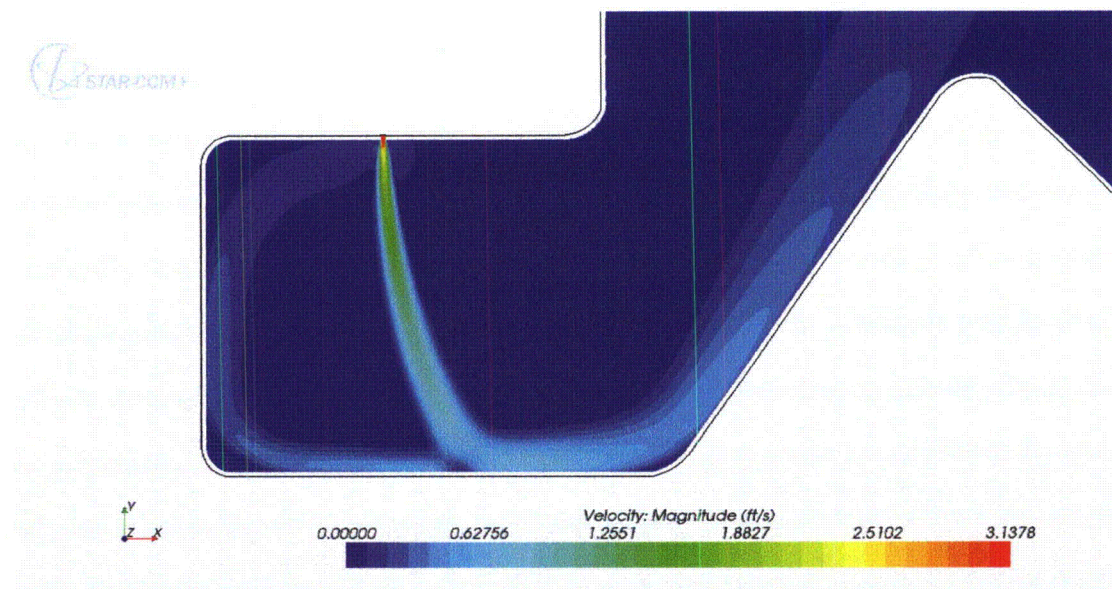


Figure J8.6-5. Water velocity at the mid-plane of the UHS

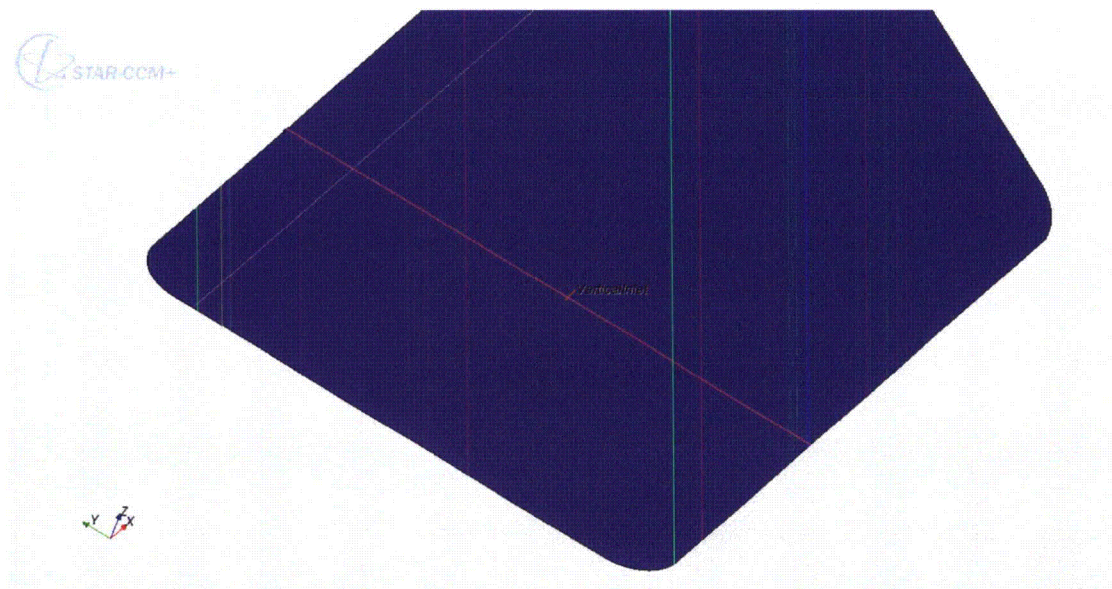


Figure J8.6-6. Location of the vertical cross-section across the inlet channel and UHS (used in the figures below)

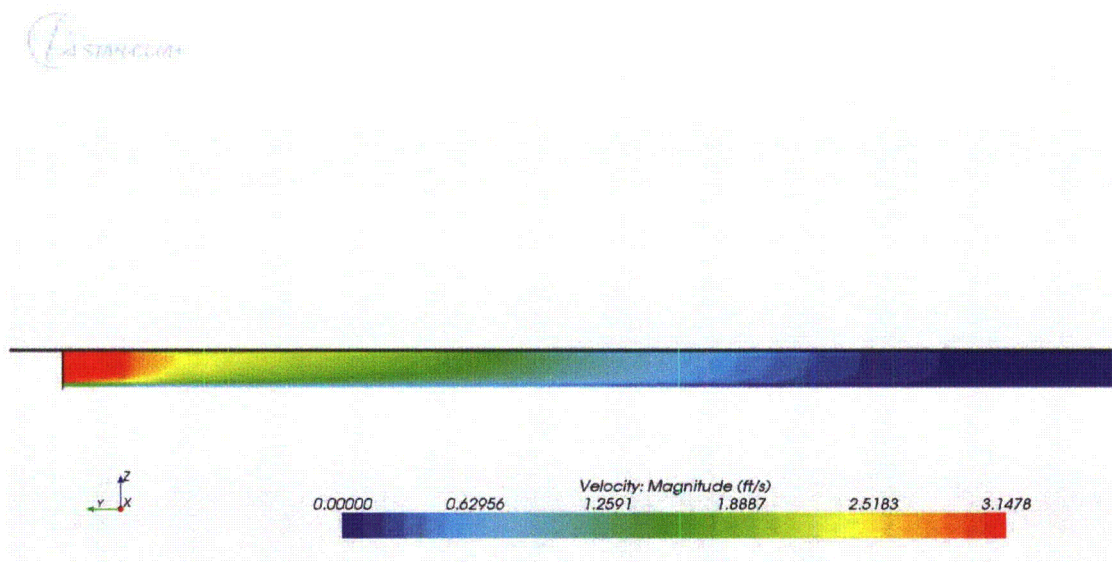


Figure J8.6-7. Water velocity on the vertical cross section along the inlet channel and UHS (see Figure J.8.6-6). Note: The scale of the y-axis is 3.5 times larger than the scale of the x-axis.

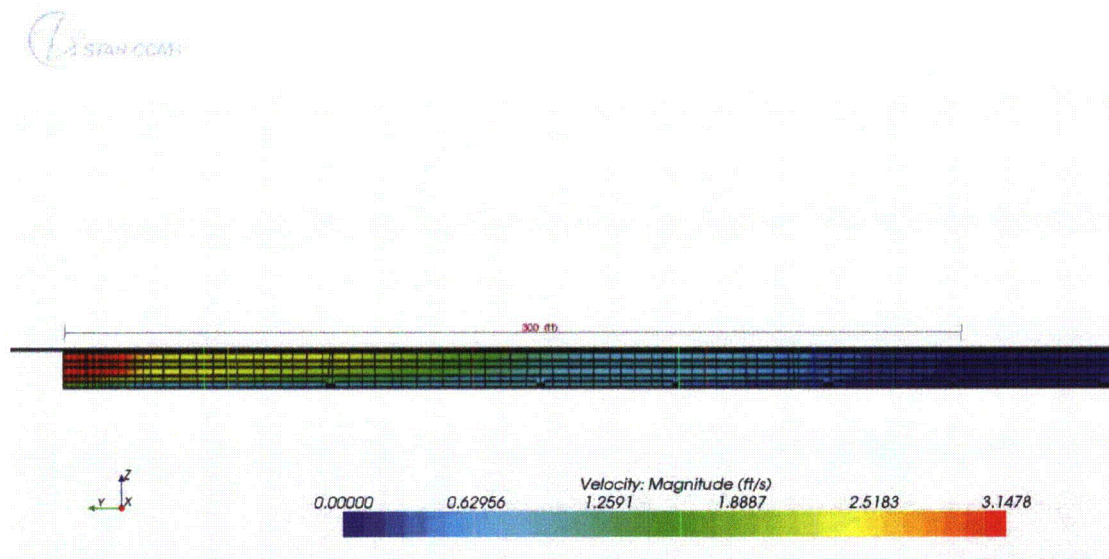


Figure J8.6-8. Water velocity on the vertical cross section along the inlet channel and UHS (see Figure J.8.6-6) with details of the mesh. Note: The scale of the y-axis is 3.5 times larger than the scale of the x-axis.

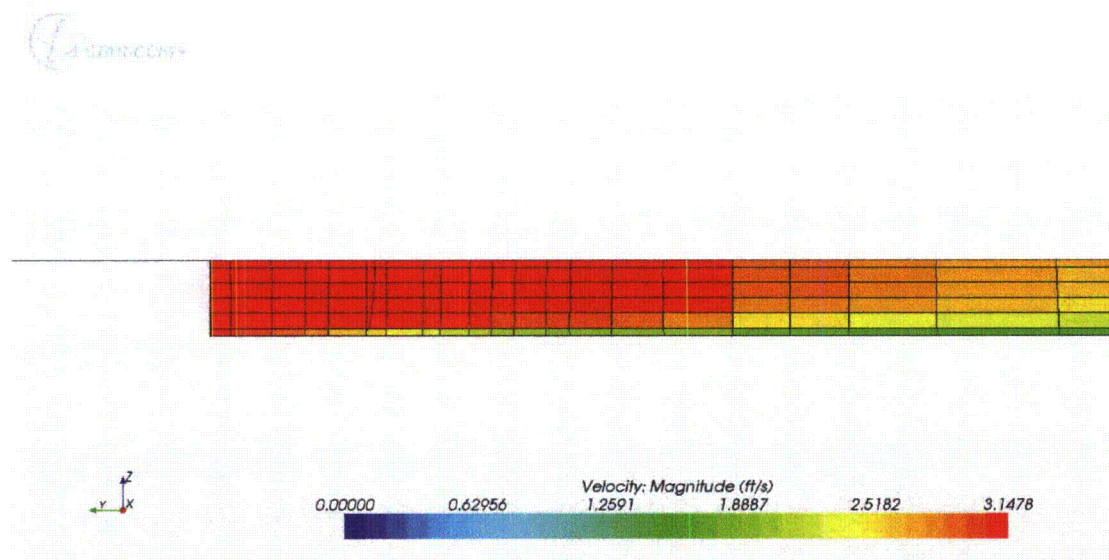


Figure J8.6-9. Water velocity on the vertical cross section along the inlet channel and UHS (see Figure J.8.6-6) with details of the mesh (close-up view of the inlet)

Request "c":

Figure J8.6-10 shows the two recirculation loops at the entry region. The following variables are estimated from the CFD results (see Figure J8.6-10):

Mass flow rate in section S1: 184.5 ft³/s
Mass flow rate in section S2: 52.4 ft³/s (~61% of plant flow to the UHS)
Mass flow rate in section S3: 46.1 ft³/s (~54% of plant flow to the UHS)
Mass flow rate entering the UHS: 86.0 ft³/s

Mean return period in Loop A: ~1 hour
Mean return period in Loop B: ~14 hours

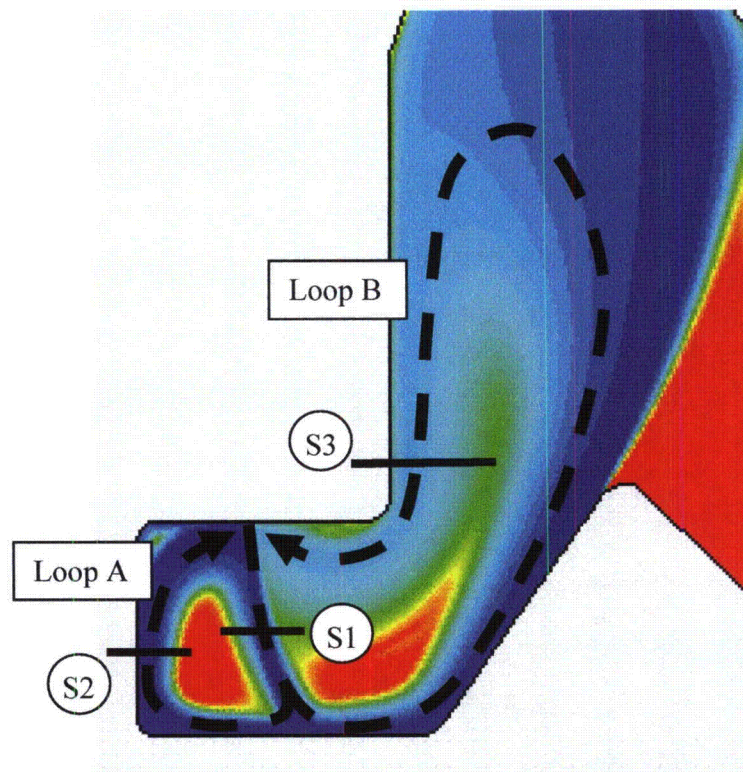


Figure J8.6-10. Recirculation loops at the entry region

Request "d":

The use of constant density fluid and thermal stratification effects in the UHS are addressed in Attachment N, Section N6.4.

The purpose of the CFD analysis is to evaluate the water flow pattern in the man-made Ultimate Heat Sink (UHS) at LaSalle County Generating and to provide effective lake volume and surface area for use in the S&L LAKET-PC computer program. Recirculation regions are present in the UHS due to its shape, which causes the water to flow in a non-straight path. Since water can be practically considered an incompressible fluid, the average velocity distribution within the UHS is governed by the conservation of mass. Changes in average water temperatures within the range of expected values (~100°F to 120°F) produce small changes in water properties and thus may marginally affect the local water velocity distribution. However, these changes would not cause a significant change in the UHS overall water flow pattern and thus to the size of the recirculation regions. Therefore, the results of the CFD calculation are insignificantly affected by a change in water temperature.

Attachment K - Preparation of Hourly Meteorological Data

Prepared: Erwin T. Prater Date 24 MAY 2012
Erwin T. Prater - Sargent & Lundy^{LLC}

Reviewed: Paul N. Derezotes Date 24 MAY 2012
Paul N. Derezotes - Sargent & Lundy^{LLC}

Preparation of Hourly Meteorological Data Used for Cooling Lake Analysis

1 Purpose

This attachment describes update of a meteorological data input file provided to support a validation study of the cooling lake at the LaSalle County Nuclear Generating Station, near Marseilles, IL. The file was expanded to include older data collected from January 1, 1995 – December 31, 2004. The updated file now includes the period of record from January 1, 1995 – September 30, 2010.

2 Parameters Included in the Meteorological Data File

The meteorological data file was compatible with the Laket program (Reference 1), which S&L uses to evaluate the thermal performance of cooling lakes. The parameter content and digital format of Laket meteorological files are listed in Table 1.

3 Meteorological Data Selection

Wind and temperature data were taken from an on-site meteorological tower at the generating station. The on-site tower measured the dry-bulb temperature and wind speed/direction at three levels: 33 ft., 200 ft. and 375 ft above ground level. Wind speed/direction and dry-bulb temperature from the lowest level (33 ft., or 10.1 meter) level were extracted for use in Laket. The on-site meteorological tower contractor supplied the on-site tower data in the form of digital text file.

The on-site meteorological tower did not collect hourly humidity, precipitation type, cloud height and cloud cover, which are required inputs for Laket. These parameters were taken from a National Weather Service observing station at the Peoria, IL airport (station identifier KPIA). That weather station is located approximately 70 miles southwest of the generating station.

4 Raw Meteorological Data

Observed (“raw”) meteorological data from KPIA were used to develop the meteorological data input file for Laket. Raw data were purchased from the National Climatic Data Center (NCDC) in Asheville, NC. Two separate digital files were purchased. These two files are briefly described below.

(1) Surface Weather Observations

Raw surface weather observations (Reference 2) from KPIA covered the period of record from January 1, 1995 through December 31, 2004. NCDC subjects meteorological data to rigorous quality control checks before archiving it. Nevertheless, meteorological databases still typically include gaps and data values outside of valid ranges. The

archived data included most of the weather parameters required by Laket (Table 1), with the following exceptions: freezing precipitation code, solar radiation, atmospheric radiation, and partial pressure of water vapor. S&L estimated those parameters using standard methods. To check the thermodynamic consistency of the input data, S&L estimated hourly wet bulb temperature, dew point temperature and humidity to ensure consistency between those parameters and the (on-site) dry-bulb temperature. In instances when the dew point temperature at KPIA exceeded the dry-bulb temperature at the on-site meteorological tower, the dew point temperature at KPIA was set equal to the dry-bulb temperature observed at the on-site tower. This ensured thermodynamic consistency between the relative humidity and the dry-bulb, wet-bulb temperature and dew point temperatures.

(2) Precipitation Data

Raw hourly digital precipitation data (Reference 3) from KPIA were available for the period of record from January 1, 1995 through December 31, 2004.

5 Creating Input Meteorological Data for Laket

S&L uses a series of modular computer programs collectively called the Surface Data Generator ("Surgen") and judgements and adjustments by a qualified, experienced, professional meteorologist to create digital meteorological data files for input into Laket. Key requirements of Laket include a specific set of weather parameters and specific digital format (Table 1), and a complete meteorological database with no bad (out of range), or missing, parameters. Surgen modules are executed independently and perform the following functions:

- (1) Interpret the unique digital formats of raw surface weather observations and precipitation data and extract required meteorological parameters.
- (2) Convert numeric units of extracted parameters to those required by the Laket program.
- (3) Scan hourly surface weather observations, and identify periods when values for selected parameters are either missing or invalid (outside of acceptable ranges). Those periods are identified by starting and ending date, and by the length of each gap (in hours).
- (4) Scan hourly surface weather observations, identify periods within the digital file when whole days or specific hours are missing; insert new, or blank records into the file to fill time gaps.
- (5) Estimate values for the following weather parameters: an indicator whether precipitation is liquid or frozen, solar radiation reaching the lake surface, atmospheric radiation reaching the lake surface, partial pressure of water vapor in the atmosphere, wet bulb temperature and dew point temperature.

- (6) Perform simple linear interpolation of weather parameter values through gaps, and insert the new interpolated values into the database.
- (7) Allow insertion of manually selected substitution values into gaps in the database that are judged not to be suitable for simple linear interpolation.
- (8) Translate processed and adjusted databases into the format required by the Laket program.

Since the project required combining wind and temperature data from an on-site meteorological tower with data collected at another site (Peoria, IL), S&L developed a project-specific FORTRAN program which merged the on-site wind speed/direction and dry-bulb temperature data with other data from KPIA. The program produced a single input file that was subsequently processed with Surgen, as described above.

6 Review and Adjustment of Meteorological Data

Surgen identified short periods of missing, or bad (out of range), raw meteorological data and used linear interpolation to fill short gaps that were generally 1-2 hours long. However, there were three periods identified which had data gaps too long for linear interpolation. Data were manually substituted from Peoria in these periods. These periods are listed below:

Wind direction and speed from Peoria, IL was used for the following periods:

- (1) 10/30/97 21:00 local standard time (LST) through 11/03/97 14:00 LST
- (2) 08/23/02 05:00 LST through 09/04/02 11:00 LST

The anemometer height at Peoria during both of these time periods was 32.8 ft (10 meters) (Reference 4).

Dry bulb temperature from Peoria, IL used for the following period:

- (3) 06/15/98 08:00 LST through 06/16/98 11:00 LST

7 Laket Meteorological Input File

Surgen produced a single Laket meteorological input file which was appended to the original meteorological data file produced in 2011. The specifications of the original and combined (updated) file are listed below

Original file:

Name: PIALSL0510.DAT

Type: ASC text

Size: 7,773 Kb

Creation date/time: 3/17/2011 4:04 PM

Updated file:

Name: PIALSL9510.DAT

Type: ASC text

Size: 21,301 Kb

Creation date/time: 3/9/2012 11:08 AM

The updated meteorological data file was tested with a short Laket input file to ensure that Laket could read the updated meteorological data file. Laket read the updated meteorological data file normally.

8 Wind Sensor Height

The wind speed/direction sensor height is an input in Laket. The wind speed and direction were taken from the 33 ft. (10.1 meter) level of the on-site meteorological tower at the generating station.

9 References

1. Sargent & Lundy (S&L), 2004. "LAKET-PC, A One Dimensional Lake Thermal Prediction Program, S&L Program Number LAK 03.7.292-2.2, Revision 0, October 30, 2004, User Manual", S&L, Chicago IL.
2. National Climatic Data Center (NCDC), 2006. "Federal Climate Complex Data Documentation for Integrated Surface Data", August 25, 2006. Published by NCDC, Asheville, NC.
3. National Climatic Data Center (NCDC), 2000. "Data Documentation for Hourly Precipitation Data TD-3240", November 15, 2000. Published by NCDC, Asheville, NC.
4. National Climatic Data Center (NCDC), 2012. Data file "anem_elev_inf" referenced in "Data Documentation for Data Set 6421 (DSI-6421) Enhanced hourly wind station data for the contiguous United States" National Climatic Data Center, Asheville North Carolina. Website: http://www.wcc.nrcs.usda.gov/ftpref/support/climate/wind_daily/td6421.pdf Accessed March, 2012.

**Table 1. Parameters and Digital Record Format of the
Standard Weather Data File Used by S&L Laket Program**

Field No.	Parameter	Units	Lower Limit	Upper Limit	Digital Format
1	Station Code Number	5 digits			F7.0
2	Year	4 digits			F6.0
3	Month	2 digits			F4.0
4	Day	2 digits			F4.0
5	Hour of Day (00 (midnight)-23 (11 pm))	2 digits			F9.2
6	Cloud Ceiling Height above Ground Level	feet	0	70,000	F9.2
7	Direction Sector from which Wind Blows (1(N) - 16(NNW))		1	16	F9.2
8	Wind Speed	knots	0	96	F9.2
9	Dry Bulb Temperature	deg F	-129	136	F9.2
10	Wet Bulb Temperature	deg F	-129	136	F9.2
11	Dew Point Temperature	deg F	-129	136	F9.2
12	Relative Humidity	percent	0	100	F9.2
13	Station Atmospheric Pressure	inches Hg	25.69	32.01	F9.2
14	Cloud Cover	Tenths	00	10	F9.2
15	Freezing Precipitation Code	1 digit	0 - liquid	1 - solid	F9.2
16	One-Hour Total Water Equivalent Precipitation	100ths inches	0	1,200	F9.2
17	Solar Radiation	Btu/ft ² -hour	0	4,000	F9.2
18	Atmospheric Radiation	Btu/ft ² -hour	5	220	F9.2
19	Partial Pressure of Water Vapor	inches Hg	0	2.00	F9.2

Attachment L - Plant Temperature Rise

Prepared: Daniel W. Nevill Date 6/27/2012
Daniel W. Nevill - Sargent & Lundy^{LLC}

Checked: William D. Brey Date 6-27-2012
William D. Brey - Sargent & Lundy^{LLC}

Reviewed: Pawel Kut Date 06-27-2012
Pawel Kut - Sargent & Lundy^{LLC}

ATTACHMENT L - TABLE OF CONTENTS

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L3.0 Assumptions	L6
L4.0 Design Inputs.....	L7
L5.0 References	L8
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L7.0 Summary and Conclusions.....	L10
L8.0 Limitations and Open Items	L11
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LIST OF APPENDICES

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L9.3	EPU Total Generated Heat Load	L35 to L37
L9.4	EPU Plant Temperature Rise Results	L38 to L57
L9.5	Plant Temperature Rise Equations	L58

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L1.0 PURPOSE

The purpose of this attachment is to determine the Core Standby Cooling System (CSCS) temperature rise across the plant for Measurement Uncertainty Recapture Power Uprate (MUR PU) and Extended Power Uprate (EPU) based on the new heat load to the Ultimate Heat Sink (UHS) determined in L-002453 [Ref. L5.1]. This temperature rise is to be used in the LAKET-PC [Ref. L5.3] model of the LaSalle County Station UHS.

L2.0 METHODOLOGY

The plant temperature rise is used in LAKET-PC [Ref. L5.3] to compute the rise in water temperature caused by the heat rejected to the UHS during the postulated accident.

There are two types of heat loads that are considered when determining the CSCS temperature rise across the plant: 1) the total generated heat load and 2) the sensible heat load. The total generated heat load can be further divided into decay heat load, pump heat load and cooler heat load. Heat load from the spent fuel pool is not considered since it is improbable that required operator actions could be performed in the post-Loss Of Coolant Accident (LOCA) reactor building environment (Assumption L3.4). The total heat load, consisting of the generated heat load and the sensible heat load, is the heat rejection to the UHS and is used to determine the plant temperature rise.

The total generated heat load (Design Input L4.1) is computed for various time steps between zero seconds and 1E+9 seconds in Calculation L-002453 [Ref. L5.1]. Linear interpolation of the results from L-002453 is used to determine the integrated total generated heat load at each time step.

The total sensible heat load is determined to be 1.22E+09 BTU (Design Input L4.2). It is assumed that all sensible heat is dissipated to the UHS at a constant rate within six hours (See Assumption L3.2).

Once the heat rejection to the UHS is determined by adding the total generated head load and the sensible heat load, the temperature rise through the plant is determined by the following equation:

$$\Delta T = \frac{Q}{c_p m} \quad (\text{Eq. L3-1})$$

where:

ΔT	= plant temperature rise [°F]
Q	= heat rejection rate to the UHS [BTU/hr]
c_p	= specific heat capacity of water [BTU/(lb _m -°F)]
m	= mass flow rate [lb _m /hr]

The mass flow rate is determined by converting the CSCS volumetric flow rate of 86 ft³/s (Assumption L3.3) to a mass flow rate at a density of 62.0 lb_m/ft³ (Assumption L3.1).

L2.1 Computer Programs and Software

The analysis performed herein utilizes Microsoft Excel® 2003 [Ref. L5.4], which is commercially available. The validation of Excel is implicit in the detailed review of all

spreadsheets used in this analysis. All computer runs were performed using PC No. ZD6661 under the Windows XP operating system. Excel Add-in function STMFUNC is used to calculate the thermal properties of water and steam at varying operating conditions [Ref. L5.5]. The Excel Add-in function STMFUNC has been validated and approved for use in accordance with the S&L Quality Assurance (QA) program.

L3.0 ASSUMPTIONS

- L3.1 Water Properties - The properties of water are evaluated at a temperature of 100°F and atmospheric pressure. The density and specific heat capacity of water at 100°F and 1 atm are 62.0 lb_m/ft³ and 0.998 BTU/lb_m-°F, respectively [Ref. L5.5].
- L3.2 Sensible Heat Load from Reactor Coolant System - It is conservatively assumed that all of the sensible heat from the reactor and the primary system is dissipated to the UHS within six hours. One-sixth of the heat is assumed to be rejected per 1-hour time step until the full sensible heat load is rejected by the sixth hour. This is based on the assumption that the temperature within the reactor will be at 100°F within six hours.
- L3.3 CSCS Volumetric Flow - The total plant flow during the UHS analysis is assumed to be 38,600 gpm (86.0 ft³/s). The total flow is based upon the cumulative flow contribution from thirteen CSCS pumps operating at design flow conditions (eight Residual Heat Removal (RHR)-Service Water pumps, 4,000 gpm each; three Diesel Generator (DG) pumps, two at 1300 gpm and one at 2,000 gpm; and two High Pressure Core Spray DG pumps, 1000 gpm each) (See Attachment D).
- L3.4 Spent Fuel Pool Heat Load - Heat load from the spent fuel pool is not considered because it is improbable that required operator action (RHR alignment) could be performed in the post-LOCA reactor building environment. Instead, the fuel pool emergency makeup pumps are modeled as providing required makeup flow to the fuel pools at 600 gpm [Ref. L5.2].

L4.0 DESIGN INPUTS

- L4.1 Total Generated Heat Load - The total generated heat load rejected to the UHS following a LOCA for one unit while the second unit is in normal shutdown from maximum power is determined in L-002453 [Ref. L5.1]. These results are presented in Appendix L9.1 for MUR PU and Appendix L9.3 for EPU.
- L4.2 Sensible Heat - The sensible heat load is 1.22E+09 BTU, per L-002453 [Ref. L5.1].
- L4.3 CSCS Pump Curves - The CSCS pump curves are provided in Attachment D of this calculation.

L5.0 REFERENCES

- L5.1 L-002453, "UHS Heat Load," Rev. 3.
- L5.2 SEAG #12-000098, "DIR for LAS-EPU-U1/2-DIR-T0608-1," 4/18/2012.
- L5.3 LAKET-PC Computer Program, Version 2.2, S&L Program No. 03.7.292-2.2, 12/09/2004.
- L5.4 Microsoft® Excel 2003, Sargent & Lundy LLC Program No. 03.2.286-1.0, dated 02/02/2004.
- L5.5 STMFUNC (Steam Table Function Dynamic Link Library) S&L Program Number 03.7.598-2.0, dated 5/15/2003.

L6.0 CALCULATIONS**L6.1 Total and Integrated Generated Heat Load Rejected to the UHS**

The total generated heat load rejected to the UHS following a LOCA for one unit while the second unit is in normal shutdown from maximum power is determined for MUR PU (3559 MW_t) and EPU (4067 MW_t) in L-002453 [Ref. L5.1]. These results are presented in Appendix L9.1 for MUR PU and Appendix L9.3 for EPU and are used to determine the temperature rise through the plant.

L6.2 Plant Temperature Rise

In order to facilitate the creation of a LAKET-PC [Ref. L5.3] input file, the plant temperature rise results are determined in one hour increments. This requires linear interpolation of the integrated total generated heat load found in L-002453 [Ref. L5.1] to determine the integrated total generated heat load at hourly intervals. Adding the integrated total generated heat load and the sensible heat load gives the total heat load, which is the heat rejected to the UHS used to determine the plant temperature rise. The plant temperature rise is calculated in Excel using Eq. L3-1. The results of this calculation are shown in Appendix L9.2 for MUR PU and Appendix L9.4 for EPU.

L7.0 SUMMARY AND CONCLUSIONS

The CSCS temperature rise across the plant following a postulated accident is determined in hourly intervals in order to be used as input to LAKET-PC [Ref. L5.3]. These results are given in Appendix L9.2 for MUR PU and Appendix L9.4 for EPU.

L8.0 LIMITATIONS AND OPEN ITEMS**L8.1 Limitations**

None.

L8.2 Open Items

None.

L9.0 APPENDICES**LIST OF APPENDICES**

App.	Title	No. of Pages
L9.1	MUR PU Total Generated Heat Load [Ref. L5.1]	2
L9.2	MUR PU Plant Temperature Rise Results	20
L9.3	EPU Total Generated Heat Load [Ref. L5.1]	3
L9.4	EPU Plant Temperature Rise Results	20
L9.5	Plant Temperature Rise Equations	1

(Total Appendix Pages – 46)

APPENDIX L9.1: MUR PU TOTAL GENERATED HEAT LOAD [Ref. L5.1]

Time (seconds)	Time (hours)	Unit 1 Decay Heat Load (Btu/hr)	Unit 2 Decay Heat Load (Btu/hr)	Pump Heat Load (Btu/hr)	Cooler Heat Load (Btu/hr)	Fuel Pool Heat Load (Btu/hr)	Total Generated Heat Load (Btu/hr)	Integrated Generated Heat Load (Btu)
0	2.78E-11	1.2143E+10	1.2143E+10	4.15E+07	5.04E+07	0.00E+00	2.44E+10	-0-
1.00E-01	2.78E-05	1.2049E+10	1.2049E+10	4.15E+07	5.04E+07	0.00E+00	2.42E+10	6.75E+05
1.50E-01	4.17E-05	1.1688E+10	1.1688E+10	4.15E+07	5.04E+07	0.00E+00	2.35E+10	1.01E+06
2.00E-01	5.56E-05	1.1329E+10	1.1329E+10	4.15E+07	5.04E+07	0.00E+00	2.27E+10	1.33E+06
4.00E-01	1.11E-04	9.0741E+09	9.0741E+09	4.15E+07	5.04E+07	0.00E+00	1.82E+10	2.47E+06
6.00E-01	1.67E-04	7.1763E+09	7.1763E+09	4.15E+07	5.04E+07	0.00E+00	1.44E+10	3.37E+06
8.00E-01	2.22E-04	5.9984E+09	5.9984E+09	4.15E+07	5.04E+07	0.00E+00	1.21E+10	4.11E+06
1.00E+00	2.78E-04	4.1175E+09	4.1175E+09	4.15E+07	5.04E+07	0.00E+00	8.33E+09	4.68E+06
1.50E+00	4.17E-04	2.9956E+09	2.9956E+09	4.15E+07	5.04E+07	0.00E+00	6.08E+09	5.68E+06
2.00E+00	5.56E-04	1.8821E+09	1.8821E+09	4.15E+07	5.04E+07	0.00E+00	3.86E+09	6.37E+06
4.00E+00	1.11E-03	8.9758E+08	8.9758E+08	4.15E+07	5.04E+07	0.00E+00	1.89E+09	7.96E+06
6.00E+00	1.67E-03	7.4167E+08	7.4167E+08	4.15E+07	5.04E+07	0.00E+00	1.58E+09	8.93E+06
8.00E+00	2.22E-03	6.9018E+08	6.9018E+08	4.15E+07	5.04E+07	0.00E+00	1.47E+09	9.77E+06
1.00E+01	2.78E-03	6.3979E+08	6.3979E+08	4.15E+07	5.04E+07	0.00E+00	1.37E+09	1.06E+07
1.50E+01	4.17E-03	5.9280E+08	5.9280E+08	4.15E+07	5.04E+07	0.00E+00	1.28E+09	1.24E+07
2.00E+01	5.56E-03	5.5625E+08	5.5625E+08	4.15E+07	5.04E+07	0.00E+00	1.20E+09	1.41E+07
4.00E+01	1.11E-02	4.8801E+08	4.8801E+08	4.15E+07	5.04E+07	0.00E+00	1.07E+09	2.04E+07
6.00E+01	1.67E-02	4.5158E+08	4.5158E+08	4.15E+07	5.04E+07	0.00E+00	9.95E+08	2.62E+07
8.00E+01	2.22E-02	4.2487E+08	4.2487E+08	4.15E+07	5.04E+07	0.00E+00	9.42E+08	3.15E+07
1.00E+02	2.78E-02	4.0714E+08	4.0714E+08	4.15E+07	5.04E+07	0.00E+00	9.06E+08	3.67E+07
1.50E+02	4.17E-02	3.7703E+08	3.7703E+08	4.15E+07	5.04E+07	0.00E+00	8.46E+08	4.88E+07
2.00E+02	5.56E-02	3.5699E+08	3.5699E+08	4.15E+07	5.04E+07	0.00E+00	8.06E+08	6.03E+07
4.00E+02	1.11E-01	3.1364E+08	3.1364E+08	4.15E+07	5.04E+07	0.00E+00	7.19E+08	1.03E+08
6.00E+02	1.67E-01	2.8899E+08	2.8899E+08	4.15E+07	5.04E+07	0.00E+00	6.70E+08	1.41E+08
8.00E+02	2.22E-01	2.7090E+08	2.7090E+08	4.15E+07	5.04E+07	0.00E+00	6.34E+08	1.77E+08
1.00E+03	2.78E-01	2.5657E+08	2.5657E+08	4.15E+07	5.04E+07	0.00E+00	6.05E+08	2.12E+08
1.50E+03	4.17E-01	2.3010E+08	2.3010E+08	4.15E+07	5.04E+07	0.00E+00	5.52E+08	2.92E+08
2.00E+03	5.56E-01	2.1128E+08	2.1128E+08	4.15E+07	5.04E+07	0.00E+00	5.14E+08	3.66E+08
4.00E+03	1.11E+00	1.7000E+08	1.7000E+08	4.15E+07	5.04E+07	0.00E+00	4.32E+08	6.29E+08
6.00E+03	1.67E+00	1.5045E+08	1.5045E+08	4.15E+07	5.04E+07	0.00E+00	3.93E+08	8.58E+08
8.00E+03	2.22E+00	1.3867E+08	1.3867E+08	4.15E+07	5.04E+07	0.00E+00	3.69E+08	1.07E+09
1.00E+04	2.78E+00	1.3065E+08	1.3065E+08	4.15E+07	5.04E+07	0.00E+00	3.53E+08	1.27E+09
1.50E+04	4.17E+00	1.1772E+08	1.1772E+08	4.15E+07	5.04E+07	0.00E+00	3.27E+08	1.74E+09
2.00E+04	5.56E+00	1.0961E+08	1.0961E+08	4.15E+07	5.04E+07	0.00E+00	3.11E+08	2.19E+09
4.00E+04	1.11E+01	9.2502E+07	9.2502E+07	4.15E+07	5.04E+07	0.00E+00	2.77E+08	3.82E+09
6.00E+04	1.67E+01	8.3225E+07	8.3225E+07	4.15E+07	5.04E+07	0.00E+00	2.58E+08	5.31E+09
8.00E+04	2.22E+01	7.6947E+07	7.6947E+07	4.15E+07	5.04E+07	0.00E+00	2.46E+08	6.71E+09

Time (seconds)	Time (hours)	Unit 1 Decay Heat Load (Btu/hr)	Unit 2 Decay Heat Load (Btu/hr)	Pump Heat Load (Btu/hr)	Cooler Heat Load (Btu/hr)	Fuel Pool Heat Load (Btu/hr)	Total Generated Heat Load (Btu/hr)	Integrated Generated Heat Load (Btu)
8.64E+04	2.40E+01	7.5332E+07	7.5332E+07	4.15E+07	5.04E+07	0.00E+00	2.43E+08	7.14E+09
1.00E+05	2.78E+01	7.2333E+07	7.2333E+07	4.15E+07	5.04E+07	0.00E+00	2.37E+08	8.05E+09
1.50E+05	4.17E+01	6.4076E+07	6.4076E+07	4.15E+07	5.04E+07	0.00E+00	2.20E+08	1.12E+10
1.73E+05	4.81E+01	6.1296E+07	6.1296E+07	4.15E+07	5.04E+07	0.00E+00	2.15E+08	1.26E+10
2.00E+05	5.56E+01	5.8479E+07	5.8479E+07	4.15E+07	5.04E+07	0.00E+00	2.09E+08	1.42E+10
2.59E+05	7.19E+01	5.3585E+07	5.3585E+07	4.15E+07	5.04E+07	0.00E+00	1.99E+08	1.75E+10
3.46E+05	9.61E+01	4.8291E+07	4.8291E+07	4.15E+07	5.04E+07	0.00E+00	1.89E+08	2.22E+10
4.00E+05	1.11E+02	4.5680E+07	4.5680E+07	4.15E+07	5.04E+07	0.00E+00	1.83E+08	2.50E+10
4.32E+05	1.20E+02	4.4345E+07	4.4345E+07	4.15E+07	5.04E+07	0.00E+00	1.81E+08	2.66E+10
6.00E+05	1.67E+02	3.8880E+07	3.8880E+07	4.15E+07	5.04E+07	0.00E+00	1.70E+08	3.48E+10
8.00E+05	2.22E+02	3.4485E+07	3.4485E+07	4.15E+07	5.04E+07	0.00E+00	1.61E+08	4.40E+10
8.64E+05	2.40E+02	3.3392E+07	3.3392E+07	4.15E+07	5.04E+07	0.00E+00	1.59E+08	4.68E+10
1.00E+06	2.78E+02	3.1425E+07	3.1425E+07	4.15E+07	5.04E+07	0.00E+00	1.55E+08	5.27E+10
1.50E+06	4.17E+02	2.6556E+07	2.6556E+07	4.15E+07	5.04E+07	0.00E+00	1.45E+08	7.36E+10
1.73E+06	4.81E+02	2.5050E+07	2.5050E+07	4.15E+07	5.04E+07	0.00E+00	1.42E+08	8.27E+10
2.00E+06	5.56E+02	2.3544E+07	2.3544E+07	4.15E+07	5.04E+07	0.00E+00	1.39E+08	9.33E+10
2.59E+06	7.19E+02	2.1055E+07	2.1055E+07	4.15E+07	5.04E+07	0.00E+00	1.34E+08	1.16E+11
3.46E+06	9.61E+02	1.8457E+07	1.8457E+07	4.15E+07	5.04E+07	0.00E+00	1.29E+08	1.47E+11
4.00E+06	1.11E+03	1.7230E+07	1.7230E+07	4.15E+07	5.04E+07	0.00E+00	1.26E+08	1.67E+11
4.32E+06	1.20E+03	1.6623E+07	1.6623E+07	4.15E+07	5.04E+07	0.00E+00	1.25E+08	1.78E+11
6.00E+06	1.67E+03	1.4207E+07	1.4207E+07	4.15E+07	5.04E+07	0.00E+00	1.20E+08	2.35E+11
8.00E+06	2.22E+03	1.2276E+07	1.2276E+07	4.15E+07	5.04E+07	0.00E+00	1.16E+08	3.01E+11
1.00E+07	2.78E+03	1.0848E+07	1.0848E+07	4.15E+07	5.04E+07	0.00E+00	1.14E+08	3.65E+11
1.50E+07	4.17E+03	8.3941E+06	8.3941E+06	4.15E+07	5.04E+07	0.00E+00	1.09E+08	5.19E+11
2.00E+07	5.56E+03	6.8375E+06	6.8375E+06	4.15E+07	5.04E+07	0.00E+00	1.06E+08	6.68E+11
4.00E+07	1.11E+04	3.9791E+06	3.9791E+06	4.15E+07	5.04E+07	0.00E+00	9.99E+07	1.24E+12
6.00E+07	1.67E+04	2.7649E+06	2.7649E+06	4.15E+07	5.04E+07	0.00E+00	9.75E+07	1.79E+12
8.00E+07	2.22E+04	2.0557E+06	2.0557E+06	4.15E+07	5.04E+07	0.00E+00	9.60E+07	2.32E+12
1.00E+08	2.78E+04	1.6150E+06	1.6150E+06	4.15E+07	5.04E+07	0.00E+00	9.52E+07	2.86E+12
1.50E+08	4.17E+04	1.0677E+06	1.0677E+06	4.15E+07	5.04E+07	0.00E+00	9.41E+07	4.17E+12
2.00E+08	5.56E+04	8.4451E+05	8.4451E+05	4.15E+07	5.04E+07	0.00E+00	9.36E+07	5.47E+12
4.00E+08	1.11E+05	5.8600E+05	5.8600E+05	4.15E+07	5.04E+07	0.00E+00	9.31E+07	1.07E+13
6.00E+08	1.67E+05	4.9627E+05	4.9627E+05	4.15E+07	5.04E+07	0.00E+00	9.29E+07	1.58E+13
8.00E+08	2.22E+05	4.3495E+05	4.3495E+05	4.15E+07	5.04E+07	0.00E+00	9.28E+07	2.10E+13
1.00E+09	2.78E+05	3.8650E+05	3.8650E+05	4.15E+07	5.04E+07	0.00E+00	9.27E+07	2.61E+13

APPENDIX L9.2: MUR PU PLANT TEMPERATURE RISE RESULTS

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
0	1	5.77E+08	2.04E+08	7.81E+08	7.81E+08	40.75
1	2	9.85E+08	4.08E+08	1.39E+09	6.13E+08	31.98
2	3	1.35E+09	6.12E+08	1.96E+09	5.65E+08	29.49
3	4	1.69E+09	8.16E+08	2.50E+09	5.44E+08	28.41
4	5	2.01E+09	1.02E+09	3.03E+09	5.27E+08	27.50
5	6	2.32E+09	1.22E+09	3.54E+09	5.12E+08	26.73
6	7	2.61E+09	1.22E+09	3.84E+09	2.94E+08	15.35
7	8	2.91E+09	1.22E+09	4.13E+09	2.94E+08	15.35
8	9	3.20E+09	1.22E+09	4.42E+09	2.94E+08	15.35
9	10	3.49E+09	1.22E+09	4.72E+09	2.94E+08	15.35
10	11	3.79E+09	1.22E+09	5.01E+09	2.94E+08	15.35
11	12	4.06E+09	1.22E+09	5.28E+09	2.71E+08	14.12
12	13	4.33E+09	1.22E+09	5.55E+09	2.68E+08	13.97
13	14	4.59E+09	1.22E+09	5.82E+09	2.68E+08	13.97
14	15	4.86E+09	1.22E+09	6.09E+09	2.68E+08	13.97
15	16	5.13E+09	1.22E+09	6.35E+09	2.68E+08	13.97
16	17	5.39E+09	1.22E+09	6.62E+09	2.62E+08	13.70
17	18	5.64E+09	1.22E+09	6.87E+09	2.52E+08	13.16
18	19	5.90E+09	1.22E+09	7.12E+09	2.52E+08	13.16
19	20	6.15E+09	1.22E+09	7.37E+09	2.52E+08	13.16
20	21	6.40E+09	1.22E+09	7.62E+09	2.52E+08	13.16
21	22	6.65E+09	1.22E+09	7.88E+09	2.52E+08	13.16
22	23	6.90E+09	1.22E+09	8.12E+09	2.46E+08	12.84
23	24	7.14E+09	1.22E+09	8.37E+09	2.44E+08	12.75
24	25	7.38E+09	1.22E+09	8.61E+09	2.40E+08	12.51
25	26	7.62E+09	1.22E+09	8.85E+09	2.40E+08	12.51
26	27	7.86E+09	1.22E+09	9.08E+09	2.40E+08	12.51
27	28	8.10E+09	1.22E+09	9.32E+09	2.37E+08	12.38
28	29	8.33E+09	1.22E+09	9.55E+09	2.28E+08	11.92
29	30	8.55E+09	1.22E+09	9.78E+09	2.28E+08	11.92
30	31	8.78E+09	1.22E+09	1.00E+10	2.28E+08	11.92
31	32	9.01E+09	1.22E+09	1.02E+10	2.28E+08	11.92
32	33	9.24E+09	1.22E+09	1.05E+10	2.28E+08	11.92
33	34	9.47E+09	1.22E+09	1.07E+10	2.28E+08	11.92
34	35	9.70E+09	1.22E+09	1.09E+10	2.28E+08	11.92
35	36	9.92E+09	1.22E+09	1.11E+10	2.28E+08	11.92
36	37	1.02E+10	1.22E+09	1.14E+10	2.28E+08	11.92
37	38	1.04E+10	1.22E+09	1.16E+10	2.28E+08	11.92
38	39	1.06E+10	1.22E+09	1.18E+10	2.28E+08	11.92
39	40	1.08E+10	1.22E+09	1.21E+10	2.28E+08	11.92
40	41	1.11E+10	1.22E+09	1.23E+10	2.28E+08	11.92
41	42	1.13E+10	1.22E+09	1.25E+10	2.25E+08	11.73
42	43	1.15E+10	1.22E+09	1.27E+10	2.17E+08	11.34
43	44	1.17E+10	1.22E+09	1.29E+10	2.17E+08	11.34

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
44	45	1.19E+10	1.22E+09	1.32E+10	2.17E+08	11.34
45	46	1.22E+10	1.22E+09	1.34E+10	2.17E+08	11.34
46	47	1.24E+10	1.22E+09	1.36E+10	2.17E+08	11.34
47	48	1.26E+10	1.22E+09	1.38E+10	2.17E+08	11.34
48	49	1.28E+10	1.22E+09	1.40E+10	2.12E+08	11.07
49	50	1.30E+10	1.22E+09	1.42E+10	2.12E+08	11.05
50	51	1.32E+10	1.22E+09	1.45E+10	2.12E+08	11.05
51	52	1.34E+10	1.22E+09	1.47E+10	2.12E+08	11.05
52	53	1.37E+10	1.22E+09	1.49E+10	2.12E+08	11.05
53	54	1.39E+10	1.22E+09	1.51E+10	2.12E+08	11.05
54	55	1.41E+10	1.22E+09	1.53E+10	2.12E+08	11.05
55	56	1.43E+10	1.22E+09	1.55E+10	2.08E+08	10.87
56	57	1.45E+10	1.22E+09	1.57E+10	2.04E+08	10.65
57	58	1.47E+10	1.22E+09	1.59E+10	2.04E+08	10.65
58	59	1.49E+10	1.22E+09	1.61E+10	2.04E+08	10.65
59	60	1.51E+10	1.22E+09	1.63E+10	2.04E+08	10.65
60	61	1.53E+10	1.22E+09	1.65E+10	2.04E+08	10.65
61	62	1.55E+10	1.22E+09	1.67E+10	2.04E+08	10.65
62	63	1.57E+10	1.22E+09	1.69E+10	2.04E+08	10.65
63	64	1.59E+10	1.22E+09	1.71E+10	2.04E+08	10.65
64	65	1.61E+10	1.22E+09	1.73E+10	2.04E+08	10.65
65	66	1.63E+10	1.22E+09	1.75E+10	2.04E+08	10.65
66	67	1.65E+10	1.22E+09	1.78E+10	2.04E+08	10.65
67	68	1.67E+10	1.22E+09	1.80E+10	2.04E+08	10.65
68	69	1.69E+10	1.22E+09	1.82E+10	2.04E+08	10.65
69	70	1.71E+10	1.22E+09	1.84E+10	2.04E+08	10.65
70	71	1.73E+10	1.22E+09	1.86E+10	2.04E+08	10.65
71	72	1.75E+10	1.22E+09	1.88E+10	2.03E+08	10.62
72	73	1.77E+10	1.22E+09	1.90E+10	1.94E+08	10.12
73	74	1.79E+10	1.22E+09	1.92E+10	1.94E+08	10.12
74	75	1.81E+10	1.22E+09	1.94E+10	1.94E+08	10.12
75	76	1.83E+10	1.22E+09	1.95E+10	1.94E+08	10.12
76	77	1.85E+10	1.22E+09	1.97E+10	1.94E+08	10.12
77	78	1.87E+10	1.22E+09	1.99E+10	1.94E+08	10.12
78	79	1.89E+10	1.22E+09	2.01E+10	1.94E+08	10.12
79	80	1.91E+10	1.22E+09	2.03E+10	1.94E+08	10.12
80	81	1.93E+10	1.22E+09	2.05E+10	1.94E+08	10.12
81	82	1.95E+10	1.22E+09	2.07E+10	1.94E+08	10.12
82	83	1.97E+10	1.22E+09	2.09E+10	1.94E+08	10.12
83	84	1.99E+10	1.22E+09	2.11E+10	1.94E+08	10.12
84	85	2.01E+10	1.22E+09	2.13E+10	1.94E+08	10.12
85	86	2.03E+10	1.22E+09	2.15E+10	1.94E+08	10.12
86	87	2.05E+10	1.22E+09	2.17E+10	1.94E+08	10.12
87	88	2.06E+10	1.22E+09	2.19E+10	1.94E+08	10.12
88	89	2.08E+10	1.22E+09	2.21E+10	1.94E+08	10.12

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
89	90	2.10E+10	1.22E+09	2.23E+10	1.94E+08	10.12
90	91	2.12E+10	1.22E+09	2.25E+10	1.94E+08	10.12
91	92	2.14E+10	1.22E+09	2.26E+10	1.94E+08	10.12
92	93	2.16E+10	1.22E+09	2.28E+10	1.94E+08	10.12
93	94	2.18E+10	1.22E+09	2.30E+10	1.94E+08	10.12
94	95	2.20E+10	1.22E+09	2.32E+10	1.94E+08	10.12
95	96	2.22E+10	1.22E+09	2.34E+10	1.94E+08	10.12
96	97	2.24E+10	1.22E+09	2.36E+10	1.87E+08	9.75
97	98	2.26E+10	1.22E+09	2.38E+10	1.86E+08	9.70
98	99	2.28E+10	1.22E+09	2.40E+10	1.86E+08	9.70
99	100	2.29E+10	1.22E+09	2.42E+10	1.86E+08	9.70
100	101	2.31E+10	1.22E+09	2.44E+10	1.86E+08	9.70
101	102	2.33E+10	1.22E+09	2.45E+10	1.86E+08	9.70
102	103	2.35E+10	1.22E+09	2.47E+10	1.86E+08	9.70
103	104	2.37E+10	1.22E+09	2.49E+10	1.86E+08	9.70
104	105	2.39E+10	1.22E+09	2.51E+10	1.86E+08	9.70
105	106	2.41E+10	1.22E+09	2.53E+10	1.86E+08	9.70
106	107	2.42E+10	1.22E+09	2.55E+10	1.86E+08	9.70
107	108	2.44E+10	1.22E+09	2.57E+10	1.86E+08	9.70
108	109	2.46E+10	1.22E+09	2.58E+10	1.86E+08	9.70
109	110	2.48E+10	1.22E+09	2.60E+10	1.86E+08	9.70
110	111	2.50E+10	1.22E+09	2.62E+10	1.86E+08	9.70
111	112	2.52E+10	1.22E+09	2.64E+10	1.82E+08	9.52
112	113	2.54E+10	1.22E+09	2.66E+10	1.82E+08	9.50
113	114	2.55E+10	1.22E+09	2.68E+10	1.82E+08	9.50
114	115	2.57E+10	1.22E+09	2.69E+10	1.82E+08	9.50
115	116	2.59E+10	1.22E+09	2.71E+10	1.82E+08	9.50
116	117	2.61E+10	1.22E+09	2.73E+10	1.82E+08	9.50
117	118	2.63E+10	1.22E+09	2.75E+10	1.82E+08	9.50
118	119	2.64E+10	1.22E+09	2.77E+10	1.82E+08	9.50
119	120	2.66E+10	1.22E+09	2.79E+10	1.82E+08	9.50
120	121	2.68E+10	1.22E+09	2.80E+10	1.75E+08	9.14
121	122	2.70E+10	1.22E+09	2.82E+10	1.75E+08	9.14
122	123	2.72E+10	1.22E+09	2.84E+10	1.75E+08	9.14
123	124	2.73E+10	1.22E+09	2.86E+10	1.75E+08	9.14
124	125	2.75E+10	1.22E+09	2.87E+10	1.75E+08	9.14
125	126	2.77E+10	1.22E+09	2.89E+10	1.75E+08	9.14
126	127	2.79E+10	1.22E+09	2.91E+10	1.75E+08	9.14
127	128	2.80E+10	1.22E+09	2.93E+10	1.75E+08	9.14
128	129	2.82E+10	1.22E+09	2.94E+10	1.75E+08	9.14
129	130	2.84E+10	1.22E+09	2.96E+10	1.75E+08	9.14
130	131	2.86E+10	1.22E+09	2.98E+10	1.75E+08	9.14
131	132	2.87E+10	1.22E+09	3.00E+10	1.75E+08	9.14
132	133	2.89E+10	1.22E+09	3.01E+10	1.75E+08	9.14
133	134	2.91E+10	1.22E+09	3.03E+10	1.75E+08	9.14

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
134	135	2.93E+10	1.22E+09	3.05E+10	1.75E+08	9.14
135	136	2.94E+10	1.22E+09	3.07E+10	1.75E+08	9.14
136	137	2.96E+10	1.22E+09	3.08E+10	1.75E+08	9.14
137	138	2.98E+10	1.22E+09	3.10E+10	1.75E+08	9.14
138	139	3.00E+10	1.22E+09	3.12E+10	1.75E+08	9.14
139	140	3.01E+10	1.22E+09	3.14E+10	1.75E+08	9.14
140	141	3.03E+10	1.22E+09	3.15E+10	1.75E+08	9.14
141	142	3.05E+10	1.22E+09	3.17E+10	1.75E+08	9.14
142	143	3.07E+10	1.22E+09	3.19E+10	1.75E+08	9.14
143	144	3.08E+10	1.22E+09	3.21E+10	1.75E+08	9.14
144	145	3.10E+10	1.22E+09	3.22E+10	1.75E+08	9.14
145	146	3.12E+10	1.22E+09	3.24E+10	1.75E+08	9.14
146	147	3.14E+10	1.22E+09	3.26E+10	1.75E+08	9.14
147	148	3.15E+10	1.22E+09	3.28E+10	1.75E+08	9.14
148	149	3.17E+10	1.22E+09	3.29E+10	1.75E+08	9.14
149	150	3.19E+10	1.22E+09	3.31E+10	1.75E+08	9.14
150	151	3.21E+10	1.22E+09	3.33E+10	1.75E+08	9.14
151	152	3.22E+10	1.22E+09	3.35E+10	1.75E+08	9.14
152	153	3.24E+10	1.22E+09	3.36E+10	1.75E+08	9.14
153	154	3.26E+10	1.22E+09	3.38E+10	1.75E+08	9.14
154	155	3.28E+10	1.22E+09	3.40E+10	1.75E+08	9.14
155	156	3.29E+10	1.22E+09	3.42E+10	1.75E+08	9.14
156	157	3.31E+10	1.22E+09	3.43E+10	1.75E+08	9.14
157	158	3.33E+10	1.22E+09	3.45E+10	1.75E+08	9.14
158	159	3.35E+10	1.22E+09	3.47E+10	1.75E+08	9.14
159	160	3.36E+10	1.22E+09	3.49E+10	1.75E+08	9.14
160	161	3.38E+10	1.22E+09	3.50E+10	1.75E+08	9.14
161	162	3.40E+10	1.22E+09	3.52E+10	1.75E+08	9.14
162	163	3.42E+10	1.22E+09	3.54E+10	1.75E+08	9.14
163	164	3.43E+10	1.22E+09	3.56E+10	1.75E+08	9.14
164	165	3.45E+10	1.22E+09	3.57E+10	1.75E+08	9.14
165	166	3.47E+10	1.22E+09	3.59E+10	1.75E+08	9.14
166	167	3.49E+10	1.22E+09	3.61E+10	1.72E+08	8.97
167	168	3.50E+10	1.22E+09	3.62E+10	1.65E+08	8.63
168	169	3.52E+10	1.22E+09	3.64E+10	1.65E+08	8.63
169	170	3.54E+10	1.22E+09	3.66E+10	1.65E+08	8.63
170	171	3.55E+10	1.22E+09	3.67E+10	1.65E+08	8.63
171	172	3.57E+10	1.22E+09	3.69E+10	1.65E+08	8.63
172	173	3.58E+10	1.22E+09	3.71E+10	1.65E+08	8.63
173	174	3.60E+10	1.22E+09	3.72E+10	1.65E+08	8.63
174	175	3.62E+10	1.22E+09	3.74E+10	1.65E+08	8.63
175	176	3.63E+10	1.22E+09	3.76E+10	1.65E+08	8.63
176	177	3.65E+10	1.22E+09	3.77E+10	1.65E+08	8.63
177	178	3.67E+10	1.22E+09	3.79E+10	1.65E+08	8.63
178	179	3.68E+10	1.22E+09	3.81E+10	1.65E+08	8.63

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
179	180	3.70E+10	1.22E+09	3.82E+10	1.65E+08	8.63
180	181	3.72E+10	1.22E+09	3.84E+10	1.65E+08	8.63
181	182	3.73E+10	1.22E+09	3.86E+10	1.65E+08	8.63
182	183	3.75E+10	1.22E+09	3.87E+10	1.65E+08	8.63
183	184	3.77E+10	1.22E+09	3.89E+10	1.65E+08	8.63
184	185	3.78E+10	1.22E+09	3.91E+10	1.65E+08	8.63
185	186	3.80E+10	1.22E+09	3.92E+10	1.65E+08	8.63
186	187	3.82E+10	1.22E+09	3.94E+10	1.65E+08	8.63
187	188	3.83E+10	1.22E+09	3.96E+10	1.65E+08	8.63
188	189	3.85E+10	1.22E+09	3.97E+10	1.65E+08	8.63
189	190	3.87E+10	1.22E+09	3.99E+10	1.65E+08	8.63
190	191	3.88E+10	1.22E+09	4.00E+10	1.65E+08	8.63
191	192	3.90E+10	1.22E+09	4.02E+10	1.65E+08	8.63
192	193	3.92E+10	1.22E+09	4.04E+10	1.65E+08	8.63
193	194	3.93E+10	1.22E+09	4.05E+10	1.65E+08	8.63
194	195	3.95E+10	1.22E+09	4.07E+10	1.65E+08	8.63
195	196	3.96E+10	1.22E+09	4.09E+10	1.65E+08	8.63
196	197	3.98E+10	1.22E+09	4.10E+10	1.65E+08	8.63
197	198	4.00E+10	1.22E+09	4.12E+10	1.65E+08	8.63
198	199	4.01E+10	1.22E+09	4.14E+10	1.65E+08	8.63
199	200	4.03E+10	1.22E+09	4.15E+10	1.65E+08	8.63
200	201	4.05E+10	1.22E+09	4.17E+10	1.65E+08	8.63
201	202	4.06E+10	1.22E+09	4.19E+10	1.65E+08	8.63
202	203	4.08E+10	1.22E+09	4.20E+10	1.65E+08	8.63
203	204	4.10E+10	1.22E+09	4.22E+10	1.65E+08	8.63
204	205	4.11E+10	1.22E+09	4.24E+10	1.65E+08	8.63
205	206	4.13E+10	1.22E+09	4.25E+10	1.65E+08	8.63
206	207	4.15E+10	1.22E+09	4.27E+10	1.65E+08	8.63
207	208	4.16E+10	1.22E+09	4.29E+10	1.65E+08	8.63
208	209	4.18E+10	1.22E+09	4.30E+10	1.65E+08	8.63
209	210	4.20E+10	1.22E+09	4.32E+10	1.65E+08	8.63
210	211	4.21E+10	1.22E+09	4.34E+10	1.65E+08	8.63
211	212	4.23E+10	1.22E+09	4.35E+10	1.65E+08	8.63
212	213	4.25E+10	1.22E+09	4.37E+10	1.65E+08	8.63
213	214	4.26E+10	1.22E+09	4.38E+10	1.65E+08	8.63
214	215	4.28E+10	1.22E+09	4.40E+10	1.65E+08	8.63
215	216	4.30E+10	1.22E+09	4.42E+10	1.65E+08	8.63
216	217	4.31E+10	1.22E+09	4.43E+10	1.65E+08	8.63
217	218	4.33E+10	1.22E+09	4.45E+10	1.65E+08	8.63
218	219	4.35E+10	1.22E+09	4.47E+10	1.65E+08	8.63
219	220	4.36E+10	1.22E+09	4.48E+10	1.65E+08	8.63
220	221	4.38E+10	1.22E+09	4.50E+10	1.65E+08	8.63
221	222	4.39E+10	1.22E+09	4.52E+10	1.65E+08	8.63
222	223	4.41E+10	1.22E+09	4.53E+10	1.61E+08	8.41
223	224	4.43E+10	1.22E+09	4.55E+10	1.60E+08	8.34

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
224	225	4.44E+10	1.22E+09	4.57E+10	1.60E+08	8.34
225	226	4.46E+10	1.22E+09	4.58E+10	1.60E+08	8.34
226	227	4.47E+10	1.22E+09	4.60E+10	1.60E+08	8.34
227	228	4.49E+10	1.22E+09	4.61E+10	1.60E+08	8.34
228	229	4.51E+10	1.22E+09	4.63E+10	1.60E+08	8.34
229	230	4.52E+10	1.22E+09	4.65E+10	1.60E+08	8.34
230	231	4.54E+10	1.22E+09	4.66E+10	1.60E+08	8.34
231	232	4.55E+10	1.22E+09	4.68E+10	1.60E+08	8.34
232	233	4.57E+10	1.22E+09	4.69E+10	1.60E+08	8.34
233	234	4.59E+10	1.22E+09	4.71E+10	1.60E+08	8.34
234	235	4.60E+10	1.22E+09	4.72E+10	1.60E+08	8.34
235	236	4.62E+10	1.22E+09	4.74E+10	1.60E+08	8.34
236	237	4.63E+10	1.22E+09	4.76E+10	1.60E+08	8.34
237	238	4.65E+10	1.22E+09	4.77E+10	1.60E+08	8.34
238	239	4.67E+10	1.22E+09	4.79E+10	1.60E+08	8.34
239	240	4.68E+10	1.22E+09	4.80E+10	1.60E+08	8.34
240	241	4.70E+10	1.22E+09	4.82E+10	1.57E+08	8.18
241	242	4.71E+10	1.22E+09	4.84E+10	1.57E+08	8.18
242	243	4.73E+10	1.22E+09	4.85E+10	1.57E+08	8.18
243	244	4.75E+10	1.22E+09	4.87E+10	1.57E+08	8.18
244	245	4.76E+10	1.22E+09	4.88E+10	1.57E+08	8.18
245	246	4.78E+10	1.22E+09	4.90E+10	1.57E+08	8.18
246	247	4.79E+10	1.22E+09	4.91E+10	1.57E+08	8.18
247	248	4.81E+10	1.22E+09	4.93E+10	1.57E+08	8.18
248	249	4.82E+10	1.22E+09	4.95E+10	1.57E+08	8.18
249	250	4.84E+10	1.22E+09	4.96E+10	1.57E+08	8.18
250	251	4.85E+10	1.22E+09	4.98E+10	1.57E+08	8.18
251	252	4.87E+10	1.22E+09	4.99E+10	1.57E+08	8.18
252	253	4.89E+10	1.22E+09	5.01E+10	1.57E+08	8.18
253	254	4.90E+10	1.22E+09	5.02E+10	1.57E+08	8.18
254	255	4.92E+10	1.22E+09	5.04E+10	1.57E+08	8.18
255	256	4.93E+10	1.22E+09	5.06E+10	1.57E+08	8.18
256	257	4.95E+10	1.22E+09	5.07E+10	1.57E+08	8.18
257	258	4.96E+10	1.22E+09	5.09E+10	1.57E+08	8.18
258	259	4.98E+10	1.22E+09	5.10E+10	1.57E+08	8.18
259	260	5.00E+10	1.22E+09	5.12E+10	1.57E+08	8.18
260	261	5.01E+10	1.22E+09	5.13E+10	1.57E+08	8.18
261	262	5.03E+10	1.22E+09	5.15E+10	1.57E+08	8.18
262	263	5.04E+10	1.22E+09	5.17E+10	1.57E+08	8.18
263	264	5.06E+10	1.22E+09	5.18E+10	1.57E+08	8.18
264	265	5.07E+10	1.22E+09	5.20E+10	1.57E+08	8.18
265	266	5.09E+10	1.22E+09	5.21E+10	1.57E+08	8.18
266	267	5.11E+10	1.22E+09	5.23E+10	1.57E+08	8.18
267	268	5.12E+10	1.22E+09	5.24E+10	1.57E+08	8.18
268	269	5.14E+10	1.22E+09	5.26E+10	1.57E+08	8.18

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
269	270	5.15E+10	1.22E+09	5.28E+10	1.57E+08	8.18
270	271	5.17E+10	1.22E+09	5.29E+10	1.57E+08	8.18
271	272	5.18E+10	1.22E+09	5.31E+10	1.57E+08	8.18
272	273	5.20E+10	1.22E+09	5.32E+10	1.57E+08	8.18
273	274	5.22E+10	1.22E+09	5.34E+10	1.57E+08	8.18
274	275	5.23E+10	1.22E+09	5.35E+10	1.57E+08	8.18
275	276	5.25E+10	1.22E+09	5.37E+10	1.57E+08	8.18
276	277	5.26E+10	1.22E+09	5.38E+10	1.57E+08	8.18
277	278	5.28E+10	1.22E+09	5.40E+10	1.55E+08	8.10
278	279	5.29E+10	1.22E+09	5.42E+10	1.50E+08	7.83
279	280	5.31E+10	1.22E+09	5.43E+10	1.50E+08	7.83
280	281	5.32E+10	1.22E+09	5.45E+10	1.50E+08	7.83
281	282	5.34E+10	1.22E+09	5.46E+10	1.50E+08	7.83
282	283	5.35E+10	1.22E+09	5.48E+10	1.50E+08	7.83
283	284	5.37E+10	1.22E+09	5.49E+10	1.50E+08	7.83
284	285	5.38E+10	1.22E+09	5.51E+10	1.50E+08	7.83
285	286	5.40E+10	1.22E+09	5.52E+10	1.50E+08	7.83
286	287	5.41E+10	1.22E+09	5.54E+10	1.50E+08	7.83
287	288	5.43E+10	1.22E+09	5.55E+10	1.50E+08	7.83
288	289	5.44E+10	1.22E+09	5.57E+10	1.50E+08	7.83
289	290	5.46E+10	1.22E+09	5.58E+10	1.50E+08	7.83
290	291	5.47E+10	1.22E+09	5.60E+10	1.50E+08	7.83
291	292	5.49E+10	1.22E+09	5.61E+10	1.50E+08	7.83
292	293	5.50E+10	1.22E+09	5.63E+10	1.50E+08	7.83
293	294	5.52E+10	1.22E+09	5.64E+10	1.50E+08	7.83
294	295	5.53E+10	1.22E+09	5.66E+10	1.50E+08	7.83
295	296	5.55E+10	1.22E+09	5.67E+10	1.50E+08	7.83
296	297	5.56E+10	1.22E+09	5.69E+10	1.50E+08	7.83
297	298	5.58E+10	1.22E+09	5.70E+10	1.50E+08	7.83
298	299	5.59E+10	1.22E+09	5.72E+10	1.50E+08	7.83
299	300	5.61E+10	1.22E+09	5.73E+10	1.50E+08	7.83
300	301	5.62E+10	1.22E+09	5.75E+10	1.50E+08	7.83
301	302	5.64E+10	1.22E+09	5.76E+10	1.50E+08	7.83
302	303	5.65E+10	1.22E+09	5.78E+10	1.50E+08	7.83
303	304	5.67E+10	1.22E+09	5.79E+10	1.50E+08	7.83
304	305	5.68E+10	1.22E+09	5.81E+10	1.50E+08	7.83
305	306	5.70E+10	1.22E+09	5.82E+10	1.50E+08	7.83
306	307	5.71E+10	1.22E+09	5.84E+10	1.50E+08	7.83
307	308	5.73E+10	1.22E+09	5.85E+10	1.50E+08	7.83
308	309	5.74E+10	1.22E+09	5.86E+10	1.50E+08	7.83
309	310	5.76E+10	1.22E+09	5.88E+10	1.50E+08	7.83
310	311	5.77E+10	1.22E+09	5.89E+10	1.50E+08	7.83
311	312	5.79E+10	1.22E+09	5.91E+10	1.50E+08	7.83
312	313	5.80E+10	1.22E+09	5.92E+10	1.50E+08	7.83
313	314	5.82E+10	1.22E+09	5.94E+10	1.50E+08	7.83

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
314	315	5.83E+10	1.22E+09	5.95E+10	1.50E+08	7.83
315	316	5.85E+10	1.22E+09	5.97E+10	1.50E+08	7.83
316	317	5.86E+10	1.22E+09	5.98E+10	1.50E+08	7.83
317	318	5.88E+10	1.22E+09	6.00E+10	1.50E+08	7.83
318	319	5.89E+10	1.22E+09	6.01E+10	1.50E+08	7.83
319	320	5.91E+10	1.22E+09	6.03E+10	1.50E+08	7.83
320	321	5.92E+10	1.22E+09	6.04E+10	1.50E+08	7.83
321	322	5.94E+10	1.22E+09	6.06E+10	1.50E+08	7.83
322	323	5.95E+10	1.22E+09	6.07E+10	1.50E+08	7.83
323	324	5.97E+10	1.22E+09	6.09E+10	1.50E+08	7.83
324	325	5.98E+10	1.22E+09	6.10E+10	1.50E+08	7.83
325	326	6.00E+10	1.22E+09	6.12E+10	1.50E+08	7.83
326	327	6.01E+10	1.22E+09	6.13E+10	1.50E+08	7.83
327	328	6.03E+10	1.22E+09	6.15E+10	1.50E+08	7.83
328	329	6.04E+10	1.22E+09	6.16E+10	1.50E+08	7.83
329	330	6.06E+10	1.22E+09	6.18E+10	1.50E+08	7.83
330	331	6.07E+10	1.22E+09	6.19E+10	1.50E+08	7.83
331	332	6.09E+10	1.22E+09	6.21E+10	1.50E+08	7.83
332	333	6.10E+10	1.22E+09	6.22E+10	1.50E+08	7.83
333	334	6.12E+10	1.22E+09	6.24E+10	1.50E+08	7.83
334	335	6.13E+10	1.22E+09	6.25E+10	1.50E+08	7.83
335	336	6.15E+10	1.22E+09	6.27E+10	1.50E+08	7.83
336	337	6.16E+10	1.22E+09	6.28E+10	1.50E+08	7.83
337	338	6.18E+10	1.22E+09	6.30E+10	1.50E+08	7.83
338	339	6.19E+10	1.22E+09	6.31E+10	1.50E+08	7.83
339	340	6.21E+10	1.22E+09	6.33E+10	1.50E+08	7.83
340	341	6.22E+10	1.22E+09	6.34E+10	1.50E+08	7.83
341	342	6.24E+10	1.22E+09	6.36E+10	1.50E+08	7.83
342	343	6.25E+10	1.22E+09	6.37E+10	1.50E+08	7.83
343	344	6.27E+10	1.22E+09	6.39E+10	1.50E+08	7.83
344	345	6.28E+10	1.22E+09	6.40E+10	1.50E+08	7.83
345	346	6.30E+10	1.22E+09	6.42E+10	1.50E+08	7.83
346	347	6.31E+10	1.22E+09	6.43E+10	1.50E+08	7.83
347	348	6.33E+10	1.22E+09	6.45E+10	1.50E+08	7.83
348	349	6.34E+10	1.22E+09	6.46E+10	1.50E+08	7.83
349	350	6.36E+10	1.22E+09	6.48E+10	1.50E+08	7.83
350	351	6.37E+10	1.22E+09	6.49E+10	1.50E+08	7.83
351	352	6.39E+10	1.22E+09	6.51E+10	1.50E+08	7.83
352	353	6.40E+10	1.22E+09	6.52E+10	1.50E+08	7.83
353	354	6.42E+10	1.22E+09	6.54E+10	1.50E+08	7.83
354	355	6.43E+10	1.22E+09	6.55E+10	1.50E+08	7.83
355	356	6.45E+10	1.22E+09	6.57E+10	1.50E+08	7.83
356	357	6.46E+10	1.22E+09	6.58E+10	1.50E+08	7.83
357	358	6.48E+10	1.22E+09	6.60E+10	1.50E+08	7.83
358	359	6.49E+10	1.22E+09	6.61E+10	1.50E+08	7.83

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
359	360	6.51E+10	1.22E+09	6.63E+10	1.50E+08	7.83
360	361	6.52E+10	1.22E+09	6.64E+10	1.50E+08	7.83
361	362	6.54E+10	1.22E+09	6.66E+10	1.50E+08	7.83
362	363	6.55E+10	1.22E+09	6.67E+10	1.50E+08	7.83
363	364	6.57E+10	1.22E+09	6.69E+10	1.50E+08	7.83
364	365	6.58E+10	1.22E+09	6.70E+10	1.50E+08	7.83
365	366	6.60E+10	1.22E+09	6.72E+10	1.50E+08	7.83
366	367	6.61E+10	1.22E+09	6.73E+10	1.50E+08	7.83
367	368	6.63E+10	1.22E+09	6.75E+10	1.50E+08	7.83
368	369	6.64E+10	1.22E+09	6.76E+10	1.50E+08	7.83
369	370	6.66E+10	1.22E+09	6.78E+10	1.50E+08	7.83
370	371	6.67E+10	1.22E+09	6.79E+10	1.50E+08	7.83
371	372	6.69E+10	1.22E+09	6.81E+10	1.50E+08	7.83
372	373	6.70E+10	1.22E+09	6.82E+10	1.50E+08	7.83
373	374	6.72E+10	1.22E+09	6.84E+10	1.50E+08	7.83
374	375	6.73E+10	1.22E+09	6.85E+10	1.50E+08	7.83
375	376	6.75E+10	1.22E+09	6.87E+10	1.50E+08	7.83
376	377	6.76E+10	1.22E+09	6.88E+10	1.50E+08	7.83
377	378	6.78E+10	1.22E+09	6.90E+10	1.50E+08	7.83
378	379	6.79E+10	1.22E+09	6.91E+10	1.50E+08	7.83
379	380	6.81E+10	1.22E+09	6.93E+10	1.50E+08	7.83
380	381	6.82E+10	1.22E+09	6.94E+10	1.50E+08	7.83
381	382	6.84E+10	1.22E+09	6.96E+10	1.50E+08	7.83
382	383	6.85E+10	1.22E+09	6.97E+10	1.50E+08	7.83
383	384	6.87E+10	1.22E+09	6.99E+10	1.50E+08	7.83
384	385	6.88E+10	1.22E+09	7.00E+10	1.50E+08	7.83
385	386	6.90E+10	1.22E+09	7.02E+10	1.50E+08	7.83
386	387	6.91E+10	1.22E+09	7.03E+10	1.50E+08	7.83
387	388	6.93E+10	1.22E+09	7.05E+10	1.50E+08	7.83
388	389	6.94E+10	1.22E+09	7.06E+10	1.50E+08	7.83
389	390	6.96E+10	1.22E+09	7.08E+10	1.50E+08	7.83
390	391	6.97E+10	1.22E+09	7.09E+10	1.50E+08	7.83
391	392	6.99E+10	1.22E+09	7.11E+10	1.50E+08	7.83
392	393	7.00E+10	1.22E+09	7.12E+10	1.50E+08	7.83
393	394	7.02E+10	1.22E+09	7.14E+10	1.50E+08	7.83
394	395	7.03E+10	1.22E+09	7.15E+10	1.50E+08	7.83
395	396	7.05E+10	1.22E+09	7.17E+10	1.50E+08	7.83
396	397	7.06E+10	1.22E+09	7.18E+10	1.50E+08	7.83
397	398	7.08E+10	1.22E+09	7.20E+10	1.50E+08	7.83
398	399	7.09E+10	1.22E+09	7.21E+10	1.50E+08	7.83
399	400	7.11E+10	1.22E+09	7.23E+10	1.50E+08	7.83
400	401	7.12E+10	1.22E+09	7.24E+10	1.50E+08	7.83
401	402	7.14E+10	1.22E+09	7.26E+10	1.50E+08	7.83
402	403	7.15E+10	1.22E+09	7.27E+10	1.50E+08	7.83
403	404	7.17E+10	1.22E+09	7.29E+10	1.50E+08	7.83

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
404	405	7.18E+10	1.22E+09	7.30E+10	1.50E+08	7.83
405	406	7.20E+10	1.22E+09	7.32E+10	1.50E+08	7.83
406	407	7.21E+10	1.22E+09	7.33E+10	1.50E+08	7.83
407	408	7.23E+10	1.22E+09	7.35E+10	1.50E+08	7.83
408	409	7.24E+10	1.22E+09	7.36E+10	1.50E+08	7.83
409	410	7.26E+10	1.22E+09	7.38E+10	1.50E+08	7.83
410	411	7.27E+10	1.22E+09	7.39E+10	1.50E+08	7.83
411	412	7.29E+10	1.22E+09	7.41E+10	1.50E+08	7.83
412	413	7.30E+10	1.22E+09	7.42E+10	1.50E+08	7.83
413	414	7.32E+10	1.22E+09	7.44E+10	1.50E+08	7.83
414	415	7.33E+10	1.22E+09	7.45E+10	1.50E+08	7.83
415	416	7.35E+10	1.22E+09	7.47E+10	1.50E+08	7.83
416	417	7.36E+10	1.22E+09	7.48E+10	1.48E+08	7.71
417	418	7.38E+10	1.22E+09	7.50E+10	1.44E+08	7.49
418	419	7.39E+10	1.22E+09	7.51E+10	1.44E+08	7.49
419	420	7.40E+10	1.22E+09	7.53E+10	1.44E+08	7.49
420	421	7.42E+10	1.22E+09	7.54E+10	1.44E+08	7.49
421	422	7.43E+10	1.22E+09	7.56E+10	1.44E+08	7.49
422	423	7.45E+10	1.22E+09	7.57E+10	1.44E+08	7.49
423	424	7.46E+10	1.22E+09	7.58E+10	1.44E+08	7.49
424	425	7.48E+10	1.22E+09	7.60E+10	1.44E+08	7.49
425	426	7.49E+10	1.22E+09	7.61E+10	1.44E+08	7.49
426	427	7.50E+10	1.22E+09	7.63E+10	1.44E+08	7.49
427	428	7.52E+10	1.22E+09	7.64E+10	1.44E+08	7.49
428	429	7.53E+10	1.22E+09	7.66E+10	1.44E+08	7.49
429	430	7.55E+10	1.22E+09	7.67E+10	1.44E+08	7.49
430	431	7.56E+10	1.22E+09	7.68E+10	1.44E+08	7.49
431	432	7.58E+10	1.22E+09	7.70E+10	1.44E+08	7.49
432	433	7.59E+10	1.22E+09	7.71E+10	1.44E+08	7.49
433	434	7.61E+10	1.22E+09	7.73E+10	1.44E+08	7.49
434	435	7.62E+10	1.22E+09	7.74E+10	1.44E+08	7.49
435	436	7.63E+10	1.22E+09	7.76E+10	1.44E+08	7.49
436	437	7.65E+10	1.22E+09	7.77E+10	1.44E+08	7.49
437	438	7.66E+10	1.22E+09	7.79E+10	1.44E+08	7.49
438	439	7.68E+10	1.22E+09	7.80E+10	1.44E+08	7.49
439	440	7.69E+10	1.22E+09	7.81E+10	1.44E+08	7.49
440	441	7.71E+10	1.22E+09	7.83E+10	1.44E+08	7.49
441	442	7.72E+10	1.22E+09	7.84E+10	1.44E+08	7.49
442	443	7.73E+10	1.22E+09	7.86E+10	1.44E+08	7.49
443	444	7.75E+10	1.22E+09	7.87E+10	1.44E+08	7.49
444	445	7.76E+10	1.22E+09	7.89E+10	1.44E+08	7.49
445	446	7.78E+10	1.22E+09	7.90E+10	1.44E+08	7.49
446	447	7.79E+10	1.22E+09	7.91E+10	1.44E+08	7.49
447	448	7.81E+10	1.22E+09	7.93E+10	1.44E+08	7.49
448	449	7.82E+10	1.22E+09	7.94E+10	1.44E+08	7.49

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
449	450	7.83E+10	1.22E+09	7.96E+10	1.44E+08	7.49
450	451	7.85E+10	1.22E+09	7.97E+10	1.44E+08	7.49
451	452	7.86E+10	1.22E+09	7.99E+10	1.44E+08	7.49
452	453	7.88E+10	1.22E+09	8.00E+10	1.44E+08	7.49
453	454	7.89E+10	1.22E+09	8.01E+10	1.44E+08	7.49
454	455	7.91E+10	1.22E+09	8.03E+10	1.44E+08	7.49
455	456	7.92E+10	1.22E+09	8.04E+10	1.44E+08	7.49
456	457	7.94E+10	1.22E+09	8.06E+10	1.44E+08	7.49
457	458	7.95E+10	1.22E+09	8.07E+10	1.44E+08	7.49
458	459	7.96E+10	1.22E+09	8.09E+10	1.44E+08	7.49
459	460	7.98E+10	1.22E+09	8.10E+10	1.44E+08	7.49
460	461	7.99E+10	1.22E+09	8.12E+10	1.44E+08	7.49
461	462	8.01E+10	1.22E+09	8.13E+10	1.44E+08	7.49
462	463	8.02E+10	1.22E+09	8.14E+10	1.44E+08	7.49
463	464	8.04E+10	1.22E+09	8.16E+10	1.44E+08	7.49
464	465	8.05E+10	1.22E+09	8.17E+10	1.44E+08	7.49
465	466	8.06E+10	1.22E+09	8.19E+10	1.44E+08	7.49
466	467	8.08E+10	1.22E+09	8.20E+10	1.44E+08	7.49
467	468	8.09E+10	1.22E+09	8.22E+10	1.44E+08	7.49
468	469	8.11E+10	1.22E+09	8.23E+10	1.44E+08	7.49
469	470	8.12E+10	1.22E+09	8.24E+10	1.44E+08	7.49
470	471	8.14E+10	1.22E+09	8.26E+10	1.44E+08	7.49
471	472	8.15E+10	1.22E+09	8.27E+10	1.44E+08	7.49
472	473	8.17E+10	1.22E+09	8.29E+10	1.44E+08	7.49
473	474	8.18E+10	1.22E+09	8.30E+10	1.44E+08	7.49
474	475	8.19E+10	1.22E+09	8.32E+10	1.44E+08	7.49
475	476	8.21E+10	1.22E+09	8.33E+10	1.44E+08	7.49
476	477	8.22E+10	1.22E+09	8.34E+10	1.44E+08	7.49
477	478	8.24E+10	1.22E+09	8.36E+10	1.44E+08	7.49
478	479	8.25E+10	1.22E+09	8.37E+10	1.44E+08	7.49
479	480	8.27E+10	1.22E+09	8.39E+10	1.44E+08	7.49
480	481	8.28E+10	1.22E+09	8.40E+10	1.42E+08	7.42
481	482	8.29E+10	1.22E+09	8.42E+10	1.41E+08	7.34
482	483	8.31E+10	1.22E+09	8.43E+10	1.41E+08	7.34
483	484	8.32E+10	1.22E+09	8.44E+10	1.41E+08	7.34
484	485	8.34E+10	1.22E+09	8.46E+10	1.41E+08	7.34
485	486	8.35E+10	1.22E+09	8.47E+10	1.41E+08	7.34
486	487	8.36E+10	1.22E+09	8.49E+10	1.41E+08	7.34
487	488	8.38E+10	1.22E+09	8.50E+10	1.41E+08	7.34
488	489	8.39E+10	1.22E+09	8.51E+10	1.41E+08	7.34
489	490	8.41E+10	1.22E+09	8.53E+10	1.41E+08	7.34
490	491	8.42E+10	1.22E+09	8.54E+10	1.41E+08	7.34
491	492	8.43E+10	1.22E+09	8.56E+10	1.41E+08	7.34
492	493	8.45E+10	1.22E+09	8.57E+10	1.41E+08	7.34
493	494	8.46E+10	1.22E+09	8.58E+10	1.41E+08	7.34

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
494	495	8.48E+10	1.22E+09	8.60E+10	1.41E+08	7.34
495	496	8.49E+10	1.22E+09	8.61E+10	1.41E+08	7.34
496	497	8.50E+10	1.22E+09	8.63E+10	1.41E+08	7.34
497	498	8.52E+10	1.22E+09	8.64E+10	1.41E+08	7.34
498	499	8.53E+10	1.22E+09	8.66E+10	1.41E+08	7.34
499	500	8.55E+10	1.22E+09	8.67E+10	1.41E+08	7.34
500	501	8.56E+10	1.22E+09	8.68E+10	1.41E+08	7.34
501	502	8.57E+10	1.22E+09	8.70E+10	1.41E+08	7.34
502	503	8.59E+10	1.22E+09	8.71E+10	1.41E+08	7.34
503	504	8.60E+10	1.22E+09	8.73E+10	1.41E+08	7.34
504	505	8.62E+10	1.22E+09	8.74E+10	1.41E+08	7.34
505	506	8.63E+10	1.22E+09	8.75E+10	1.41E+08	7.34
506	507	8.65E+10	1.22E+09	8.77E+10	1.41E+08	7.34
507	508	8.66E+10	1.22E+09	8.78E+10	1.41E+08	7.34
508	509	8.67E+10	1.22E+09	8.80E+10	1.41E+08	7.34
509	510	8.69E+10	1.22E+09	8.81E+10	1.41E+08	7.34
510	511	8.70E+10	1.22E+09	8.82E+10	1.41E+08	7.34
511	512	8.72E+10	1.22E+09	8.84E+10	1.41E+08	7.34
512	513	8.73E+10	1.22E+09	8.85E+10	1.41E+08	7.34
513	514	8.74E+10	1.22E+09	8.87E+10	1.41E+08	7.34
514	515	8.76E+10	1.22E+09	8.88E+10	1.41E+08	7.34
515	516	8.77E+10	1.22E+09	8.89E+10	1.41E+08	7.34
516	517	8.79E+10	1.22E+09	8.91E+10	1.41E+08	7.34
517	518	8.80E+10	1.22E+09	8.92E+10	1.41E+08	7.34
518	519	8.81E+10	1.22E+09	8.94E+10	1.41E+08	7.34
519	520	8.83E+10	1.22E+09	8.95E+10	1.41E+08	7.34
520	521	8.84E+10	1.22E+09	8.96E+10	1.41E+08	7.34
521	522	8.86E+10	1.22E+09	8.98E+10	1.41E+08	7.34
522	523	8.87E+10	1.22E+09	8.99E+10	1.41E+08	7.34
523	524	8.88E+10	1.22E+09	9.01E+10	1.41E+08	7.34
524	525	8.90E+10	1.22E+09	9.02E+10	1.41E+08	7.34
525	526	8.91E+10	1.22E+09	9.03E+10	1.41E+08	7.34
526	527	8.93E+10	1.22E+09	9.05E+10	1.41E+08	7.34
527	528	8.94E+10	1.22E+09	9.06E+10	1.41E+08	7.34
528	529	8.95E+10	1.22E+09	9.08E+10	1.41E+08	7.34
529	530	8.97E+10	1.22E+09	9.09E+10	1.41E+08	7.34
530	531	8.98E+10	1.22E+09	9.10E+10	1.41E+08	7.34
531	532	9.00E+10	1.22E+09	9.12E+10	1.41E+08	7.34
532	533	9.01E+10	1.22E+09	9.13E+10	1.41E+08	7.34
533	534	9.02E+10	1.22E+09	9.15E+10	1.41E+08	7.34
534	535	9.04E+10	1.22E+09	9.16E+10	1.41E+08	7.34
535	536	9.05E+10	1.22E+09	9.18E+10	1.41E+08	7.34
536	537	9.07E+10	1.22E+09	9.19E+10	1.41E+08	7.34
537	538	9.08E+10	1.22E+09	9.20E+10	1.41E+08	7.34
538	539	9.09E+10	1.22E+09	9.22E+10	1.41E+08	7.34

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
539	540	9.11E+10	1.22E+09	9.23E+10	1.41E+08	7.34
540	541	9.12E+10	1.22E+09	9.25E+10	1.41E+08	7.34
541	542	9.14E+10	1.22E+09	9.26E+10	1.41E+08	7.34
542	543	9.15E+10	1.22E+09	9.27E+10	1.41E+08	7.34
543	544	9.17E+10	1.22E+09	9.29E+10	1.41E+08	7.34
544	545	9.18E+10	1.22E+09	9.30E+10	1.41E+08	7.34
545	546	9.19E+10	1.22E+09	9.32E+10	1.41E+08	7.34
546	547	9.21E+10	1.22E+09	9.33E+10	1.41E+08	7.34
547	548	9.22E+10	1.22E+09	9.34E+10	1.41E+08	7.34
548	549	9.24E+10	1.22E+09	9.36E+10	1.41E+08	7.34
549	550	9.25E+10	1.22E+09	9.37E+10	1.41E+08	7.34
550	551	9.26E+10	1.22E+09	9.39E+10	1.41E+08	7.34
551	552	9.28E+10	1.22E+09	9.40E+10	1.41E+08	7.34
552	553	9.29E+10	1.22E+09	9.41E+10	1.41E+08	7.34
553	554	9.31E+10	1.22E+09	9.43E+10	1.41E+08	7.34
554	555	9.32E+10	1.22E+09	9.44E+10	1.41E+08	7.34
555	556	9.33E+10	1.22E+09	9.46E+10	1.39E+08	7.24
556	557	9.35E+10	1.22E+09	9.47E+10	1.37E+08	7.13
557	558	9.36E+10	1.22E+09	9.48E+10	1.37E+08	7.13
558	559	9.37E+10	1.22E+09	9.50E+10	1.37E+08	7.13
559	560	9.39E+10	1.22E+09	9.51E+10	1.37E+08	7.13
560	561	9.40E+10	1.22E+09	9.52E+10	1.37E+08	7.13
561	562	9.42E+10	1.22E+09	9.54E+10	1.37E+08	7.13
562	563	9.43E+10	1.22E+09	9.55E+10	1.37E+08	7.13
563	564	9.44E+10	1.22E+09	9.57E+10	1.37E+08	7.13
564	565	9.46E+10	1.22E+09	9.58E+10	1.37E+08	7.13
565	566	9.47E+10	1.22E+09	9.59E+10	1.37E+08	7.13
566	567	9.48E+10	1.22E+09	9.61E+10	1.37E+08	7.13
567	568	9.50E+10	1.22E+09	9.62E+10	1.37E+08	7.13
568	569	9.51E+10	1.22E+09	9.63E+10	1.37E+08	7.13
569	570	9.52E+10	1.22E+09	9.65E+10	1.37E+08	7.13
570	571	9.54E+10	1.22E+09	9.66E+10	1.37E+08	7.13
571	572	9.55E+10	1.22E+09	9.67E+10	1.37E+08	7.13
572	573	9.57E+10	1.22E+09	9.69E+10	1.37E+08	7.13
573	574	9.58E+10	1.22E+09	9.70E+10	1.37E+08	7.13
574	575	9.59E+10	1.22E+09	9.72E+10	1.37E+08	7.13
575	576	9.61E+10	1.22E+09	9.73E+10	1.37E+08	7.13
576	577	9.62E+10	1.22E+09	9.74E+10	1.37E+08	7.13
577	578	9.63E+10	1.22E+09	9.76E+10	1.37E+08	7.13
578	579	9.65E+10	1.22E+09	9.77E+10	1.37E+08	7.13
579	580	9.66E+10	1.22E+09	9.78E+10	1.37E+08	7.13
580	581	9.67E+10	1.22E+09	9.80E+10	1.37E+08	7.13
581	582	9.69E+10	1.22E+09	9.81E+10	1.37E+08	7.13
582	583	9.70E+10	1.22E+09	9.82E+10	1.37E+08	7.13
583	584	9.72E+10	1.22E+09	9.84E+10	1.37E+08	7.13

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
584	585	9.73E+10	1.22E+09	9.85E+10	1.37E+08	7.13
585	586	9.74E+10	1.22E+09	9.87E+10	1.37E+08	7.13
586	587	9.76E+10	1.22E+09	9.88E+10	1.37E+08	7.13
587	588	9.77E+10	1.22E+09	9.89E+10	1.37E+08	7.13
588	589	9.78E+10	1.22E+09	9.91E+10	1.37E+08	7.13
589	590	9.80E+10	1.22E+09	9.92E+10	1.37E+08	7.13
590	591	9.81E+10	1.22E+09	9.93E+10	1.37E+08	7.13
591	592	9.83E+10	1.22E+09	9.95E+10	1.37E+08	7.13
592	593	9.84E+10	1.22E+09	9.96E+10	1.37E+08	7.13
593	594	9.85E+10	1.22E+09	9.97E+10	1.37E+08	7.13
594	595	9.87E+10	1.22E+09	9.99E+10	1.37E+08	7.13
595	596	9.88E+10	1.22E+09	1.00E+11	1.37E+08	7.13
596	597	9.89E+10	1.22E+09	1.00E+11	1.37E+08	7.13
597	598	9.91E+10	1.22E+09	1.00E+11	1.37E+08	7.13
598	599	9.92E+10	1.22E+09	1.00E+11	1.37E+08	7.13
599	600	9.93E+10	1.22E+09	1.01E+11	1.37E+08	7.13
600	601	9.95E+10	1.22E+09	1.01E+11	1.37E+08	7.13
601	602	9.96E+10	1.22E+09	1.01E+11	1.37E+08	7.13
602	603	9.98E+10	1.22E+09	1.01E+11	1.37E+08	7.13
603	604	9.99E+10	1.22E+09	1.01E+11	1.37E+08	7.13
604	605	1.00E+11	1.22E+09	1.01E+11	1.37E+08	7.13
605	606	1.00E+11	1.22E+09	1.01E+11	1.37E+08	7.13
606	607	1.00E+11	1.22E+09	1.02E+11	1.37E+08	7.13
607	608	1.00E+11	1.22E+09	1.02E+11	1.37E+08	7.13
608	609	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
609	610	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
610	611	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
611	612	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
612	613	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
613	614	1.01E+11	1.22E+09	1.02E+11	1.37E+08	7.13
614	615	1.01E+11	1.22E+09	1.03E+11	1.37E+08	7.13
615	616	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
616	617	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
617	618	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
618	619	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
619	620	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
620	621	1.02E+11	1.22E+09	1.03E+11	1.37E+08	7.13
621	622	1.02E+11	1.22E+09	1.04E+11	1.37E+08	7.13
622	623	1.02E+11	1.22E+09	1.04E+11	1.37E+08	7.13
623	624	1.03E+11	1.22E+09	1.04E+11	1.37E+08	7.13
624	625	1.03E+11	1.22E+09	1.04E+11	1.37E+08	7.13
625	626	1.03E+11	1.22E+09	1.04E+11	1.37E+08	7.13
626	627	1.03E+11	1.22E+09	1.04E+11	1.37E+08	7.13
627	628	1.03E+11	1.22E+09	1.04E+11	1.37E+08	7.13
628	629	1.03E+11	1.22E+09	1.05E+11	1.37E+08	7.13

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
629	630	1.03E+11	1.22E+09	1.05E+11	1.37E+08	7.13
630	631	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
631	632	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
632	633	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
633	634	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
634	635	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
635	636	1.04E+11	1.22E+09	1.05E+11	1.37E+08	7.13
636	637	1.04E+11	1.22E+09	1.06E+11	1.37E+08	7.13
637	638	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
638	639	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
639	640	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
640	641	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
641	642	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
642	643	1.05E+11	1.22E+09	1.06E+11	1.37E+08	7.13
643	644	1.05E+11	1.22E+09	1.07E+11	1.37E+08	7.13
644	645	1.05E+11	1.22E+09	1.07E+11	1.37E+08	7.13
645	646	1.06E+11	1.22E+09	1.07E+11	1.37E+08	7.13
646	647	1.06E+11	1.22E+09	1.07E+11	1.37E+08	7.13
647	648	1.06E+11	1.22E+09	1.07E+11	1.37E+08	7.13
648	649	1.06E+11	1.22E+09	1.07E+11	1.37E+08	7.13
649	650	1.06E+11	1.22E+09	1.07E+11	1.37E+08	7.13
650	651	1.06E+11	1.22E+09	1.08E+11	1.37E+08	7.13
651	652	1.06E+11	1.22E+09	1.08E+11	1.37E+08	7.13
652	653	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
653	654	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
654	655	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
655	656	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
656	657	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
657	658	1.07E+11	1.22E+09	1.08E+11	1.37E+08	7.13
658	659	1.07E+11	1.22E+09	1.09E+11	1.37E+08	7.13
659	660	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
660	661	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
661	662	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
662	663	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
663	664	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
664	665	1.08E+11	1.22E+09	1.09E+11	1.37E+08	7.13
665	666	1.08E+11	1.22E+09	1.10E+11	1.37E+08	7.13
666	667	1.08E+11	1.22E+09	1.10E+11	1.37E+08	7.13
667	668	1.09E+11	1.22E+09	1.10E+11	1.37E+08	7.13
668	669	1.09E+11	1.22E+09	1.10E+11	1.37E+08	7.13
669	670	1.09E+11	1.22E+09	1.10E+11	1.37E+08	7.13
670	671	1.09E+11	1.22E+09	1.10E+11	1.37E+08	7.13
671	672	1.09E+11	1.22E+09	1.10E+11	1.37E+08	7.13
672	673	1.09E+11	1.22E+09	1.11E+11	1.37E+08	7.13
673	674	1.09E+11	1.22E+09	1.11E+11	1.37E+08	7.13

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
674	675	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
675	676	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
676	677	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
677	678	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
678	679	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
679	680	1.10E+11	1.22E+09	1.11E+11	1.37E+08	7.13
680	681	1.10E+11	1.22E+09	1.12E+11	1.37E+08	7.13
681	682	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
682	683	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
683	684	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
684	685	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
685	686	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
686	687	1.11E+11	1.22E+09	1.12E+11	1.37E+08	7.13
687	688	1.11E+11	1.22E+09	1.13E+11	1.37E+08	7.13
688	689	1.11E+11	1.22E+09	1.13E+11	1.37E+08	7.13
689	690	1.12E+11	1.22E+09	1.13E+11	1.37E+08	7.13
690	691	1.12E+11	1.22E+09	1.13E+11	1.37E+08	7.13
691	692	1.12E+11	1.22E+09	1.13E+11	1.37E+08	7.13
692	693	1.12E+11	1.22E+09	1.13E+11	1.37E+08	7.13
693	694	1.12E+11	1.22E+09	1.13E+11	1.37E+08	7.13
694	695	1.12E+11	1.22E+09	1.14E+11	1.37E+08	7.13
695	696	1.12E+11	1.22E+09	1.14E+11	1.37E+08	7.13
696	697	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
697	698	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
698	699	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
699	700	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
700	701	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
701	702	1.13E+11	1.22E+09	1.14E+11	1.37E+08	7.13
702	703	1.13E+11	1.22E+09	1.15E+11	1.37E+08	7.13
703	704	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
704	705	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
705	706	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
706	707	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
707	708	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
708	709	1.14E+11	1.22E+09	1.15E+11	1.37E+08	7.13
709	710	1.14E+11	1.22E+09	1.16E+11	1.37E+08	7.13
710	711	1.14E+11	1.22E+09	1.16E+11	1.37E+08	7.13
711	712	1.15E+11	1.22E+09	1.16E+11	1.37E+08	7.13
712	713	1.15E+11	1.22E+09	1.16E+11	1.37E+08	7.13
713	714	1.15E+11	1.22E+09	1.16E+11	1.37E+08	7.13
714	715	1.15E+11	1.22E+09	1.16E+11	1.37E+08	7.13
715	716	1.15E+11	1.22E+09	1.16E+11	1.37E+08	7.13
716	717	1.15E+11	1.22E+09	1.17E+11	1.37E+08	7.13
717	718	1.15E+11	1.22E+09	1.17E+11	1.37E+08	7.13
718	719	1.16E+11	1.22E+09	1.17E+11	1.37E+08	7.13

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
719	720	1.16E+11	1.22E+09	1.17E+11	1.34E+08	6.98
720	721	1.16E+11	1.22E+09	1.17E+11	1.31E+08	6.86
721	722	1.16E+11	1.22E+09	1.17E+11	1.31E+08	6.86
722	723	1.16E+11	1.22E+09	1.17E+11	1.31E+08	6.86
723	724	1.16E+11	1.22E+09	1.17E+11	1.31E+08	6.86
724	725	1.16E+11	1.22E+09	1.18E+11	1.31E+08	6.86
725	726	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
726	727	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
727	728	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
728	729	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
729	730	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
730	731	1.17E+11	1.22E+09	1.18E+11	1.31E+08	6.86
731	732	1.17E+11	1.22E+09	1.19E+11	1.31E+08	6.86
732	733	1.17E+11	1.22E+09	1.19E+11	1.31E+08	6.86
733	734	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
734	735	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
735	736	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
736	737	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
737	738	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
738	739	1.18E+11	1.22E+09	1.19E+11	1.31E+08	6.86
739	740	1.18E+11	1.22E+09	1.20E+11	1.31E+08	6.86
740	741	1.18E+11	1.22E+09	1.20E+11	1.31E+08	6.86
741	742	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
742	743	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
743	744	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
744	745	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
745	746	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
746	747	1.19E+11	1.22E+09	1.20E+11	1.31E+08	6.86
747	748	1.19E+11	1.22E+09	1.21E+11	1.31E+08	6.86
748	749	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
749	750	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
750	751	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
751	752	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
752	753	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
753	754	1.20E+11	1.22E+09	1.21E+11	1.31E+08	6.86
754	755	1.20E+11	1.22E+09	1.22E+11	1.31E+08	6.86
755	756	1.20E+11	1.22E+09	1.22E+11	1.31E+08	6.86
756	757	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
757	758	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
758	759	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
759	760	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
760	761	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
761	762	1.21E+11	1.22E+09	1.22E+11	1.31E+08	6.86
762	763	1.21E+11	1.22E+09	1.23E+11	1.31E+08	6.86
763	764	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
764	765	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86
765	766	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86
766	767	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86
767	768	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86
768	769	1.22E+11	1.22E+09	1.23E+11	1.31E+08	6.86
769	770	1.22E+11	1.22E+09	1.24E+11	1.31E+08	6.86
770	771	1.22E+11	1.22E+09	1.24E+11	1.31E+08	6.86
771	772	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
772	773	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
773	774	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
774	775	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
775	776	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
776	777	1.23E+11	1.22E+09	1.24E+11	1.31E+08	6.86
777	778	1.23E+11	1.22E+09	1.25E+11	1.31E+08	6.86
778	779	1.23E+11	1.22E+09	1.25E+11	1.31E+08	6.86
779	780	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
780	781	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
781	782	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
782	783	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
783	784	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
784	785	1.24E+11	1.22E+09	1.25E+11	1.31E+08	6.86
785	786	1.24E+11	1.22E+09	1.26E+11	1.31E+08	6.86
786	787	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
787	788	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
788	789	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
789	790	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
790	791	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
791	792	1.25E+11	1.22E+09	1.26E+11	1.31E+08	6.86
792	793	1.25E+11	1.22E+09	1.27E+11	1.31E+08	6.86
793	794	1.25E+11	1.22E+09	1.27E+11	1.31E+08	6.86
794	795	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
795	796	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
796	797	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
797	798	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
798	799	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
799	800	1.26E+11	1.22E+09	1.27E+11	1.31E+08	6.86
800	801	1.26E+11	1.22E+09	1.28E+11	1.31E+08	6.86
801	802	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
802	803	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
803	804	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
804	805	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
805	806	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
806	807	1.27E+11	1.22E+09	1.28E+11	1.31E+08	6.86
807	808	1.27E+11	1.22E+09	1.29E+11	1.31E+08	6.86
808	809	1.27E+11	1.22E+09	1.29E+11	1.31E+08	6.86

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
809	810	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
810	811	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
811	812	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
812	813	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
813	814	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
814	815	1.28E+11	1.22E+09	1.29E+11	1.31E+08	6.86
815	816	1.28E+11	1.22E+09	1.30E+11	1.31E+08	6.86
816	817	1.28E+11	1.22E+09	1.30E+11	1.31E+08	6.86
817	818	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
818	819	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
819	820	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
820	821	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
821	822	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
822	823	1.29E+11	1.22E+09	1.30E+11	1.31E+08	6.86
823	824	1.29E+11	1.22E+09	1.31E+11	1.31E+08	6.86
824	825	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
825	826	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
826	827	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
827	828	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
828	829	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
829	830	1.30E+11	1.22E+09	1.31E+11	1.31E+08	6.86
830	831	1.30E+11	1.22E+09	1.32E+11	1.31E+08	6.86
831	832	1.30E+11	1.22E+09	1.32E+11	1.31E+08	6.86
832	833	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
833	834	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
834	835	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
835	836	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
836	837	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
837	838	1.31E+11	1.22E+09	1.32E+11	1.31E+08	6.86
838	839	1.31E+11	1.22E+09	1.33E+11	1.31E+08	6.86
839	840	1.31E+11	1.22E+09	1.33E+11	1.31E+08	6.86
840	841	1.32E+11	1.22E+09	1.33E+11	1.31E+08	6.86
841	842	1.32E+11	1.22E+09	1.33E+11	1.31E+08	6.86
842	843	1.32E+11	1.22E+09	1.33E+11	1.31E+08	6.86
843	844	1.32E+11	1.22E+09	1.33E+11	1.31E+08	6.86
844	845	1.32E+11	1.22E+09	1.33E+11	1.31E+08	6.86
845	846	1.32E+11	1.22E+09	1.34E+11	1.31E+08	6.86
846	847	1.32E+11	1.22E+09	1.34E+11	1.31E+08	6.86
847	848	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
848	849	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
849	850	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
850	851	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
851	852	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
852	853	1.33E+11	1.22E+09	1.34E+11	1.31E+08	6.86
853	854	1.33E+11	1.22E+09	1.35E+11	1.31E+08	6.86

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
854	855	1.33E+11	1.22E+09	1.35E+11	1.31E+08	6.86
855	856	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
856	857	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
857	858	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
858	859	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
859	860	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
860	861	1.34E+11	1.22E+09	1.35E+11	1.31E+08	6.86
861	862	1.34E+11	1.22E+09	1.36E+11	1.31E+08	6.86
862	863	1.35E+11	1.22E+09	1.36E+11	1.31E+08	6.86
863	864	1.35E+11	1.22E+09	1.36E+11	1.31E+08	6.86

APPENDIX L9.3: EPU TOTAL GENERATED HEAT LOAD [Ref. L5.1]

Time (seconds)	Time (hours)	Unit 1 Decay Heat Load (Btu/hr)	Unit 2 Decay Heat Load (Btu/hr)	Pump Heat Load (Btu/hr)	Cooler Heat Load (Btu/hr)	Fuel Pool Heat Load (Btu/hr)	Total Generated Heat Load (Btu/hr)	Integrated Generated Heat Load (Btu)
0	2.78E-11	1.3879E+10	1.3879E+10	4.15E+07	5.04E+07	0.00E+00	2.79E+10	-0-
1.00E-01	2.78E-05	1.3774E+10	1.3774E+10	4.15E+07	5.04E+07	0.00E+00	2.76E+10	7.71E+05
1.50E-01	4.17E-05	1.3362E+10	1.3362E+10	4.15E+07	5.04E+07	0.00E+00	2.68E+10	1.15E+06
2.00E-01	5.56E-05	1.2951E+10	1.2951E+10	4.15E+07	5.04E+07	0.00E+00	2.60E+10	1.52E+06
4.00E-01	1.11E-04	1.0373E+10	1.0373E+10	4.15E+07	5.04E+07	0.00E+00	2.08E+10	2.82E+06
6.00E-01	1.67E-04	8.2054E+09	8.2054E+09	4.15E+07	5.04E+07	0.00E+00	1.65E+10	3.85E+06
8.00E-01	2.22E-04	6.8591E+09	6.8591E+09	4.15E+07	5.04E+07	0.00E+00	1.38E+10	4.70E+06
1.00E+00	2.78E-04	4.7092E+09	4.7092E+09	4.15E+07	5.04E+07	0.00E+00	9.51E+09	5.34E+06
1.50E+00	4.17E-04	3.4268E+09	3.4268E+09	4.15E+07	5.04E+07	0.00E+00	6.95E+09	6.49E+06
2.00E+00	5.56E-04	2.1554E+09	2.1554E+09	4.15E+07	5.04E+07	0.00E+00	4.40E+09	7.27E+06
4.00E+00	1.11E-03	1.0298E+09	1.0298E+09	4.15E+07	5.04E+07	0.00E+00	2.15E+09	9.10E+06
6.00E+00	1.67E-03	8.5177E+08	8.5177E+08	4.15E+07	5.04E+07	0.00E+00	1.80E+09	1.02E+07
8.00E+00	2.22E-03	7.9292E+08	7.9292E+08	4.15E+07	5.04E+07	0.00E+00	1.68E+09	1.12E+07
1.00E+01	2.78E-03	7.3532E+08	7.3532E+08	4.15E+07	5.04E+07	0.00E+00	1.56E+09	1.21E+07
1.50E+01	4.17E-03	6.8147E+08	6.8147E+08	4.15E+07	5.04E+07	0.00E+00	1.45E+09	1.42E+07
2.00E+01	5.56E-03	6.3969E+08	6.3969E+08	4.15E+07	5.04E+07	0.00E+00	1.37E+09	1.61E+07
4.00E+01	1.11E-02	5.6169E+08	5.6169E+08	4.15E+07	5.04E+07	0.00E+00	1.22E+09	2.33E+07
6.00E+01	1.67E-02	5.2005E+08	5.2005E+08	4.15E+07	5.04E+07	0.00E+00	1.13E+09	2.98E+07
8.00E+01	2.22E-02	4.8938E+08	4.8938E+08	4.15E+07	5.04E+07	0.00E+00	1.07E+09	3.59E+07
1.00E+02	2.78E-02	4.6939E+08	4.6939E+08	4.15E+07	5.04E+07	0.00E+00	1.03E+09	4.18E+07
1.50E+02	4.17E-02	4.3511E+08	4.3511E+08	4.15E+07	5.04E+07	0.00E+00	9.62E+08	5.56E+07
2.00E+02	5.56E-02	4.1249E+08	4.1249E+08	4.15E+07	5.04E+07	0.00E+00	9.17E+08	6.87E+07
3.00E+02	8.33E-02	3.8279E+08	3.8279E+08	4.15E+07	5.04E+07	0.00E+00	8.58E+08	9.33E+07
4.00E+02	1.11E-01	3.6294E+08	3.6294E+08	4.15E+07	5.04E+07	0.00E+00	8.18E+08	1.17E+08
6.00E+02	1.67E-01	3.3463E+08	3.3463E+08	4.15E+07	5.04E+07	0.00E+00	7.61E+08	1.60E+08
8.00E+02	2.22E-01	3.1409E+08	3.1409E+08	4.15E+07	5.04E+07	0.00E+00	7.20E+08	2.02E+08
1.00E+03	2.78E-01	2.9757E+08	2.9757E+08	4.15E+07	5.04E+07	0.00E+00	6.87E+08	2.41E+08
1.50E+03	4.17E-01	2.6731E+08	2.6731E+08	4.15E+07	5.04E+07	0.00E+00	6.27E+08	3.32E+08
1.80E+03	5.00E-01	2.5343E+08	2.5343E+08	4.15E+07	5.04E+07	0.00E+00	5.99E+08	3.83E+08
2.00E+03	5.56E-01	2.4552E+08	2.4552E+08	4.15E+07	5.04E+07	0.00E+00	5.83E+08	4.16E+08
3.00E+03	8.33E-01	2.1679E+08	2.1679E+08	4.15E+07	5.04E+07	0.00E+00	5.26E+08	5.70E+08
4.00E+03	1.11E+00	1.9847E+08	1.9847E+08	4.15E+07	5.04E+07	0.00E+00	4.89E+08	7.11E+08
4.80E+03	1.33E+00	1.8779E+08	1.8779E+08	4.15E+07	5.04E+07	0.00E+00	4.67E+08	8.17E+08
6.00E+03	1.67E+00	1.7613E+08	1.7613E+08	4.15E+07	5.04E+07	0.00E+00	4.44E+08	9.69E+08
8.00E+03	2.22E+00	1.6280E+08	1.6280E+08	4.15E+07	5.04E+07	0.00E+00	4.18E+08	1.21E+09
1.00E+04	2.78E+00	1.5364E+08	1.5364E+08	4.15E+07	5.04E+07	0.00E+00	3.99E+08	1.44E+09
1.50E+04	4.17E+00	1.3907E+08	1.3907E+08	4.15E+07	5.04E+07	0.00E+00	3.70E+08	1.97E+09

Time (seconds)	Time (hours)	Unit 1 Decay Heat Load (Btu/hr)	Unit 2 Decay Heat Load (Btu/hr)	Pump Heat Load (Btu/hr)	Cooler Heat Load (Btu/hr)	Fuel Pool Heat Load (Btu/hr)	Total Generated Heat Load (Btu/hr)	Integrated Generated Heat Load (Btu)
2.00E+04	5.56E+00	1.2976E+08	1.2976E+08	4.15E+07	5.04E+07	0.00E+00	3.51E+08	2.47E+09
3.00E+04	8.33E+00	1.1781E+08	1.1781E+08	4.15E+07	5.04E+07	0.00E+00	3.28E+08	3.41E+09
4.00E+04	1.11E+01	1.1002E+08	1.1002E+08	4.15E+07	5.04E+07	0.00E+00	3.12E+08	4.30E+09
6.00E+04	1.67E+01	9.9417E+07	9.9417E+07	4.15E+07	5.04E+07	0.00E+00	2.91E+08	5.98E+09
8.00E+04	2.22E+01	9.2102E+07	9.2102E+07	4.15E+07	5.04E+07	0.00E+00	2.76E+08	7.55E+09
8.64E+04	2.40E+01	9.0201E+07	9.0201E+07	4.15E+07	5.04E+07	0.00E+00	2.72E+08	8.04E+09
1.00E+05	2.78E+01	8.6662E+07	8.6662E+07	4.15E+07	5.04E+07	0.00E+00	2.65E+08	9.05E+09
1.50E+05	4.17E+01	7.6905E+07	7.6905E+07	4.15E+07	5.04E+07	0.00E+00	2.46E+08	1.26E+10
1.73E+05	4.80E+01	7.3546E+07	7.3546E+07	4.15E+07	5.04E+07	0.00E+00	2.39E+08	1.41E+10
1.80E+05	5.00E+01	7.2630E+07	7.2630E+07	4.15E+07	5.04E+07	0.00E+00	2.37E+08	1.46E+10
2.00E+05	5.56E+01	7.0187E+07	7.0187E+07	4.15E+07	5.04E+07	0.00E+00	2.32E+08	1.59E+10
2.59E+05	7.20E+01	6.4344E+07	6.4344E+07	4.15E+07	5.04E+07	0.00E+00	2.21E+08	1.96E+10
3.46E+05	9.60E+01	5.7946E+07	5.7946E+07	4.15E+07	5.04E+07	0.00E+00	2.08E+08	2.48E+10
3.60E+05	1.00E+02	5.7085E+07	5.7085E+07	4.15E+07	5.04E+07	0.00E+00	2.06E+08	2.56E+10
4.00E+05	1.11E+02	5.4809E+07	5.4809E+07	4.15E+07	5.04E+07	0.00E+00	2.02E+08	2.79E+10
4.32E+05	1.20E+02	5.3227E+07	5.3227E+07	4.15E+07	5.04E+07	0.00E+00	1.98E+08	2.97E+10
6.00E+05	1.67E+02	4.6676E+07	4.6676E+07	4.15E+07	5.04E+07	0.00E+00	1.85E+08	3.86E+10
8.00E+05	2.22E+02	4.1471E+07	4.1471E+07	4.15E+07	5.04E+07	0.00E+00	1.75E+08	4.86E+10
8.64E+05	2.40E+02	4.0208E+07	4.0208E+07	4.15E+07	5.04E+07	0.00E+00	1.72E+08	5.17E+10
1.00E+06	2.78E+02	3.7890E+07	3.7890E+07	4.15E+07	5.04E+07	0.00E+00	1.68E+08	5.81E+10
1.50E+06	4.17E+02	3.2144E+07	3.2144E+07	4.15E+07	5.04E+07	0.00E+00	1.56E+08	8.06E+10
1.73E+06	4.80E+02	3.0340E+07	3.0340E+07	4.15E+07	5.04E+07	0.00E+00	1.53E+08	9.04E+10
2.00E+06	5.56E+02	2.8577E+07	2.8577E+07	4.15E+07	5.04E+07	0.00E+00	1.49E+08	1.02E+11
2.59E+06	7.20E+02	2.5621E+07	2.5621E+07	4.15E+07	5.04E+07	0.00E+00	1.43E+08	1.26E+11
3.46E+06	9.60E+02	2.2512E+07	2.2512E+07	4.15E+07	5.04E+07	0.00E+00	1.37E+08	1.59E+11
4.00E+06	1.11E+03	2.1069E+07	2.1069E+07	4.15E+07	5.04E+07	0.00E+00	1.34E+08	1.80E+11
4.32E+06	1.20E+03	2.0347E+07	2.0347E+07	4.15E+07	5.04E+07	0.00E+00	1.33E+08	1.92E+11
6.00E+06	1.67E+03	1.7502E+07	1.7502E+07	4.15E+07	5.04E+07	0.00E+00	1.27E+08	2.52E+11
8.00E+06	2.22E+03	1.5253E+07	1.5253E+07	4.15E+07	5.04E+07	0.00E+00	1.22E+08	3.22E+11
1.00E+07	2.78E+03	1.3625E+07	1.3625E+07	4.15E+07	5.04E+07	0.00E+00	1.19E+08	3.89E+11
1.50E+07	4.17E+03	1.0840E+07	1.0840E+07	4.15E+07	5.04E+07	0.00E+00	1.14E+08	5.50E+11
2.00E+07	5.56E+03	9.0590E+06	9.0590E+06	4.15E+07	5.04E+07	0.00E+00	1.10E+08	7.06E+11
4.00E+07	1.11E+04	5.7085E+06	5.7085E+06	4.15E+07	5.04E+07	0.00E+00	1.03E+08	1.30E+12
6.00E+07	1.67E+04	4.1374E+06	4.1374E+06	4.15E+07	5.04E+07	0.00E+00	1.00E+08	1.86E+12
8.00E+07	2.22E+04	3.1603E+06	3.1603E+06	4.15E+07	5.04E+07	0.00E+00	9.82E+07	2.42E+12
1.00E+08	2.78E+04	2.5191E+06	2.5191E+06	4.15E+07	5.04E+07	0.00E+00	9.70E+07	2.96E+12
1.50E+08	4.17E+04	1.6738E+06	1.6738E+06	4.15E+07	5.04E+07	0.00E+00	9.53E+07	4.29E+12
2.00E+08	5.56E+04	1.3094E+06	1.3094E+06	4.15E+07	5.04E+07	0.00E+00	9.45E+07	5.61E+12

Time (seconds)	Time (hours)	Unit 1 Decay Heat Load (Btu/hr)	Unit 2 Decay Heat Load (Btu/hr)	Pump Heat Load (Btu/hr)	Cooler Heat Load (Btu/hr)	Fuel Pool Heat Load (Btu/hr)	Total Generated Heat Load (Btu/hr)	Integrated Generated Heat Load (Btu)
4.00E+08	1.11E+05	8.8563E+05	8.8563E+05	4.15E+07	5.04E+07	0.00E+00	9.37E+07	1.08E+13
6.00E+08	1.67E+05	7.4392E+05	7.4392E+05	4.15E+07	5.04E+07	0.00E+00	9.34E+07	1.60E+13
8.00E+08	2.22E+05	6.4788E+05	6.4788E+05	4.15E+07	5.04E+07	0.00E+00	9.32E+07	2.12E+13
1.00E+09	2.78E+05	5.7057E+05	5.7057E+05	4.15E+07	5.04E+07	0.00E+00	9.31E+07	2.64E+13

APPENDIX L9.4: EPU PLANT TEMPERATURE RISE RESULTS

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
0	1	6.54E+08	2.04E+08	8.58E+08	8.58E+08	44.80
1	2	1.11E+09	4.08E+08	1.52E+09	6.62E+08	34.57
2	3	1.52E+09	6.12E+08	2.13E+09	6.12E+08	31.95
3	4	1.91E+09	8.16E+08	2.72E+09	5.89E+08	30.73
4	5	2.27E+09	1.02E+09	3.29E+09	5.69E+08	29.69
5	6	2.62E+09	1.22E+09	3.85E+09	5.55E+08	28.99
6	7	2.96E+09	1.22E+09	4.18E+09	3.39E+08	17.72
7	8	3.30E+09	1.22E+09	4.52E+09	3.39E+08	17.72
8	9	3.63E+09	1.22E+09	4.85E+09	3.26E+08	17.03
9	10	3.95E+09	1.22E+09	5.17E+09	3.20E+08	16.69
10	11	4.27E+09	1.22E+09	5.49E+09	3.20E+08	16.69
11	12	4.57E+09	1.22E+09	5.79E+09	3.03E+08	15.84
12	13	4.87E+09	1.22E+09	6.09E+09	3.01E+08	15.73
13	14	5.17E+09	1.22E+09	6.40E+09	3.01E+08	15.73
14	15	5.47E+09	1.22E+09	6.70E+09	3.01E+08	15.73
15	16	5.77E+09	1.22E+09	7.00E+09	3.01E+08	15.73
16	17	6.07E+09	1.22E+09	7.29E+09	2.95E+08	15.42
17	18	6.35E+09	1.22E+09	7.58E+09	2.83E+08	14.80
18	19	6.64E+09	1.22E+09	7.86E+09	2.83E+08	14.80
19	20	6.92E+09	1.22E+09	8.14E+09	2.83E+08	14.80
20	21	7.20E+09	1.22E+09	8.43E+09	2.83E+08	14.80
21	22	7.49E+09	1.22E+09	8.71E+09	2.83E+08	14.80
22	23	7.76E+09	1.22E+09	8.99E+09	2.76E+08	14.42
23	24	8.04E+09	1.22E+09	9.26E+09	2.74E+08	14.31
24	25	8.31E+09	1.22E+09	9.53E+09	2.69E+08	14.03
25	26	8.58E+09	1.22E+09	9.80E+09	2.69E+08	14.03
26	27	8.84E+09	1.22E+09	1.01E+10	2.69E+08	14.03
27	28	9.11E+09	1.22E+09	1.03E+10	2.66E+08	13.88
28	29	9.37E+09	1.22E+09	1.06E+10	2.55E+08	13.34
29	30	9.62E+09	1.22E+09	1.08E+10	2.55E+08	13.34
30	31	9.88E+09	1.22E+09	1.11E+10	2.55E+08	13.34
31	32	1.01E+10	1.22E+09	1.14E+10	2.55E+08	13.34
32	33	1.04E+10	1.22E+09	1.16E+10	2.55E+08	13.34
33	34	1.06E+10	1.22E+09	1.19E+10	2.55E+08	13.34
34	35	1.09E+10	1.22E+09	1.21E+10	2.55E+08	13.34
35	36	1.12E+10	1.22E+09	1.24E+10	2.55E+08	13.34
36	37	1.14E+10	1.22E+09	1.26E+10	2.55E+08	13.34
37	38	1.17E+10	1.22E+09	1.29E+10	2.55E+08	13.34
38	39	1.19E+10	1.22E+09	1.31E+10	2.55E+08	13.34
39	40	1.22E+10	1.22E+09	1.34E+10	2.55E+08	13.34
40	41	1.24E+10	1.22E+09	1.37E+10	2.55E+08	13.34
41	42	1.27E+10	1.22E+09	1.39E+10	2.51E+08	13.11

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
42	43	1.29E+10	1.22E+09	1.41E+10	2.42E+08	12.65
43	44	1.32E+10	1.22E+09	1.44E+10	2.42E+08	12.65
44	45	1.34E+10	1.22E+09	1.46E+10	2.42E+08	12.65
45	46	1.37E+10	1.22E+09	1.49E+10	2.42E+08	12.65
46	47	1.39E+10	1.22E+09	1.51E+10	2.42E+08	12.65
47	48	1.41E+10	1.22E+09	1.54E+10	2.42E+08	12.65
48	49	1.44E+10	1.22E+09	1.56E+10	2.38E+08	12.43
49	50	1.46E+10	1.22E+09	1.58E+10	2.38E+08	12.43
50	51	1.48E+10	1.22E+09	1.61E+10	2.35E+08	12.25
51	52	1.51E+10	1.22E+09	1.63E+10	2.35E+08	12.25
52	53	1.53E+10	1.22E+09	1.65E+10	2.35E+08	12.25
53	54	1.56E+10	1.22E+09	1.68E+10	2.35E+08	12.25
54	55	1.58E+10	1.22E+09	1.70E+10	2.35E+08	12.25
55	56	1.60E+10	1.22E+09	1.72E+10	2.31E+08	12.06
56	57	1.62E+10	1.22E+09	1.75E+10	2.26E+08	11.82
57	58	1.65E+10	1.22E+09	1.77E+10	2.26E+08	11.82
58	59	1.67E+10	1.22E+09	1.79E+10	2.26E+08	11.82
59	60	1.69E+10	1.22E+09	1.81E+10	2.26E+08	11.82
60	61	1.72E+10	1.22E+09	1.84E+10	2.26E+08	11.82
61	62	1.74E+10	1.22E+09	1.86E+10	2.26E+08	11.82
62	63	1.76E+10	1.22E+09	1.88E+10	2.26E+08	11.82
63	64	1.78E+10	1.22E+09	1.91E+10	2.26E+08	11.82
64	65	1.81E+10	1.22E+09	1.93E+10	2.26E+08	11.82
65	66	1.83E+10	1.22E+09	1.95E+10	2.26E+08	11.82
66	67	1.85E+10	1.22E+09	1.97E+10	2.26E+08	11.82
67	68	1.87E+10	1.22E+09	2.00E+10	2.26E+08	11.82
68	69	1.90E+10	1.22E+09	2.02E+10	2.26E+08	11.82
69	70	1.92E+10	1.22E+09	2.04E+10	2.26E+08	11.82
70	71	1.94E+10	1.22E+09	2.06E+10	2.26E+08	11.82
71	72	1.96E+10	1.22E+09	2.09E+10	2.26E+08	11.82
72	73	1.99E+10	1.22E+09	2.11E+10	2.14E+08	11.18
73	74	2.01E+10	1.22E+09	2.13E+10	2.14E+08	11.18
74	75	2.03E+10	1.22E+09	2.15E+10	2.14E+08	11.18
75	76	2.05E+10	1.22E+09	2.17E+10	2.14E+08	11.18
76	77	2.07E+10	1.22E+09	2.19E+10	2.14E+08	11.18
77	78	2.09E+10	1.22E+09	2.22E+10	2.14E+08	11.18
78	79	2.11E+10	1.22E+09	2.24E+10	2.14E+08	11.18
79	80	2.14E+10	1.22E+09	2.26E+10	2.14E+08	11.18
80	81	2.16E+10	1.22E+09	2.28E+10	2.14E+08	11.18
81	82	2.18E+10	1.22E+09	2.30E+10	2.14E+08	11.18
82	83	2.20E+10	1.22E+09	2.32E+10	2.14E+08	11.18
83	84	2.22E+10	1.22E+09	2.34E+10	2.14E+08	11.18
84	85	2.24E+10	1.22E+09	2.36E+10	2.14E+08	11.18
85	86	2.26E+10	1.22E+09	2.39E+10	2.14E+08	11.18
86	87	2.29E+10	1.22E+09	2.41E+10	2.14E+08	11.18

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
87	88	2.31E+10	1.22E+09	2.43E+10	2.14E+08	11.18
88	89	2.33E+10	1.22E+09	2.45E+10	2.14E+08	11.18
89	90	2.35E+10	1.22E+09	2.47E+10	2.14E+08	11.18
90	91	2.37E+10	1.22E+09	2.49E+10	2.14E+08	11.18
91	92	2.39E+10	1.22E+09	2.51E+10	2.14E+08	11.18
92	93	2.41E+10	1.22E+09	2.54E+10	2.14E+08	11.18
93	94	2.44E+10	1.22E+09	2.56E+10	2.14E+08	11.18
94	95	2.46E+10	1.22E+09	2.58E+10	2.14E+08	11.18
95	96	2.48E+10	1.22E+09	2.60E+10	2.14E+08	11.18
96	97	2.50E+10	1.22E+09	2.62E+10	2.07E+08	10.80
97	98	2.52E+10	1.22E+09	2.64E+10	2.07E+08	10.80
98	99	2.54E+10	1.22E+09	2.66E+10	2.07E+08	10.80
99	100	2.56E+10	1.22E+09	2.68E+10	2.07E+08	10.80
100	101	2.58E+10	1.22E+09	2.70E+10	2.04E+08	10.64
101	102	2.60E+10	1.22E+09	2.72E+10	2.04E+08	10.64
102	103	2.62E+10	1.22E+09	2.74E+10	2.04E+08	10.64
103	104	2.64E+10	1.22E+09	2.76E+10	2.04E+08	10.64
104	105	2.66E+10	1.22E+09	2.79E+10	2.04E+08	10.64
105	106	2.68E+10	1.22E+09	2.81E+10	2.04E+08	10.64
106	107	2.70E+10	1.22E+09	2.83E+10	2.04E+08	10.64
107	108	2.72E+10	1.22E+09	2.85E+10	2.04E+08	10.64
108	109	2.74E+10	1.22E+09	2.87E+10	2.04E+08	10.64
109	110	2.76E+10	1.22E+09	2.89E+10	2.04E+08	10.64
110	111	2.79E+10	1.22E+09	2.91E+10	2.04E+08	10.64
111	112	2.81E+10	1.22E+09	2.93E+10	2.00E+08	10.46
112	113	2.83E+10	1.22E+09	2.95E+10	2.00E+08	10.44
113	114	2.85E+10	1.22E+09	2.97E+10	2.00E+08	10.44
114	115	2.87E+10	1.22E+09	2.99E+10	2.00E+08	10.44
115	116	2.89E+10	1.22E+09	3.01E+10	2.00E+08	10.44
116	117	2.91E+10	1.22E+09	3.03E+10	2.00E+08	10.44
117	118	2.93E+10	1.22E+09	3.05E+10	2.00E+08	10.44
118	119	2.95E+10	1.22E+09	3.07E+10	2.00E+08	10.44
119	120	2.97E+10	1.22E+09	3.09E+10	2.00E+08	10.44
120	121	2.98E+10	1.22E+09	3.11E+10	1.92E+08	10.01
121	122	3.00E+10	1.22E+09	3.13E+10	1.92E+08	10.01
122	123	3.02E+10	1.22E+09	3.15E+10	1.92E+08	10.01
123	124	3.04E+10	1.22E+09	3.16E+10	1.92E+08	10.01
124	125	3.06E+10	1.22E+09	3.18E+10	1.92E+08	10.01
125	126	3.08E+10	1.22E+09	3.20E+10	1.92E+08	10.01
126	127	3.10E+10	1.22E+09	3.22E+10	1.92E+08	10.01
127	128	3.12E+10	1.22E+09	3.24E+10	1.92E+08	10.01
128	129	3.14E+10	1.22E+09	3.26E+10	1.92E+08	10.01
129	130	3.16E+10	1.22E+09	3.28E+10	1.92E+08	10.01
130	131	3.18E+10	1.22E+09	3.30E+10	1.92E+08	10.01
131	132	3.20E+10	1.22E+09	3.32E+10	1.92E+08	10.01

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
132	133	3.21E+10	1.22E+09	3.34E+10	1.92E+08	10.01
133	134	3.23E+10	1.22E+09	3.36E+10	1.92E+08	10.01
134	135	3.25E+10	1.22E+09	3.38E+10	1.92E+08	10.01
135	136	3.27E+10	1.22E+09	3.39E+10	1.92E+08	10.01
136	137	3.29E+10	1.22E+09	3.41E+10	1.92E+08	10.01
137	138	3.31E+10	1.22E+09	3.43E+10	1.92E+08	10.01
138	139	3.33E+10	1.22E+09	3.45E+10	1.92E+08	10.01
139	140	3.35E+10	1.22E+09	3.47E+10	1.92E+08	10.01
140	141	3.37E+10	1.22E+09	3.49E+10	1.92E+08	10.01
141	142	3.39E+10	1.22E+09	3.51E+10	1.92E+08	10.01
142	143	3.41E+10	1.22E+09	3.53E+10	1.92E+08	10.01
143	144	3.43E+10	1.22E+09	3.55E+10	1.92E+08	10.01
144	145	3.44E+10	1.22E+09	3.57E+10	1.92E+08	10.01
145	146	3.46E+10	1.22E+09	3.59E+10	1.92E+08	10.01
146	147	3.48E+10	1.22E+09	3.61E+10	1.92E+08	10.01
147	148	3.50E+10	1.22E+09	3.62E+10	1.92E+08	10.01
148	149	3.52E+10	1.22E+09	3.64E+10	1.92E+08	10.01
149	150	3.54E+10	1.22E+09	3.66E+10	1.92E+08	10.01
150	151	3.56E+10	1.22E+09	3.68E+10	1.92E+08	10.01
151	152	3.58E+10	1.22E+09	3.70E+10	1.92E+08	10.01
152	153	3.60E+10	1.22E+09	3.72E+10	1.92E+08	10.01
153	154	3.62E+10	1.22E+09	3.74E+10	1.92E+08	10.01
154	155	3.64E+10	1.22E+09	3.76E+10	1.92E+08	10.01
155	156	3.66E+10	1.22E+09	3.78E+10	1.92E+08	10.01
156	157	3.67E+10	1.22E+09	3.80E+10	1.92E+08	10.01
157	158	3.69E+10	1.22E+09	3.82E+10	1.92E+08	10.01
158	159	3.71E+10	1.22E+09	3.84E+10	1.92E+08	10.01
159	160	3.73E+10	1.22E+09	3.85E+10	1.92E+08	10.01
160	161	3.75E+10	1.22E+09	3.87E+10	1.92E+08	10.01
161	162	3.77E+10	1.22E+09	3.89E+10	1.92E+08	10.01
162	163	3.79E+10	1.22E+09	3.91E+10	1.92E+08	10.01
163	164	3.81E+10	1.22E+09	3.93E+10	1.92E+08	10.01
164	165	3.83E+10	1.22E+09	3.95E+10	1.92E+08	10.01
165	166	3.85E+10	1.22E+09	3.97E+10	1.92E+08	10.01
166	167	3.87E+10	1.22E+09	3.99E+10	1.88E+08	9.81
167	168	3.88E+10	1.22E+09	4.01E+10	1.80E+08	9.40
168	169	3.90E+10	1.22E+09	4.02E+10	1.80E+08	9.40
169	170	3.92E+10	1.22E+09	4.04E+10	1.80E+08	9.40
170	171	3.94E+10	1.22E+09	4.06E+10	1.80E+08	9.40
171	172	3.96E+10	1.22E+09	4.08E+10	1.80E+08	9.40
172	173	3.97E+10	1.22E+09	4.10E+10	1.80E+08	9.40
173	174	3.99E+10	1.22E+09	4.11E+10	1.80E+08	9.40
174	175	4.01E+10	1.22E+09	4.13E+10	1.80E+08	9.40
175	176	4.03E+10	1.22E+09	4.15E+10	1.80E+08	9.40
176	177	4.05E+10	1.22E+09	4.17E+10	1.80E+08	9.40

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
177	178	4.06E+10	1.22E+09	4.19E+10	1.80E+08	9.40
178	179	4.08E+10	1.22E+09	4.20E+10	1.80E+08	9.40
179	180	4.10E+10	1.22E+09	4.22E+10	1.80E+08	9.40
180	181	4.12E+10	1.22E+09	4.24E+10	1.80E+08	9.40
181	182	4.14E+10	1.22E+09	4.26E+10	1.80E+08	9.40
182	183	4.15E+10	1.22E+09	4.28E+10	1.80E+08	9.40
183	184	4.17E+10	1.22E+09	4.29E+10	1.80E+08	9.40
184	185	4.19E+10	1.22E+09	4.31E+10	1.80E+08	9.40
185	186	4.21E+10	1.22E+09	4.33E+10	1.80E+08	9.40
186	187	4.23E+10	1.22E+09	4.35E+10	1.80E+08	9.40
187	188	4.24E+10	1.22E+09	4.37E+10	1.80E+08	9.40
188	189	4.26E+10	1.22E+09	4.38E+10	1.80E+08	9.40
189	190	4.28E+10	1.22E+09	4.40E+10	1.80E+08	9.40
190	191	4.30E+10	1.22E+09	4.42E+10	1.80E+08	9.40
191	192	4.32E+10	1.22E+09	4.44E+10	1.80E+08	9.40
192	193	4.33E+10	1.22E+09	4.46E+10	1.80E+08	9.40
193	194	4.35E+10	1.22E+09	4.48E+10	1.80E+08	9.40
194	195	4.37E+10	1.22E+09	4.49E+10	1.80E+08	9.40
195	196	4.39E+10	1.22E+09	4.51E+10	1.80E+08	9.40
196	197	4.41E+10	1.22E+09	4.53E+10	1.80E+08	9.40
197	198	4.42E+10	1.22E+09	4.55E+10	1.80E+08	9.40
198	199	4.44E+10	1.22E+09	4.57E+10	1.80E+08	9.40
199	200	4.46E+10	1.22E+09	4.58E+10	1.80E+08	9.40
200	201	4.48E+10	1.22E+09	4.60E+10	1.80E+08	9.40
201	202	4.50E+10	1.22E+09	4.62E+10	1.80E+08	9.40
202	203	4.51E+10	1.22E+09	4.64E+10	1.80E+08	9.40
203	204	4.53E+10	1.22E+09	4.66E+10	1.80E+08	9.40
204	205	4.55E+10	1.22E+09	4.67E+10	1.80E+08	9.40
205	206	4.57E+10	1.22E+09	4.69E+10	1.80E+08	9.40
206	207	4.59E+10	1.22E+09	4.71E+10	1.80E+08	9.40
207	208	4.60E+10	1.22E+09	4.73E+10	1.80E+08	9.40
208	209	4.62E+10	1.22E+09	4.75E+10	1.80E+08	9.40
209	210	4.64E+10	1.22E+09	4.76E+10	1.80E+08	9.40
210	211	4.66E+10	1.22E+09	4.78E+10	1.80E+08	9.40
211	212	4.68E+10	1.22E+09	4.80E+10	1.80E+08	9.40
212	213	4.69E+10	1.22E+09	4.82E+10	1.80E+08	9.40
213	214	4.71E+10	1.22E+09	4.84E+10	1.80E+08	9.40
214	215	4.73E+10	1.22E+09	4.85E+10	1.80E+08	9.40
215	216	4.75E+10	1.22E+09	4.87E+10	1.80E+08	9.40
216	217	4.77E+10	1.22E+09	4.89E+10	1.80E+08	9.40
217	218	4.78E+10	1.22E+09	4.91E+10	1.80E+08	9.40
218	219	4.80E+10	1.22E+09	4.93E+10	1.80E+08	9.40
219	220	4.82E+10	1.22E+09	4.94E+10	1.80E+08	9.40
220	221	4.84E+10	1.22E+09	4.96E+10	1.80E+08	9.40
221	222	4.86E+10	1.22E+09	4.98E+10	1.80E+08	9.40

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
222	223	4.87E+10	1.22E+09	5.00E+10	1.75E+08	9.14
223	224	4.89E+10	1.22E+09	5.01E+10	1.74E+08	9.06
224	225	4.91E+10	1.22E+09	5.03E+10	1.74E+08	9.06
225	226	4.93E+10	1.22E+09	5.05E+10	1.74E+08	9.06
226	227	4.94E+10	1.22E+09	5.07E+10	1.74E+08	9.06
227	228	4.96E+10	1.22E+09	5.08E+10	1.74E+08	9.06
228	229	4.98E+10	1.22E+09	5.10E+10	1.74E+08	9.06
229	230	5.00E+10	1.22E+09	5.12E+10	1.74E+08	9.06
230	231	5.01E+10	1.22E+09	5.14E+10	1.74E+08	9.06
231	232	5.03E+10	1.22E+09	5.15E+10	1.74E+08	9.06
232	233	5.05E+10	1.22E+09	5.17E+10	1.74E+08	9.06
233	234	5.07E+10	1.22E+09	5.19E+10	1.74E+08	9.06
234	235	5.08E+10	1.22E+09	5.21E+10	1.74E+08	9.06
235	236	5.10E+10	1.22E+09	5.22E+10	1.74E+08	9.06
236	237	5.12E+10	1.22E+09	5.24E+10	1.74E+08	9.06
237	238	5.13E+10	1.22E+09	5.26E+10	1.74E+08	9.06
238	239	5.15E+10	1.22E+09	5.27E+10	1.74E+08	9.06
239	240	5.17E+10	1.22E+09	5.29E+10	1.74E+08	9.06
240	241	5.19E+10	1.22E+09	5.31E+10	1.70E+08	8.88
241	242	5.20E+10	1.22E+09	5.33E+10	1.70E+08	8.88
242	243	5.22E+10	1.22E+09	5.34E+10	1.70E+08	8.88
243	244	5.24E+10	1.22E+09	5.36E+10	1.70E+08	8.88
244	245	5.25E+10	1.22E+09	5.38E+10	1.70E+08	8.88
245	246	5.27E+10	1.22E+09	5.39E+10	1.70E+08	8.88
246	247	5.29E+10	1.22E+09	5.41E+10	1.70E+08	8.88
247	248	5.31E+10	1.22E+09	5.43E+10	1.70E+08	8.88
248	249	5.32E+10	1.22E+09	5.44E+10	1.70E+08	8.88
249	250	5.34E+10	1.22E+09	5.46E+10	1.70E+08	8.88
250	251	5.36E+10	1.22E+09	5.48E+10	1.70E+08	8.88
251	252	5.37E+10	1.22E+09	5.50E+10	1.70E+08	8.88
252	253	5.39E+10	1.22E+09	5.51E+10	1.70E+08	8.88
253	254	5.41E+10	1.22E+09	5.53E+10	1.70E+08	8.88
254	255	5.42E+10	1.22E+09	5.55E+10	1.70E+08	8.88
255	256	5.44E+10	1.22E+09	5.56E+10	1.70E+08	8.88
256	257	5.46E+10	1.22E+09	5.58E+10	1.70E+08	8.88
257	258	5.48E+10	1.22E+09	5.60E+10	1.70E+08	8.88
258	259	5.49E+10	1.22E+09	5.61E+10	1.70E+08	8.88
259	260	5.51E+10	1.22E+09	5.63E+10	1.70E+08	8.88
260	261	5.53E+10	1.22E+09	5.65E+10	1.70E+08	8.88
261	262	5.54E+10	1.22E+09	5.67E+10	1.70E+08	8.88
262	263	5.56E+10	1.22E+09	5.68E+10	1.70E+08	8.88
263	264	5.58E+10	1.22E+09	5.70E+10	1.70E+08	8.88
264	265	5.59E+10	1.22E+09	5.72E+10	1.70E+08	8.88
265	266	5.61E+10	1.22E+09	5.73E+10	1.70E+08	8.88
266	267	5.63E+10	1.22E+09	5.75E+10	1.70E+08	8.88

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
267	268	5.65E+10	1.22E+09	5.77E+10	1.70E+08	8.88
268	269	5.66E+10	1.22E+09	5.78E+10	1.70E+08	8.88
269	270	5.68E+10	1.22E+09	5.80E+10	1.70E+08	8.88
270	271	5.70E+10	1.22E+09	5.82E+10	1.70E+08	8.88
271	272	5.71E+10	1.22E+09	5.84E+10	1.70E+08	8.88
272	273	5.73E+10	1.22E+09	5.85E+10	1.70E+08	8.88
273	274	5.75E+10	1.22E+09	5.87E+10	1.70E+08	8.88
274	275	5.76E+10	1.22E+09	5.89E+10	1.70E+08	8.88
275	276	5.78E+10	1.22E+09	5.90E+10	1.70E+08	8.88
276	277	5.80E+10	1.22E+09	5.92E+10	1.70E+08	8.88
277	278	5.82E+10	1.22E+09	5.94E+10	1.68E+08	8.78
278	279	5.83E+10	1.22E+09	5.95E+10	1.62E+08	8.45
279	280	5.85E+10	1.22E+09	5.97E+10	1.62E+08	8.45
280	281	5.86E+10	1.22E+09	5.99E+10	1.62E+08	8.45
281	282	5.88E+10	1.22E+09	6.00E+10	1.62E+08	8.45
282	283	5.90E+10	1.22E+09	6.02E+10	1.62E+08	8.45
283	284	5.91E+10	1.22E+09	6.03E+10	1.62E+08	8.45
284	285	5.93E+10	1.22E+09	6.05E+10	1.62E+08	8.45
285	286	5.94E+10	1.22E+09	6.07E+10	1.62E+08	8.45
286	287	5.96E+10	1.22E+09	6.08E+10	1.62E+08	8.45
287	288	5.98E+10	1.22E+09	6.10E+10	1.62E+08	8.45
288	289	5.99E+10	1.22E+09	6.12E+10	1.62E+08	8.45
289	290	6.01E+10	1.22E+09	6.13E+10	1.62E+08	8.45
290	291	6.03E+10	1.22E+09	6.15E+10	1.62E+08	8.45
291	292	6.04E+10	1.22E+09	6.16E+10	1.62E+08	8.45
292	293	6.06E+10	1.22E+09	6.18E+10	1.62E+08	8.45
293	294	6.07E+10	1.22E+09	6.20E+10	1.62E+08	8.45
294	295	6.09E+10	1.22E+09	6.21E+10	1.62E+08	8.45
295	296	6.11E+10	1.22E+09	6.23E+10	1.62E+08	8.45
296	297	6.12E+10	1.22E+09	6.25E+10	1.62E+08	8.45
297	298	6.14E+10	1.22E+09	6.26E+10	1.62E+08	8.45
298	299	6.16E+10	1.22E+09	6.28E+10	1.62E+08	8.45
299	300	6.17E+10	1.22E+09	6.29E+10	1.62E+08	8.45
300	301	6.19E+10	1.22E+09	6.31E+10	1.62E+08	8.45
301	302	6.20E+10	1.22E+09	6.33E+10	1.62E+08	8.45
302	303	6.22E+10	1.22E+09	6.34E+10	1.62E+08	8.45
303	304	6.24E+10	1.22E+09	6.36E+10	1.62E+08	8.45
304	305	6.25E+10	1.22E+09	6.38E+10	1.62E+08	8.45
305	306	6.27E+10	1.22E+09	6.39E+10	1.62E+08	8.45
306	307	6.29E+10	1.22E+09	6.41E+10	1.62E+08	8.45
307	308	6.30E+10	1.22E+09	6.42E+10	1.62E+08	8.45
308	309	6.32E+10	1.22E+09	6.44E+10	1.62E+08	8.45
309	310	6.33E+10	1.22E+09	6.46E+10	1.62E+08	8.45
310	311	6.35E+10	1.22E+09	6.47E+10	1.62E+08	8.45
311	312	6.37E+10	1.22E+09	6.49E+10	1.62E+08	8.45

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
312	313	6.38E+10	1.22E+09	6.50E+10	1.62E+08	8.45
313	314	6.40E+10	1.22E+09	6.52E+10	1.62E+08	8.45
314	315	6.41E+10	1.22E+09	6.54E+10	1.62E+08	8.45
315	316	6.43E+10	1.22E+09	6.55E+10	1.62E+08	8.45
316	317	6.45E+10	1.22E+09	6.57E+10	1.62E+08	8.45
317	318	6.46E+10	1.22E+09	6.59E+10	1.62E+08	8.45
318	319	6.48E+10	1.22E+09	6.60E+10	1.62E+08	8.45
319	320	6.50E+10	1.22E+09	6.62E+10	1.62E+08	8.45
320	321	6.51E+10	1.22E+09	6.63E+10	1.62E+08	8.45
321	322	6.53E+10	1.22E+09	6.65E+10	1.62E+08	8.45
322	323	6.54E+10	1.22E+09	6.67E+10	1.62E+08	8.45
323	324	6.56E+10	1.22E+09	6.68E+10	1.62E+08	8.45
324	325	6.58E+10	1.22E+09	6.70E+10	1.62E+08	8.45
325	326	6.59E+10	1.22E+09	6.72E+10	1.62E+08	8.45
326	327	6.61E+10	1.22E+09	6.73E+10	1.62E+08	8.45
327	328	6.63E+10	1.22E+09	6.75E+10	1.62E+08	8.45
328	329	6.64E+10	1.22E+09	6.76E+10	1.62E+08	8.45
329	330	6.66E+10	1.22E+09	6.78E+10	1.62E+08	8.45
330	331	6.67E+10	1.22E+09	6.80E+10	1.62E+08	8.45
331	332	6.69E+10	1.22E+09	6.81E+10	1.62E+08	8.45
332	333	6.71E+10	1.22E+09	6.83E+10	1.62E+08	8.45
333	334	6.72E+10	1.22E+09	6.84E+10	1.62E+08	8.45
334	335	6.74E+10	1.22E+09	6.86E+10	1.62E+08	8.45
335	336	6.75E+10	1.22E+09	6.88E+10	1.62E+08	8.45
336	337	6.77E+10	1.22E+09	6.89E+10	1.62E+08	8.45
337	338	6.79E+10	1.22E+09	6.91E+10	1.62E+08	8.45
338	339	6.80E+10	1.22E+09	6.93E+10	1.62E+08	8.45
339	340	6.82E+10	1.22E+09	6.94E+10	1.62E+08	8.45
340	341	6.84E+10	1.22E+09	6.96E+10	1.62E+08	8.45
341	342	6.85E+10	1.22E+09	6.97E+10	1.62E+08	8.45
342	343	6.87E+10	1.22E+09	6.99E+10	1.62E+08	8.45
343	344	6.88E+10	1.22E+09	7.01E+10	1.62E+08	8.45
344	345	6.90E+10	1.22E+09	7.02E+10	1.62E+08	8.45
345	346	6.92E+10	1.22E+09	7.04E+10	1.62E+08	8.45
346	347	6.93E+10	1.22E+09	7.06E+10	1.62E+08	8.45
347	348	6.95E+10	1.22E+09	7.07E+10	1.62E+08	8.45
348	349	6.97E+10	1.22E+09	7.09E+10	1.62E+08	8.45
349	350	6.98E+10	1.22E+09	7.10E+10	1.62E+08	8.45
350	351	7.00E+10	1.22E+09	7.12E+10	1.62E+08	8.45
351	352	7.01E+10	1.22E+09	7.14E+10	1.62E+08	8.45
352	353	7.03E+10	1.22E+09	7.15E+10	1.62E+08	8.45
353	354	7.05E+10	1.22E+09	7.17E+10	1.62E+08	8.45
354	355	7.06E+10	1.22E+09	7.18E+10	1.62E+08	8.45
355	356	7.08E+10	1.22E+09	7.20E+10	1.62E+08	8.45
356	357	7.09E+10	1.22E+09	7.22E+10	1.62E+08	8.45

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
357	358	7.11E+10	1.22E+09	7.23E+10	1.62E+08	8.45
358	359	7.13E+10	1.22E+09	7.25E+10	1.62E+08	8.45
359	360	7.14E+10	1.22E+09	7.27E+10	1.62E+08	8.45
360	361	7.16E+10	1.22E+09	7.28E+10	1.62E+08	8.45
361	362	7.18E+10	1.22E+09	7.30E+10	1.62E+08	8.45
362	363	7.19E+10	1.22E+09	7.31E+10	1.62E+08	8.45
363	364	7.21E+10	1.22E+09	7.33E+10	1.62E+08	8.45
364	365	7.22E+10	1.22E+09	7.35E+10	1.62E+08	8.45
365	366	7.24E+10	1.22E+09	7.36E+10	1.62E+08	8.45
366	367	7.26E+10	1.22E+09	7.38E+10	1.62E+08	8.45
367	368	7.27E+10	1.22E+09	7.40E+10	1.62E+08	8.45
368	369	7.29E+10	1.22E+09	7.41E+10	1.62E+08	8.45
369	370	7.31E+10	1.22E+09	7.43E+10	1.62E+08	8.45
370	371	7.32E+10	1.22E+09	7.44E+10	1.62E+08	8.45
371	372	7.34E+10	1.22E+09	7.46E+10	1.62E+08	8.45
372	373	7.35E+10	1.22E+09	7.48E+10	1.62E+08	8.45
373	374	7.37E+10	1.22E+09	7.49E+10	1.62E+08	8.45
374	375	7.39E+10	1.22E+09	7.51E+10	1.62E+08	8.45
375	376	7.40E+10	1.22E+09	7.52E+10	1.62E+08	8.45
376	377	7.42E+10	1.22E+09	7.54E+10	1.62E+08	8.45
377	378	7.43E+10	1.22E+09	7.56E+10	1.62E+08	8.45
378	379	7.45E+10	1.22E+09	7.57E+10	1.62E+08	8.45
379	380	7.47E+10	1.22E+09	7.59E+10	1.62E+08	8.45
380	381	7.48E+10	1.22E+09	7.61E+10	1.62E+08	8.45
381	382	7.50E+10	1.22E+09	7.62E+10	1.62E+08	8.45
382	383	7.52E+10	1.22E+09	7.64E+10	1.62E+08	8.45
383	384	7.53E+10	1.22E+09	7.65E+10	1.62E+08	8.45
384	385	7.55E+10	1.22E+09	7.67E+10	1.62E+08	8.45
385	386	7.56E+10	1.22E+09	7.69E+10	1.62E+08	8.45
386	387	7.58E+10	1.22E+09	7.70E+10	1.62E+08	8.45
387	388	7.60E+10	1.22E+09	7.72E+10	1.62E+08	8.45
388	389	7.61E+10	1.22E+09	7.74E+10	1.62E+08	8.45
389	390	7.63E+10	1.22E+09	7.75E+10	1.62E+08	8.45
390	391	7.65E+10	1.22E+09	7.77E+10	1.62E+08	8.45
391	392	7.66E+10	1.22E+09	7.78E+10	1.62E+08	8.45
392	393	7.68E+10	1.22E+09	7.80E+10	1.62E+08	8.45
393	394	7.69E+10	1.22E+09	7.82E+10	1.62E+08	8.45
394	395	7.71E+10	1.22E+09	7.83E+10	1.62E+08	8.45
395	396	7.73E+10	1.22E+09	7.85E+10	1.62E+08	8.45
396	397	7.74E+10	1.22E+09	7.87E+10	1.62E+08	8.45
397	398	7.76E+10	1.22E+09	7.88E+10	1.62E+08	8.45
398	399	7.78E+10	1.22E+09	7.90E+10	1.62E+08	8.45
399	400	7.79E+10	1.22E+09	7.91E+10	1.62E+08	8.45
400	401	7.81E+10	1.22E+09	7.93E+10	1.62E+08	8.45
401	402	7.82E+10	1.22E+09	7.95E+10	1.62E+08	8.45

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
402	403	7.84E+10	1.22E+09	7.96E+10	1.62E+08	8.45
403	404	7.86E+10	1.22E+09	7.98E+10	1.62E+08	8.45
404	405	7.87E+10	1.22E+09	7.99E+10	1.62E+08	8.45
405	406	7.89E+10	1.22E+09	8.01E+10	1.62E+08	8.45
406	407	7.90E+10	1.22E+09	8.03E+10	1.62E+08	8.45
407	408	7.92E+10	1.22E+09	8.04E+10	1.62E+08	8.45
408	409	7.94E+10	1.22E+09	8.06E+10	1.62E+08	8.45
409	410	7.95E+10	1.22E+09	8.08E+10	1.62E+08	8.45
410	411	7.97E+10	1.22E+09	8.09E+10	1.62E+08	8.45
411	412	7.99E+10	1.22E+09	8.11E+10	1.62E+08	8.45
412	413	8.00E+10	1.22E+09	8.12E+10	1.62E+08	8.45
413	414	8.02E+10	1.22E+09	8.14E+10	1.62E+08	8.45
414	415	8.03E+10	1.22E+09	8.16E+10	1.62E+08	8.45
415	416	8.05E+10	1.22E+09	8.17E+10	1.62E+08	8.45
416	417	8.07E+10	1.22E+09	8.19E+10	1.59E+08	8.32
417	418	8.08E+10	1.22E+09	8.20E+10	1.54E+08	8.06
418	419	8.10E+10	1.22E+09	8.22E+10	1.54E+08	8.06
419	420	8.11E+10	1.22E+09	8.24E+10	1.54E+08	8.06
420	421	8.13E+10	1.22E+09	8.25E+10	1.54E+08	8.06
421	422	8.14E+10	1.22E+09	8.27E+10	1.54E+08	8.06
422	423	8.16E+10	1.22E+09	8.28E+10	1.54E+08	8.06
423	424	8.17E+10	1.22E+09	8.30E+10	1.54E+08	8.06
424	425	8.19E+10	1.22E+09	8.31E+10	1.54E+08	8.06
425	426	8.21E+10	1.22E+09	8.33E+10	1.54E+08	8.06
426	427	8.22E+10	1.22E+09	8.34E+10	1.54E+08	8.06
427	428	8.24E+10	1.22E+09	8.36E+10	1.54E+08	8.06
428	429	8.25E+10	1.22E+09	8.37E+10	1.54E+08	8.06
429	430	8.27E+10	1.22E+09	8.39E+10	1.54E+08	8.06
430	431	8.28E+10	1.22E+09	8.40E+10	1.54E+08	8.06
431	432	8.30E+10	1.22E+09	8.42E+10	1.54E+08	8.06
432	433	8.31E+10	1.22E+09	8.44E+10	1.54E+08	8.06
433	434	8.33E+10	1.22E+09	8.45E+10	1.54E+08	8.06
434	435	8.34E+10	1.22E+09	8.47E+10	1.54E+08	8.06
435	436	8.36E+10	1.22E+09	8.48E+10	1.54E+08	8.06
436	437	8.38E+10	1.22E+09	8.50E+10	1.54E+08	8.06
437	438	8.39E+10	1.22E+09	8.51E+10	1.54E+08	8.06
438	439	8.41E+10	1.22E+09	8.53E+10	1.54E+08	8.06
439	440	8.42E+10	1.22E+09	8.54E+10	1.54E+08	8.06
440	441	8.44E+10	1.22E+09	8.56E+10	1.54E+08	8.06
441	442	8.45E+10	1.22E+09	8.57E+10	1.54E+08	8.06
442	443	8.47E+10	1.22E+09	8.59E+10	1.54E+08	8.06
443	444	8.48E+10	1.22E+09	8.61E+10	1.54E+08	8.06
444	445	8.50E+10	1.22E+09	8.62E+10	1.54E+08	8.06
445	446	8.51E+10	1.22E+09	8.64E+10	1.54E+08	8.06
446	447	8.53E+10	1.22E+09	8.65E+10	1.54E+08	8.06

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
447	448	8.54E+10	1.22E+09	8.67E+10	1.54E+08	8.06
448	449	8.56E+10	1.22E+09	8.68E+10	1.54E+08	8.06
449	450	8.58E+10	1.22E+09	8.70E+10	1.54E+08	8.06
450	451	8.59E+10	1.22E+09	8.71E+10	1.54E+08	8.06
451	452	8.61E+10	1.22E+09	8.73E+10	1.54E+08	8.06
452	453	8.62E+10	1.22E+09	8.74E+10	1.54E+08	8.06
453	454	8.64E+10	1.22E+09	8.76E+10	1.54E+08	8.06
454	455	8.65E+10	1.22E+09	8.78E+10	1.54E+08	8.06
455	456	8.67E+10	1.22E+09	8.79E+10	1.54E+08	8.06
456	457	8.68E+10	1.22E+09	8.81E+10	1.54E+08	8.06
457	458	8.70E+10	1.22E+09	8.82E+10	1.54E+08	8.06
458	459	8.71E+10	1.22E+09	8.84E+10	1.54E+08	8.06
459	460	8.73E+10	1.22E+09	8.85E+10	1.54E+08	8.06
460	461	8.75E+10	1.22E+09	8.87E+10	1.54E+08	8.06
461	462	8.76E+10	1.22E+09	8.88E+10	1.54E+08	8.06
462	463	8.78E+10	1.22E+09	8.90E+10	1.54E+08	8.06
463	464	8.79E+10	1.22E+09	8.91E+10	1.54E+08	8.06
464	465	8.81E+10	1.22E+09	8.93E+10	1.54E+08	8.06
465	466	8.82E+10	1.22E+09	8.95E+10	1.54E+08	8.06
466	467	8.84E+10	1.22E+09	8.96E+10	1.54E+08	8.06
467	468	8.85E+10	1.22E+09	8.98E+10	1.54E+08	8.06
468	469	8.87E+10	1.22E+09	8.99E+10	1.54E+08	8.06
469	470	8.88E+10	1.22E+09	9.01E+10	1.54E+08	8.06
470	471	8.90E+10	1.22E+09	9.02E+10	1.54E+08	8.06
471	472	8.92E+10	1.22E+09	9.04E+10	1.54E+08	8.06
472	473	8.93E+10	1.22E+09	9.05E+10	1.54E+08	8.06
473	474	8.95E+10	1.22E+09	9.07E+10	1.54E+08	8.06
474	475	8.96E+10	1.22E+09	9.08E+10	1.54E+08	8.06
475	476	8.98E+10	1.22E+09	9.10E+10	1.54E+08	8.06
476	477	8.99E+10	1.22E+09	9.12E+10	1.54E+08	8.06
477	478	9.01E+10	1.22E+09	9.13E+10	1.54E+08	8.06
478	479	9.02E+10	1.22E+09	9.15E+10	1.54E+08	8.06
479	480	9.04E+10	1.22E+09	9.16E+10	1.54E+08	8.06
480	481	9.05E+10	1.22E+09	9.18E+10	1.51E+08	7.87
481	482	9.07E+10	1.22E+09	9.19E+10	1.51E+08	7.87
482	483	9.08E+10	1.22E+09	9.21E+10	1.51E+08	7.87
483	484	9.10E+10	1.22E+09	9.22E+10	1.51E+08	7.87
484	485	9.11E+10	1.22E+09	9.24E+10	1.51E+08	7.87
485	486	9.13E+10	1.22E+09	9.25E+10	1.51E+08	7.87
486	487	9.14E+10	1.22E+09	9.27E+10	1.51E+08	7.87
487	488	9.16E+10	1.22E+09	9.28E+10	1.51E+08	7.87
488	489	9.17E+10	1.22E+09	9.30E+10	1.51E+08	7.87
489	490	9.19E+10	1.22E+09	9.31E+10	1.51E+08	7.87
490	491	9.21E+10	1.22E+09	9.33E+10	1.51E+08	7.87
491	492	9.22E+10	1.22E+09	9.34E+10	1.51E+08	7.87

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
492	493	9.24E+10	1.22E+09	9.36E+10	1.51E+08	7.87
493	494	9.25E+10	1.22E+09	9.37E+10	1.51E+08	7.87
494	495	9.27E+10	1.22E+09	9.39E+10	1.51E+08	7.87
495	496	9.28E+10	1.22E+09	9.40E+10	1.51E+08	7.87
496	497	9.30E+10	1.22E+09	9.42E+10	1.51E+08	7.87
497	498	9.31E+10	1.22E+09	9.43E+10	1.51E+08	7.87
498	499	9.33E+10	1.22E+09	9.45E+10	1.51E+08	7.87
499	500	9.34E+10	1.22E+09	9.46E+10	1.51E+08	7.87
500	501	9.36E+10	1.22E+09	9.48E+10	1.51E+08	7.87
501	502	9.37E+10	1.22E+09	9.49E+10	1.51E+08	7.87
502	503	9.39E+10	1.22E+09	9.51E+10	1.51E+08	7.87
503	504	9.40E+10	1.22E+09	9.52E+10	1.51E+08	7.87
504	505	9.42E+10	1.22E+09	9.54E+10	1.51E+08	7.87
505	506	9.43E+10	1.22E+09	9.55E+10	1.51E+08	7.87
506	507	9.45E+10	1.22E+09	9.57E+10	1.51E+08	7.87
507	508	9.46E+10	1.22E+09	9.58E+10	1.51E+08	7.87
508	509	9.48E+10	1.22E+09	9.60E+10	1.51E+08	7.87
509	510	9.49E+10	1.22E+09	9.61E+10	1.51E+08	7.87
510	511	9.51E+10	1.22E+09	9.63E+10	1.51E+08	7.87
511	512	9.52E+10	1.22E+09	9.64E+10	1.51E+08	7.87
512	513	9.54E+10	1.22E+09	9.66E+10	1.51E+08	7.87
513	514	9.55E+10	1.22E+09	9.67E+10	1.51E+08	7.87
514	515	9.57E+10	1.22E+09	9.69E+10	1.51E+08	7.87
515	516	9.58E+10	1.22E+09	9.70E+10	1.51E+08	7.87
516	517	9.60E+10	1.22E+09	9.72E+10	1.51E+08	7.87
517	518	9.61E+10	1.22E+09	9.73E+10	1.51E+08	7.87
518	519	9.63E+10	1.22E+09	9.75E+10	1.51E+08	7.87
519	520	9.64E+10	1.22E+09	9.76E+10	1.51E+08	7.87
520	521	9.66E+10	1.22E+09	9.78E+10	1.51E+08	7.87
521	522	9.67E+10	1.22E+09	9.80E+10	1.51E+08	7.87
522	523	9.69E+10	1.22E+09	9.81E+10	1.51E+08	7.87
523	524	9.70E+10	1.22E+09	9.83E+10	1.51E+08	7.87
524	525	9.72E+10	1.22E+09	9.84E+10	1.51E+08	7.87
525	526	9.73E+10	1.22E+09	9.86E+10	1.51E+08	7.87
526	527	9.75E+10	1.22E+09	9.87E+10	1.51E+08	7.87
527	528	9.76E+10	1.22E+09	9.89E+10	1.51E+08	7.87
528	529	9.78E+10	1.22E+09	9.90E+10	1.51E+08	7.87
529	530	9.79E+10	1.22E+09	9.92E+10	1.51E+08	7.87
530	531	9.81E+10	1.22E+09	9.93E+10	1.51E+08	7.87
531	532	9.82E+10	1.22E+09	9.95E+10	1.51E+08	7.87
532	533	9.84E+10	1.22E+09	9.96E+10	1.51E+08	7.87
533	534	9.85E+10	1.22E+09	9.98E+10	1.51E+08	7.87
534	535	9.87E+10	1.22E+09	9.99E+10	1.51E+08	7.87
535	536	9.88E+10	1.22E+09	1.00E+11	1.51E+08	7.87
536	537	9.90E+10	1.22E+09	1.00E+11	1.51E+08	7.87

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
537	538	9.91E+10	1.22E+09	1.00E+11	1.51E+08	7.87
538	539	9.93E+10	1.22E+09	1.01E+11	1.51E+08	7.87
539	540	9.94E+10	1.22E+09	1.01E+11	1.51E+08	7.87
540	541	9.96E+10	1.22E+09	1.01E+11	1.51E+08	7.87
541	542	9.97E+10	1.22E+09	1.01E+11	1.51E+08	7.87
542	543	9.99E+10	1.22E+09	1.01E+11	1.51E+08	7.87
543	544	1.00E+11	1.22E+09	1.01E+11	1.51E+08	7.87
544	545	1.00E+11	1.22E+09	1.01E+11	1.51E+08	7.87
545	546	1.00E+11	1.22E+09	1.02E+11	1.51E+08	7.87
546	547	1.00E+11	1.22E+09	1.02E+11	1.51E+08	7.87
547	548	1.01E+11	1.22E+09	1.02E+11	1.51E+08	7.87
548	549	1.01E+11	1.22E+09	1.02E+11	1.51E+08	7.87
549	550	1.01E+11	1.22E+09	1.02E+11	1.51E+08	7.87
550	551	1.01E+11	1.22E+09	1.02E+11	1.51E+08	7.87
551	552	1.01E+11	1.22E+09	1.02E+11	1.51E+08	7.87
552	553	1.01E+11	1.22E+09	1.03E+11	1.51E+08	7.87
553	554	1.02E+11	1.22E+09	1.03E+11	1.51E+08	7.87
554	555	1.02E+11	1.22E+09	1.03E+11	1.51E+08	7.87
555	556	1.02E+11	1.22E+09	1.03E+11	1.49E+08	7.76
556	557	1.02E+11	1.22E+09	1.03E+11	1.46E+08	7.63
557	558	1.02E+11	1.22E+09	1.03E+11	1.46E+08	7.63
558	559	1.02E+11	1.22E+09	1.04E+11	1.46E+08	7.63
559	560	1.02E+11	1.22E+09	1.04E+11	1.46E+08	7.63
560	561	1.03E+11	1.22E+09	1.04E+11	1.46E+08	7.63
561	562	1.03E+11	1.22E+09	1.04E+11	1.46E+08	7.63
562	563	1.03E+11	1.22E+09	1.04E+11	1.46E+08	7.63
563	564	1.03E+11	1.22E+09	1.04E+11	1.46E+08	7.63
564	565	1.03E+11	1.22E+09	1.04E+11	1.46E+08	7.63
565	566	1.03E+11	1.22E+09	1.05E+11	1.46E+08	7.63
566	567	1.03E+11	1.22E+09	1.05E+11	1.46E+08	7.63
567	568	1.04E+11	1.22E+09	1.05E+11	1.46E+08	7.63
568	569	1.04E+11	1.22E+09	1.05E+11	1.46E+08	7.63
569	570	1.04E+11	1.22E+09	1.05E+11	1.46E+08	7.63
570	571	1.04E+11	1.22E+09	1.05E+11	1.46E+08	7.63
571	572	1.04E+11	1.22E+09	1.05E+11	1.46E+08	7.63
572	573	1.04E+11	1.22E+09	1.06E+11	1.46E+08	7.63
573	574	1.04E+11	1.22E+09	1.06E+11	1.46E+08	7.63
574	575	1.05E+11	1.22E+09	1.06E+11	1.46E+08	7.63
575	576	1.05E+11	1.22E+09	1.06E+11	1.46E+08	7.63
576	577	1.05E+11	1.22E+09	1.06E+11	1.46E+08	7.63
577	578	1.05E+11	1.22E+09	1.06E+11	1.46E+08	7.63
578	579	1.05E+11	1.22E+09	1.06E+11	1.46E+08	7.63
579	580	1.05E+11	1.22E+09	1.07E+11	1.46E+08	7.63
580	581	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63
581	582	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
582	583	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63
583	584	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63
584	585	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63
585	586	1.06E+11	1.22E+09	1.07E+11	1.46E+08	7.63
586	587	1.06E+11	1.22E+09	1.08E+11	1.46E+08	7.63
587	588	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
588	589	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
589	590	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
590	591	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
591	592	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
592	593	1.07E+11	1.22E+09	1.08E+11	1.46E+08	7.63
593	594	1.07E+11	1.22E+09	1.09E+11	1.46E+08	7.63
594	595	1.08E+11	1.22E+09	1.09E+11	1.46E+08	7.63
595	596	1.08E+11	1.22E+09	1.09E+11	1.46E+08	7.63
596	597	1.08E+11	1.22E+09	1.09E+11	1.46E+08	7.63
597	598	1.08E+11	1.22E+09	1.09E+11	1.46E+08	7.63
598	599	1.08E+11	1.22E+09	1.09E+11	1.46E+08	7.63
599	600	1.08E+11	1.22E+09	1.10E+11	1.46E+08	7.63
600	601	1.08E+11	1.22E+09	1.10E+11	1.46E+08	7.63
601	602	1.09E+11	1.22E+09	1.10E+11	1.46E+08	7.63
602	603	1.09E+11	1.22E+09	1.10E+11	1.46E+08	7.63
603	604	1.09E+11	1.22E+09	1.10E+11	1.46E+08	7.63
604	605	1.09E+11	1.22E+09	1.10E+11	1.46E+08	7.63
605	606	1.09E+11	1.22E+09	1.10E+11	1.46E+08	7.63
606	607	1.09E+11	1.22E+09	1.11E+11	1.46E+08	7.63
607	608	1.09E+11	1.22E+09	1.11E+11	1.46E+08	7.63
608	609	1.10E+11	1.22E+09	1.11E+11	1.46E+08	7.63
609	610	1.10E+11	1.22E+09	1.11E+11	1.46E+08	7.63
610	611	1.10E+11	1.22E+09	1.11E+11	1.46E+08	7.63
611	612	1.10E+11	1.22E+09	1.11E+11	1.46E+08	7.63
612	613	1.10E+11	1.22E+09	1.11E+11	1.46E+08	7.63
613	614	1.10E+11	1.22E+09	1.12E+11	1.46E+08	7.63
614	615	1.10E+11	1.22E+09	1.12E+11	1.46E+08	7.63
615	616	1.11E+11	1.22E+09	1.12E+11	1.46E+08	7.63
616	617	1.11E+11	1.22E+09	1.12E+11	1.46E+08	7.63
617	618	1.11E+11	1.22E+09	1.12E+11	1.46E+08	7.63
618	619	1.11E+11	1.22E+09	1.12E+11	1.46E+08	7.63
619	620	1.11E+11	1.22E+09	1.12E+11	1.46E+08	7.63
620	621	1.11E+11	1.22E+09	1.13E+11	1.46E+08	7.63
621	622	1.11E+11	1.22E+09	1.13E+11	1.46E+08	7.63
622	623	1.12E+11	1.22E+09	1.13E+11	1.46E+08	7.63
623	624	1.12E+11	1.22E+09	1.13E+11	1.46E+08	7.63
624	625	1.12E+11	1.22E+09	1.13E+11	1.46E+08	7.63
625	626	1.12E+11	1.22E+09	1.13E+11	1.46E+08	7.63
626	627	1.12E+11	1.22E+09	1.13E+11	1.46E+08	7.63

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
627	628	1.12E+11	1.22E+09	1.14E+11	1.46E+08	7.63
628	629	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
629	630	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
630	631	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
631	632	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
632	633	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
633	634	1.13E+11	1.22E+09	1.14E+11	1.46E+08	7.63
634	635	1.13E+11	1.22E+09	1.15E+11	1.46E+08	7.63
635	636	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
636	637	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
637	638	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
638	639	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
639	640	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
640	641	1.14E+11	1.22E+09	1.15E+11	1.46E+08	7.63
641	642	1.14E+11	1.22E+09	1.16E+11	1.46E+08	7.63
642	643	1.15E+11	1.22E+09	1.16E+11	1.46E+08	7.63
643	644	1.15E+11	1.22E+09	1.16E+11	1.46E+08	7.63
644	645	1.15E+11	1.22E+09	1.16E+11	1.46E+08	7.63
645	646	1.15E+11	1.22E+09	1.16E+11	1.46E+08	7.63
646	647	1.15E+11	1.22E+09	1.16E+11	1.46E+08	7.63
647	648	1.15E+11	1.22E+09	1.17E+11	1.46E+08	7.63
648	649	1.15E+11	1.22E+09	1.17E+11	1.46E+08	7.63
649	650	1.16E+11	1.22E+09	1.17E+11	1.46E+08	7.63
650	651	1.16E+11	1.22E+09	1.17E+11	1.46E+08	7.63
651	652	1.16E+11	1.22E+09	1.17E+11	1.46E+08	7.63
652	653	1.16E+11	1.22E+09	1.17E+11	1.46E+08	7.63
653	654	1.16E+11	1.22E+09	1.17E+11	1.46E+08	7.63
654	655	1.16E+11	1.22E+09	1.18E+11	1.46E+08	7.63
655	656	1.16E+11	1.22E+09	1.18E+11	1.46E+08	7.63
656	657	1.17E+11	1.22E+09	1.18E+11	1.46E+08	7.63
657	658	1.17E+11	1.22E+09	1.18E+11	1.46E+08	7.63
658	659	1.17E+11	1.22E+09	1.18E+11	1.46E+08	7.63
659	660	1.17E+11	1.22E+09	1.18E+11	1.46E+08	7.63
660	661	1.17E+11	1.22E+09	1.18E+11	1.46E+08	7.63
661	662	1.17E+11	1.22E+09	1.19E+11	1.46E+08	7.63
662	663	1.17E+11	1.22E+09	1.19E+11	1.46E+08	7.63
663	664	1.18E+11	1.22E+09	1.19E+11	1.46E+08	7.63
664	665	1.18E+11	1.22E+09	1.19E+11	1.46E+08	7.63
665	666	1.18E+11	1.22E+09	1.19E+11	1.46E+08	7.63
666	667	1.18E+11	1.22E+09	1.19E+11	1.46E+08	7.63
667	668	1.18E+11	1.22E+09	1.19E+11	1.46E+08	7.63
668	669	1.18E+11	1.22E+09	1.20E+11	1.46E+08	7.63
669	670	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63
670	671	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63
671	672	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
672	673	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63
673	674	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63
674	675	1.19E+11	1.22E+09	1.20E+11	1.46E+08	7.63
675	676	1.19E+11	1.22E+09	1.21E+11	1.46E+08	7.63
676	677	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
677	678	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
678	679	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
679	680	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
680	681	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
681	682	1.20E+11	1.22E+09	1.21E+11	1.46E+08	7.63
682	683	1.20E+11	1.22E+09	1.22E+11	1.46E+08	7.63
683	684	1.21E+11	1.22E+09	1.22E+11	1.46E+08	7.63
684	685	1.21E+11	1.22E+09	1.22E+11	1.46E+08	7.63
685	686	1.21E+11	1.22E+09	1.22E+11	1.46E+08	7.63
686	687	1.21E+11	1.22E+09	1.22E+11	1.46E+08	7.63
687	688	1.21E+11	1.22E+09	1.22E+11	1.46E+08	7.63
688	689	1.21E+11	1.22E+09	1.23E+11	1.46E+08	7.63
689	690	1.21E+11	1.22E+09	1.23E+11	1.46E+08	7.63
690	691	1.22E+11	1.22E+09	1.23E+11	1.46E+08	7.63
691	692	1.22E+11	1.22E+09	1.23E+11	1.46E+08	7.63
692	693	1.22E+11	1.22E+09	1.23E+11	1.46E+08	7.63
693	694	1.22E+11	1.22E+09	1.23E+11	1.46E+08	7.63
694	695	1.22E+11	1.22E+09	1.23E+11	1.46E+08	7.63
695	696	1.22E+11	1.22E+09	1.24E+11	1.46E+08	7.63
696	697	1.22E+11	1.22E+09	1.24E+11	1.46E+08	7.63
697	698	1.23E+11	1.22E+09	1.24E+11	1.46E+08	7.63
698	699	1.23E+11	1.22E+09	1.24E+11	1.46E+08	7.63
699	700	1.23E+11	1.22E+09	1.24E+11	1.46E+08	7.63
700	701	1.23E+11	1.22E+09	1.24E+11	1.46E+08	7.63
701	702	1.23E+11	1.22E+09	1.24E+11	1.46E+08	7.63
702	703	1.23E+11	1.22E+09	1.25E+11	1.46E+08	7.63
703	704	1.23E+11	1.22E+09	1.25E+11	1.46E+08	7.63
704	705	1.24E+11	1.22E+09	1.25E+11	1.46E+08	7.63
705	706	1.24E+11	1.22E+09	1.25E+11	1.46E+08	7.63
706	707	1.24E+11	1.22E+09	1.25E+11	1.46E+08	7.63
707	708	1.24E+11	1.22E+09	1.25E+11	1.46E+08	7.63
708	709	1.24E+11	1.22E+09	1.25E+11	1.46E+08	7.63
709	710	1.24E+11	1.22E+09	1.26E+11	1.46E+08	7.63
710	711	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
711	712	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
712	713	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
713	714	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
714	715	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
715	716	1.25E+11	1.22E+09	1.26E+11	1.46E+08	7.63
716	717	1.25E+11	1.22E+09	1.27E+11	1.46E+08	7.63

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
717	718	1.26E+11	1.22E+09	1.27E+11	1.46E+08	7.63
718	719	1.26E+11	1.22E+09	1.27E+11	1.46E+08	7.63
719	720	1.26E+11	1.22E+09	1.27E+11	1.46E+08	7.63
720	721	1.26E+11	1.22E+09	1.27E+11	1.40E+08	7.31
721	722	1.26E+11	1.22E+09	1.27E+11	1.40E+08	7.31
722	723	1.26E+11	1.22E+09	1.27E+11	1.40E+08	7.31
723	724	1.26E+11	1.22E+09	1.28E+11	1.40E+08	7.31
724	725	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
725	726	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
726	727	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
727	728	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
728	729	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
729	730	1.27E+11	1.22E+09	1.28E+11	1.40E+08	7.31
730	731	1.27E+11	1.22E+09	1.29E+11	1.40E+08	7.31
731	732	1.27E+11	1.22E+09	1.29E+11	1.40E+08	7.31
732	733	1.28E+11	1.22E+09	1.29E+11	1.40E+08	7.31
733	734	1.28E+11	1.22E+09	1.29E+11	1.40E+08	7.31
734	735	1.28E+11	1.22E+09	1.29E+11	1.40E+08	7.31
735	736	1.28E+11	1.22E+09	1.29E+11	1.40E+08	7.31
736	737	1.28E+11	1.22E+09	1.29E+11	1.40E+08	7.31
737	738	1.28E+11	1.22E+09	1.30E+11	1.40E+08	7.31
738	739	1.28E+11	1.22E+09	1.30E+11	1.40E+08	7.31
739	740	1.29E+11	1.22E+09	1.30E+11	1.40E+08	7.31
740	741	1.29E+11	1.22E+09	1.30E+11	1.40E+08	7.31
741	742	1.29E+11	1.22E+09	1.30E+11	1.40E+08	7.31
742	743	1.29E+11	1.22E+09	1.30E+11	1.40E+08	7.31
743	744	1.29E+11	1.22E+09	1.30E+11	1.40E+08	7.31
744	745	1.29E+11	1.22E+09	1.31E+11	1.40E+08	7.31
745	746	1.29E+11	1.22E+09	1.31E+11	1.40E+08	7.31
746	747	1.30E+11	1.22E+09	1.31E+11	1.40E+08	7.31
747	748	1.30E+11	1.22E+09	1.31E+11	1.40E+08	7.31
748	749	1.30E+11	1.22E+09	1.31E+11	1.40E+08	7.31
749	750	1.30E+11	1.22E+09	1.31E+11	1.40E+08	7.31
750	751	1.30E+11	1.22E+09	1.31E+11	1.40E+08	7.31
751	752	1.30E+11	1.22E+09	1.32E+11	1.40E+08	7.31
752	753	1.30E+11	1.22E+09	1.32E+11	1.40E+08	7.31
753	754	1.31E+11	1.22E+09	1.32E+11	1.40E+08	7.31
754	755	1.31E+11	1.22E+09	1.32E+11	1.40E+08	7.31
755	756	1.31E+11	1.22E+09	1.32E+11	1.40E+08	7.31
756	757	1.31E+11	1.22E+09	1.32E+11	1.40E+08	7.31
757	758	1.31E+11	1.22E+09	1.32E+11	1.40E+08	7.31
758	759	1.31E+11	1.22E+09	1.33E+11	1.40E+08	7.31
759	760	1.31E+11	1.22E+09	1.33E+11	1.40E+08	7.31
760	761	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31
761	762	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
762	763	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31
763	764	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31
764	765	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31
765	766	1.32E+11	1.22E+09	1.33E+11	1.40E+08	7.31
766	767	1.32E+11	1.22E+09	1.34E+11	1.40E+08	7.31
767	768	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
768	769	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
769	770	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
770	771	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
771	772	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
772	773	1.33E+11	1.22E+09	1.34E+11	1.40E+08	7.31
773	774	1.33E+11	1.22E+09	1.35E+11	1.40E+08	7.31
774	775	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
775	776	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
776	777	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
777	778	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
778	779	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
779	780	1.34E+11	1.22E+09	1.35E+11	1.40E+08	7.31
780	781	1.34E+11	1.22E+09	1.36E+11	1.40E+08	7.31
781	782	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
782	783	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
783	784	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
784	785	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
785	786	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
786	787	1.35E+11	1.22E+09	1.36E+11	1.40E+08	7.31
787	788	1.35E+11	1.22E+09	1.37E+11	1.40E+08	7.31
788	789	1.35E+11	1.22E+09	1.37E+11	1.40E+08	7.31
789	790	1.36E+11	1.22E+09	1.37E+11	1.40E+08	7.31
790	791	1.36E+11	1.22E+09	1.37E+11	1.40E+08	7.31
791	792	1.36E+11	1.22E+09	1.37E+11	1.40E+08	7.31
792	793	1.36E+11	1.22E+09	1.37E+11	1.40E+08	7.31
793	794	1.36E+11	1.22E+09	1.37E+11	1.40E+08	7.31
794	795	1.36E+11	1.22E+09	1.38E+11	1.40E+08	7.31
795	796	1.36E+11	1.22E+09	1.38E+11	1.40E+08	7.31
796	797	1.37E+11	1.22E+09	1.38E+11	1.40E+08	7.31
797	798	1.37E+11	1.22E+09	1.38E+11	1.40E+08	7.31
798	799	1.37E+11	1.22E+09	1.38E+11	1.40E+08	7.31
799	800	1.37E+11	1.22E+09	1.38E+11	1.40E+08	7.31
800	801	1.37E+11	1.22E+09	1.38E+11	1.40E+08	7.31
801	802	1.37E+11	1.22E+09	1.39E+11	1.40E+08	7.31
802	803	1.37E+11	1.22E+09	1.39E+11	1.40E+08	7.31
803	804	1.38E+11	1.22E+09	1.39E+11	1.40E+08	7.31
804	805	1.38E+11	1.22E+09	1.39E+11	1.40E+08	7.31
805	806	1.38E+11	1.22E+09	1.39E+11	1.40E+08	7.31
806	807	1.38E+11	1.22E+09	1.39E+11	1.40E+08	7.31

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
807	808	1.38E+11	1.22E+09	1.39E+11	1.40E+08	7.31
808	809	1.38E+11	1.22E+09	1.40E+11	1.40E+08	7.31
809	810	1.38E+11	1.22E+09	1.40E+11	1.40E+08	7.31
810	811	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
811	812	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
812	813	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
813	814	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
814	815	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
815	816	1.39E+11	1.22E+09	1.40E+11	1.40E+08	7.31
816	817	1.39E+11	1.22E+09	1.41E+11	1.40E+08	7.31
817	818	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
818	819	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
819	820	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
820	821	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
821	822	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
822	823	1.40E+11	1.22E+09	1.41E+11	1.40E+08	7.31
823	824	1.40E+11	1.22E+09	1.42E+11	1.40E+08	7.31
824	825	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
825	826	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
826	827	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
827	828	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
828	829	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
829	830	1.41E+11	1.22E+09	1.42E+11	1.40E+08	7.31
830	831	1.41E+11	1.22E+09	1.43E+11	1.40E+08	7.31
831	832	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
832	833	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
833	834	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
834	835	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
835	836	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
836	837	1.42E+11	1.22E+09	1.43E+11	1.40E+08	7.31
837	838	1.42E+11	1.22E+09	1.44E+11	1.40E+08	7.31
838	839	1.42E+11	1.22E+09	1.44E+11	1.40E+08	7.31
839	840	1.43E+11	1.22E+09	1.44E+11	1.40E+08	7.31
840	841	1.43E+11	1.22E+09	1.44E+11	1.40E+08	7.31
841	842	1.43E+11	1.22E+09	1.44E+11	1.40E+08	7.31
842	843	1.43E+11	1.22E+09	1.44E+11	1.40E+08	7.31
843	844	1.43E+11	1.22E+09	1.44E+11	1.40E+08	7.31
844	845	1.43E+11	1.22E+09	1.45E+11	1.40E+08	7.31
845	846	1.43E+11	1.22E+09	1.45E+11	1.40E+08	7.31
846	847	1.44E+11	1.22E+09	1.45E+11	1.40E+08	7.31
847	848	1.44E+11	1.22E+09	1.45E+11	1.40E+08	7.31
848	849	1.44E+11	1.22E+09	1.45E+11	1.40E+08	7.31
849	850	1.44E+11	1.22E+09	1.45E+11	1.40E+08	7.31
850	851	1.44E+11	1.22E+09	1.45E+11	1.40E+08	7.31
851	852	1.44E+11	1.22E+09	1.46E+11	1.40E+08	7.31

Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
852	853	1.44E+11	1.22E+09	1.46E+11	1.40E+08	7.31
853	854	1.45E+11	1.22E+09	1.46E+11	1.40E+08	7.31
854	855	1.45E+11	1.22E+09	1.46E+11	1.40E+08	7.31
855	856	1.45E+11	1.22E+09	1.46E+11	1.40E+08	7.31
856	857	1.45E+11	1.22E+09	1.46E+11	1.40E+08	7.31
857	858	1.45E+11	1.22E+09	1.46E+11	1.40E+08	7.31
858	859	1.45E+11	1.22E+09	1.47E+11	1.40E+08	7.31
859	860	1.45E+11	1.22E+09	1.47E+11	1.40E+08	7.31
860	861	1.46E+11	1.22E+09	1.47E+11	1.40E+08	7.31
861	862	1.46E+11	1.22E+09	1.47E+11	1.40E+08	7.31
862	863	1.46E+11	1.22E+09	1.47E+11	1.40E+08	7.31
863	864	1.46E+11	1.22E+09	1.47E+11	1.40E+08	7.31

APPENDIX L9.5: Plant Temperature Rise Equations

A		B	C	D	E	F	G	H
1		S Flowrate	86	dfs		Mass Flow	=SC\$1*SC\$2*3600	lbm/hr
2		Density	62	lbm/ft3		cp	=cp(14.3,100)	BTU/lbm-F
3	Starting Time (hr)	Ending Time (hr)	Integrated Generated Heat Load (BTU)	Total Sensible Heat Added (BTU)	Total Heat Added (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (Deg F)	
4	0	1	=FORECAST(\$B4,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B4,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B4,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6	=C4+D4	=E4/(B4-A4)	=F4/G\$1/G\$2	
5	=B4	=A5+1	=FORECAST(\$B5,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B5,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B5,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6+D4	=C5+D5	=E5/(B5-A5)	=F5/G\$1/G\$2	
6	=B5	=A6+1	=FORECAST(\$B6,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B6,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B6,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6+D5	=C6+D6	=E6/(B6-A6)	=F6/G\$1/G\$2	
7	=B6	=A7+1	=FORECAST(\$B7,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B7,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B7,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6+D6	=C7+D7	=E7/(B7-A7)	=F7/G\$1/G\$2	
8	=B7	=A8+1	=FORECAST(\$B8,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B8,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B8,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6+D7	=C8+D8	=E8/(B8-A8)	=F8/G\$1/G\$2	
9	=B8	=A9+1	=FORECAST(\$B9,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B9,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B9,Total!\$B\$2:\$B\$80,1)-1,0,2))	=Total!\$F\$2/6+D8	=C9+D9	=E9/(B9-A9)	=F9/G\$1/G\$2	
10	=B9	=A10+1	=FORECAST(\$B10,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B10,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B10,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D9	=C10+D10	=E10/(B10-A10)	=F10/G\$1/G\$2	
11	=B10	=A11+1	=FORECAST(\$B11,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B11,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B11,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D10	=C11+D11	=E11/(B11-A11)	=F11/G\$1/G\$2	
12	=B11	=A12+1	=FORECAST(\$B12,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B12,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B12,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D11	=C12+D12	=E12/(B12-A12)	=F12/G\$1/G\$2	
13	=B12	=A13+1	=FORECAST(\$B13,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B13,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B13,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D12	=C13+D13	=E13/(B13-A13)	=F13/G\$1/G\$2	
14	=B13	=A14+1	=FORECAST(\$B14,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B14,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B14,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D13	=C14+D14	=E14/(B14-A14)	=F14/G\$1/G\$2	
15	=B14	=A15+1	=FORECAST(\$B15,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B15,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B15,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D14	=C15+D15	=E15/(B15-A15)	=F15/G\$1/G\$2	
16	=B15	=A16+1	=FORECAST(\$B16,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B16,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B16,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D15	=C16+D16	=E16/(B16-A16)	=F16/G\$1/G\$2	
17	=B16	=A17+1	=FORECAST(\$B17,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B17,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B17,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D16	=C17+D17	=E17/(B17-A17)	=F17/G\$1/G\$2	
18	=B17	=A18+1	=FORECAST(\$B18,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B18,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B18,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D17	=C18+D18	=E18/(B18-A18)	=F18/G\$1/G\$2	
19	=B18	=A19+1	=FORECAST(\$B19,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B19,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B19,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D18	=C19+D19	=E19/(B19-A19)	=F19/G\$1/G\$2	
20	=B19	=A20+1	=FORECAST(\$B20,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B20,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B20,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D19	=C20+D20	=E20/(B20-A20)	=F20/G\$1/G\$2	
21	=B20	=A21+1	=FORECAST(\$B21,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B21,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B21,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D20	=C21+D21	=E21/(B21-A21)	=F21/G\$1/G\$2	
22	=B21	=A22+1	=FORECAST(\$B22,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B22,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B22,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D21	=C22+D22	=E22/(B22-A22)	=F22/G\$1/G\$2	
23	=B22	=A23+1	=FORECAST(\$B23,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B23,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B23,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D22	=C23+D23	=E23/(B23-A23)	=F23/G\$1/G\$2	
24	=B23	=A24+1	=FORECAST(\$B24,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B24,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B24,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D23	=C24+D24	=E24/(B24-A24)	=F24/G\$1/G\$2	
25	=B24	=A25+1	=FORECAST(\$B25,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B25,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B25,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D24	=C25+D25	=E25/(B25-A25)	=F25/G\$1/G\$2	
26	=B25	=A26+1	=FORECAST(\$B26,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B26,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B26,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D25	=C26+D26	=E26/(B26-A26)	=F26/G\$1/G\$2	
27	=B26	=A27+1	=FORECAST(\$B27,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B27,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B27,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D26	=C27+D27	=E27/(B27-A27)	=F27/G\$1/G\$2	
28	=B27	=A28+1	=FORECAST(\$B28,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B28,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B28,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D27	=C28+D28	=E28/(B28-A28)	=F28/G\$1/G\$2	
29	=B28	=A29+1	=FORECAST(\$B29,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B29,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B29,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D28	=C29+D29	=E29/(B29-A29)	=F29/G\$1/G\$2	
30	=B29	=A30+1	=FORECAST(\$B30,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B30,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B30,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D29	=C30+D30	=E30/(B30-A30)	=F30/G\$1/G\$2	
31	=B30	=A31+1	=FORECAST(\$B31,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B31,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B31,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D30	=C31+D31	=E31/(B31-A31)	=F31/G\$1/G\$2	
32	=B31	=A32+1	=FORECAST(\$B32,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B32,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B32,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D31	=C32+D32	=E32/(B32-A32)	=F32/G\$1/G\$2	
33	=B32	=A33+1	=FORECAST(\$B33,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B33,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B33,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D32	=C33+D33	=E33/(B33-A33)	=F33/G\$1/G\$2	
34	=B33	=A34+1	=FORECAST(\$B34,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B34,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B34,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D33	=C34+D34	=E34/(B34-A34)	=F34/G\$1/G\$2	
35	=B34	=A35+1	=FORECAST(\$B35,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B35,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B35,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D34	=C35+D35	=E35/(B35-A35)	=F35/G\$1/G\$2	
36	=B35	=A36+1	=FORECAST(\$B36,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B36,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B36,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D35	=C36+D36	=E36/(B36-A36)	=F36/G\$1/G\$2	
37	=B36	=A37+1	=FORECAST(\$B37,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B37,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B37,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D36	=C37+D37	=E37/(B37-A37)	=F37/G\$1/G\$2	
38	=B37	=A38+1	=FORECAST(\$B38,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B38,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B38,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D37	=C38+D38	=E38/(B38-A38)	=F38/G\$1/G\$2	
39	=B38	=A39+1	=FORECAST(\$B39,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B39,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B39,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D38	=C39+D39	=E39/(B39-A39)	=F39/G\$1/G\$2	
40	=B39	=A40+1	=FORECAST(\$B40,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B40,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B40,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D39	=C40+D40	=E40/(B40-A40)	=F40/G\$1/G\$2	
41	=B40	=A41+1	=FORECAST(\$B41,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B41,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B41,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D40	=C41+D41	=E41/(B41-A41)	=F41/G\$1/G\$2	
42	=B41	=A42+1	=FORECAST(\$B42,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B42,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B42,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D41	=C42+D42	=E42/(B42-A42)	=F42/G\$1/G\$2	
43	=B42	=A43+1	=FORECAST(\$B43,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B43,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B43,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D42	=C43+D43	=E43/(B43-A43)	=F43/G\$1/G\$2	
44	=B43	=A44+1	=FORECAST(\$B44,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B44,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B44,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D43	=C44+D44	=E44/(B44-A44)	=F44/G\$1/G\$2	
45	=B44	=A45+1	=FORECAST(\$B45,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B45,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B45,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D44	=C45+D45	=E45/(B45-A45)	=F45/G\$1/G\$2	
46	=B45	=A46+1	=FORECAST(\$B46,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B46,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B46,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D45	=C46+D46	=E46/(B46-A46)	=F46/G\$1/G\$2	
47	=B46	=A47+1	=FORECAST(\$B47,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B47,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B47,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D46	=C47+D47	=E47/(B47-A47)	=F47/G\$1/G\$2	
48	=B47	=A48+1	=FORECAST(\$B48,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B48,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B48,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D47	=C48+D48	=E48/(B48-A48)	=F48/G\$1/G\$2	
49	=B48	=A49+1	=FORECAST(\$B49,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B49,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B49,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D48	=C49+D49	=E49/(B49-A49)	=F49/G\$1/G\$2	
50	=B49	=A50+1	=FORECAST(\$B50,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B50,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B50,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D49	=C50+D50	=E50/(B50-A50)	=F50/G\$1/G\$2	
51	=B50	=A51+1	=FORECAST(\$B51,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B51,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B51,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D50	=C51+D51	=E51/(B51-A51)	=F51/G\$1/G\$2	
52	=B51	=A52+1	=FORECAST(\$B52,OFFSET(Total!\$E\$2:\$E\$80,MATCH(\$B52,Total!\$B\$2:\$B\$80,1)-1,0,2),OFFSET(Total!\$B\$2:\$B\$80,MATCH(\$B52,Total!\$B\$2:\$B\$80,1)-1,0,2))	=D51	=C52+D52	=E52/(B52-A52)	=F52/G\$1/G\$2	

Attachment M - LAKET-PC Weather File Creation

Prepared: Daniel W. Nevill Date 6/27/2012
Daniel W. Nevill - Sargent & Lundy^{LLC}

Reviewed: Robert W. Young Date 27-Sep-2012
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M1.0 PURPOSE / OBJECTIVE

The purpose of this attachment is to determine the worst 24-hour and 30-day weather period and the worst 30-day period of net evaporation for LaSalle County Station. The new weather data is compared to the weather data used in the existing analysis to determine if the new weather data set is more limiting. If the existing weather data is no longer bounding, new LAKET weather files are compiled. This will be used as input in determining the maximum plant inlet temperature and evaporative drawdown of the LaSalle County Station Ultimate Heat Sink, which determines the design basis Ultimate Heat Sink (UHS) performance for 30 days following an accident. Weather data has been provided from January 1, 1995 through September 30, 2010.

M2.0 METHODOLOGY

A LAKET-compatible meteorological data file, 'PIALSL9510.txt', was created consisting of meteorological data for LaSalle County Station and Peoria, IL from January 1, 1995 through September 30, 2010. See Design Input M4.1 for additional information on this file. Wind speed, wind direction, and dry-bulb temperature data were taken from an on-site meteorological tower at LaSalle County Station. Humidity, precipitation type, cloud height, and cloud cover data were not available from the on-site meteorological tower, and were taken from a National Weather Service observing station at the Peoria, IL airport (approximately 70 miles southwest of LaSalle County Station). This weather data file is input to LAKET [Ref. M5.2], and the worst weather and worst net evaporation time periods are found from the range of dates included in this file.

Based on options selected in the input file, the LAKET run returns a plot file that includes the total evaporation, precipitation, natural lake temperature, lake inlet temperature (same as the plant outlet temperature), and the UHS outlet temperature (same as the plant inlet temperature). Since LAKET returns results in three hour increments, a rolling average over 24 hours is created using Microsoft Excel [Ref. M5.1] by averaging the UHS outlet temperature of the selected time step along with the previous seven time steps. The worst weather day is chosen as the day with the highest UHS outlet temperature 24-hour rolling temperature average. The worst 30 days of weather is determined using a similar methodology, in which a 30-day rolling average of the UHS outlet temperature is calculated and the maximum is chosen as the representative worst weather month.

M2.1 Worst 24-Hour and 30-Day Weather

A specific UHS model was created in LAKET (based on Case 3a from Attachment H) with a transit time that corresponds to the three hour time step period. Case 3a is used since it uses a worst 1-day plus worst 30-day weather file and represents the worst case scenario of 18-in sedimentation. The following changes were made to Case 3a for determining the worst weather conditions:

- The date range is changed to match the date range of weather file 'PIALSL9510.txt.'
- The lake initial temperature is set at 100°F. (Assumption M3.1)
- The model is set as open cycle, so the UHS is at the same temperature at the beginning of each 3 hour interval.
- Anemometer height is set at 33-ft in accordance with the instrument setup at LaSalle County Station (Design Input M4.2).
- Lake elevation is fixed at 690-ft (Assumption M3.2).
- The circulating plant flow is set at 873.0 ft³/s for a circulation time of 3 hours.
- The plant discharge water temperature (TPRISE variable in LAKET) is set at 100°F (Assumption M3.3). For an open cycle model, this value is the lake inlet temperature.

- Effective area and effective volume are set to 57.9% of total area and 63.4% of total volume, respectively, due to the results of Attachment J - UHS Flow Path Analysis.

The UHS outlet temperature for each 3 hour period corresponds to the environmental effects on the UHS during these three hours. From these results, it can be implied that higher UHS outlet temperatures represent worse (hotter) weather conditions.

M2.2 Worst 30-Days of Net Evaporation

For determining the worst 30-days of net evaporation, a UHS model is created in LAKET (based on Case 3c in Attachment H). Case 3c is used since it uses a worst 30-day net evaporation weather file and represents the worst case scenario of 18-in sedimentation. The following changes were made to Case 3c for determining the worst net evaporation conditions:

- The date range is changed to match the date range of weather file 'PIALSL9510.txt.'
- Anemometer height is set at 33-ft in accordance with the instrument setup at LaSalle County Station (Design Input M4.2).
- Lake elevation is fixed at 690-ft (Assumption M3.2).
- Initial temperature is set at 40°F as a representative winter UHS temperature (Assumption M3.1).
- The temperature rise through the plant (TPRISE variable in LAKET) is set at the approximate average temperature rise at EPU of ~9°F (Assumption M3.3).
- Effective area and effective volume are set to 47.10 acres and 216.45 acre-ft, respectively, due to the results of Attachment J - UHS Flow Path Analysis and the Case 3c model area and volume.

The net evaporation is calculated by subtracting precipitation from the total evaporation. The worst 30 days of net evaporation is determined using rolling averages, similar to the methodology used in determining the worst weather.

M2.3 Weather File Creation for Comparison to Existing Analysis

Following determination of the worst weather days and the worst net evaporation days, weather files for input to LAKET are created. For the worst weather input file, conditions from the worst weather day are used as the first day in the new weather file. Following the first day, the conditions from the worst 30-day period are added to create a 31-day worst weather "month." Precipitation is conservatively set to zero for all time steps comprising the worst weather month (Assumption M3.4). To determine if this new worst weather month is more limiting than the existing worst weather month used in Attachment H, the input file from Case 3a is ran using the new worst weather month. If the new weather month does not result in a higher maximum UHS outlet temperature, the existing worst weather month will be retained as it is more severe.

For the worst net evaporation weather file, the conditions from the worst 30-day period are compiled to create a 30-day worst net evaporation “month.” Similar to the worst weather month, precipitation is set to zero for all time steps (Assumption M3.4). To determine if this new worst net evaporation month is more limiting than the existing worst net evaporation month from Attachment H, the input file from Case 3c is ran using the new worst net evaporation month. If the new weather file does not result in more lake drawdown, the existing worst net evaporation month will be retained as it is more severe.

M2.4 Weather File Creation for UHS Analysis

If the existing weather file is not bounding, new weather files are created based on the new most limiting day and month determined by this analysis. These weather files use the weather information provided in ‘PIALSL9510.txt’ with the following changes:

- The station code is set to zero. This input has no impact on the results of this analysis.
- The start date and time is set at 7/1/1900 at 12AM. This input has no effect on the results of this analysis.
- Precipitation is set to zero for all time steps (Assumption M3.4).

In order to determine the effect of the time of day of the worst weather day on the UHS, eight different worst weather files will be created. The first file will start at 12 AM of the worst weather day followed by subsequent files at 3 hour intervals (e.g. the second weather file starts at 3 AM of the worst weather day). After 24 hours of the worst weather day, the worst 30 days subsequently added to the file. The start of the worst 30 days is selected to maintain a 1 hour interval between time steps. For example, if the worst 24 hour day ends at 11PM, the next time step will be at 12AM of the beginning of the worst 30 days.

For the worst net evaporation, only one weather file will be created, corresponding to the dates and times determined to be the most limiting.

M2.5 Computer Programs and Software

LAKET-PC Version 2.2 [Ref. M5.2] was used to perform the lake transient analysis contained in this evaluation. This was run on S&L PC No. ZD6661 on Windows XP operating system.

Postprocessing of the LAKET-PC results is done using Microsoft Excel® 2003 [Ref. M5.1], which is commercially available. The validation of Excel is implicit in the detailed review of all spreadsheets used in this analysis. All computer runs were performed using PC No. ZD6661 under the Windows XP operating system.

M3.0 ASSUMPTIONS

- M3.1 Initial Lake Temperature - For the worst weather evaluation, the initial lake temperature is set at 100°F. This is an arbitrary reference value for determining the relative weather severity and does not influence the results of this analysis.

For the worst net evaporation month, the initial lake temperature is assumed to be 40°F. This is used as a representative value for the lake temperature during the winter since the weather data file begins on January 1. This does not influence the results of this analysis as the worst net evaporation month occurs during the summer.

- M3.2 Fixed Lake Elevation - The lake elevation when determining the worst weather month and worst net evaporation month is fixed at 690-ft. A constant lake elevation removes the effects of lake level in determining the weather effects on the UHS temperature and evaporation.

- M3.3 Station Thermal Boundary Condition - The plant discharge water temperature when determining the worst weather day and month is assumed to be 100°F. Since the lake is modeled as open cycle, the lake starts at this temperature at the start of each 3 hour time interval. A constant initial temperature allows for isolation of the meteorological effects on the lake.

When determining the worst net evaporation month, the temperature rise through the plant is assumed to be constant at approximately 9°F, which is the average temperature rise for EPU over the calculated 30 day period (Calculated from Appendix L9.3 of Attachment L - Plant Temperature Rise). A constant temperature rise through the plant removes the effects of the plant heat load in determining the evaporation.

- M3.4 Precipitation - When creating the worst weather “month” and worst net evaporation “month,” precipitation is set to zero for all time steps. This is conservative when determining the limiting initial UHS temperature.

M4.0 DESIGN INPUTS

- M4.1 Weather Data File - The LAKET-compatible meteorological data file is developed from weather data from LaSalle County Station and Peoria from 1/1/1995 to 9/30/2010 in Attachment K - Preparation of Hourly Meteorological Data. This file has the following properties:

Name: PIALSL9510.txt

Type: ASC text

Size: 21,812 KB

Creation date/time: 3/9/2012 11:08 AM CST (12:08 PM CDT)

- M4.2 Anemometer Height - The anemometer height at LaSalle County Station is 33 feet from Attachment K -Preparation of Hourly Meteorological Data.
- M4.3 Plant Temperature Rise - The approximate average plant temperature rise at EPU is calculated to be ~9°F as taken from Attachment L - Plant Temperature Rise (Appendix L9.3: Calculated average of the first 30 days following an accident evaluated in Attachment L).
- M4.4 Effective Area and Volume Percentages - The effective area percentage is 57.9% and the effective volume percentage is 63.4% from Attachment J - UHS Flow Path Analysis.

M5.0 REFERENCES

- M5.1 Microsoft® Office Excel 2003 (11.8120.8122) SP2, Copyright 1985-2003 Microsoft Corporation, Sargent & Lundy LLC Program No. 03.2.286-1.0, dated 2/2/2004.
- M5.2 LAKET-PC Computer Program, Version 2.2, S&L Program No. 03.7.292-2.2, 12/09/2004. Controlled File Path: \\SNLVS5\SYS3\OPSS\LAK29222\

M6.0 CALCULATIONS AND RESULTS

Analysis of rolling averages determine the worst day and 30 day period for UHS temperature and the worst 30 day period for net evaporation for the weather file created from LaSalle County Station meteorological data from 1/1/1995 to 9/30/2010. These results are then compared to the existing weather files used in the Attachment H of this calculation.

M6.1 Worst Weather Conditions

LAKET input file 'Worst_Weather.dat' was compiled to determine the worst weather day and 30-day period from 1/1/1995 to 9/30/2010. The top ten worst 24-hour periods and 30-day periods are shown below in Table M6-1. Note that the temperature provided is for comparison purposes only and not representative of the expected actual temperature of the UHS (See Limitation M8.1).

Table M6-1: Worst Weather Days

End Date	24-Hour Average Temp. (°F)	End Date	30-Day Average Temp. (°F)
7/25/01 6:00 AM	99.609	8/20/95 3:00 PM	98.867
7/25/01 3:00 AM	99.586	8/20/95 6:00 PM	98.866
7/19/98 12:00 AM	99.576	8/21/95 12:00 PM	98.865
7/18/98 9:00 PM	99.576	8/21/95 3:00 AM	98.865
7/25/01 12:00 AM	99.526	8/21/95 6:00 PM	98.864
7/24/01 9:00 PM	99.516	8/20/95 9:00 PM	98.864
7/19/98 3:00 AM	99.515	8/21/95 6:00 AM	98.864
7/25/01 9:00 AM	99.488	8/21/95 12:00 AM	98.864
8/19/95 12:00 AM	99.474	8/21/95 9:00 PM	98.864
7/22/01 3:00 PM	99.464	8/20/95 12:00 PM	98.863

Based on this data, a weather file for LAKET was created for the worst (hottest) weather, 'Worst_Weather.txt'. The worst weather file is created by first inputting the worst 24-hr day (7/25/2001 ending at 6:00 AM) and then inputting the worst period of 30 days (7/21/1995 4:00PM to 8/20/1995 3:00PM) to create a 31-day weather file.

To compare the new weather file with the existing weather file, Case 3a from L-002457 was run using the new weather file. This was done by creating a LAKET input file, "WorstWeather_Comparison.dat," with the same conditions as Case 3a, but an adjusted anemometer height to reflect the setup at LaSalle County Station. As seen in the output file, 'WorstWeather_Comparison.out,' the maximum UHS outlet temperature using the new worst weather file is 105.96°F. From Attachment H, the results from Case 3a using the existing weather file is a maximum UHS outlet temperature of 104.00°F. The new weather file results in a greater UHS outlet temperature, so it will replace the existing worst weather file in the UHS analysis.

M6.2 Worst Net Evaporation

LAKET input file 'NetEvap_WorstMonth.dat' was compiled to determine the worst 30-day period of net evaporation from 1/1/1995 to 9/30/2010. Using the results from LAKET, the worst ten 30-day periods in terms of net evaporation are shown below in Table M6-2. Note that the net evaporation values provided are for comparison purposes only and not representative of the expected actual evaporation of the UHS (See Limitation M8.1).

Table M6-2: Worst Net Evaporation Days

End Date	30-Day Net Evaporation (cfs)
7/13/02 9:00 PM	1.569
7/13/02 6:00 PM	1.568
7/14/02 12:00 AM	1.566
7/13/02 3:00 PM	1.565
7/13/02 12:00 PM	1.563
7/14/02 3:00 AM	1.563
7/13/02 9:00 AM	1.563
7/13/02 6:00 AM	1.562
7/14/02 6:00 AM	1.560
7/13/02 3:00 AM	1.557

The worst net evaporation weather file, 'NetEvap_weather.txt,' is created by inputting the weather conditions from the worst net evaporation period of 30 days (6/13/2002 10:00 PM to 7/13/2002 9:00 PM). In order to compare this with the worst 30 day net evaporation period from Attachment H, Case 3c from Attachment H was run using the new weather file. This was done by creating a LAKET input file, "NetEvap_Comparison.dat," with the same conditions as Case 3c, but an adjusted anemometer height to reflect the setup at LaSalle County Station.

As seen in the output file, 'NetEvap_Comparison.out,' the minimum lake elevation using the new worst net evaporation weather file is 688.63-ft. From Attachment H, the results from Case 3c using the existing weather file is a minimum lake elevation of 688.52-ft. Since the existing weather file results in greater lake drawdown, the existing weather conditions from 6/18/1954 to 7/18/1954 will continue to be used for this analysis.

M6.3 Weather File Creation for UHS Analysis

After determination of the worst weather day and month and the worst net evaporation month, weather files are created for use in the UHS Analysis.

For the worst weather day and month, eight new weather files are created starting at different times to determine the limiting time of day. A summary of the eight created weather files, including the start times and end times used in taking weather data from 'PIALSL9510.txt' is presented in the table below:

Table M6-3: Worst Weather 24-Hour/30-Day Files

File Name	Worst 24-hr Start	Worst 24-hr End	Worst 30-Day Start	Worst 30-Day End
1-30day_12am.txt	7/24/2001 12AM	7/24/2001 11PM	7/21/1995 12AM	8/19/1995 11PM
1-30day_3am.txt	7/24/2001 3AM	7/25/2001 2AM	7/21/1995 3AM	8/20/1995 2AM
1-30day_6am.txt	7/24/2001 6AM	7/25/2001 5AM	7/21/1995 6AM	8/20/1995 5AM
1-30day_9am.txt	7/24/2001 9AM	7/25/2001 8AM	7/21/1995 9AM	8/20/1995 8AM
1-30day_12pm.txt	7/24/2001 12PM	7/25/2001 11AM	7/21/1995 12PM	8/20/1995 11AM
1-30day_3pm.txt	7/24/2001 3PM	7/25/2001 2PM	7/21/1995 3PM	8/20/1995 2PM
1-30day_6pm.txt	7/24/2001 6PM	7/25/2001 5PM	7/21/1995 6PM	8/20/1995 5PM
1-30day_9pm.txt	7/24/2001 9PM	7/25/2001 8PM	7/21/1995 9PM	8/20/1995 8PM

The worst net evaporation month was determined to be the existing weather file, '30dayevap.txt'. This will continued to be used in the UHS analysis, and no further weather file compilation is needed.

M7.0 SUMMARY AND CONCLUSIONS

The worst weather day and 30 days and worst net evaporation 30 days were determined by running LAKET over a range of days spanning from 1/1/1995 to 9/30/2010. The worst weather day was determined to be 7/25/2001 ending at 6:00 AM, while the worst 30 day period of weather spanned from 7/21/1995 4:00 PM to 8/20/1995 3:00 PM. A comparison of this weather file with the existing weather file shows that the new weather file based on the weather data from 'PIALSL9510.txt' results in a higher maximum UHS outlet temperature than the existing weather file. Therefore the new weather files summarized in Table M6-3 will be used in the UHS analysis.

For net evaporation, the worst 30 day period was determined to span from 6/13/2002 10:00 PM to 7/13/2002 9:00 PM. Comparison of this 30 day span with the previous limiting 30 days, 6/18/1954 to 7/18/1954, shows that the 1954 span remains bounding. Therefore, the existing worst 30-day net evaporation weather file will be used in the UHS analysis.

M8.0 LIMITATIONS

- M8.1 24-Hour and 30-Day Rolling Average Values - The values for UHS outlet temperature and net evaporation provided in Tables M6-1 and M6-2 are merely representative values for use in comparing weather effects over different time periods. These values are not actual expected values for the LaSalle UHS.

M9.0 APPENDICES**List of Appendices**

App.	Description	No. of Pages
M9.1	Electronic File Listing	2

Appendix M9.1: Electronic File Listing

Appendix M9.1: Electronic File Listing

A summary of the electronic files and their purposes is provided below:

LaSalle County Station / Peoria Weather File

File Name	Date
PIALSL9510.txt	3/09/2012 12:08 PM

Files for Determining 24-Hour and 30-Day Worst Weather

File Name	Date
Worst_Weather.dat	4/24/2012 11:26 AM
Worst_Weather.out	4/24/2012 11:26 AM
Worst_Weather.plt	4/24/2012 11:26 AM
Worst_Weather.pltX	4/24/2012 11:26 AM

Files for Determining Worst Net Evaporation

File Name	Date
NetEvap_WorstMonth.dat	5/17/2012 3:01 PM
NetEvap_WorstMonth.out	5/17/2012 3:03 PM
NetEvap_WorstMonth.plt	5/17/2012 3:03 PM
NetEvap_WorstMonth.pltX	5/17/2012 3:03 PM

Compiled Weather Files (Section M6.1 and Section M6.2)

File Name	Date
Worst_Weather.txt	4/26/2012 10:11 AM
NetEvap_weather.txt	5/17/2012 3:23 PM

Files for Comparison to Previous Worst Weather

File Name	Date
WorstWeather_Comparison.dat	4/26/2012 10:12 AM
WorstWeather_Comparison.out	4/26/2012 10:12 AM
WorstWeather_Comparison.plt	4/26/2012 10:12 AM
WorstWeather_Comparison.pltX	4/26/2012 10:12 AM

Files for Comparison to Previous Worst Net Evaporation Weather

File Name	Date
NetEvap_Comparison.dat	5/17/2012 3:20 PM
NetEvap_Comparison.out	5/17/2012 3:23 PM
NetEvap_Comparison.plt	5/17/2012 3:23 PM
NetEvap_Comparison.pltX	5/17/2012 3:23 PM

Appendix M9.1: Electronic File Listing

Weather Files for UHS Analysis

File Name	Date
1-30day_12am.txt	4/26/2012 3:23 PM
1-30day_3am.txt	4/26/2012 3:25 PM
1-30day_6am.txt	4/26/2012 3:26 PM
1-30day_9am.txt	4/26/2012 3:29 PM
1-30day_12pm.txt	4/26/2012 3:30 PM
1-30day_3pm.txt	4/26/2012 3:32 PM
1-30day_6pm.txt	4/26/2012 3:33 PM
1-30day_9pm.txt	4/26/2012 3:34 PM
30dayevap.txt	4/06/2006 4:18 PM

A more detailed look at the files listed in the tables above is provided below:

Further Detail for Electronic Files

Name	Type	Modified	Size	Ratio	Packed
1-30day_12am.txt	Text Document	4/26/2012 3:23 PM	118,296	88%	14,272
1-30day_12pm.txt	Text Document	4/26/2012 3:30 PM	118,296	88%	14,300
1-30day_3am.txt	Text Document	4/26/2012 3:25 PM	118,296	88%	14,298
1-30day_3pm.txt	Text Document	4/26/2012 3:32 PM	118,296	83%	14,224
1-30day_6am.txt	Text Document	4/26/2012 3:26 PM	118,296	88%	14,339
1-30day_6pm.txt	Text Document	4/26/2012 3:33 PM	118,296	88%	14,262
1-30day_9am.txt	Text Document	4/26/2012 3:29 PM	118,296	88%	14,321
1-30day_9pm.txt	Text Document	4/26/2012 3:34 PM	118,296	88%	14,245
30dayevap.txt	Text Document	4/6/2006 4:18 PM	116,808	85%	17,890
NetEvap_Comparison.dat	DAT File	5/17/2012 3:20 PM	2,623	83%	449
NetEvap_Comparison.out	OUT File	5/17/2012 3:23 PM	48,857	95%	2,679
NetEvap_Comparison.plt	PLT File	5/17/2012 3:23 PM	141,372	72%	39,051
NetEvap_Comparison.pltX	PLTX File	5/17/2012 3:23 PM	14,400	76%	3,495
NetEvap_weather.txt	Text Document	5/17/2012 3:23 PM	114,480	87%	14,843
NetEvap_WorstMonth.dat	DAT File	5/17/2012 3:01 PM	357	38%	222
NetEvap_WorstMonth.out	OUT File	5/17/2012 3:03 PM	278,691	91%	23,803
NetEvap_WorstMonth.plt	PLT File	5/17/2012 3:03 PM	26,874,556	80%	5,390,503
NetEvap_WorstMonth.pltX	PLTX File	5/17/2012 3:03 PM	3,957,376	78%	871,914
PIALS19510.txt	Text Document	3/9/2012 12:08 PM	21,811,582	87%	2,742,002
Worst_Weather.dat	DAT File	4/24/2012 11:26 AM	401	44%	223
Worst_Weather.out	OUT File	4/24/2012 11:26 AM	305,229	92%	25,441
Worst_Weather.plt	PLT File	4/24/2012 11:26 AM	26,874,556	81%	5,234,116
Worst_Weather.pltX	PLTX File	4/24/2012 11:26 AM	2,760,960	84%	435,906
Worst_Weather.txt	Text Document	4/26/2012 10:11 AM	118,296	88%	14,341
WorstWeather_Comparison.dat	DAT File	4/26/2012 10:12 AM	2,355	82%	425
WorstWeather_Comparison.out	OUT File	4/26/2012 10:12 AM	49,077	95%	2,664
WorstWeather_Comparison.plt	PLT File	4/26/2012 10:12 AM	146,044	72%	40,312
WorstWeather_Comparison.pltX	PLTX File	4/26/2012 10:12 AM	14,880	77%	3,461

Attachment N – LAKET-PC Methodology Validation

Prepared: Daniel W. Nevill Date 9/30/2013
Daniel W. Nevill - Sargent & Lundy^{LLC}

Reviewed: Paul J. Szymiczek Date 9/30/2013
Paul J. Szymiczek - Sargent & Lundy^{LLC}

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N1.0 PURPOSE

The purpose of this attachment is to evaluate the methodology in the LAKET-PC program and compare it to accepted methods for analyzing UHS cooling ponds. The LAKET-PC method is compared to NUREG-0693, "Analysis of Ultimate Heat Sink Cooling Ponds," [Ref. N5.1]. This evaluation reviews the individual equations for heat transfer, wind characterization, and evaporation used in both the NUREG document and the LAKET-PC program.

N2.0 METHODOLOGY

NUREG-0693, "Analysis of Ultimate Heat Sink Cooling Ponds" [Ref. N5.1] presents a method for analyzing the performance of ultimate heat sink cooling ponds. It was published in November 1980 and contains the accepted methodology for characterizing the thermal performance of cooling ponds.

The methodology of LAKET-PC is compared to NUREG-0693 based on review of the LAKET-PC manual [Ref. N5.2]. The equations for heat transfer, wind characterization, evaporation, and the iterative method are compared between both documents. LAKET-PC is validated in the process of demonstrating that the method of calculation is equal to the approved method outlined in NUREG-0693.

N2.0.1 Lake Stratification - NRC RAI #6 [Ref. N5.4] asks for additional information about the effects of thermal stratification of the lake.

A method for determining if a lake is stratified is presented in Sargent & Lundy standard MES-11.1 [Ref. N5.7]. This method consists of assuming the lake is stratified with the less dense hot water floating on top of the slightly more dense colder water. If the calculated value for the upper layer depth is close to or beneath the actual lake bottom, then the lake can be regarded as not stratified. The depth of the upper layer hot water is determined using Eq. 1.

$$h_u = \left[\frac{f_i Q^2 D_s^3 L}{4g\beta\Delta T B^2} \right]^{1/4} \quad (\text{Eq. N2-1})$$

Where:

f_i - Interfacial shear coefficient, estimated as one-half of bottom friction coefficient

$$f_i = 0.5 * 8 * g / C_z^2 \quad (\text{Eq. N2-2})$$

C_z - Chezy coefficient

$$C_z = 1.47 * H^{1/6} / n \quad (\text{Eq. N2-3})$$

H - lake depth (ft)

n - Manning roughness coefficient

Q - Circulating water flow (ft³/s)

D_s - Dilution ratio (total lake flow / circulating water flow)

L - Lake length (ft)

g - gravity, 32.2 ft/s²

β - Bulk expansion coefficient of water (°F)

$$\beta = 4.1 \times 10^{-6} * (T_{ave} - 39^\circ\text{F}) \quad (\text{Eq. N2-4})$$

T_{ave} - Average temperature of discharge and receiving water temperature (°F)

ΔT - Temperature difference between upper and lower levels (°F)

B - Width of lake (ft)

For the case where a jet or plume is formed in the lake, the dilution ratio (D_s) is found from the following steps.

$$Fr = U_d / \sqrt{h_d g \beta \Delta T} \quad (\text{Eq. N2-5})$$

$$h_{\max} = 0.42 \cdot \sqrt{h_d b_d} (h_d / b_d)^{1/4} Fr \quad (\text{Eq. N2-6})$$

$$D_s^* = 1.4 \sqrt{1 + Fr^2} (h_d / b_d)^{1/4} \quad (\text{Eq. N2-7})$$

Where:

Fr - discharge Froude number

U_d - Velocity at discharge structure (ft/s)

h_d - Depth of discharge structure (ft)

b_d - 1/2 width of discharge structure (ft)

D_s^* - Dilution ratio without correction for lake bottom

If the maximum depth of the plume (h_{\max}) is greater than the depth of the lake, a correction factor is applied to the dilution ratio.

$$r = (0.75 H / h_{\max})^{3/4} \quad (\text{Eq. N2-8})$$

$$D_s = r D_s^* \quad (\text{Eq. N2-9})$$

Where:

r - Dilution correction factor

The upper layer depth (h_u) is used to determine the degree of stratification in the lake. If the volume of the lake below the upper layer depth is small compared to the total volume of the lake, then a plug flow model such as LAKET should be valid. When the volume below the upper layer depth is greater than one half the total volume of the lake, a different model that accounts for stratification should be used.

N2.1 Acceptance Criteria

N2.1.1 Acceptance Criterion N1 – The calculation method in LAKET-PC for analysis of the thermal performance of cooling ponds shall be consistent with the accepted methodology presented in NUREG-0693, “Analysis of Ultimate Heat Sink Cooling Ponds” [Ref. N5.1].

N2.1.2 Acceptance Criterion N2 - The LAKET-PC program [Ref. N5.2] is not applicable for stratified lakes. The fraction of lake volume below the upper layer depth shall be less than 50% for the UHS to be considered not stratified [Ref. N5.7].

N3.0 ASSUMPTIONS

- N3.1 Lake Stratification Calculation Inputs - The minimum mixing zone temperature is assumed to be 100.0°F. The maximum mixing zone temperature is assumed to be 125.0°F. These values are based on values of interest (during the first few days following an accident) from the mixing zone analysis done in Attachment O.

The Manning coefficient is assumed to be 0.02. This is an approximate, conservative value [Ref. 5.6, Table 3.3.17] based on the surface of crushed stone bedding and rip rap [Ref. N5.5].

N4.0 DESIGN INPUTS

- N4.1 Accepted UHS Analysis Method – The accepted analysis method for UHS cooling ponds is taken from NUREG-0693, “Analysis of Ultimate Heat Sink Cooling Ponds” [Ref. N5.1].
- N4.2 LAKET-PC Methodology – The analysis method used in LAKET-PC is determined from the LAKET-PC user manual and the computer code [Ref. N5.2].
- N4.3 Wind Dependence Functions – Wind dependence functions are taken from MIT Report 161, “An Analytical and Experimental Study of Transient Cooling Pond Behavior,” [Ref. N5.3].
- N4.4 Lake Stratification Inputs - The bases for inputs to the lake stratification analysis are provided in Table N6-4.
-

N5.0 REFERENCES

- N5.1 NUREG-0693, "Analysis of Ultimate Heat Sink Cooling Ponds," Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission, November 1980.
- N5.2 LAKET-PC Version 2.2, Sargent & Lundy^{LLC}, Program No. 03.7.292-2.2, 12/09/2004. Controlled File Path: \\SNLVS5\SYS3\OPS\$\LAK29222\
- N5.3 MIT Report 161, "An Analytical and Experimental Study of Transient Cooling Pond Behavior," Ryan and Harleman, Massachusetts Institute of Technology, Cambridge Massachusetts, 1973.
- N5.4 Request for Additional Information Docket Nos. 50-373 and 50-374, "LaSalle County Station, Units 1 and 2 - Request for Additional Information Related to License Amendment Request to Technical Specification 3.7.3 Ultimate Heat Sink (TAC Nos. ME9076 and ME 9077," 6/27/2013.
- N5.5 S-79, "CSCS Pond Water Inlet Chutes Plan and Sections," Rev. H.
- N5.6 Avallone, Eugene A. and Baumeister III, Theodore, "Marks' Standard Handbook for Mechanical Engineers," 10th edition.
- N5.7 MES-11.1, S&L Mechanical Engineering Standard, "Effective Area of Cooling Lakes," Rev. 1.
- N5.8 RS-13-002, "Response to Request for Additional Information Related to License Amendment Request to Technical Specification 3.7.3, 'Ultimate Heat Sink'," 1/18/2013.

N6.0 EVALUATIONS

N6.1 LAKET-PC Background

LAKET-PC is a one-dimensional thermal prediction model first written in 1976 which has been well established in many areas of cooling lake sizing and analysis. The lake simulation model is used to yield water surface temperature as a function of position and time. The inherent assumptions used in the LAKET-PC model are as follows:

1. Thermal One Dimensionality – A one dimensional model assumes that the temperature is constant at any point along the plane perpendicular to the direction of flow. There are neither cross-stream variations nor thermal stratification with respect to depth.
2. Time Increment – The calculation scheme in LAKET-PC is an iterative process, where the calculation interval can be set to increments of minutes or hours. Weather data input to the model is generally hourly, and so weather data is held fixed for intervals smaller than one hour.
3. Fluid Interactions – The simulation model used in LAKET-PC involves adjacent fluid masses at different temperatures. The horizontal heat conduction due to this temperature difference is assumed to be negligible with respect to the heat rejection at the air / water interface, and is ignored. Similarly, conductive heat loss and frictional retardation at the water / channel interface are ignored.
4. Lake Rectangularization – The one-dimensional model assumptions coerce the water body into an idealized rectangular channel. The length of this channel is the flow path length of the actual water body, while the width and depth are computed theoretical values.
5. Global Flow Components – LAKET-PC assumes that all secondary water gains and losses, such as makeup, blowdown, and runoff are distributed globally over the entire lake surface. This is a reasonable assumption for the majority of applications; an actual configuration in which component flow is known to exert a disproportionate local influence will not be modeled accurately on that local scale. However, the net result of the component will be correctly modeled.

The movement of fluid through the one-dimensional channel is envisioned as a series of individual, distinct fluid segments. Each segment has an individual length and temperature, while the width and depth remain constant for all. The channel thus forms a queue of fluid segments, where additions are made at the inlet, and deletions are made at the outlet. This is referred to as a “first in, first out” queue. Any segment that enters the channel will cause an equal amount to be expelled at the outlet. The program assumes that all segments are uniform in temperature, and each segment is allowed to react independently with the environment.

N6.2 Heat Transfer Model

This evaluation only considers the thermal model utilized in calculating the lake surface temperature, and does not delve into the effects of precipitation, makeup, blow down, or calculation of total dissolved solids.

A) Edinger and Geyer Equilibrium Temperature Heat Transfer Model

Both NUREG-0693 and LAKET-PC present thermal models in which the surface temperature of the cooling pond is calculated, as the bulk heat transfer modeled in these equations occurs at the water / air surface boundary. Both thermal models utilize the Edinger and Geyer "Equilibrium Temperature Heat Transfer Model." The equilibrium temperature is defined as the water surface temperature at which the lake is in thermal equilibrium with the environment. At this temperature, the heat removal from the water balances the heat addition, and the net effective heat transfer at the air / water surface is zero. Thus, the equilibrium temperature at any given time is a function only of the current meteorological environment. This is not to be confused with the "natural" lake temperature used in LAKET-PC, which is the instantaneous water temperature in response to the meteorological parameters. The equilibrium temperature is the theoretical steady state solution, while the natural temperature is the actual transient thermal response to the weather conditions.

The equilibrium temperature is used to define the heat transfer (Q) per the following equation:

$$\int_0^Q dQ = \int_E^{T_s} K \cdot dT$$

where

- Q = net heat transfer into the water (BTU/ft²day)
- E = equilibrium temperature (°F)
- T_s = water surface temperature (°F)
- K = equilibrium heat transfer coefficient (BTU/ft² day °F)

Note that for this equation, K is assumed to be constant. However, when evaluating ultimate heat sinks, which accept high heat loads, the external heat load rejected to the pond will increase the surface temperature significantly higher than the equilibrium temperature. Thus, this equation is an iterative process in which the lake surface temperature is co-dependent on the net heat transfer rate and the heat transfer coefficient. The surface temperature and heat transfer coefficient is held constant for each time step iteration when calculated in LAKET-PC.

B) Heat Sources Contributing to the Cooling Pond

The contributing components for the net heat transfer to the lake, listed below, are consistent between both LAKET-PC and NUREG-0693.

$$Q = Q_{SN} + Q_{AN} - Q_{BR} - Q_E - Q_C + Q_{RJ}$$

where:

- Q_{SN} = net incident short wave solar radiation
- Q_{AN} = net incident long wave atmospheric radiation
- Q_{BR} = net rate of long wave back radiation from the lake surface
- Q_E = net rate of heat loss due to evaporation
- Q_C = net rate of heat loss due to conduction and convection
- Q_{RJ} = net rate of heat rejected to the lake by the plant

Table N6-1 below presents the equations for each component of the net heat load. Note that for both methods, the solar radiation is generally a measured value, while the others are approximated based on meteorological conditions.

Table N6-1: Heat Load Equations

	NUREG-0693	LAKET-PC
Q_{SN}	Measured value	Calculated outside of LAKET-PC (included with weather data) ¹
Q_{AN}	$1.2 \times 10^{-13} (T_A + 460)^6 (1 + 0.17C^2)$	Calculated outside of LAKET-PC (included with weather data) ¹
Q_{BR}	$4.026 \times 10^{-8} (460 + T_S)^4$	$4 \times 10^{-8} (460 + T_S)^4$
Q_E	$(e_s - e_a)F(w)$ approximated as: $\beta(T_S - T_D)F(w)$	$(e_s - e_a)F(w)$
Q_C	$0.26(T_S - T_A)F(w)$	$0.255(T_S - T_A)F(w)$
Q_{RJ}	Input based on plant heat load	Input based on plant heat load

1) An additional description of solar radiation and atmospheric radiation can be found in RS-13-002 [Ref. 5.8].

where:

- C = fraction of sky covered by clouds (0.0 – 1.0) (measured)
- T_A = dry bulb air temperature (°F)
- T_S = water surface temperature (°F)
- T_D = dew point temperature (°F)
- e_s = saturated vapor pressure at T_S (mmHg)
- e_a = partial vapor pressure at T_A and relative humidity (mmHg)
- β = $0.255 - 0.0085 \left(\frac{T_S + T_D}{2} \right) + 0.000204 \left(\frac{T_S + T_D}{2} \right)^2$ (mmHg/°F)
- $F(w)$ = wind speed function (see Section N6.2C) (BTU/ft² day/mmHg)

Table N6-1 shows that the equations for each contributing heat load to the cooling pond are the same between NUREG-0693 and LAKET-PC.

C) Wind FunctionNUREG-0693

The wind function ($F(w)$) is used to characterize the effect of wind on the evaporative heat loss from the water.

The simple thermal model presented in NUREG-0693 utilizes a form of the wind function developed by Brady, which is solely dependent on the wind speed.

$$F_B(w) = 70 + 0.7W^2$$

where

$F_B(w)$ = Brady wind function (BTU/ft² day/mmHg)

W = wind speed measured 18-ft above the water surface (mph)

However, Section 2.3 of NUREG-0693 discusses possible over-conservatism in this wind function and also presents an alternative equation. The Brady wind function, presented above, seems to underestimate the evaporative heat flux. Another approach presented by Patrick Ryan in MIT Report No. 161 [Ref. N5.3] and summarized in NUREG-0693 includes the temperature dependence of the water surface when calculating evaporative heat loss. This Ryan function is less conservative than the Brady function, but based on firmer physical grounds. The Ryan function presented in NUREG-0693 is as follows:

$$F_R(w) = 22.4 \left[\left(\frac{T_s + 460}{1 - \frac{0.378e_s}{P}} \right) - \left(\frac{T_a + 460}{1 - \frac{0.378e_a}{P}} \right) \right]^{1/3} + 14W_2$$

where

$F_R(w)$ = Ryan wind function (BTU/ft² day/mmHg)

P = atmospheric pressure (mmHg)

W_2 = wind speed measured 2 meters above the water surface (mph)

A comparison of calculations utilizing each of these two wind functions is shown in Fig. N6-1 in Section N6.3.

LAKET-PC

LAKET-PC uses two different wind speed functions, one for natural evaporation off a pond at its natural temperature, and another for the forced evaporation off a heated pond with elevated surface temperatures. This is done to capture the effect of different phenomena above forced and natural water surfaces. Both wind functions are taken from MIT Report No. 161 [Ref. N5.3].

The wind speed function for a natural lake is solely dependent on the wind speed:

$$F_{LH}(w) = 17W_2$$

where

$F_{LH}(w)$ = Lake Hefner wind function (BTU/ft² day/mmHg) [Ref. N5.3]

Additional heat rejected to the cooling pond will increase the temperature of the water surface, and introduce the effect of free convection due to the temperature differential between the water and the air. Consistent with NUREG-0693, LAKET-PC utilizes the Ryan wind function ($F_r(w)$) to account for free and forced convection when the surface of the water is at an elevated temperature. Specifically, LAKET-PC utilizes the Ryan wind function when the surface temperature is 2.5°F higher than the natural temperature of the lake.

N6.3 Comparison of Calculation Methods

There are several simplifying assumptions made when generating the set of equations used for the heat transfer model defined on page 9 of NUREG-0693 [Ref. N5.1]. This includes the approximation that the heat transfer from the back radiation and atmospheric radiation effectively cancel each other out. The model presented in NUREG-0693 also utilizes the Brady wind function ($F_B(w)$), which is solely a function of wind speed.

However, Figure 2.4 in NUREG-0693 (reproduced below) presents the results from a hypothetical one square foot section of a pond surface subject to constant meteorological conditions utilizing varying levels of rigor in the calculations and wind functions.

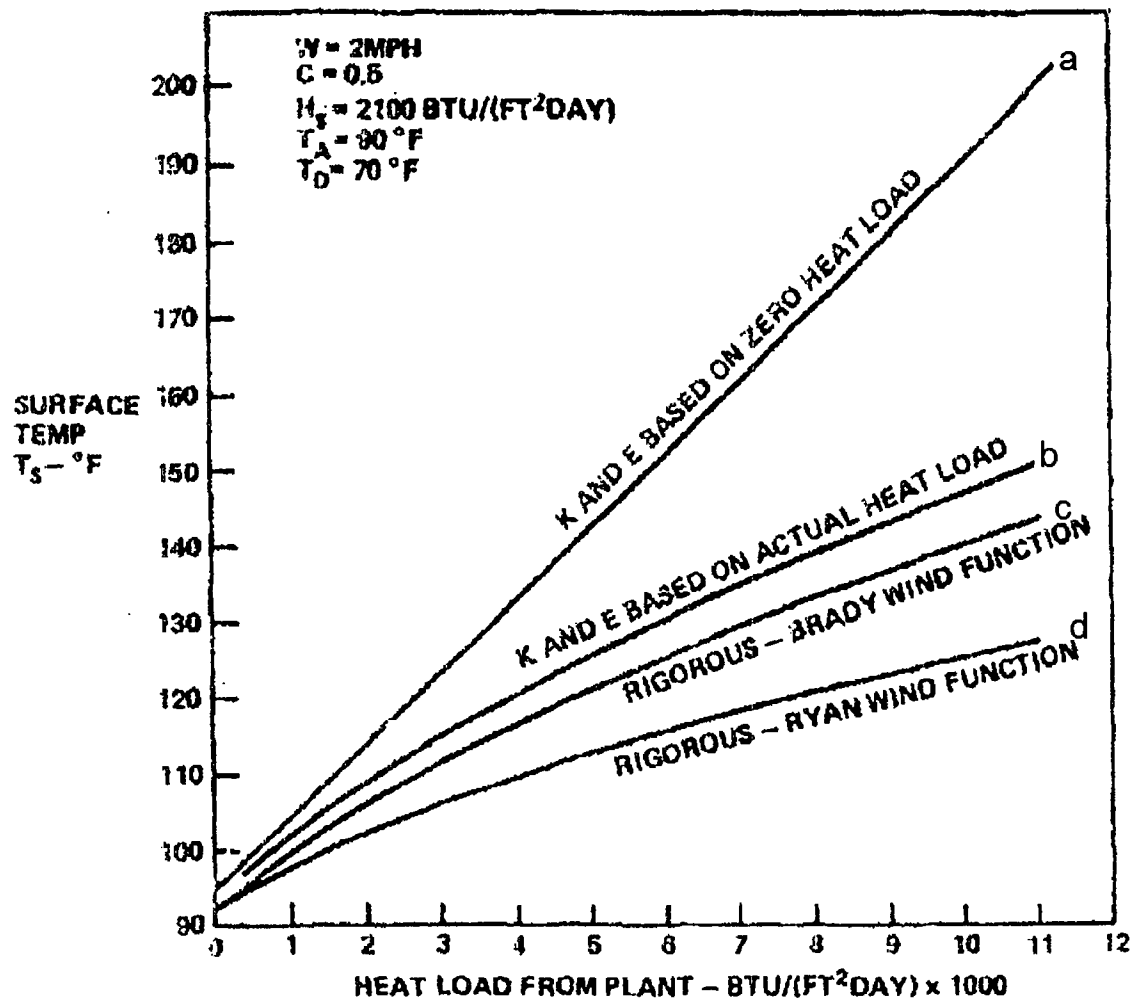


Fig. N6-1: Comparison of Calculation Methods

where

- a) Simplified method with equilibrium temperature and heat transfer coefficients based on unloaded pond conditions (not a function of pond temperature). Brady wind function.
- b) Simplified method where atmospheric and back radiation are ignored, but equilibrium temperature and heat transfer coefficients are based on pond temperatures. Brady wind function.
- c) Rigorous method where each contributing heat source is explicitly calculated. Brady wind function.
- d) Rigorous method where each contributing heat source is explicitly calculated. Ryan wind function (LAKET methodology)

Furthermore, the explicit impact of the wind function on evaporative heat flux is analyzed to demonstrate the significant influence of forced evaporation. This is done by

calculating the evaporative heat flux for several lake surface temperatures at the constant meteorological conditions used in Fig. N6-1 (per NUREG-0693). The evaporative heat flux is calculated using the equation given in Table N6-1:

$$Q_E = (e_s - e_A) \cdot F(W)$$

Note that the equation above shows that given a constant water temperature, a decrease in atmospheric pressure will result in a slightly increased heat flux. The constant meteorological conditions used in the calculation are presented below in Table N6-2.

Table N6-2: Constant Weather Parameters

Parameter	Symbol	Value
Dew Point Temp (°F)	T _d	70
Ambient Air Temp (°F)	T _a	90
Relative Humidity (%)	RH	52%
Wind Speed measured at 18-ft (mph)	W	2
Wind Speed corrected at 2-m (mph)	W ₂	1.7
Atm Pressure (mmHg)	P	760.137
Partial Vapor Pressure at T _A and RH (mmHg)	e _A	18.772

The calculation of the evaporative heat flux and each contributing term is conducted below in Table N6-3.

Table N6-3: Calculation of Evaporative Heat Flux

Water Surface Temperature (°F)	T _s	150	135	120	105	90
Saturated Vapor at T _s (mmHg)	e _s	192.279	131.212	87.531	56.971	36.100
Brady Wind Function (BTU/ft ² day/mmHg)	F _B (W)	72.80	72.80	72.80	72.80	72.80
Ryan / Lake Hefner Wind Function ¹ (BTU/ft ² day/mmHg)	F _R (W)	134.06	120.85	106.97	90.39	61.76
Evaporative Heat Flux (BTU/ft ² day) (using Brady Wind Func.)	Q _{EB}	12,631	8,186	5,006	2,781	1,261
Evaporative Heat Flux (BTU/ft ² day) (Using Ryan / Lake Hefner Wind Func.)	Q _{ER}	23,261	13,588	7,355	3,453	1,070

1) Per the methodology in LAKET-PC, the Lake Hefner wind function is used instead of the Ryan wind function when e_s approaches e_A.

Results from Table N6-3 are presented in Fig. N6-2.

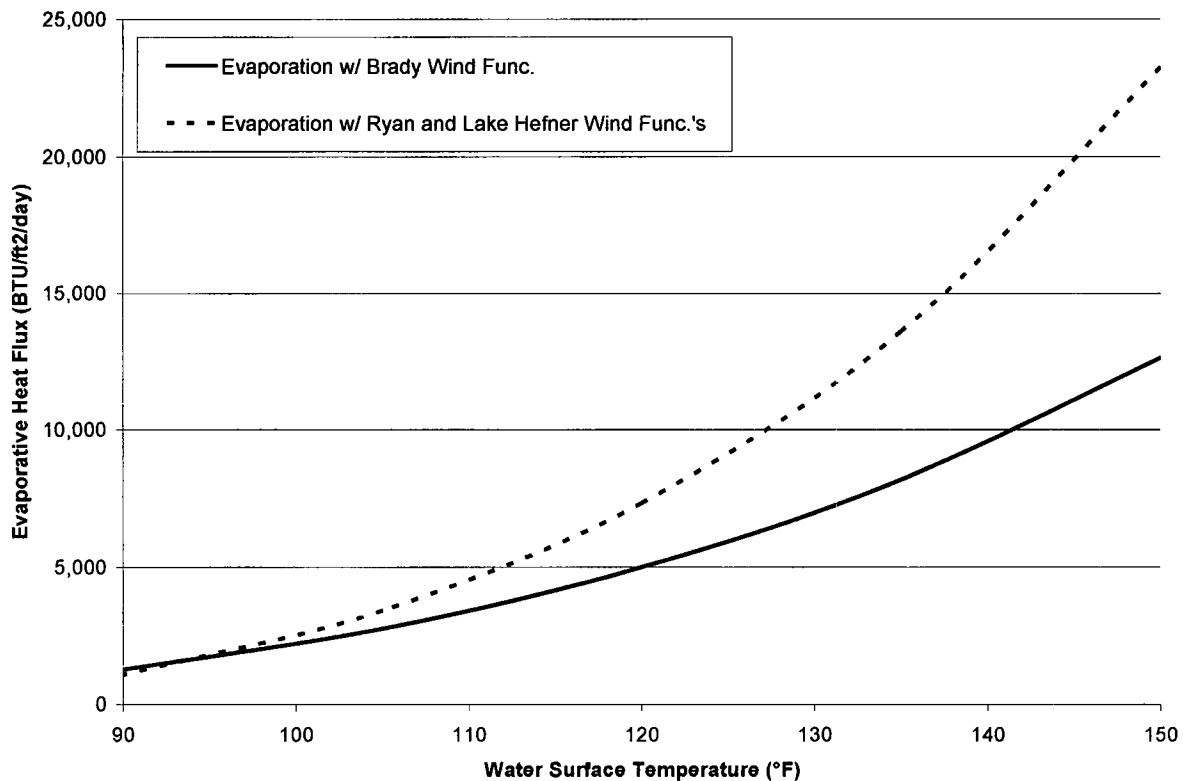


Fig. N6-2: Evaporative Heat Flux Calculation Results

Fig. N6-2 shows that the Ryan wind function (which accounts for forced evaporation due to elevated pond temperatures) results in significantly higher evaporative heat flux values at elevated water temperatures. As UHS cooling ponds are expected to see significant heat rejection, the surface temperatures will be notably higher than the natural lake temperature and thus, accounting for this effect when calculating evaporation is necessary. The results in Fig. N6-2 are consistent with the results presented in NUREG-0693, shown in Fig. N6-1. The differences in evaporation calculated with either of the two wind functions are negligible for lightly loaded cooling ponds (where the lake temperature is relatively close to the natural lake temperature). However, when the heat rejection to the pond is increased and the resulting water temperature increases significantly beyond the natural lake temperature, the effect of the Brady vs. Ryan wind functions becomes apparent. The increased evaporative heat flux shown in Fig. N6-2 will result in lower water temperatures, as shown by Cases c) and d) in Fig. N6-1.

N6.4 Lake Stratification

The calculation of the upper layer depth was done for the UHS at LaSalle in order to determine the degree of stratification. The following table shows the calculation of the upper layer depth, which is done according to the methodology presented in Section N2.0.1. This calculation is done for varying values of temperature rise through the plant since this value changes significantly during the first few hours following an accident. The temperature difference between the upper and lower layers is calculated as the

difference between the plant outlet temperature and the 'mixing zone' of the UHS located near the plant outlet. The temperature of a mixing zone comprising 10% and 20% of the UHS area is determined in a Section O6.9 of Attachment O.

Table N6-4: Calculation of Upper Layer Depth

Parameter	Symbol	Units	Hour 1	Hour 4	Hour 6	Basis
Gross Lake Area	A	Acres	81.32	81.32	81.32	Att. O, Table O2-1
Gross Lake Volume	V	Acre-ft	340	340	340	Att. O, Table O2-1
Average Depth	H	ft	4.18	4.18	4.18	$= V / A$
Flow Rate	Q	cfs	86	86	86	Att. O, Design Inp. 4.6
Plant Inlet Temperature	T_i	$^{\circ}\text{F}$	102.00	101.73	102.62	Case 3a, 6AM from Att. O
Temperature Rise through Plant	ΔT_p	$^{\circ}\text{F}$	25.95	35.8	22.43	Att. P, Appendix P9.2
Plant Outlet Temperature	T_o	$^{\circ}\text{F}$	127.95	137.53	125.05	$= T_i + \Delta T_p$
Minimum Assumed Mixing Zone Temperature	T_m	$^{\circ}\text{F}$	100.0	100.0	100.0	Assumed
ΔT Between Plant Outlet and Mix. Zone	ΔT	$^{\circ}\text{F}$	27.95	37.53	25.05	$= T_o - T_m$
Lake Length	L	ft	5500	5500	5500	Main Body, Design Inp. 4.4
Lake Width	B	ft	644	644	644	$= A * 43560 / L$
Width of Discharge Structure	B_d	ft	8.0	8.0	8.0	Ref. N5.5
Depth of Discharge Structure	h_d	ft	3.5	3.5	3.5	UHS Depth with 1.5 feet of sedimentation
Discharge Velocity	V_d	ft/s	3.071	3.071	3.071	$= Q / (B_d * h_d)$
Maximum Assumed Mixing Zone Temperature	T	$^{\circ}\text{F}$	125.0	125.0	125.0	Assumed
Assumed Manning Roughness Coeff.	n	(-)	0.02	0.02	0.02	Ref. N5.6, Table 3.3.17
Bulk Expansion Coefficient	β	$^{\circ}\text{F}$	3.53E-04	3.53E-04	3.53E-04	Eq. N2-4
Discharge Froude Number	Fr	(-)	2.91	2.52	3.08	Eq. N2-5
Maximum Plume Depth	h_{max}	ft	4.43	3.82	4.68	Eq. N2-6
Dilution ratio (uncorrected)	D_s^*	(-)	4.17	3.66	4.38	Eq. N2-7
Dilution Ratio Correction Factor	r	(-)	0.77	0.86	0.74	Eq. N2-8
Dilution Ratio (corrected)	D_s	(-)	3.22	3.16	3.25	Eq. N2-9
Chezy's Coefficient	C_z	(-)	93.29	93.29	93.29	Eq. N2-3
Interfacial Friction Coefficient	f_i	(-)	0.015	0.015	0.015	Eq. N2-2
Upper Layer Depth	h_u	ft	2.49	2.28	2.57	Eq. N2-1
Test for Lake Stratification						
Gross Volume	V	Acre-ft	340	340	340	Att. O, Table O2-1
Volume Below Upper Layer	V_b	Acre-ft	143.2	159.9	136.4	Interpolation of Table 7.1 in Main Body
Fraction of Lake Volume Below h_u		(-)	0.42	0.47	0.40	$= V_b / V$

As seen in Table N6-4, the most conservative calculated upper layer depth for the LaSalle UHS is 2.28 ft. Using this depth, the fraction of the UHS below the upper layer depth is 47%. According to MES-11.1 [Ref. N5.7], LAKET is applicable to a certain lake if this fraction is less than 50%. Therefore, LAKET is acceptable for analyzing the LaSalle UHS.

N7.0 SUMMARY AND CONCLUSIONS

The methodology used in LAKET-PC is entirely consistent with the thermal model presented in NUREG-0693 and the wind speed functions presented in MIT Report No 161, which is also referenced and cited in NUREG-0693. The use of the Ryan wind function (LAKET-PC) over the Brady wind function (NUREG thermal model) results in lower lake temperatures. This is due to the fact that the Ryan wind function accounts for the effect of forced evaporation at water temperatures significantly higher than ambient air temperatures. However, NUREG-0693 fully endorses the use of the Ryan wind function as a more accurate, although less conservative, method for calculating evaporative heat flux. Thus, Acceptance Criterion N1 is met.

In Table N6-4, it is determined that the fraction of lake volume below the calculated upper layer depth is 47%. Acceptance Criterion N2 requires that the lake volume below the upper layer depth be less than 50% for the lake to be considered not stratified. Therefore, Acceptance Criterion N2 is met.

N8.0 LIMITATIONS AND OPEN ITEMS

None.

N9.0 APPENDICES

None.

O1.0 PURPOSE/OBJECTIVE

The purpose of this attachment is to revise the existing Ultimate Heat Sink (UHS) analysis to include the weather selection methodology from Rev. 2 of Regulatory Guide 1.27 [Ref. O5.8] and a more realistic heat release to the UHS based on Revision 4 of L-002453 [Ref. O5.4]. This attachment includes analysis for only the Current Licensed Thermal Power (CLTP) (3559 MW_t).

Revision 7 included analysis for both CLTP (3559 MW_t) and Extended Power Uprate (EPU) (3998 MW_t) power levels. Since Revision 7 plans for EPU have been cancelled, therefore only the CLTP power level is analyzed in this attachment. The results in Revision 7 remain conservative as they utilize a more conservative UHS heat load than used in Revision 8. Rev. 8 shows that the acceptance criteria are met using Rev. 2 of Reg. Guide 1.27 [Ref. O5.8].

The results of this attachment serve as an update to the current UHS design basis at LaSalle. See Section 1.1 of the main body of this calculation for further description on the history of this calculation.

O2.0 METHODOLOGY AND ACCEPTANCE CRITERIA

The Sargent & Lundy (S&L) LAKET-PC computer program [Ref. O5.2] is utilized to determine the combined impact of decay heat, initial UHS temperature, and allowable sediment accumulation in the UHS. Based on the allowable UHS initial temperature (Design Input O4.5), the maximum UHS temperature is determined for average sediment accumulations of zero (0), six (6), twelve (12), and eighteen (18) inches.

O2.1 Worst Weather File Creation

O2.1.1 Regulatory Guide Criteria

Reg. Guide 1.27, Rev. 2 [Ref. O5.8] describes a method for considering meteorological conditions in the design of the UHS. A synthetic weather file is created using weather data from the critical time period due to design of the UHS (33-45 hours for the LaSalle UHS), the worst 24 hours, and the worst 30 days. The synthetic weather file can be combined in this order, or alternatively the worst consecutive day period of the sum of these times can be used as the design basis. This calculation explores both options, each starting with the worst critical time period corresponding to the UHS transit time. For the LaSalle UHS, the critical time period unique to the design of the UHS is the transit time, which depends on the level of sedimentation. The transit time is ~33 hours, ~39 hours, ~42 hours, or ~45 hours for 18 inches of sedimentation, 12 inches, 6 inches, and 0 inches, respectively (see Section O6.3).

O2.1.2 LAKET-PC Model for Weather Screening

In order to find the worst weather periods, a specific UHS model was created in LAKET-PC with a transit time corresponding to the three hour time step period. The model is open cycle, which means water exiting the lake is discarded and new water enters the lake at predetermined conditions independent of the existing lake conditions. The UHS is set to the same initial temperature at the beginning of each three hour time step. Since initial conditions are the same for each time step, there are no residual effects due to the weather from the preceding time step. The UHS outlet temperature for each 3 hour period corresponds to the environmental effects on the UHS during these three hours. From these results, it can be concluded that higher UHS outlet temperatures represent worse (hotter) weather conditions.

The LAKET-PC models 'Worst_Weather_110.dat' and 'Worst_Weather_120.dat' were used to find the worst weather based on a UHS initial temperature of 110°F and 120°F, respectively. The weather file analyzed is 'PIALSL9510.txt', which is documented in Attachment M of this calculation. The weather data spans from January 1995 to September 2010. 'Worst_Weather_110.dat' and 'Worst_Weather_120.dat' are based off the input file 'Worst_Weather.dat', which was developed in Attachment M of this calculation to determine the worst meteorological conditions based on an initial UHS temperature of 100°F. The following changes were made to 'Worst_Weather.dat' for the new input files:

- 'Worst_Weather_110.dat' changes from 'Worst_Weather.dat':
 - Lake initial temperature set to 110°F
 - TPRISE (plant discharge water temperature) parameter set to 110.0°F
- 'Worst_Weather_120.dat' changes from 'Worst_Weather.dat':
 - Lake initial temperature set to 120°F
 - TPRISE (plant discharge water temperature) parameter set to 120.0°F

The worst weather with an initial UHS temperature of 110°F and 120°F is considered since the approximate average temperature of the flow from the plant input to the UHS over the first several days following an accident falls between these temperatures. Additionally, these temperatures ensure that the Ryan wind function is used throughout the entire weather screening since they remain greater than 2.5°F above the natural lake temperature at all times.

The results from 'Worst_Weather_110.dat' and 'Worst_Weather_120.dat' can be used to determine the worst weather over any time period using a similar methodology as outlined in Section M2.0 of this calculation. The rolling average of the lake temperature over the time period in which the worst weather conditions are being determined is calculated for each time step. The time periods with the highest rolling average are considered to have the worst weather. These periods of time are applied to the design event in order to determine the period that results in the highest UHS temperature. A synthetic weather file is created using the worst weather time periods that are required for each case as outlined in Table O2-2.

- O2.1.3 Lake Area and Volume – The lake area and volume remains unchanged from that described in Section I2.1.2 in Attachment I. A summary of the initial lake levels is provided in Table O2-1, below.

Table O2-1: Initial Lake Level

Sediment Level	Lake Elevation (ft)	Area (acre)	Volume (acre-ft)	Effective Area (acre)	Effective Volume (acre-ft)
18-in	689.98	81.32	340.0	47.08	215.59
12-in	689.98	82.12	380.5	47.55	241.24
6-in	689.98	82.96	422.1	48.03	267.64
0-in	689.98	83.80	463.5	48.52	293.89

The remainder of the drawdown curve (from a lake elevation of 689-ft through 685-ft) remains the same as given in Table 7.1 of the main body of this calculation with respect to the total lake volume and surface area. The effective volume and effective area are updated using the percentages determined in Attachment J (effective volume is 63.4% of total volume and effective area is 57.9% of total area).

- O2.1.4 Plant Temperature Rise - The UHS heat load has been revised for this attachment to include the effects of the Residual Heat Removal (RHR) heat exchangers. The new heat load on the UHS for CLTP operation is determined in L-002453 [Ref. O5.4]. The plant temperature rise is dependent on the UHS heat load, and the calculation of the new plant temperature rise is documented in Attachment P.
- O2.1.5 LAKET Case Runs - There are several different types of cases that are run. These include the worst weather cases, the worst net evaporation cases, worst 33 hour plus 24 hour plus 30 day cases, and diurnal wind exponent cases.

A) Worst Temperature Cases - The worst temperature cases determine the maximum UHS outlet temperature based on an initial UHS temperature equal to the proposed Technical Specification (TS) temperature limits for the UHS (see Design Input O4.5). These cases determine if the UHS outlet temperature will remain below the limiting temperature of 107°F (see Design Input O4.1). Cases are run at varying start times due to the variable allowable UHS temperatures (see Design Input O4.5).

B) Worst Net Evaporation Cases - The net evaporation cases use the same input file as the corresponding worst weather case, but are run with the most limiting 30-day net evaporation weather file. These cases are run at all levels of sedimentation. The limiting weather file begins at 12:00 AM, so the initial temperature is set to the TS initial UHS temperature limit of 104.53°F (Design Input O4.5). The most limiting net evaporation weather was determined to be 6/18/1954 to 7/18/1954 in Attachment M, and this weather is used for the net evaporation cases in this attachment. Additionally, sensitivity cases are run to determine the effect of changing the wind power law exponent.

C) Worst 33 Hour - 24 Hour - 30 Day Cases - Rev. 2 of Reg. Guide 1.27 [Ref. O5.8] gives two alternatives for selecting the worst weather data. The first alternative consists of finding three critical time periods: 1) the time period in which the UHS will reach a maximum following a shutdown (for this case it is the UHS transit time), 2) the worst 1-day weather period, and 3) the worst 30-day weather period. These three time periods, which do not have to occur contiguously, are combined to produce a synthetic weather period. Alternatively, the worst 33-consecutive-day (transit time + 1 day + 30 days) weather period may be used as the basis for the worst weather period. For the LaSalle UHS, the consecutive 33 day period is chosen starting with the worst weather period corresponding to the UHS transit time.

To determine which of these alternatives is most conservative, cases are run using both methods and the results are compared.

D) Wind Sensitivity Cases - In the NRC Request for Additional Information (RAI) [Ref. O5.3], more information is requested regarding the diurnal effects of wind speed. This case determines the effects on the maximum UHS outlet temperature when considering a diurnal wind power law exponent based on the analysis performed in EC 394434 [Ref. O5.10]. Case Wind_375 is run to determine the results of adjusting the 375 feet wind speed at the meteorological tower to 2 meters above the UHS [Ref. O5.12] based on wind tunnel testing as documented in EC394434 [Ref. O5.10].

A list of all cases run for this analysis is shown below:

Table O2-2: List of LAKET Cases

Case Name	Time Period	Sedimentation Level	Start Time	Weather File
<i>Worst Temperature Cases</i>				
Case 1a_12AM	worst 45 hours + next 30 days	0 in.	0:00	WW_0-6.22.txt
Case 1a_3AM	worst 45 hours + next 30 days	0 in.	3:00	WW_3-6.22.txt
Case 1a_6AM	worst 45 hours + next 30 days	0 in.	6:00	WW_6-6.22.txt
Case 1a_9AM	worst 45 hours + next 30 days	0 in.	9:00	WW_9.txt
Case 1a_12PM	worst 45 hours + next 30 days	0 in.	12:00	WW_12.txt
Case 1a_3PM	worst 45 hours + next 30 days	0 in.	15:00	WW_15.txt
Case 1a_6PM	worst 45 hours + next 30 days	0 in.	18:00	WW_18-6.22.txt
Case 1a_9PM	worst 45 hours + next 30 days	0 in.	21:00	WW_21-6.22.txt
Case 2a_12AM	worst 42 hours + next 30 days	6 in.	0:00	WW_0-6.22.txt
Case 2a_3AM	worst 42 hours + next 30 days	6 in.	3:00	WW_3-6.22.txt
Case 2a_6AM	worst 42 hours + next 30 days	6 in.	6:00	WW_6-6.22.txt
Case 2a_9AM	worst 42 hours + next 30 days	6 in.	9:00	WW_9.txt
Case 2a_12PM	worst 42 hours + next 30 days	6 in.	12:00	WW_12.txt

Case Name	Time Period	Sedimentation Level	Start Time	Weather File
Case 2a_3PM	worst 42 hours + next 30 days	6 in.	15:00	WW_15.txt
Case 2a_6PM	worst 42 hours + next 30 days	6 in.	18:00	WW_18-6.22.txt
Case 2a_9PM	worst 42 hours + next 30 days	6 in.	21:00	WW_21-6.22.txt
Case 3a_12AM	worst 33 hours + next 30 days	18 in.	0:00	WW_0-6.22.txt
Case 3a_3AM	worst 33 hours + next 30 days	18 in.	3:00	WW_3-6.22.txt
Case 3a_6AM	worst 33 hours + next 30 days	18 in.	6:00	WW_6-6.22.txt
Case 3a_9AM	worst 33 hours + next 30 days	18 in.	9:00	WW_9.txt
Case 3a_12PM	worst 33 hours + next 30 days	18 in.	12:00	WW_12.txt
Case 3a_3PM	worst 33 hours + next 30 days	18 in.	15:00	WW_15.txt
Case 3a_6PM	worst 33 hours + next 30 days	18 in.	18:00	WW_18-6.22.txt
Case 3a_9PM	worst 33 hours + next 30 days	18 in.	21:00	WW_21-6.22.txt
Case 4a_12AM	worst 39 hours + next 30 days	12 in.	0:00	WW_0-6.22.txt
Case 4a_3AM	worst 39 hours + next 30 days	12 in.	3:00	WW_3-6.22.txt
Case 4a_6AM	worst 39 hours + next 30 days	12 in.	6:00	WW_6-6.22.txt
Case 4a_9AM	worst 39 hours + next 30 days	12 in.	9:00	WW_9.txt
Case 4a_12PM	worst 39 hours + next 30 days	12 in.	12:00	WW_12.txt
Case 4a_3PM	worst 39 hours + next 30 days	12 in.	15:00	WW_15.txt
Case 4a_6PM	worst 39 hours + next 30 days	12 in.	18:00	WW_18-6.22.txt
Case 4a_9PM	worst 39 hours + next 30 days	12 in.	21:00	WW_21-6.22.txt
<i>Worst Net Evaporation Cases</i>				
Case 1c	worst 30 days for evaporation	0 in.	0:00	30dayevap.txt
Case 2c	worst 30 days for evaporation	6 in.	0:00	30dayevap.txt
Case 3c	worst 30 days for evaporation	18 in.	0:00	30dayevap.txt
Case 4c	worst 30 days for evaporation	12 in.	0:00	30dayevap.txt
NetEvap-0.1	worst 30 days for evaporation	18 in.	0:00	NetEvap_0.1.txt
NetEvap-0.2	worst 30 days for evaporation	18 in.	0:00	NetEvap_0.2.txt
<i>Worst 33 Hours + 24 Hours + 30 Day Cases</i>				
WW_33-24-30	worst 33 hours + worst 24 hours + worst 30 days	18 in.	9:00	WW_33-24-30.txt
WW_33-24-30-6AM	worst 33 hours + worst 24 hours + worst 30 days	18 in.	6:00	WW_33-24-30-6AM.txt
WW_33-24-30-6AM2	worst 33 hours + worst 24 hours + worst 30 days	18 in.	6:00	WW_33-24-30-6AM2.txt
<i>Wind Sensitivity Cases</i>				
Case Diurnal	worst 33 hours + next 30 days	18 in.	6:00	Diurnal.txt
Case Wind_375	worst 33 hours + next 30 days	18 in.	6:00	Wind_375.txt

Case Name	Time Period	Sedimentation Level	Start Time	Weather File
<i>Mixing Cases</i>				
Mixing - 10%	Mixing - 10%	18 in.	6:00	WW_6-6.22.txt
Mixing - 20%	Mixing - 20%	18 in.	6:00	WW_6-6.22.txt
Mixing - 10% - 9AM	Mixing - 10% - 9AM	18 in.	9:00	WW_9.txt
Mixing -20% - 12PM	Mixing -20% - 12PM	18 in.	12:00	WW_12.txt

O2.2 UHS Mixing

RAI #4 [Ref. O5.3], asks for a detailed analysis that conservatively accounts for fluid segment mixing and corresponding lower water surface temperatures. LAKET-PC [Ref. O5.2] currently does not have the capability to simulate this mixing; however, the included lake effectiveness compensates for this effect by simulating the resultant stagnant lake areas caused by mixing. To provide additional assurance, the effect of UHS mixing is determined using LAKET-PC [Ref. O5.2] results with modifications made outside of LAKET-PC in Microsoft Excel [Ref. O5.5].

The existing UHS thermal model consists of a plug type model developed in LAKET-PC [Ref. O5.2]. The simplified diagram of the LaSalle UHS model is shown on Figure O2.1. The model effective area and volume are 57.9% and 63.4% of their total values (see Attachment J).

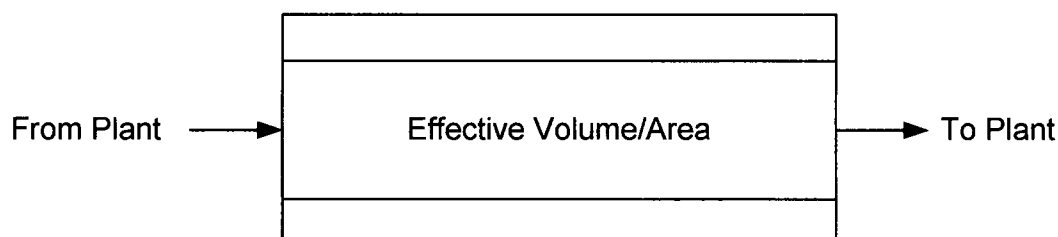


Figure O2.1 - Existing UHS Model

To simulate the effect of entrance mixing, the existing model is modified as shown in Figure O2.2. This new model is similar to the two stage model described in the MIT Report 161 [Ref. O5.7, Figure 3-9] as presented in Figure O2.3. The mixing zone with various sizes has been created outside of LAKET-PC [Ref. O5.2]. The discharge temperature out of the mixing zone is calculated for each time step (one hour) by assuming complete mixing of the plant discharge water and the mixing zone water. The effects of evaporation and other heat transfer are conservatively ignored. According to MIT Report 161 [Ref. O5.7, Section 6.5.1] the mixing region is typically small (<10% of the total area), therefore the two sensitivity cases are developed with 10% and 20% mixing zones. In these cases the mixing zone area/volume is subtracted from the nominal LAKET-PC model. For the purpose of the mixing zone sensitivity runs the 6AM case with 18" of sedimentation (Case 3a_6AM) is selected as the nominal case.

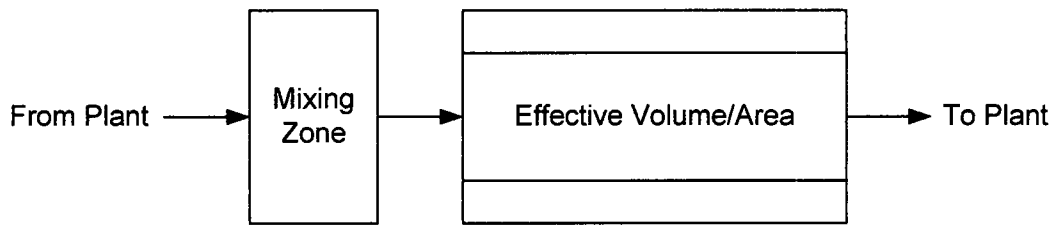


Figure O2.2 - Modified UHS Model for Mixing Effects

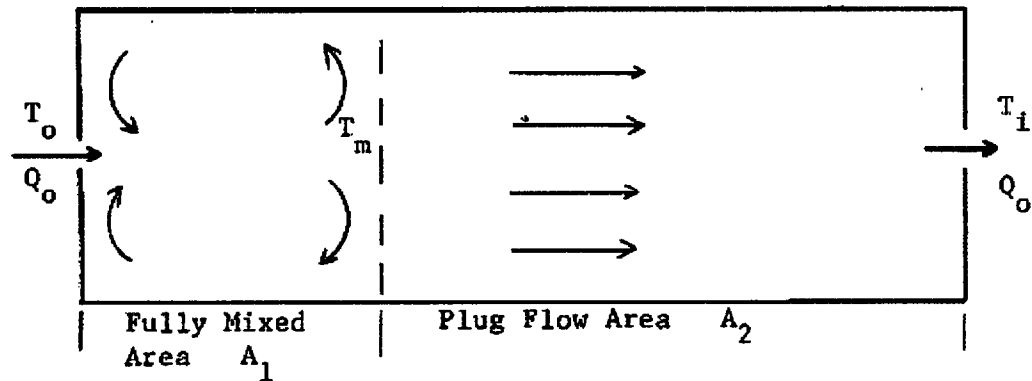


Figure O2.3 – MIT Report 161 [Ref. O5.7] Two Stage Pond

O2.3 Acceptance Criteria

- O2.3.1 Acceptance Criterion #1 - Peak Temperature - The maximum plant inlet temperature from the UHS shall remain equal to or less than 107°F.
- O2.3.2 Acceptance Criterion #2 - UHS Drawdown - There are no specific acceptance criteria for maximum UHS lake drawdown. However, for the worst 30-day evaporation period, the maximum lake drawdown is determined for input to calculation L-001355 [Ref. O5.6].

O2.4 Limitations

Same as main body of calculation.

O2.5 Identification of Computer Programs

Postprocessing of the LAKET-PC results is done using Microsoft Excel® 2003 [Ref. O5.5], which is commercially available. The validation of Excel is implicit in the detailed review of all spreadsheets used in this analysis. All computer runs were performed using PC No. ZD6661 under the Windows XP operating system.

LAKET-PC Version 2.2 [Ref. O5.2] was used to perform the lake transient analysis contained in this evaluation. This was run on S&L PC No. ZD6661 on the Windows XP operating system.

O3.0 ASSUMPTIONS

- O3.1 Effective Area and Volume at Different Sediment Levels - The effective area and volume percentages determined in Attachment J are determined for 18-in of sediment. It is assumed that these percentages apply to the other sediment levels analyzed in this evaluation. Since changes in sediment level change the depth of the lake evenly throughout the entire lake (see Section 6.2 of the main body of this calculation), the percentages of effective area and volume will negligibly change with sediment level.
- O3.2 UHS Inventory for Fire Fighting – It is assumed that all UHS inventory for fire fighting is used immediately following an accident. This is conservative as it decreases the volume of water in the UHS.
- O3.3 UHS Transit Time - For weather sorting, the weather file is sorted in three hour increments. For compatibility the transit time for 18-in, 12-in, 6-in, and 0-in of sedimentation is assumed to be approximately 33-hr, 39-hr, 42-hr, and 45-hr, respectively. See the UHS transit time calculation in Section O6.3.
- O3.4 Other - All other assumptions are the same as the assumptions in the main body of calculation.

O4.0 DESIGN INPUT

- O4.1 Maximum Allowable UHS Temperature – The maximum allowable UHS temperature is 107°F [Ref. O5.9].
- O4.2 General Seepage Rate – A seepage rate of 0.2 ft³/s is retained from Design Input 4.3 of the main body of this calculation. In Rev. 7, the spent fuel pool makeup flow was added to determine the total UHS seepage rate, but this is no longer added in Rev. 8 (see Section O6.2).
- O4.3 UHS Inventory for Fire Fighting Following an Accident – Following an accident, 440,400 gallons of water from the UHS must be available for fire fighting [Ref. O5.1, Section 9.2.6.3].
- O4.4 Anemometer Height – For the worst net evaporation weather data, which is from the Peoria weather data spanning from 1948 to 1996, the anemometer height is 20-ft (as taken from input files for the worst net evaporation cases in previous revisions). For the worst weather data, which is taken from the LaSalle Station weather data spanning from 1995 to 2010, the anemometer is at a height of 33-ft (See Attachment K).
- O4.5 Proposed TS Limits - The proposed TS temperature limits for the UHS for each of the event start times are provided in the proposed TS changes [Ref. O5.9]. These temperatures plus an uncertainty of 0.75°F are used as the initial UHS outlet temperature in the LAKET-PC model. Due to an initial iteration in the LAKET-PC code, the initial forced temperature input in the input file may differ from the values in Table O4-1. However, the initial UHS outlet temperature in the output file will match the value in Table O4-1.

Table O4-1: Proposed TS Limits

Event Start Time	Proposed TS Limit	Proposed TS Limit Plus Uncertainty (0.75°F)
0:00	103.78°F	104.53°F
3:00	101.97°F	102.72°F
6:00	101.25°F	102.00°F
9:00	102.44°F	103.19°F
12:00	104.00°F	104.75°F
15:00	104.00°F	104.75°F
18:00	104.00°F	104.75°F
21:00	104.00°F	104.75°F

- O4.6 CSCS Volumetric Flow - The total plant flow during the UHS analysis is 29,300 GPM (65.3 ft³/s) for the first 16 hours of the event [Ref. O5.11, Attachment C]. The total plant flow is 38,600 gpm (86.0 ft³/s) after 16 hours [Ref. O5.11, Attachment C]. The total flow after 16 hours is based upon the cumulative flow contribution from thirteen CSCS pumps operating at design flow conditions (eight Residual Heat Removal (RHR)-Service Water pumps, 4,000 gpm each; three Diesel Generator (DG) pumps, two at 1,300 gpm and one at 2,000 gpm; and two High Pressure Core Spray DG pumps, 1000 gpm each) (See Attachment D). Prior to 16 hours, two RHR Service Water pumps and one of the 1,300 gpm DG pumps are not in operation [Ref. O5.11, Attachment C].
- O4.7 Other - All other design inputs are the same as the design inputs in the main body of calculation.

O5.0 REFERENCES

- O5.1 LaSalle County Station Updated Final Safety Analysis Report (UFSAR), Rev. 19.
- O5.2 LAKET-PC Computer Program, Version 2.2, S&L Program No. 03.7.292-2.2, 7/31/2013. Controlled File Path: \\SNLVS5\SYS3\OPSS\LAK29222\
- O5.3 NRC Request for Additional Information, Docket Nos. 50-373 and 50-374, "LaSalle County Station, Units 1 and 2 - Request for Additional Information Related to License Amendment Request to Technical Specification 3.7.3 Ultimate Heat Sink (TAC Nos. ME9076 and ME 9077)," ADAMS Accession No. M13099A206, 6/27/2013.
- O5.4 L-002453, "UHS Heat Load," Rev. 4.
- O5.5 Microsoft® Excel 2003, Sargent & Lundy LLC Program No. 03.2.286-1.0, dated 02/02/2004.
- O5.6 L-001355, "LaSalle County Station CSCS Hydraulic Model," Rev. 005A.
- O5.7 MIT Report 161, "An Analytical and Experimental Study of Transient Cooling Pond Behavior," Ryan and Harleman, Massachusetts Institute of Technology, Cambridge Massachusetts, 1973.
- O5.8 Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," Rev. 2.
- O5.9 RS-12-084, "Request for a License Amendment to LaSalle County Station, Units 1 and 2, Technical Specification 3.7.3, 'Ultimate Heat Sink'," NRC Docket Nos. 50-373 and 50-374, ADAMS Accession No. ML12200A330, 6/12/2012.
- O5.10 EC 394434, "UHS Wind Correction Exponent Evaluation," Rev. 1.
- O5.11 SEAG 13-000074, "LaSalle County Station Transmittal of Design Information (TODI) for UHS Analyses," Rev. 0.
- O5.12 SEAG 13-000080, "LaSalle Station Transmittal of Design Information (TODI) for Calc L-002457 with WSR of Intake Flume," 9/30/2013.

O6.0 CALCULATIONS

O6.1 Calculation of Plant Temperature Rise

The CSCS temperature rise across the plant is computed in Attachment P. The heat rejected to the UHS is determined for an operating scenario that considers a LOCA on one unit and a reactor SCRAM for the non-LOCA unit coincident with a loss of the cooling lake. Both RHR heat exchangers are in service for the LOCA unit. For the non-LOCA unit one RHR heat exchanger is in suppression pool cooling mode (and later shutdown cooling mode) while the other RHR heat exchanger is in fuel pool cooling assist mode.

See Appendix P9.2 of Attachment P for the results of the plant temperature rise.

O6.2 Seepage Rate

The seepage rate is determined from a UHS seepage of 0.2 ft³/s (Design Input O4.2). Revision 7 included a constant flow of 600 gpm for spent fuel pool makeup (See Design Input I4.1). Instead of spent fuel pool makeup drawn from the UHS, the spent fuel pool is cooled through the use of the RHR heat exchanger [Ref. O5.4, Attachment D]. The heat load rejected by the RHR heat exchanger to the UHS is calculated in L-002453 [Ref. O5.4], and included in the plant temperature rise calculated in Attachment P. Therefore, no additional seepage flow is added to account for spent fuel pool makeup flow.

O6.3 UHS Transit Time

The UHS transit time for each sedimentation level can be determined using the effective volume and the UHS flow rate. This calculation is shown in Table O6-1, below.

Table O6-1: UHS Transit Time Calculation

	Symbol	0-in	6-in	12-in	18-in	Basis
Eff. Volume (acre-ft)	V_e	293.89	267.64	241.27	215.59	Table O2-1
Conversion (ft ³ /acre-ft)	C	43560	43560	43560	43560	
Volume (ft ³)	V	12,801,848	11,658,398	10,509,721	9,391,100	$= V_e * C$
Flow Rate (ft ³ /s)	Q_{B16}	65.3	65.3	65.3	65.3	Design Input O4.6
Volume Removed in 16 hrs (ft ³)	V_{B16}	3,761,280	3,761,280	3,761,280	3,761,280	$= Q_{B16} * 16 \text{ hr} * 3600 \text{ s/hr}$
Transit Time (s)	t_{B16}	57,600	57,600	57,600	57,600	$= 16 \text{ hr} * 3600 \text{ s/hr}$
Flow Rate (ft ³ /s)	Q_{A16}	86.0	86.0	86.0	86.0	Design Input O4.6
Remaining Volume (ft ³)	V_{A16}	9,040,568	7,897,118	6,748,441	5,629,820	$= V - V_{B16}$
Transit Time (s)	t_{A16}	105,123	91,827	78,470	65,463	$= V_{A16} / Q_{A16}$
Total Transit Time (s)	t	162,723	149,427	136,070	123,063	$= t_{B16} + t_{A16}$
Total Transit Time (hr)	t	45.2	41.5	37.8	34.2	$= t / (3600 \text{ s/hr})$

For weather sorting, the weather file is sorted in three hour increments. For compatibility, the transit time for 18-in, 12-in, 6-in, and 0-in of sedimentation is assumed to be approximately 33-hr, 39-hr, 42-hr, and 45-hr, respectively (see Assumption O3.3).

O6.4 Weather File Creation

O6.4.1 Worst Weather Screening

Rolling averages of the lake output results from the weather screening files 'Worst_Weather_110.dat' and 'Worst_Weather_120.dat' were computed for varying lengths of time: 24 hours, 33 hours, 39 hours, 42 hours, and 45 hours. Besides the 24 hours, these time periods represent potential transit times for the LaSalle UHS depending on the level of sedimentation. The time with the highest rolling average corresponds to the start time of the worst weather period over the time span that is under consideration. Since LAKET-PC cases are made at varying accident start times and sedimentation levels, the worst weather periods are determined for various start times over multiple time periods. These results are shown in Tables O6-2 and O6-3.

Table O6-2: Worst Weather Periods - 110°F Initial Temperature

Start Time	24 Hour	33 Hour	36 Hour	39 Hour	42 Hour	45 Hour
12AM	6/23/09	8/18/95	8/18/95	8/18/95	8/15/95	8/18/95
3AM	6/23/09	8/18/95	8/18/95	8/18/95	6/22/09	6/22/09
6AM	7/24/01	6/22/09	6/22/09	6/22/09	6/22/09	6/22/09
9AM	7/24/01	6/22/09	6/22/09	6/22/09	6/22/09	8/17/95
12PM	6/22/09	6/22/09	6/22/09	6/22/09	6/22/09	8/17/95
3PM	6/22/09	6/22/09	6/22/09	8/17/95	8/17/95	8/17/95
6PM	6/22/09	8/11/10	8/11/10	8/14/95	8/17/95	8/17/95
9PM	6/22/09	8/11/10	8/14/95	8/14/95	8/14/95	8/14/95

Table O6-3: Worst Weather Periods - 120°F Initial Temperature

Start Time	24 Hour	33 Hour	36 Hour	39 Hour	42 Hour	45 Hour
12AM	6/23/09	8/18/95	8/18/95	8/18/95	8/15/95	8/18/95
3AM	8/18/95	8/18/95	8/18/95	8/18/95	8/18/95	8/18/95
6AM	7/24/01	8/18/95	6/22/09	6/22/09	6/22/09	6/22/09
9AM	7/24/01	6/22/09	6/22/09	6/22/09	6/22/09	8/17/95
12PM	6/22/09	6/22/09	6/22/09	6/22/09	8/17/95	8/17/95
3PM	6/22/09	6/22/09	6/22/09	8/17/95	8/17/95	8/17/95
6PM	8/11/10	8/11/10	8/26/95	8/26/95	8/17/95	8/17/95
9PM	8/11/10	8/26/95	8/26/95	8/14/95	8/17/95	8/14/95

In cases in which different worst weather periods are determined, the differences in the rolling average of the worst time periods are negligible. For example, the rolling average of the 24 hours starting at 3AM on 6/23/2009 for an initial temperature of 110°F was determined to be 107.980°F. For the 24 hours starting at 3AM on 8/18/1995, the rolling average is 107.977°F. This is typical of all time periods in which the differing initial temperature causes a change in the worst weather period. Therefore, it is concluded that the 110°F and 120°F screenings produce essentially the same worst running average periods.

In addition to determining the worst time span corresponding to the UHS transit time, it is also important to check for the worst weather for shorter time periods. It is possible that in screening based on transit time, a short span of bad weather can be missed if it is quickly followed by relatively mild weather.

Because of this, the worst weather periods for 9 hours and 12 hours have also been determined.

Table O6-4: Worst Weather - 9 Hour and 12 Hour Period

	9 Hour		12 Hour	
	110°F	120°F	110°F	120°F
1)	7/22/01 9AM	7/22/01 9AM	6/23/09 6AM	6/23/09 6AM
2)	6/23/09 9AM	6/23/09 9AM	6/23/09 9AM	6/23/09 9AM
3)	6/23/95 9AM	6/23/95 9AM	6/23/95 6AM	6/23/95 6AM

Due to the prevalence of the 6/22/2009 - 6/23/2009 in the 9 and 12 hour periods in Table O6-3 and the UHS transit time periods in Tables O6-2 and O6-3, LAKET-PC runs at each starting time are run starting on 6/22/2009 in addition to the worst weather periods found in Tables O6-2 and O6-3. This ensures that the worst 9 hour and 12 hour weather periods align with the initial accident heat loads exiting the UHS.

O6.4.2 Weather File Creation

Weather files are created for each run based on the worst weather periods determined in Section O6.4.1. For the cases in Table O6-5, the worst weather file is created by inputting the worst 33 hour time (the transit time for 18 inches of sedimentation) period as determined in Tables O6-2 and O6-3 plus the following 31 days. An additional 15 hours is added since LAKET-PC requires a weather file comprised of weather input in multiples of 24.

The weather conditions are taken from the file 'PIALSL9510.txt', creation of which is documented in Attachment K. The table below gives a summary of the start and end times used for creating the weather file based on a 33 hour transit time. The 33 hour transit time is used since it corresponds to the case with the most sedimentation (18 in.), which is expected to produce the most limiting temperature.

Table O6-5: Worst Weather Files

File Name	Start Time	End Time
WW_0.txt	8/18/1995 12AM	9/19/1995 11PM
WW_3.txt	8/18/1995 3AM	9/20/1995 2AM
WW_6.txt	8/18/1995 6AM	9/20/1995 5AM
WW_9.txt	6/22/2009 9AM	7/25/2009 8AM
WW_12.txt	6/22/2009 12PM	7/25/2009 11AM
WW_15.txt	6/22/2009 3PM	7/25/2009 2PM
WW_18.txt	8/11/2010 6PM	9/13/2010 5PM
WW_21.txt	8/11/2010 9PM	9/13/2010 8PM
WW_0-6.22.txt	6/22/2009 12AM	7/24/2009 11PM
WW_3-6.22.txt	6/22/2009 3AM	7/25/2009 2AM
WW_6-6.22.txt	6/22/2009 6AM	7/25/2009 5AM
WW_18-6.22.txt	6/22/2009 6PM	7/25/2009 5PM
WW_21-6.22.txt	6/22/2009 9PM	7/25/2009 8PM

The file listings for these weather files are presented in Appendix O8.1.

O6.4.3 Worst Weather Comparison

For times at which 6/22/2009 is not chosen as the worst weather period for 33 hours in Table O6-2, cases are run using the given worst weather period and using the 6/22/2009 weather period. This is only done for the 18-inches of sedimentation cases (approximately 33 hour transit time), as these cases are expected to be the most limiting. The results are shown in Table O6-6, below.

Table O6-6: Worst Weather Comparison

Case	Start Time	Initial Temperature	Maximum Temperature
<i>12AM</i>			
Case 3a_12AM	6/22/2009 12AM	104.53°F	104.53°F
Case 3a_12AM-8.18	8/18/1995 12AM	104.53°F	104.53°F
<i>3AM</i>			
Case 3a_3AM	6/22/2009 3AM	102.72°F	105.75°F
Case 3a_3AM-8.18	8/18/1995 3AM	102.72°F	104.60°F
<i>6AM</i>			
Case 3a_6AM	6/22/2009 6AM	102.00°F	106.15°F
Case 3a_6AM-8.18	8/18/1995 6AM	102.00°F	103.72°F
<i>6PM</i>			
Case 3a_6PM	6/22/2009 6PM	104.75°F	104.75°F
Case 3a_6PM-8.11	8/11/2010 6PM	104.75°F	104.75°F
<i>9PM</i>			
Case 3a_9PM	6/22/2009 9PM	104.75°F	104.75°F
Case 3a_9PM-8.11	8/11/2010 6PM	104.75°F	104.75°F

As seen in the results of Table O6-6, the 6/22/2009 cases result in an equal maximum temperature (when the maximum temperature is the initial temperature) or higher maximum temperature for all time periods. Therefore, all cases will be run using the 6/22/2009 weather data as it produces the most limiting results. Cases with differing levels of sedimentation use the same weather files. This is acceptable since the weather files consist of the worst 33 hours plus the following 31 days and any extra time needed to make the number of entries in the weather file a multiple of 24. Due to the extra time added after the 31 days, these weather files are the same for the longer transit times of the lower sedimentation cases.

O6.5 Comparison to 33-24-30 Case

As described in Section O2.1.5, Rev. 2 of Regulatory Guide 1.27 [Ref. O5.8] gives two alternatives for selecting the worst weather data.

To determine which of these methods is most conservative, cases were run using weather files created using both alternatives. The UHS transit time for 18 inches of sedimentation is approximately 33 hours (See Section O6.3). Therefore, a synthetic weather file period of 33 days is created consisting of the worst 33 hours plus the worst 24 hours plus the worst 30 days. The worst 33 hour and worst 24 hour time periods are determined from Tables O6-2 and O6-3. The worst 30-day time period was determined in Attachment M. Three different cases are run, one starting at 9 AM and the other two starting at 6 AM.

Two 6 AM cases are run, one starting at the worst weather time period of 8/8/1995, and the other starting at 6/22/2009. These weather files are summarized in Table O6-7.

Table O6-7: 33-24-30 Case Weather Files

File Name	33- hr Start Time	33-hr End Time	24-hr Start Time	24-hr End Time	30-day Start Time	30-day End Time ¹
WWV_33-24-30.txt	6/22/2009 9AM	6/23/2009 5PM	6/22/2009 6PM	6/23/2009 5PM	7/21/1995 6PM	8/22/1995 8AM
WWV_33-24-30-6AM.txt	8/18/1995 6AM	8/19/1995 2PM	6/22/2009 3PM	6/23/2009 2PM	7/21/1995 3PM	8/22/1995 5AM
WWV_33-24-30-6AM2.txt	6/22/2009 6AM	6/23/2009 2PM	6/22/2009 3PM	6/23/2009 2PM	7/21/1995 3PM	8/22/1995 5AM

1) An extra 15 hours is added to make the entries in the weather file a multiple of 24

Case 3a_6AM and Case 3a_9AM use the worst 33-consecutive-day weather period, and the weather files used for these cases are described in Table O6-5.

A comparison of the results of these cases is provided in Table O6-8, below.

Table O6-8: 33-24-30 Case Comparison

Case	Weather File	Initial Temperature	Maximum Temperature
6AM Cases			
WWV_33-24-30-6AM	WWV_33-24-30-6AM.txt	102.00	104.73
WWV_33-24-30-6AM2	WWV_33-24-30-6AM2.txt	102.00	105.93
Case 3a_6AM	WWV_6-6.22.txt	102.00	106.15
9AM Cases			
WWV_33-24-30	WWV_33-24-30.txt	103.19	105.21
Case 3a_9AM	WWV_9.txt	103.19	105.31

The results in Table O6-8 show that the cases run with the 33-consecutive-day weather period result in a higher maximum temperature. Since this is more conservative, the 33-consecutive-day weather period is used for the worst weather cases.

O6.6 Maximum Allowable Lake Temperature

LAKET-PC [Ref. O5.2] is run to determine the UHS response to the heat load developed in Attachment P. Cases are run at four different sedimentation levels: 0 inches, 6 inches, 12 inches, and 18 inches. The time of day which the transient is assumed is critical when determining the maximum allowable initial temperature of the UHS. To account for the time of day at which the UHS transient may start, eight start times are used for all sedimentation levels.

Each case is run with an initial temperature corresponding to the Technical Specification limits (see Design Input O4.5). Limiting weather data was determined in Sections O6.4 and O6.5, and the weather file dates are outlined in Table O6-5. The results of the LAKET runs are provided in Table O6-9.

Table O6-9: Worst Temperature Cases

Case	Weather Data	Sediment Level (in.)	Initial UHS Temp. (°F)	Maximum Plant Inlet Temp. (°F)
Case 1a_12AM	WW_0-6.22.txt	0	104.53	104.53
Case 1a_3AM	WW_3-6.22.txt	0	102.72	102.72
Case 1a_6AM	WW_6-6.22.txt	0	102.00	103.12
Case 1a_9AM	WW_9.txt	0	103.19	104.33
Case 1a_12PM	WW_12.txt	0	104.75	104.97
Case 1a_3PM	WW_15.txt	0	104.75	104.75
Case 1a_6PM	WW_18-6.22.txt	0	104.75	104.75
Case 1a_9PM	WW_21-6.22.txt	0	104.75	104.75
Case 2a_12AM	WW_0-6.22.txt	6	104.53	105.21
Case 2a_3AM	WW_3-6.22.txt	6	102.72	104.54
Case 2a_6AM	WW_6-6.22.txt	6	102.00	103.21
Case 2a_9AM	WW_9.txt	6	103.19	104.42
Case 2a_12PM	WW_12.txt	6	104.75	104.99
Case 2a_3PM	WW_15.txt	6	104.75	104.75
Case 2a_6PM	WW_18-6.22.txt	6	104.75	104.75
Case 2a_9PM	WW_21-6.22.txt	6	104.75	104.75
Case 3a_12AM	WW_0-6.22.txt	18	104.53	104.53
Case 3a_3AM	WW_3-6.22.txt	18	102.72	105.75
Case 3a_6AM	WW_6-6.22.txt	18	102.00	106.15
Case 3a_9AM	WW_9.txt	18	103.19	105.31
Case 3a_12PM	WW_12.txt	18	104.75	105.05
Case 3a_3PM	WW_15.txt	18	104.75	104.75
Case 3a_6PM	WW_18-6.22.txt	18	104.75	104.75
Case 3a_9PM	WW_21-6.22.txt	18	104.75	104.75
Case 4a_12AM	WW_0-6.22.txt	12	104.53	105.86
Case 4a_3AM	WW_3-6.22.txt	12	102.72	105.97
Case 4a_6AM	WW_6-6.22.txt	12	102.00	105.33
Case 4a_9AM	WW_9.txt	12	103.19	104.54
Case 4a_12PM	WW_12.txt	12	104.75	105.01

Case	Weather Data	Sediment Level (in.)	Initial UHS Temp. (°F)	Maximum Plant Inlet Temp. (°F)
Case 4a_3PM	WW_15.txt	12	104.75	104.75
Case 4a_6PM	WW_18-6.22.txt	12	104.75	104.75
Case 4a_9PM	WW_21-6.22.txt	12	104.75	104.75

The results in Table O6-9 show that no cases exceed the maximum allowable plant inlet temperature of 107°F (Design Input O4.1). The most limiting case is 'Case 3a_6AM', which corresponds to 18 inches of sedimentation and an accident start time of 6AM.

O6.7 Maximum Net Evaporation

Cases 1c, 2c, 3c, and 4c are run to determine the maximum expected UHS drawdown at different sedimentation levels. These cases are run using the worst 30-day net evaporation weather period, which was determined to be 6/18/1954 to 7/18/1954 in Attachment M. The results of these cases are presented in Table O6-10.

In addition to Cases 1c through 4c, two additional cases were run to determine the sensitivity of the net evaporation to the wind power law exponent used by LAKET-PC [Ref. O5.2]. The power law equation is defined as [Ref. O5.2]:

$$\frac{v_2}{v_1} = \left(\frac{z_2}{z_1} \right)^\alpha \quad (\text{Eq. O6-1})$$

Where:

v_1 = wind velocity at LAKET evaluation height (knots)

v_2 = wind velocity at anemometer height (knots)

z_1 = LAKET evaluation height (2 meters = 6.562 feet)

z_2 = Anemometer height (ft)

α = Power law exponent

The default exponent used when adjusting the wind from the anemometer height to the 2-meter height used in the LAKET-PC calculations is an exponent of 0.3 [Ref. O5.2]. The wind input to the weather file '30dayevap.txt' was altered to simulate an exponent of 0.1 in case 'NetEvap-0.1' and an exponent of 0.2 in case 'NetEvap-0.2'. The weather files with the adjusted wind speeds are 'NetEvap_0.1.txt' and 'NetEvap_0.2.txt'. These results are summarized in Table O6-10.

Table O6-10: Worst Net Evaporation Cases

Case	Weather Data	Sediment Level (in.)	Initial Lake Temp. (°F)	Maximum UHS Drawdown (ft)
Case 1c	30dayevap.txt	0	104.53	1.42
Case 2c	30dayevap.txt	6	104.53	1.42
Case 3c	30dayevap.txt	18	104.53	1.42
Case 4c	30dayevap.txt	12	104.53	1.42

Case	Weather Data	Sediment Level (in.)	Initial Lake Temp. (°F)	Maximum UHS Drawdown (ft)
NetEvap-0.1	NetEvap_0.1.txt	18	104.53	1.47
NetEvap-0.2	NetEvap_0.2.txt	18	104.53	1.45

As seen in the results from Table O6-10, the maximum UHS drawdown is around 1.5 feet. Please note that more limiting UHS drawdown of 2.27 would exist with consideration of inventory loss due to spent fuel pool makeup as documented in Section I7.1 of Attachment I. Reducing the power law exponent increases the UHS drawdown, but the change is relatively small.

O6.8 Wind Sensitivity Cases

To determine the effects of a diurnal wind power law coefficient on the maximum UHS temperature, a weather file was created for a LAKET-PC run to incorporate the coefficients determined in EC 394434 [Ref. O5.10]. The base weather case of 'WW_6-6.22.txt', provides wind speed values at a height of 33 feet. The adjusted wind speed at 2 meters was found using Eq. O6-1 and the power law exponents (α) from EC 394434 [Ref. O5.10]. These adjusted wind speed values were inserted into 'WW_6-6.22.txt' to create the new weather file, 'Diurnal.txt'. The LAKET-PC run 'Case Diurnal' was run to determine the maximum UHS temperature using the diurnal wind speed exponents.

For Case Wind_375, wind speeds were taken from EC 394434 [Ref. O5.10] as measured at an anemometer height of 375 feet. These wind speeds were multiplied by a wind speed ratio of 0.405, which is the calculated multiplier to adjust the wind speed from 375 feet at the meteorological tower to 2 meters (6.56 feet) above the UHS [Ref. O5.12]. These wind speeds were then converted to knots for entry into a LAKET weather file. These adjusted wind speed values were inserted into 'WW_6-6.22.txt' to create the new weather file, 'Wind_375.txt'. The LAKET-PC run Case Wind_375 was then run with this weather file and the results are reported in Table O6-11.

Table O6-11: Wind Sensitivity Runs

Case	Weather Data	Sediment Level (in.)	Initial Lake Temp. (°F)	Maximum UHS Temperature (°F)
Case 3a_6AM	WW_6-6.22.txt	18	102.00	106.15
Case Diurnal	Diurnal.txt	18	102.00	105.08
Case Wind_375	Wind_375.txt	18	102.00	104.34

As seen in Table O6-11, the maximum UHS temperature from the diurnal case remains below the maximum UHS temperature of Case 3a_6AM, which uses a constant wind speed coefficient of 0.3. Therefore, the use of a constant coefficient of 0.3 is conservative.

The maximum UHS temperature of Case Wind_375 also remains below the maximum UHS temperature of Case 3a_6AM.

O6.9 UHS Mixing

To determine the effect of mixing at the plant discharge into the UHS, several sensitivity cases were run in

LAKET-PC [Ref. O5.2]. These cases include a mixing region that is 10% the size of the UHS and a mixing region at 20% the size of the UHS. Microsoft Excel [Ref. O5.5] is used to calculate the temperature in the mixing zone, and LAKET-PC is used to calculate temperature for the remaining UHS.

- O6.9.1 Non-Mixing Zone UHS Area and Volume - For these LAKET-PC runs, the area and volume of the UHS not in the mixing zone is needed. These values were calculated as 10% of the total UHS area and volume for the 10% sensitivity run and 20% of the total UHS area and volume for the 20% sensitivity run. The effective area is 57.9% and the effective volume is 63.4% as determined in Attachment J. The UHS drawdown curves for these cases are summarized in Table O6-12.

Table O6-12: UHS Drawdown Curves for Mixing Zone Sensitivity Runs

Elevation	Total Area (acres)	Total Volume (acre-ft)	Effective Area (acres)	Effective Volume (acre-ft)
<i>10% Mixing Region</i>				
689.98	73.19	306.00	42.38	194.00
689	71.78	234.72	41.56	148.81
688	70.34	163.71	40.72	103.79
687	26.73	91.98	15.48	58.32
686	20.00	54.00	11.58	34.24
685	12.08	39.42	6.99	24.99
<i>20% Mixing Region</i>				
689.98	65.06	272.00	37.67	172.45
689	63.80	208.64	36.94	132.28
688	62.52	145.52	36.20	92.26
687	23.76	81.76	13.76	51.84
686	17.78	48.00	10.29	30.43
685	10.74	35.04	6.22	22.22

- O6.9.2 Mixing Zone Temperature - The case 'Case3a_6AM.dat' is selected as the nominal case for the UHS mixing sensitivity runs. The temperature of the mixing zone is determined in Microsoft Excel, and then LAKET-PC is run to determine the impact on the UHS temperature in the non-mixing zone portion of the UHS. Multiple iterations of the LAKET-PC analysis are needed as these results are used in calculating the mixing zone temperature. The change in the mixing zone temperature between time steps is input as the FPLANT variable in LAKET-PC. Iterations are run until the desired convergence in the mixing zone temperature is achieved.

Additional cases are run for 10% mixing starting at 9AM and 20% mixing starting at 12PM. This is to account for the reduced UHS transit time due to the reduced UHS volumes determined in Table O6-12.

The Microsoft Excel [Ref. O5.5] equations used for the UHS mixing analysis are given in Appendix O8.2.

O6.9.3 **Results** - The full Microsoft Excel [Ref. O5.5] results for the 10% mixing zone and 20% mixing zone cases are provided in Appendix O8.2. A summary of these results are provided in Table O6-13.

Table O6-13: UHS Mixing Sensitivity Runs

Case	Weather Data	Sediment Level (In.)	Initial Lake Temp. (°F)	Maximum UHS Temperature (°F)
<i>6AM Cases</i>				
Case 3a_6AM (0% Mixing)	WW_6-6.22.txt	18	102.00	106.15
Mixing - 10%	WW_6-6.22.txt	18	102.00	104.32
Mixing - 20%	WW_6-6.22.txt	18	102.00	104.66
<i>9AM Cases</i>				
Case 3a_9AM (0% Mixing)	WW_9.txt	18	103.19	105.31
Mixing - 10% - 9AM	WW_9.txt	18	103.19	104.67
<i>12PM Cases</i>				
Case 3a_12PM (0% Mixing)	WW_12.txt	18	104.75	105.05
Mixing - 20% - 12PM	WW_12.txt	18	104.75	105.05

As seen from the results in Table O6-13, the highest maximum UHS temperature occurs when no mixing zone is considered. For the 12PM case, the maximum UHS temperature occurs three hours following the accident. The UHS discharge to the plant at this time has not been through the mixing zone, which accounts for the temperature being identical between the mixing and non-mixing cases. It is considered conservative to run the cases in LAKET without adjusting the results for a mixing zone at the inlet of the UHS.

O7.0 RESULTS AND CONCLUSIONS

O7.1 Maximum Allowable Lake Temperature Summary

Table O6-9 provides a summary of the maximum UHS temperatures for the maximum allowable initial temperatures given in the Tech Specs (see Design Input O4.1). The highest UHS temperature is 106.15 from Case 3c_6AM, which corresponds to an accident start time at 6:00 AM and 18 inches of sedimentation. This remains below the maximum allowable UHS outlet temperature of 107°F. Figure O7.1 shows the UHS inlet temperature and UHS inlet temperature over the 33 day worst temperature event for Case 3c_6AM.

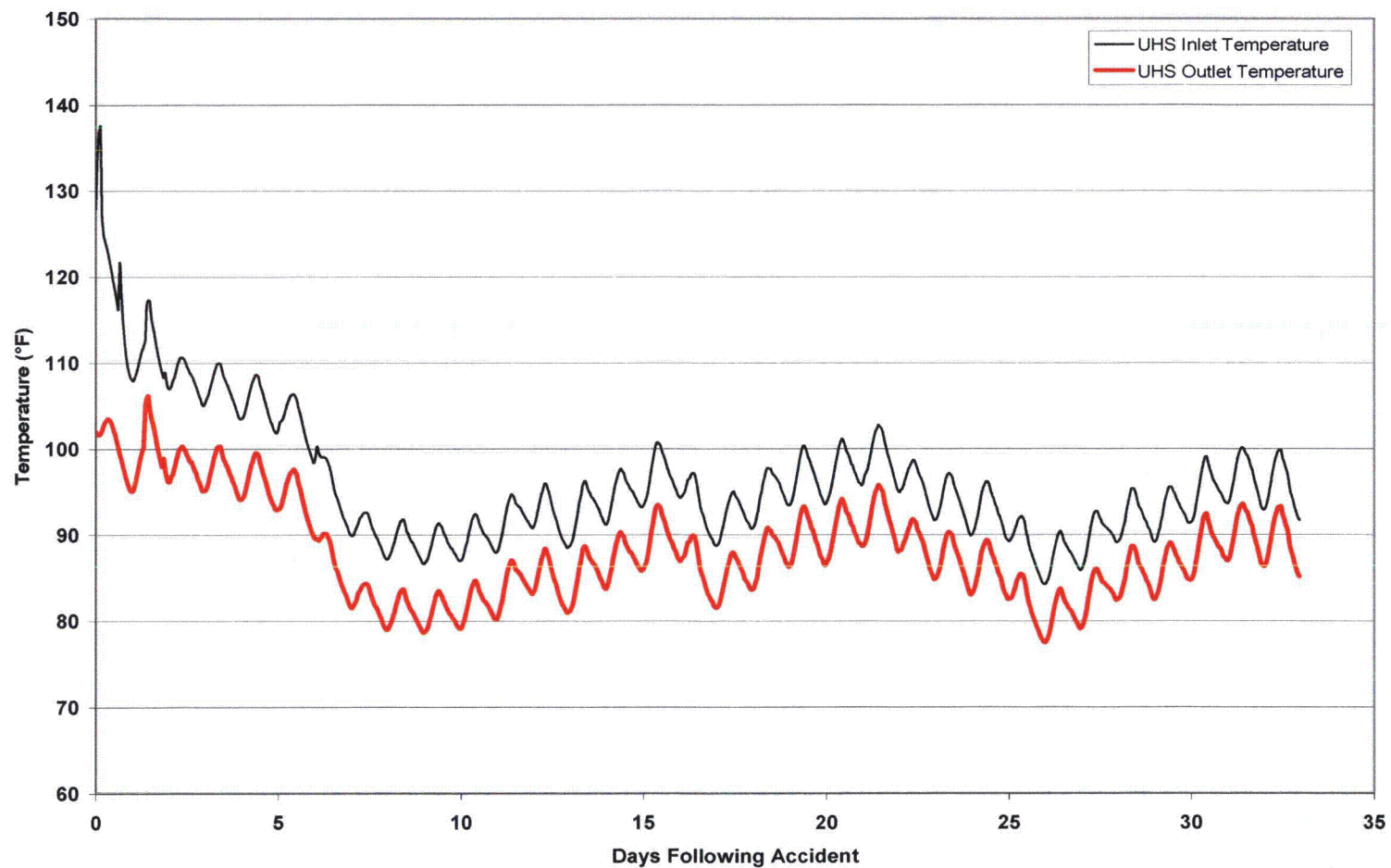
O7.2 Maximum Net Evaporation Summary

Table O6-10 provides a summary of the maximum lake drawdown for the worst net evaporation cases. These results show that there is a maximum UHS drawdown of approximately 1.5 feet occurring at a sedimentation level of 0, 6, or 18 inches. In addition, it is shown that there is a small increase in the UHS drawdown when the power law exponent for the wind speed adjustment is decreased. Please note that more limiting UHS drawdown of 2.27 would exist with consideration of inventory loss due to spent fuel pool makeup as documented in Section I7.1 of Attachment I. Figure O7.2 shows the UHS drawdown over the worst 30 days for net evaporation from Case 1c.

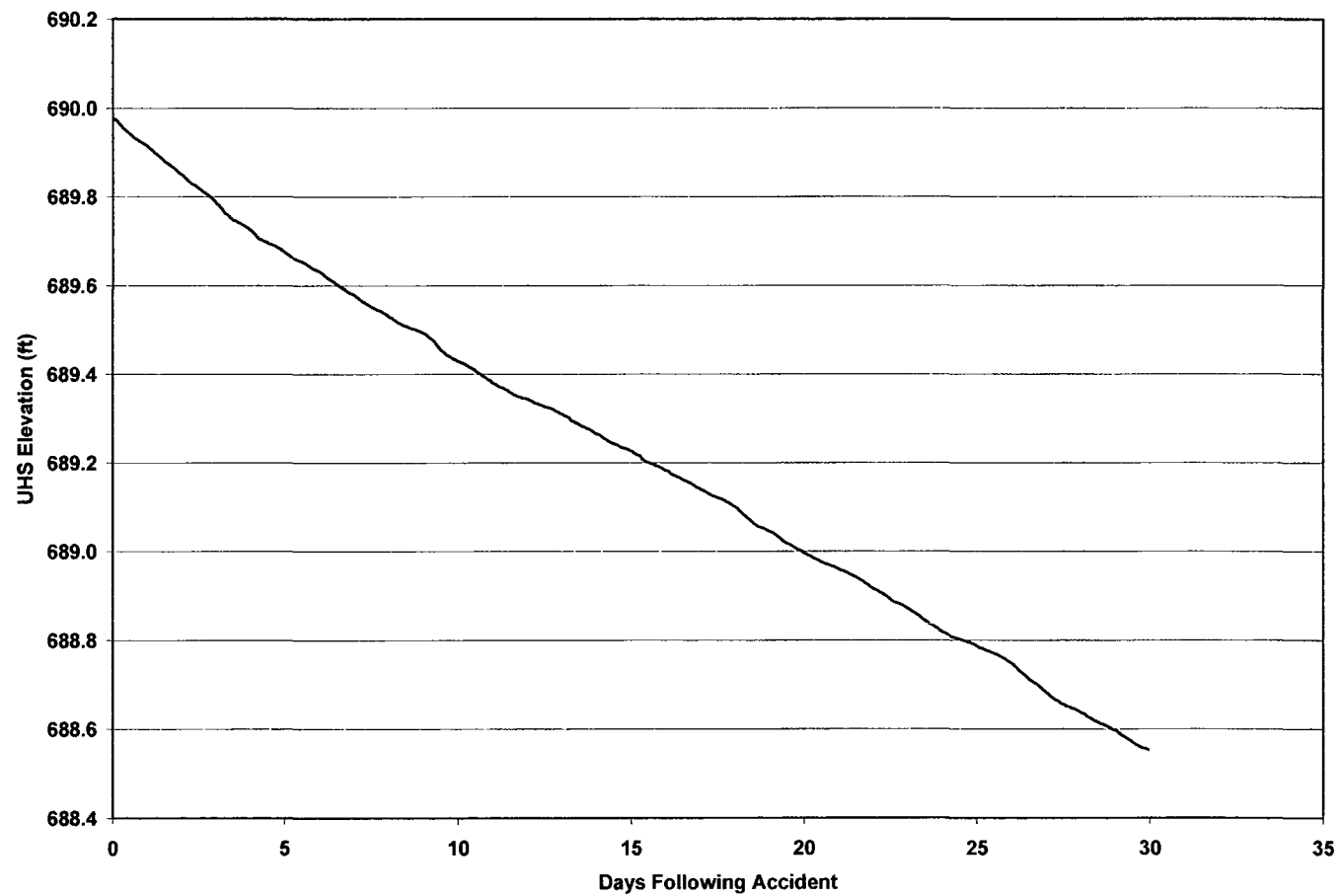
O7.3 Compliance with Acceptance Criteria

- O7.3.1 Acceptance Criterion #1 - Peak Temperature – As shown in Table O6-9, the maximum UHS temperature is not greater than 107°F for any of the worst weather cases. Therefore, Acceptance Criterion #1 is met.
- O7.3.2 Acceptance Criterion #2 - UHS Drawdown – The maximum expected lake drawdown for the cases evaluated is given in Table O6-10 and summarized in Section O7.2. This will be used in calculation L-001355 [Ref. O5.6].

Figure O7.1, Case 3a_6AM: UHS LOCA Temperature Transient
Worst 33-Day Temperature Period
(d = 18", t = 0600 hrs, Ti = 102.0°F)



**Figure O7.2, Case 1c: UHS LOCA Drawdown
Worst 30 Day Evaporation Weather Period
(d = 0", t = 0000 hrs, Ti = 104.53°F)**



8.0 APPENDICES

No.	Title	No. of Pages
O8.1	Electronic File Listing	5
O8.2	UHS Mixing Results and Equations	4

Appendix O8.1 - Electronic File Listing

APPENDIX O8.1 - ELECTRONIC FILE LISTING**Weather Files**

File Name	Size	Date
PIALSL9510.txt	21,301 KB	3/09/2012 11:08 PM CST
WW_33-24-30.txt	123 KB	9/5/2013 8:58 AM CST
WW_33-24-30-6AM.txt	123 KB	9/5/2013 9:09 AM CST
WW_33-24-30-6AM2.txt	123 KB	9/5/2013 9:08 AM CST
WW_0.txt	123 KB	1/28/2013 8:35 AM CST
WW_3.txt	123 KB	1/28/2013 8:37 AM CST
WW_6.txt	123 KB	1/28/2013 8:38 AM CST
WW_9.txt	123 KB	1/28/2013 8:38 AM CST
WW_12.txt	123 KB	1/28/2013 8:39 AM CST
WW_15.txt	123 KB	1/28/2013 8:40 AM CST
WW_18.txt	123 KB	9/5/2013 10:23 AM CST
WW_21.txt	123 KB	1/28/2013 8:42 AM CST
WW_0-6.22.txt	123 KB	1/28/2013 11:07 AM CST
WW_3-6.22.txt	123 KB	1/28/2013 11:08 AM CST
WW_6-6.22.txt	123 KB	1/28/2013 11:09 AM CST
WW_18-6.22.txt	123 KB	1/28/2013 8:41 AM CST
WW_21-6.22.txt	123 KB	1/28/2013 11:09 AM CST
NetEvap_0.1.txt	116 KB	9/4/2013 10:10 AM CST
NetEvap_0.2.txt	116 KB	9/4/2013 10:11 AM CST
Diurnal.txt	123 KB	9/13/2013 2:26 PM CST
Wind_375.txt	123 KB	9/20/2013 1:40 PM CST

Weather Sorting Files

File Name	Size	Date
Worst_Weather_110.dat	1 KB	12/3/2012 10:12 AM CST
Worst_Weather_110.out	299 KB	7/15/2013 3:29 PM CST
Worst_Weather_110.pltX	2,697 KB	7/15/2013 3:29 PM CST
Worst_Weather_120.dat	1 KB	11/30/2012 3:52 PM CST
Worst_Weather_120.out	299 KB	7/15/2013 3:31 PM CST
Worst_Weather_120.pltX	2,697 KB	7/15/2013 3:31 PM CST

Worst Weather Comparison

File Name	Size	Date
Case3a_12AM-8.18.dat	6 KB	9/18/2013 4:53 PM CST
Case3a_12AM-8.18.out	129 KB	9/18/2013 5:02 PM CST
Case3a_12AM-8.18.pltX	47 KB	9/18/2013 5:02 PM CST

Appendix O8.I - Electronic File Listing

Case3a_3AM-8.18.dat	6 KB	9/18/2013 4:51 PM CST
Case3a_3AM-8.18.out	129 KB	9/18/2013 5:05 PM CST
Case3a_3AM-8.18.pltX	47 KB	9/18/2013 5:05 PM CST
Case3a_6AM-8.18.dat	6 KB	9/18/2013 4:51 PM CST
Case3a_6AM-8.18.out	129 KB	9/18/2013 5:06 PM CST
Case3a_6AM-8.18.pltX	47 KB	9/18/2013 5:06 PM CST
Case3a_6PM-8.11.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_6PM-8.11.out	129 KB	9/18/2013 5:07 PM CST
Case3a_6PM-8.11.pltX	47 KB	9/18/2013 5:07 PM CST
Case3a_9PM-8.11.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_9PM-8.11.out	129 KB	9/18/2013 5:09 PM CST
Case3a_9PM-8.11.pltX	47 KB	9/18/2013 5:09 PM CST

33-24-30 Comparison

File Name	Size	Date
WW_33-24-30.dat	6 KB	9/18/2013 4:58 PM CST
WW_33-24-30.out	129 KB	9/18/2013 5:11 PM CST
WW_33-24-30.pltX	47 KB	9/18/2013 5:11 PM CST
WW_33-24-30-6AM.dat	6 KB	9/18/2013 4:58 PM CST
WW_33-24-30-6AM.out	129 KB	9/18/2013 5:11 PM CST
WW_33-24-30-6AM.pltX	47 KB	9/18/2013 5:11 PM CST
WW_33-24-30-6AM2.dat	6 KB	9/18/2013 4:58 PM CST
WW_33-24-30-6AM2.out	129 KB	9/18/2013 5:11 PM CST
WW_33-24-30-6AM2.pltX	47 KB	9/18/2013 5:11 PM CST

Worst Weather Files

File Name	Size	Date
Case1a_12AM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_12AM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_12AM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_3AM.dat	6 KB	9/18/2013 4:46 PM CST
Case1a_3AM.out	129 KB	9/18/2013 5:19 PM CST
Case1a_3AM.pltX	47 KB	9/18/2013 5:19 PM CST
Case1a_6AM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_6AM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_6AM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_9AM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_9AM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_9AM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_12PM.dat	6 KB	9/18/2013 4:48 PM CST

Appendix O8.1 - Electronic File Listing

Case1a_12PM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_12PM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_3PM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_3PM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_3PM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_6PM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_6PM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_6PM.pltX	47 KB	9/18/2013 5:20 PM CST
Case1a_9PM.dat	6 KB	9/18/2013 4:47 PM CST
Case1a_9PM.out	129 KB	9/18/2013 5:20 PM CST
Case1a_9PM.pltX	47 KB	9/18/2013 5:20 PM CST
Case2a_12AM.dat	6 KB	9/18/2013 4:49 PM CST
Case2a_12AM.out	129 KB	9/18/2013 5:24 PM CST
Case2a_12AM.pltX	47 KB	9/18/2013 5:24 PM CST
Case2a_3AM.dat	6 KB	9/18/2013 5:27 PM CST
Case2a_3AM.out	129 KB	9/18/2013 5:27 PM CST
Case2a_3AM.pltX	47 KB	9/18/2013 5:27 PM CST
Case2a_6AM.dat	6 KB	9/18/2013 4:48 PM CST
Case2a_6AM.out	129 KB	9/18/2013 5:23 PM CST
Case2a_6AM.pltX	47 KB	9/18/2013 5:23 PM CST
Case2a_9AM.dat	6 KB	9/18/2013 4:49 PM CST
Case2a_9AM.out	129 KB	9/18/2013 5:23 PM CST
Case2a_9AM.pltX	47 KB	9/18/2013 5:23 PM CST
Case2a_12PM.dat	6 KB	9/18/2013 4:49 PM CST
Case2a_12PM.out	129 KB	9/18/2013 5:24 PM CST
Case2a_12PM.pltX	47 KB	9/18/2013 5:24 PM CST
Case2a_3PM.dat	6 KB	9/18/2013 4:48 PM CST
Case2a_3PM.out	129 KB	9/18/2013 5:23 PM CST
Case2a_3PM.pltX	47 KB	9/18/2013 5:23 PM CST
Case2a_6PM.dat	6 KB	9/18/2013 4:49 PM CST
Case2a_6PM.out	129 KB	9/18/2013 5:23 PM CST
Case2a_6PM.pltX	47 KB	9/18/2013 5:23 PM CST
Case2a_9PM.dat	6 KB	9/18/2013 4:49 PM CST
Case2a_9PM.out	129 KB	9/18/2013 5:24 PM CST
Case2a_9PM.pltX	47 KB	9/18/2013 5:24 PM CST
Case3a_12AM.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_12AM.out	129 KB	9/18/2013 4:55 PM CST
Case3a_12AM.pltX	47 KB	9/18/2013 4:55 PM CST
Case3a_3AM.dat	6 KB	9/18/2013 4:51 PM CST
Case3a_3AM.out	129 KB	9/18/2013 5:04 PM CST

Appendix O8.1 - Electronic File Listing

Case3a_3AM.pltX	47 KB	9/18/2013 5:04 PM CST
Case3a_6AM.dat	6 KB	9/18/2013 4:51 PM CST
Case3a_6AM.out	129 KB	9/18/2013 5:06 PM CST
Case3a_6AM.pltX	47 KB	9/18/2013 5:06 PM CST
Case3a_9AM.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_9AM.out	129 KB	9/18/2013 5:14 PM CST
Case3a_9AM.pltX	47 KB	9/18/2013 5:14 PM CST
Case3a_12PM.dat	6 KB	9/18/2013 4:53 PM CST
Case3a_12PM.out	129 KB	9/18/2013 5:29 PM CST
Case3a_12PM.pltX	47 KB	9/18/2013 5:29 PM CST
Case3a_3PM.dat	6 KB	9/18/2013 4:51 PM CST
Case3a_3PM.out	129 KB	9/18/2013 5:30 PM CST
Case3a_3PM.pltX	47 KB	9/18/2013 5:30 PM CST
Case3a_6PM.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_6PM.out	129 KB	9/18/2013 5:07 PM CST
Case3a_6PM.pltX	47 KB	9/18/2013 5:07 PM CST
Case3a_9PM.dat	6 KB	9/18/2013 4:52 PM CST
Case3a_9PM.out	129 KB	9/18/2013 5:09 PM CST
Case3a_9PM.pltX	47 KB	9/18/2013 5:09 PM CST
Case4a_12AM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_12AM.out	129 KB	9/18/2013 5:36 PM CST
Case4a_12AM.pltX	47 KB	9/18/2013 5:36 PM CST
Case4a_3AM.dat	6 KB	9/18/2013 4:56 PM CST
Case4a_3AM.out	129 KB	9/18/2013 5:34 PM CST
Case4a_3AM.pltX	47 KB	9/18/2013 5:34 PM CST
Case4a_6AM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_6AM.out	129 KB	9/18/2013 5:35 PM CST
Case4a_6AM.pltX	47 KB	9/18/2013 5:35 PM CST
Case4a_9AM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_9AM.out	129 KB	9/18/2013 5:35 PM CST
Case4a_9AM.pltX	47 KB	9/18/2013 5:35 PM CST
Case4a_12PM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_12PM.out	129 KB	9/18/2013 5:36 PM CST
Case4a_12PM.pltX	47 KB	9/18/2013 5:36 PM CST
Case4a_3PM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_3PM.out	129 KB	9/18/2013 5:35 PM CST
Case4a_3PM.pltX	47 KB	9/18/2013 5:35 PM CST
Case4a_6PM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_6PM.out	129 KB	9/18/2013 5:35 PM CST
Case4a_6PM.pltX	47 KB	9/18/2013 5:35 PM CST

Appendix O8.1 - Electronic File Listing

Case4a_9PM.dat	6 KB	9/18/2013 4:57 PM CST
Case4a_9PM.out	129 KB	9/18/2013 5:35 PM CST
Case4a_9PM.pltX	47 KB	9/18/2013 5:35 PM CST

Worst Net Evaporation Files

File Name	Size	Date
Case1c.dat	6 KB	9/18/2013 4:48 PM CST
Case1c.out	125 KB	9/18/2013 5:43 PM CST
Case1c.pltX	52 KB	9/18/2013 5:43 PM CST
Case2c.dat	6 KB	9/18/2013 4:49 PM CST
Case2c.out	125 KB	9/18/2013 5:43 PM CST
Case2c.pltX	43 KB	9/18/2013 5:43 PM CST
Case3c.dat	6 KB	9/18/2013 4:53 PM CST
Case3c.out	125 KB	9/18/2013 5:43 PM CST
Case3c.pltX	43 KB	9/18/2013 5:43 PM CST
Case4c.dat	6 KB	9/18/2013 4:58 PM CST
Case4c.out	125 KB	9/18/2013 5:44 PM CST
Case4c.pltX	43 KB	9/18/2013 5:44 PM CST
NetEvap-0.1.dat	6 KB	9/20/2013 2:46 PM CST
NetEvap-0.1.out	125 KB	9/20/2013 2:47 PM CST
NetEvap-0.1.pltX	43 KB	9/20/2013 2:47 PM CST
NetEvap-0.2.dat	6 KB	9/20/2013 2:46 PM CST
NetEvap-0.2.out	125 KB	9/20/2013 2:47 PM CST
NetEvap-0.2.pltX	43 KB	9/20/2013 2:47 PM CST

UHS Mixing Files

File Name	Size	Date
Mixing-10%.dat	6 KB	9/18/2013 6:02 PM CST
Mixing-10%.out	129 KB	9/18/2013 6:02 PM CST
Mixing-10%.pltX	57 KB	9/18/2013 6:02 PM CST
Mixing-20%.dat	6 KB	9/19/2013 3:51 PM CST
Mixing-20%.out	129 KB	9/19/2013 3:52 PM CST
Mixing-20%.pltX	57 KB	9/19/2013 3:52 PM CST
Mixing-10%-9AM.dat	6 KB	9/27/2013 12:42 PM CST
Mixing-10%-9AM.out	129 KB	9/27/2013 12:42 PM CST
Mixing-10%-9AM.pltX	47 KB	9/27/2013 12:42 PM CST
Mixing-20%-12PM.dat	6 KB	9/27/2013 12:27 PM CST
Mixing-20%-12PM.out	129 KB	9/27/2013 12:27 PM CST
Mixing-20%-12PM.pltX	47 KB	9/27/2013 12:27 PM CST

Appendix O8.1 - Electronic File Listing

Wind Sensitivity Files

File Name	Size	Date
CaseDiurnal.dat	6 KB	9/20/2013 2:47 PM CST
CaseDiurnal.out	129 KB	9/20/2013 2:47 PM CST
CaseDiurnal.pltX	47 KB	9/20/2013 2:47 PM CST
Case Wind_375.dat	6 KB	9/20/2013 2:40 PM CST
Case Wind_375.out	47 KB	9/20/2013 2:40 PM CST
Case Wind_375.pltX	129 KB	9/20/2013 2:40 PM CST

Appendix O8.2 - UHS Mixing Results and Equations

UHS Mixing Equations

	A	B	C	D	E	F	G	H	I	J	K	L
1		=MAX(B5:B748)	=MAX(C5:C748)	=MAX(D5:D748)				Mixing Zone Vol=	=Input/E5*43560*0.1	R3		
2	10% Mixing	T Nat	T IN	T OUT	Plant Tout		Mix Temp	Vnew=	=65.3*60*60	=86*60*60	ft3	
3	New Lake T 2.3c	(°F)	(°F)	(°F)			(°F)	Plant DT	LAKET DT	Convergence DT	LAKET DT i1	LAKET DT i2
4						=D5		=SUM(H5:H749)	=SUM(I5:I749)	=MAX(J6:J749)	6780.91066338037	6801.35172098318
5	183	89.1909	106.123	102.003	=D5+H5	=(I\$2*E5+G4*(I\$1-I\$2))/I\$1		25.95	=G5-D5	=ABS(L5-I5)	4.12	4.11894749635391
6	183.041666667	89.4723	110.516	101.636	=D6+H6	=(I\$2*E6+G5*(I\$1-I\$2))/I\$1		32.2	=G6-D6	=ABS(L6-I6)	8.88	8.88489652038913
7	183.083333333	90.0218	114.694	101.624	=D7+H7	=(I\$2*E7+G6*(I\$1-I\$2))/I\$1		35.16	=G7-D7	=ABS(L7-I7)	13.07	13.0655417737158
8	183.125	90.6814	118.317	101.727	=D8+H8	=(I\$2*E8+G7*(I\$1-I\$2))/I\$1		35.8	=G8-D8	=ABS(L8-I8)	16.59	16.5874470293705
9	183.166666667	91.5572	119.772	102.132	=D9+H9	=(I\$2*E9+G8*(I\$1-I\$2))/I\$1		25.36	=G9-D9	=ABS(L9-I9)	17.64	17.639166059468
10	183.208333333	92.4975	120.614	102.624	=D10+H10	=(I\$2*E10+G9*(I\$1-I\$2))/I\$1		22.43	=G10-D10	=ABS(L10-I10)	17.99	17.9856907466745
11	183.25	93.373	121.196	103.036	=D11+H11	=(I\$2*E11+G10*(I\$1-I\$2))/I\$1		21.26	=G11-D11	=ABS(L11-I11)	18.16	18.1588049767235
12	183.291666667	94.1185	121.585	103.315	=D12+H12	=(I\$2*E12+G11*(I\$1-I\$2))/I\$1		20.32	=G12-D12	=ABS(L12-I12)	18.27	18.2671281051142
13	183.333333333	94.7224	121.784	103.464	=D13+H13	=(I\$2*E13+G12*(I\$1-I\$2))/I\$1		19.39	=G13-D13	=ABS(L13-I13)	18.32	18.3200076256199
14	183.375	95.1096	121.813	103.403	=D14+H14	=(I\$2*E14+G13*(I\$1-I\$2))/I\$1		18.57	=G14-D14	=ABS(L14-I14)	18.41	18.4110056860162
15	183.416666667	95.2859	121.703	103.133	=D15+H15	=(I\$2*E15+G14*(I\$1-I\$2))/I\$1		17.96	=G15-D15	=ABS(L15-I15)	18.57	18.5665631208804
16	183.458333333	95.2445	121.451	102.671	=D16+H16	=(I\$2*E16+G15*(I\$1-I\$2))/I\$1		17.45	=G16-D16	=ABS(L16-I16)	18.78	18.7780036368959
17	183.5	95.0577	121.074	102.104	=D17+H17	=(I\$2*E17+G16*(I\$1-I\$2))/I\$1		16.98	=G17-D17	=ABS(L17-I17)	18.97	18.9696153589219
18	183.541666667	94.8666	120.615	101.545	=D18+H18	=(I\$2*E18+G17*(I\$1-I\$2))/I\$1		16.64	=G18-D18	=ABS(L18-I18)	19.07	19.0701161296132
19	183.583333333	94.5514	120.066	100.826	=D19+H19	=(I\$2*E19+G18*(I\$1-I\$2))/I\$1		16.35	=G19-D19	=ABS(L19-I19)	19.24	19.2432379495846
20	183.625	94.2603	119.47	100.14	=D20+H20	=(I\$2*E20+G19*(I\$1-I\$2))/I\$1		16.17	=G20-D20	=ABS(L20-I20)	19.33	19.3325480173827
21	183.666666667	93.9183	119.936	99.4062	=D21+H21	=(I\$2*E21+G20*(I\$1-I\$2))/I\$1		22.29	=G21-D21	=ABS(L21-I21)	20.53	20.5311853302293
22	183.708333333	93.6113	119.531	98.7207	=D22+H22	=(I\$2*E22+G21*(I\$1-I\$2))/I\$1		19.27	=G22-D22	=ABS(L22-I22)	20.81	20.8097457619266
23	183.75	93.2993	118.625	98.0447	=D23+H23	=(I\$2*E23+G22*(I\$1-I\$2))/I\$1		17.13	=G23-D23	=ABS(L23-I23)	20.58	20.5752106731427
24	183.791666667	92.9855	117.441	97.3806	=D24+H24	=(I\$2*E24+G23*(I\$1-I\$2))/I\$1		15.6	=G24-D24	=ABS(L24-I24)	20.06	20.0604562300453
25	183.833333333	92.6697	116.138	96.7276	=D25+H25	=(I\$2*E25+G24*(I\$1-I\$2))/I\$1		14.46	=G25-D25	=ABS(L25-I25)	19.41	19.4062193905123
26	183.875	92.3989	114.84	96.1396	=D26+H26	=(I\$2*E26+G25*(I\$1-I\$2))/I\$1		13.79	=G26-D26	=ABS(L26-I26)	18.7	18.6972751328943
27	183.916666667	92.1258	113.615	95.5546	=D27+H27	=(I\$2*E27+G26*(I\$1-I\$2))/I\$1		13.42	=G27-D27	=ABS(L27-I27)	18.06	18.0568116875153
28	183.958333333	92.0281	112.52	95.1697	=D28+H28	=(I\$2*E28+G27*(I\$1-I\$2))/I\$1		13.22	=G28-D28	=ABS(L28-I28)	17.35	17.3501530945977
29	184	92.1894	111.592	95.0521	=D29+H29	=(I\$2*E29+G28*(I\$1-I\$2))/I\$1		13.05	=G29-D29	=ABS(L29-I29)	16.54	16.54425585071
30	184.041666667	92.5473	110.831	95.1515	=D30+H30	=(I\$2*E30+G29*(I\$1-I\$2))/I\$1		12.8	=G30-D30	=ABS(L30-I30)	15.68	15.6829268201775
31	184.083333333	93.1978	110.308	95.7779	=D31+H31	=(I\$2*E31+G30*(I\$1-I\$2))/I\$1		12.52	=G31-D31	=ABS(L31-I31)	14.53	14.5262854333635
32	184.125	93.9705	109.989	96.5194	=D32+H32	=(I\$2*E32+G31*(I\$1-I\$2))/I\$1		12.27	=G32-D32	=ABS(L32-I32)	13.47	13.4681312105408
33	184.166666667	94.8213	109.869	97.3392	=D33+H33	=(I\$2*E33+G32*(I\$1-I\$2))/I\$1		12.1	=G33-D33	=ABS(L33-I33)	12.53	12.5337067960865
34	184.208333333	95.7017	109.938	98.1883	=D34+H34	=(I\$2*E34+G33*(I\$1-I\$2))/I\$1		11.98	=G34-D34	=ABS(L34-I34)	11.75	11.7463564692429
35	184.25	96.5625	109.55	99.82	=D35+H35	=(I\$2*E35+G34*(I\$1-I\$2))/I\$1		11.88	=G35-D35	=ABS(L35-I35)	10.46	10.4836879316764
36	184.291666667	97.3197	110.187	101.264	=D36+H36	=(I\$2*E36+G35*(I\$1-I\$2))/I\$1		11.79	=G36-D36	=ABS(L36-I36)	9.58	9.61461947731524
37	184.333333333	97.9185	111.083	102.741	=D37+H37	=(I\$2*E37+G36*(I\$1-I\$2))/I\$1		11.71	=G37-D37	=ABS(L37-I37)	8.85	8.88439809897515
38	184.375	98.3195	111.904	104.248	=D38+H38	=(I\$2*E38+G37*(I\$1-I\$2))/I\$1		11.65	=G38-D38	=ABS(L38-I38)	8.22	8.27055260429391
39	184.416666667	98.5568	113.037	104.316	=D39+H39	=(I\$2*E39+G38*(I\$1-I\$2))/I\$1		11.58	=G39-D39	=ABS(L39-I39)	8.86	8.90858195779592
40	184.458333333	98.5639	113.623	104.132	=D40+H40	=(I\$2*E40+G39*(I\$1-I\$2))/I\$1		11.51	=G40-D40	=ABS(L40-I40)	9.55	9.59792457235487
41	184.5	98.412	113.831	104.067	=D41+H41	=(I\$2*E41+G40*(I\$1-I\$2))/I\$1		11.45	=G41-D41	=ABS(L41-I41)	9.98	10.0364989203799

Appendix O8.2 - UHS Mixing Results and Equations

0% Mixing Results (partial)

0% Mixing	T Nat	T IN	T OUT	
	(°F)	(°F)	(°F)	Actual Time
7/1/1900 12:00 AM	89.19	127.95	102.00	06:00 AM
7/1/1900 01:00 AM	89.47	133.84	101.64	07:00 AM
7/1/1900 02:00 AM	90.02	136.78	101.62	08:00 AM
7/1/1900 03:00 AM	90.68	137.53	101.73	09:00 AM
7/1/1900 04:00 AM	91.56	127.49	102.13	10:00 AM
7/1/1900 05:00 AM	92.50	125.05	102.62	11:00 AM
7/1/1900 06:00 AM	93.37	124.30	103.04	12:00 PM
7/1/1900 07:00 AM	94.12	123.64	103.32	01:00 PM
7/1/1900 08:00 AM	94.72	122.85	103.46	02:00 PM
7/1/1900 09:00 AM	95.11	121.97	103.40	03:00 PM
7/1/1900 10:00 AM	95.28	121.09	103.13	04:00 PM
7/1/1900 11:00 AM	95.24	120.12	102.67	05:00 PM
7/1/1900 12:00 PM	95.06	119.08	102.10	06:00 PM
7/1/1900 01:00 PM	94.87	118.19	101.55	07:00 PM
7/1/1900 02:00 PM	94.55	117.18	100.83	08:00 PM
7/1/1900 03:00 PM	94.26	116.31	100.14	09:00 PM
7/1/1900 04:00 PM	93.92	121.70	99.41	10:00 PM
7/1/1900 05:00 PM	93.61	117.99	98.72	11:00 PM
7/1/1900 06:00 PM	93.30	115.17	98.04	12:00 AM
7/1/1900 07:00 PM	92.98	112.98	97.38	01:00 AM
7/1/1900 08:00 PM	92.67	111.19	96.73	02:00 AM
7/1/1900 09:00 PM	92.40	109.93	96.14	03:00 AM
7/1/1900 10:00 PM	92.12	108.97	95.55	04:00 AM
7/1/1900 11:00 PM	92.03	108.39	95.17	05:00 AM
7/2/1900 12:00 AM	92.19	108.10	95.05	06:00 AM
7/2/1900 01:00 AM	92.55	107.95	95.15	07:00 AM
7/2/1900 02:00 AM	93.20	108.30	95.78	08:00 AM
7/2/1900 03:00 AM	93.97	108.79	96.52	09:00 AM
7/2/1900 04:00 AM	94.82	109.44	97.34	10:00 AM
7/2/1900 05:00 AM	95.70	110.17	98.19	11:00 AM
7/2/1900 06:00 AM	96.56	110.90	99.02	12:00 PM
7/2/1900 07:00 AM	97.32	111.53	99.74	01:00 PM
7/2/1900 08:00 AM	97.92	112.02	100.31	02:00 PM
7/2/1900 09:00 AM	98.32	112.68	104.88	03:00 PM
7/2/1900 10:00 AM	98.56	116.65	105.91	04:00 PM
7/2/1900 11:00 AM	98.56	117.36	106.15	05:00 PM
7/2/1900 12:00 PM	98.41	117.20	104.59	06:00 PM
7/2/1900 01:00 PM	98.21	115.25	103.65	07:00 PM
7/2/1900 02:00 PM	97.96	114.29	102.96	08:00 PM
7/2/1900 03:00 PM	97.58	113.42	102.18	09:00 PM
7/2/1900 04:00 PM	96.94	112.29	101.11	10:00 PM
7/2/1900 05:00 PM	96.35	111.26	100.13	11:00 PM
7/2/1900 06:00 PM	95.83	110.38	99.37	12:00 AM
7/2/1900 07:00 PM	95.38	109.58	98.61	01:00 AM
7/2/1900 08:00 PM	94.99	108.89	97.96	02:00 AM
7/2/1900 09:00 PM	94.47	108.34	98.94	03:00 AM
7/2/1900 10:00 PM	94.04	108.90	97.62	04:00 AM
7/2/1900 11:00 PM	93.81	107.80	96.69	05:00 AM

Appendix O8.2 - UHS Mixing Results and Equations

10% Mixing Results (partial)

10% Mixing	T Nat	T IN	T OUT	Plant Tout	Mix Temp	Vnew=	235080	309600	ft3 /hr	
	(°F)	(°F)	(°F)		(°F)	Plant DT	LAKET DT	Convergence DT	LAKET DT I1	LAKET DT I2
7/1/1900 12:00 AM	89.19	106.12	102.00	127.95	106.12	25.95	4.12	0.00	4.12	4.12
7/1/1900 01:00 AM	89.47	110.52	101.64	133.84	110.52	32.2	8.88	0.00	8.88	8.88
7/1/1900 02:00 AM	90.02	114.69	101.62	136.78	114.69	35.16	13.07	0.00	13.07	13.07
7/1/1900 03:00 AM	90.68	118.32	101.73	137.53	118.31	35.8	16.59	0.00	16.59	16.59
7/1/1900 04:00 AM	91.56	119.77	102.13	127.49	119.77	25.36	17.64	0.00	17.64	17.64
7/1/1900 05:00 AM	92.50	120.61	102.62	125.05	120.61	22.43	17.99	0.00	17.99	17.99
7/1/1900 06:00 AM	93.37	121.20	103.04	124.30	121.19	21.26	18.16	0.00	18.16	18.16
7/1/1900 07:00 AM	94.12	121.59	103.32	123.64	121.58	20.32	18.27	0.00	18.27	18.27
7/1/1900 08:00 AM	94.72	121.78	103.46	122.85	121.78	19.39	18.32	0.00	18.32	18.32
7/1/1900 09:00 AM	95.11	121.81	103.40	121.97	121.81	18.57	18.41	0.00	18.41	18.41
7/1/1900 10:00 AM	95.29	121.70	103.13	121.09	121.70	17.96	18.57	0.00	18.57	18.57
7/1/1900 11:00 AM	95.24	121.45	102.67	120.12	121.45	17.45	18.78	0.00	18.78	18.78
7/1/1900 12:00 PM	95.06	121.07	102.10	119.08	121.07	16.98	18.97	0.00	18.97	18.97
7/1/1900 01:00 PM	94.87	120.62	101.55	118.19	120.62	16.64	19.07	0.00	19.07	19.07
7/1/1900 02:00 PM	94.55	120.07	100.83	117.18	120.07	16.35	19.24	0.00	19.24	19.24
7/1/1900 03:00 PM	94.26	119.47	100.14	116.31	119.47	16.17	19.33	0.00	19.33	19.33
7/1/1900 04:00 PM	93.92	119.94	99.41	121.70	119.94	22.29	20.53	0.00	20.53	20.53
7/1/1900 05:00 PM	93.61	119.53	98.72	117.99	119.53	19.27	20.81	0.00	20.81	20.81
7/1/1900 06:00 PM	93.30	118.63	98.04	115.17	118.62	17.13	20.58	0.00	20.58	20.58
7/1/1900 07:00 PM	92.99	117.44	97.38	112.98	117.44	15.6	20.06	0.00	20.06	20.06
7/1/1900 08:00 PM	92.67	116.14	96.73	111.19	116.13	14.46	19.41	0.00	19.41	19.41
7/1/1900 09:00 PM	92.40	114.84	96.14	109.93	114.84	13.79	18.70	0.00	18.70	18.70
7/1/1900 10:00 PM	92.13	113.62	95.55	108.97	113.61	13.42	18.06	0.00	18.06	18.06
7/1/1900 11:00 PM	92.03	112.52	95.17	108.39	112.52	13.22	17.35	0.00	17.35	17.35
7/2/1900 12:00 AM	92.19	111.59	95.05	108.10	111.60	13.05	16.54	0.00	16.54	16.54
7/2/1900 01:00 AM	92.55	110.83	95.15	107.95	110.83	12.8	15.68	0.00	15.68	15.68
7/2/1900 02:00 AM	93.20	110.31	95.78	108.30	110.30	12.52	14.53	0.00	14.53	14.53
7/2/1900 03:00 AM	93.97	109.99	96.52	108.79	109.99	12.27	13.47	0.00	13.47	13.47
7/2/1900 04:00 AM	94.82	109.87	97.34	109.44	109.87	12.1	12.53	0.00	12.53	12.53
7/2/1900 05:00 AM	95.70	109.94	98.19	110.17	109.93	11.98	11.75	0.00	11.75	11.75
7/2/1900 06:00 AM	96.56	109.55	99.82	111.70	110.30	11.88	10.48	0.00	10.46	10.48
7/2/1900 07:00 AM	97.32	110.19	101.26	113.05	110.88	11.79	9.61	0.00	9.58	9.61
7/2/1900 08:00 AM	97.92	111.08	102.74	114.45	111.63	11.71	8.88	0.00	8.85	8.88
7/2/1900 09:00 AM	98.32	111.90	104.25	115.90	112.52	11.65	8.27	0.00	8.22	8.27
7/2/1900 10:00 AM	98.56	113.04	104.32	115.90	113.22	11.58	8.91	0.00	8.86	8.91
7/2/1900 11:00 AM	98.56	113.62	104.13	115.64	113.73	11.51	9.60	0.00	9.55	9.60
7/2/1900 12:00 PM	98.41	113.83	104.07	115.52	114.10	11.45	10.04	0.00	9.98	10.04
7/2/1900 01:00 PM	98.21	114.13	103.74	115.13	114.32	11.39	10.58	0.00	10.53	10.58
7/2/1900 02:00 PM	97.96	114.26	103.35	114.68	114.39	11.33	11.04	0.00	11.00	11.04
7/2/1900 03:00 PM	97.59	114.06	103.10	114.37	114.39	11.27	11.29	0.00	11.24	11.29
7/2/1900 04:00 PM	96.94	114.00	102.20	113.41	114.18	11.21	11.98	0.00	11.94	11.98
7/2/1900 05:00 PM	96.35	113.71	101.42	112.58	113.85	11.16	12.43	0.00	12.40	12.43
7/2/1900 06:00 PM	95.84	112.93	101.33	112.43	113.55	11.1	12.22	0.00	12.20	12.22
7/2/1900 07:00 PM	95.38	112.85	100.74	111.78	113.18	11.04	12.44	0.00	12.43	12.44
7/2/1900 08:00 PM	94.99	112.55	100.07	111.06	112.74	10.99	12.67	0.00	12.66	12.67
7/2/1900 09:00 PM	94.47	112.08	99.20	110.14	112.20	10.94	12.99	0.00	12.99	12.99
7/2/1900 10:00 PM	94.04	111.52	98.41	109.30	111.59	10.89	13.18	0.00	13.17	13.18
7/2/1900 11:00 PM	93.81	110.94	97.80	108.64	110.97	10.84	13.17	0.00	13.17	13.17

Appendix O8.2 - UHS Mixing Results and Equations

20% Mixing Results (partial)

20% Mixing	T Nat	T IN	T OUT	Plant Tout	Mix Temp	Vnew=	235080	309600	R3/hr	LAKET	LAKET	LAKET
	(°F)	(°F)	(°F)		(°F)	Plant DT	LAKET DT	Convergence DT	DT i1	DT i2	DT i3	
7/1/1900 12:00 AM	89.19	104.06	102.00	127.95	104.06	25.95	2.06	0.00	2.06	2.06	2.06	
7/1/1900 01:00 AM	89.47	107.18	101.64	133.84	107.17	32.2	5.54	0.00	5.54	5.54	5.54	
7/1/1900 02:00 AM	90.02	110.27	101.62	136.78	110.27	35.16	8.65	0.00	8.65	8.65	8.65	
7/1/1900 03:00 AM	90.68	113.12	101.73	137.53	113.12	35.8	11.39	0.00	11.39	11.39	11.39	
7/1/1900 04:00 AM	91.56	114.62	102.13	127.49	114.62	25.36	12.49	0.00	12.49	12.49	12.49	
7/1/1900 05:00 AM	92.50	115.71	102.62	125.05	115.71	22.43	13.09	0.00	13.09	13.09	13.09	
7/1/1900 06:00 AM	93.37	116.61	103.04	124.30	116.61	21.26	13.57	0.00	13.57	13.57	13.57	
7/1/1900 07:00 AM	94.12	117.35	103.32	123.64	117.34	20.32	14.03	0.00	14.03	14.03	14.03	
7/1/1900 08:00 AM	94.72	117.91	103.46	122.85	117.92	19.39	14.45	0.00	14.45	14.45	14.45	
7/1/1900 09:00 AM	95.11	118.34	103.40	121.97	118.34	18.57	14.94	0.00	14.94	14.94	14.94	
7/1/1900 10:00 AM	95.29	118.63	103.13	121.09	118.63	17.96	15.50	0.00	15.50	15.50	15.50	
7/1/1900 11:00 AM	95.24	118.78	102.67	120.12	118.79	17.45	16.11	0.00	16.12	16.11	16.11	
7/1/1900 12:00 PM	95.06	118.81	102.10	119.08	118.82	16.98	16.71	0.00	16.71	16.71	16.71	
7/1/1900 01:00 PM	94.87	118.76	101.55	118.19	118.75	16.64	17.21	0.00	17.21	17.21	17.21	
7/1/1900 02:00 PM	94.55	118.59	100.83	117.18	118.59	16.35	17.76	0.00	17.76	17.76	17.76	
7/1/1900 03:00 PM	94.26	118.35	100.14	116.31	118.35	16.17	18.21	0.00	18.21	18.21	18.21	
7/1/1900 04:00 PM	93.92	118.70	99.41	121.70	118.70	22.29	19.29	0.00	19.29	19.29	19.29	
7/1/1900 05:00 PM	93.61	118.62	98.72	117.99	118.62	19.27	19.90	0.00	19.91	19.90	19.90	
7/1/1900 06:00 PM	93.30	118.27	98.05	115.18	118.26	17.13	20.22	0.00	20.22	20.22	20.22	
7/1/1900 07:00 PM	92.99	117.71	97.38	112.98	117.71	15.6	20.33	0.00	20.33	20.33	20.33	
7/1/1900 08:00 PM	92.67	117.03	96.73	111.19	117.03	14.46	20.30	0.00	20.31	20.30	20.30	
7/1/1900 09:00 PM	92.40	116.29	96.14	109.93	116.29	13.79	20.15	0.00	20.15	20.15	20.15	
7/1/1900 10:00 PM	92.13	115.53	95.56	108.98	115.52	13.42	19.97	0.00	19.97	19.97	19.97	
7/1/1900 11:00 PM	92.03	114.78	95.17	108.39	114.78	13.22	19.61	0.00	19.61	19.61	19.61	
7/2/1900 12:00 AM	92.19	114.08	95.05	108.10	114.08	13.05	19.03	0.00	19.03	19.03	19.03	
7/2/1900 01:00 AM	92.55	113.44	95.15	107.95	113.44	12.8	18.29	0.00	18.10	18.29	18.29	
7/2/1900 02:00 AM	93.20	112.90	95.78	108.30	112.90	12.52	17.12	0.00	16.95	17.12	17.12	
7/2/1900 03:00 AM	93.97	112.01	97.07	109.34	112.53	12.27	15.46	0.00	9.78	15.46	15.46	
7/2/1900 04:00 AM	94.82	111.78	98.71	110.81	112.35	12.1	13.64	0.00	8.24	13.64	13.64	
7/2/1900 05:00 AM	95.70	111.86	100.40	112.38	112.35	11.98	11.95	0.00	7.47	11.95	11.95	
7/2/1900 06:00 AM	96.56	111.90	102.41	114.29	112.56	11.88	10.15	0.00	8.72	10.15	10.15	
7/2/1900 07:00 AM	97.32	112.56	103.10	114.89	112.80	11.79	9.70	0.00	9.21	9.70	9.70	
7/2/1900 08:00 AM	97.92	112.91	103.59	115.30	113.06	11.71	9.47	0.00	9.42	9.47	9.47	
7/2/1900 09:00 AM	98.32	112.97	104.23	115.88	113.36	11.65	9.13	0.00	9.69	9.13	9.13	
7/2/1900 10:00 AM	98.56	113.36	104.40	115.98	113.63	11.58	9.23	0.00	10.07	9.23	9.23	
7/2/1900 11:00 AM	98.56	113.69	104.37	115.88	113.86	11.51	9.50	0.00	10.55	9.50	9.50	
7/2/1900 12:00 PM	98.41	113.61	104.66	116.11	114.10	11.45	9.44	0.00	10.98	9.44	9.44	
7/2/1900 01:00 PM	98.21	114.00	104.45	115.84	114.28	11.39	9.83	0.00	11.45	9.83	9.83	
7/2/1900 02:00 PM	97.96	114.20	104.21	115.54	114.41	11.33	10.20	0.00	11.91	10.20	10.20	
7/2/1900 03:00 PM	97.59	113.83	104.42	115.69	114.55	11.27	10.13	0.00	10.38	10.13	10.13	
7/2/1900 04:00 PM	96.94	114.11	103.69	114.90	114.58	11.21	10.89	0.00	12.17	10.89	10.89	
7/2/1900 05:00 PM	96.35	114.14	102.92	114.08	114.53	11.16	11.61	0.00	13.48	11.62	11.61	
7/2/1900 06:00 PM	95.83	114.08	102.19	113.29	114.40	11.1	12.21	0.00	14.38	12.21	12.21	
7/2/1900 07:00 PM	95.38	113.94	101.49	112.53	114.21	11.04	12.71	0.00	15.00	12.71	12.71	
7/2/1900 08:00 PM	94.99	113.75	100.81	111.80	113.95	10.99	13.14	0.00	15.36	13.14	13.14	
7/2/1900 09:00 PM	94.47	113.45	100.00	110.94	113.64	10.94	13.64	0.00	15.69	13.64	13.64	
7/2/1900 10:00 PM	94.03	113.13	99.26	110.15	113.27	10.89	14.02	0.00	15.81	14.02	14.02	
7/2/1900 11:00 PM	93.81	112.81	98.65	109.49	112.88	10.84	14.22	0.00	15.71	14.22	14.22	

Appendix O8.2 - UHS Mixing Results and Equations

10% - 9AM Mixing Results (partial)

10% Mixing -9AM	T Nat	T IN	T OUT	Plant Tout	Mix Temp	Vnew=	235080	309600	ft3 /hr	LAKET	LAKET
	(°F)	(°F)	(°F)		(°F)	Plant DT	LAKET DT	Convergence DT	DT i1	DT i2	
7/1/1900 12:00 AM	89.81	107.31	103.19	129.14	107.31	25.95	4.12	0.00	4.12	4.12	
7/1/1900 01:00 AM	90.70	111.82	103.54	135.74	111.83	32.2	8.28	0.00	8.88	8.28	
7/1/1900 02:00 AM	91.65	116.17	103.99	139.15	116.16	35.16	12.18	0.00	13.07	12.18	
7/1/1900 03:00 AM	92.53	119.97	104.35	140.15	119.97	35.8	15.62	0.00	16.59	15.62	
7/1/1900 04:00 AM	93.29	121.55	104.57	129.93	121.55	25.36	16.98	0.00	17.64	16.98	
7/1/1900 05:00 AM	93.90	122.43	104.67	127.10	122.43	22.43	17.76	0.00	17.99	17.76	
7/1/1900 06:00 AM	94.30	122.97	104.56	125.82	122.97	21.26	18.41	0.00	18.16	18.41	
7/1/1900 07:00 AM	94.49	123.23	104.25	124.57	123.22	20.32	18.98	0.00	18.27	18.98	
7/1/1900 08:00 AM	94.46	123.21	103.74	123.13	123.21	19.39	19.47	0.00	18.32	19.47	
7/1/1900 09:00 AM	94.28	122.97	103.13	121.70	122.97	18.57	19.84	0.00	18.41	19.84	
7/1/1900 10:00 AM	94.10	122.58	102.54	120.50	122.58	17.96	20.04	0.00	18.57	20.04	
7/1/1900 11:00 AM	93.80	122.05	101.78	119.23	122.05	17.45	20.27	0.00	18.78	20.27	
7/1/1900 12:00 PM	93.52	121.41	101.06	118.04	121.41	16.98	20.35	0.00	18.97	20.35	
7/1/1900 01:00 PM	93.19	120.70	100.29	116.93	120.70	16.64	20.41	0.00	19.07	20.41	
7/1/1900 02:00 PM	92.89	119.94	99.57	115.92	119.94	16.35	20.37	0.00	19.24	20.37	
7/1/1900 03:00 PM	92.59	119.16	98.86	115.03	119.16	16.17	20.30	0.00	19.33	20.30	
7/1/1900 04:00 PM	92.29	119.43	98.17	120.46	119.43	22.29	21.26	0.00	20.53	21.26	
7/1/1900 05:00 PM	91.98	118.87	97.49	116.76	118.87	19.27	21.38	0.00	20.81	21.38	
7/1/1900 06:00 PM	91.72	117.86	96.88	114.01	117.86	17.13	20.98	0.00	20.58	20.98	
7/1/1900 07:00 PM	91.46	116.60	96.27	111.87	116.61	15.6	20.33	0.00	20.06	20.33	
7/1/1900 08:00 PM	91.37	115.29	95.86	110.32	115.29	14.46	19.43	0.00	19.41	19.43	
7/1/1900 09:00 PM	91.54	114.08	95.72	109.51	114.08	13.79	18.36	0.00	18.70	18.36	
7/1/1900 10:00 PM	91.90	113.07	95.80	109.22	113.07	13.42	17.27	0.00	18.06	17.27	
7/1/1900 11:00 PM	92.56	112.31	96.21	109.43	112.31	13.22	16.10	0.00	17.35	16.10	
7/2/1900 12:00 AM	93.34	111.79	96.75	109.80	111.78	13.05	15.04	0.00	16.54	15.04	
7/2/1900 01:00 AM	94.19	111.45	97.36	110.16	111.44	12.8	14.09	0.00	15.68	14.09	
7/2/1900 02:00 AM	95.08	111.29	98.20	110.72	111.29	12.52	13.09	0.00	14.53	13.09	
7/2/1900 03:00 AM	95.95	111.29	99.03	111.30	111.29	12.27	12.26	0.00	13.47	12.26	
7/2/1900 04:00 AM	96.71	111.42	99.76	111.86	111.41	12.1	11.66	0.00	12.53	11.66	
7/2/1900 05:00 AM	97.32	111.60	100.32	112.30	111.60	11.98	11.28	0.00	11.75	11.28	
7/2/1900 06:00 AM	97.73	111.45	100.81	112.69	111.83	11.88	11.02	0.00	10.48	11.02	
7/2/1900 07:00 AM	97.97	111.22	101.99	113.78	112.24	11.79	10.24	0.13	9.61	10.11	
7/2/1900 08:00 AM	97.98	112.05	102.79	114.50	112.71	11.71	9.92	0.15	8.88	9.77	
7/2/1900 09:00 AM	97.83	112.52	103.82	115.47	113.29	11.65	9.46	0.07	8.27	9.40	
7/2/1900 10:00 AM	97.64	113.44	103.63	115.21	113.69	11.58	10.05	0.03	8.91	10.08	
7/2/1900 11:00 AM	97.40	113.88	103.35	114.86	113.93	11.51	10.58	0.12	9.60	10.70	
7/2/1900 12:00 PM	97.03	113.94	103.26	114.71	114.10	11.45	10.83	0.28	10.04	11.11	
7/2/1900 01:00 PM	96.40	114.08	102.43	113.82	114.04	11.39	11.61	0.27	10.58	11.88	
7/2/1900 02:00 PM	95.83	113.90	101.60	112.93	113.81	11.33	12.21	0.22	11.04	12.43	
7/2/1900 03:00 PM	95.32	113.36	101.23	112.50	113.53	11.27	12.31	0.17	11.29	12.47	
7/2/1900 04:00 PM	94.88	113.09	100.59	111.80	113.17	11.21	12.58	0.13	11.98	12.71	
7/2/1900 05:00 PM	94.49	112.69	99.97	111.13	112.74	11.16	12.77	0.06	12.43	12.83	
7/2/1900 06:00 PM	93.99	111.78	99.77	110.87	112.35	11.1	12.59	0.03	12.22	12.55	
7/2/1900 07:00 PM	93.56	111.56	99.18	110.22	111.91	11.04	12.72	0.06	12.44	12.66	
7/2/1900 08:00 PM	93.35	111.22	98.66	109.65	111.44	10.99	12.77	0.08	12.67	12.69	
7/2/1900 09:00 PM	93.37	110.82	98.32	109.26	110.98	10.94	12.66	0.09	12.99	12.57	
7/2/1900 10:00 PM	93.57	110.43	98.10	108.99	110.56	10.89	12.47	0.13	13.18	12.34	
7/2/1900 11:00 PM	93.97	110.09	98.03	108.87	110.21	10.84	12.18	0.18	13.17	12.00	

Appendix O8.2 - UHS Mixing Results and Equations

20% - 12PM Mixing Results (partial)

20% Mixing - 12AM	T Nat	T IN	T OUT	Plant Tout	Mix Temp	Vnew=	235080	309600	f3/hr	LAKET	LAKET	LAKET
	(°F)	(°F)	(°F)		(°F)	Plant DT	LAKET DT	Convergence DT		DT i1	DT i2	DT i3
7/1/1900 12:00 AM	90.05	106.81	104.75	130.70	106.81	25.95	2.06	0.00		2.06	2.06	2.06
7/1/1900 01:00 AM	90.84	109.98	104.96	137.16	109.98	32.2	5.02	0.00		5.54	5.02	5.02
7/1/1900 02:00 AM	91.48	113.15	105.05	140.21	113.14	35.16	8.10	0.00		8.65	8.10	8.10
7/1/1900 03:00 AM	91.91	116.02	104.92	140.72	116.03	35.8	11.10	0.00		11.39	11.10	11.10
7/1/1900 04:00 AM	92.14	117.48	104.59	129.95	117.48	25.36	12.89	0.00		12.49	12.89	12.89
7/1/1900 05:00 AM	92.14	118.42	104.07	126.50	118.42	22.43	14.35	0.00		13.09	14.35	14.35
7/1/1900 06:00 AM	91.99	119.08	103.45	124.71	119.08	21.26	15.63	0.00		13.57	15.63	15.63
7/1/1900 07:00 AM	91.84	119.51	102.85	123.17	119.51	20.32	16.66	0.00		14.03	16.66	16.66
7/1/1900 08:00 AM	91.58	119.72	102.08	121.47	119.71	19.39	17.64	0.00		14.45	17.64	17.64
7/1/1900 09:00 AM	91.33	119.73	101.34	119.91	119.73	18.57	18.39	0.00		14.94	18.39	18.39
7/1/1900 10:00 AM	91.04	119.60	100.56	118.52	119.61	17.96	19.04	0.00		15.50	19.04	19.04
7/1/1900 11:00 AM	90.77	119.37	99.84	117.29	119.36	17.45	19.53	0.00		16.11	19.53	19.53
7/1/1900 12:00 PM	90.50	119.02	99.12	116.10	119.02	16.98	19.90	0.00		16.71	19.90	19.90
7/1/1900 01:00 PM	90.23	118.61	98.42	115.06	118.61	16.64	20.19	0.00		17.21	20.19	20.19
7/1/1900 02:00 PM	89.95	118.13	97.73	114.08	118.14	16.35	20.40	0.00		17.76	20.40	20.40
7/1/1900 03:00 PM	89.71	117.63	97.11	113.28	117.63	16.17	20.52	0.00		18.21	20.52	20.52
7/1/1900 04:00 PM	89.47	117.75	96.50	118.79	117.75	22.29	21.25	0.00		19.29	21.25	21.25
7/1/1900 05:00 PM	89.41	117.50	96.08	115.35	117.50	19.27	21.42	0.00		19.90	21.42	21.42
7/1/1900 06:00 PM	89.60	117.04	95.94	113.07	117.04	17.13	21.10	0.00		20.22	21.10	21.10
7/1/1900 07:00 PM	89.99	116.47	96.01	111.61	116.47	15.6	20.46	0.00		20.33	20.46	20.46
7/1/1900 08:00 PM	90.67	115.88	96.41	110.87	115.88	14.46	19.47	0.00		20.30	19.47	19.47
7/1/1900 09:00 PM	91.46	115.35	96.94	110.73	115.35	13.79	18.41	0.00		20.15	18.41	18.41
7/1/1900 10:00 PM	92.34	114.88	97.54	110.96	114.89	13.42	17.34	0.00		19.97	17.35	17.34
7/1/1900 11:00 PM	93.25	114.52	98.17	111.39	114.52	13.22	16.35	0.00		19.61	16.35	16.35
7/2/1900 12:00 AM	94.14	114.24	98.77	111.82	114.24	13.05	15.47	0.00		19.03	15.47	15.47
7/2/1900 01:00 AM	94.92	114.01	99.24	112.04	114.01	12.8	14.77	0.00		18.29	14.77	14.77
7/2/1900 02:00 AM	95.55	113.80	99.54	112.06	113.81	12.52	14.26	0.00		17.12	14.27	14.26
7/2/1900 03:00 AM	95.98	112.97	100.40	112.67	113.69	12.27	13.29	0.00		15.46	13.29	13.29
7/2/1900 04:00 AM	96.24	112.91	101.39	113.49	113.67	12.1	12.28	0.00		13.64	12.12	12.28
7/2/1900 05:00 AM	96.27	113.22	102.14	114.12	113.71	11.98	11.57	0.00		11.95	11.43	11.57
7/2/1900 06:00 AM	96.13	112.95	103.45	115.33	113.88	11.88	10.43	0.00		10.15	10.58	10.43
7/2/1900 07:00 AM	95.96	113.57	103.52	115.31	114.03	11.79	10.51	0.00		9.70	10.87	10.51
7/2/1900 08:00 AM	95.73	113.88	103.44	115.15	114.15	11.71	10.71	0.00		9.47	11.25	10.71
7/2/1900 09:00 AM	95.40	113.62	103.68	115.33	114.27	11.65	10.60	0.00		9.13	11.41	10.60
7/2/1900 10:00 AM	94.81	113.96	102.97	114.55	114.30	11.58	11.33	0.00		9.23	12.11	11.33
7/2/1900 11:00 AM	94.27	114.03	102.31	113.82	114.25	11.51	11.94	0.00		9.50	12.65	11.94
7/2/1900 12:00 PM	93.80	113.71	102.10	113.55	114.18	11.45	12.08	0.00		9.44	12.64	12.08
7/2/1900 01:00 PM	93.39	113.77	101.50	112.89	114.04	11.39	12.54	0.00		9.83	12.99	12.54
7/2/1900 02:00 PM	93.02	113.69	100.94	112.27	113.86	11.33	12.91	0.00		10.20	13.21	12.91
7/2/1900 03:00 PM	92.55	113.12	100.72	111.99	113.66	11.27	12.94	0.00		10.13	13.03	12.94
7/2/1900 04:00 PM	92.15	113.09	100.14	111.35	113.42	11.21	13.28	0.00		10.89	13.23	13.28
7/2/1900 05:00 PM	91.96	112.97	99.62	110.78	113.14	11.16	13.53	0.00		11.61	13.31	13.53
7/2/1900 06:00 PM	92.00	112.76	99.26	110.36	112.85	11.1	13.60	0.00		12.21	13.19	13.60
7/2/1900 07:00 PM	92.23	112.61	98.93	109.97	112.55	11.04	13.63	0.00		12.71	13.00	13.63
7/2/1900 08:00 PM	92.66	112.34	98.82	109.81	112.26	10.99	13.45	0.00		13.14	12.63	13.45
7/2/1900 09:00 PM	93.27	112.10	98.91	109.85	112.01	10.94	13.10	0.00		13.64	12.11	13.10
7/2/1900 10:00 PM	93.94	111.87	99.08	109.97	111.80	10.89	12.72	0.00		14.02	11.65	12.72
7/2/1900 11:00 PM	94.66	111.68	99.36	110.20	111.63	10.84	12.27	0.00		14.22	11.22	12.27

Appendix O8.2 - UHS Mixing Results and Equations

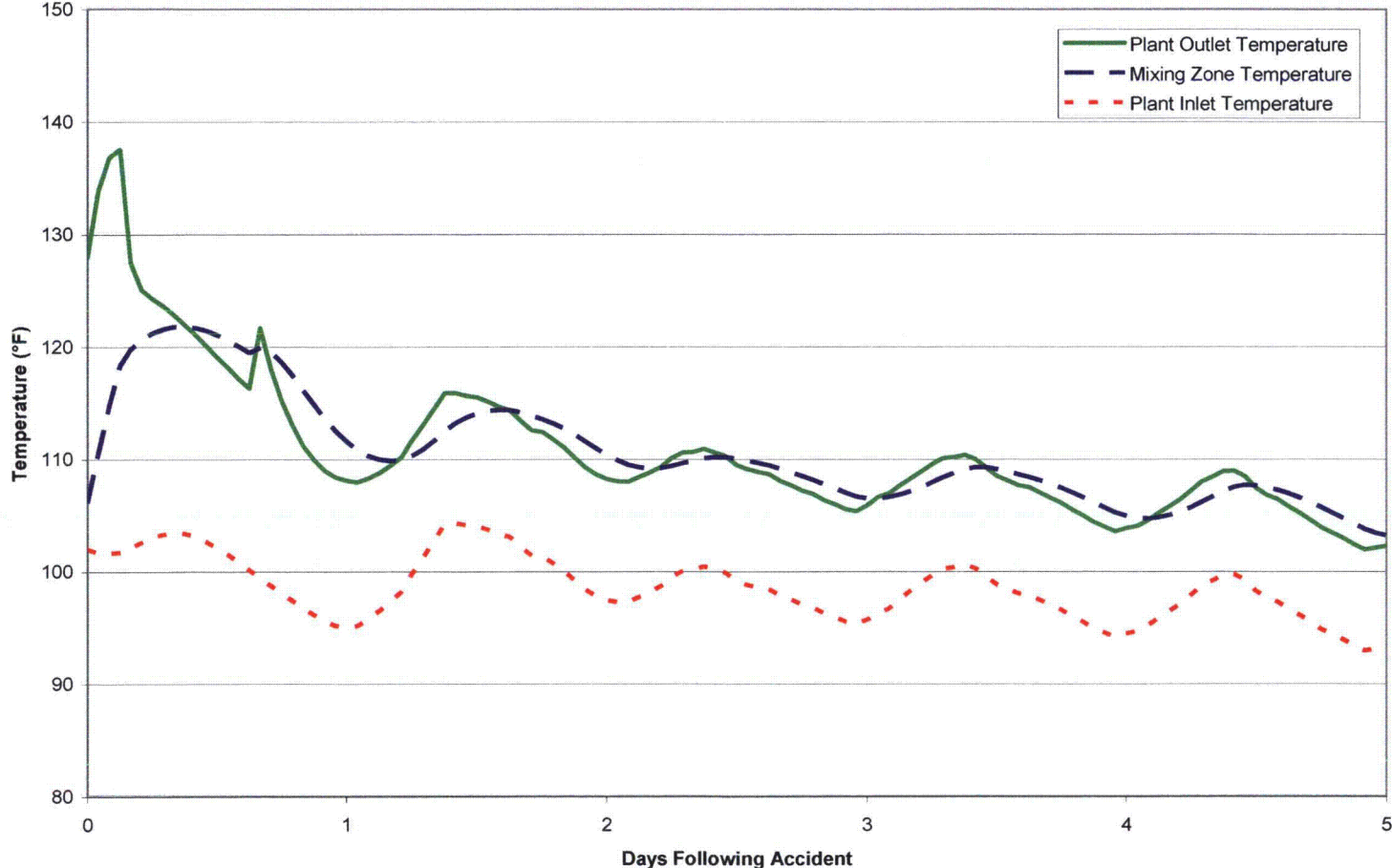


Fig. O8.2-1: Five Day Temperature Profile for the 10% Mixing Case

Appendix O8.2 - UHS Mixing Results and Equations

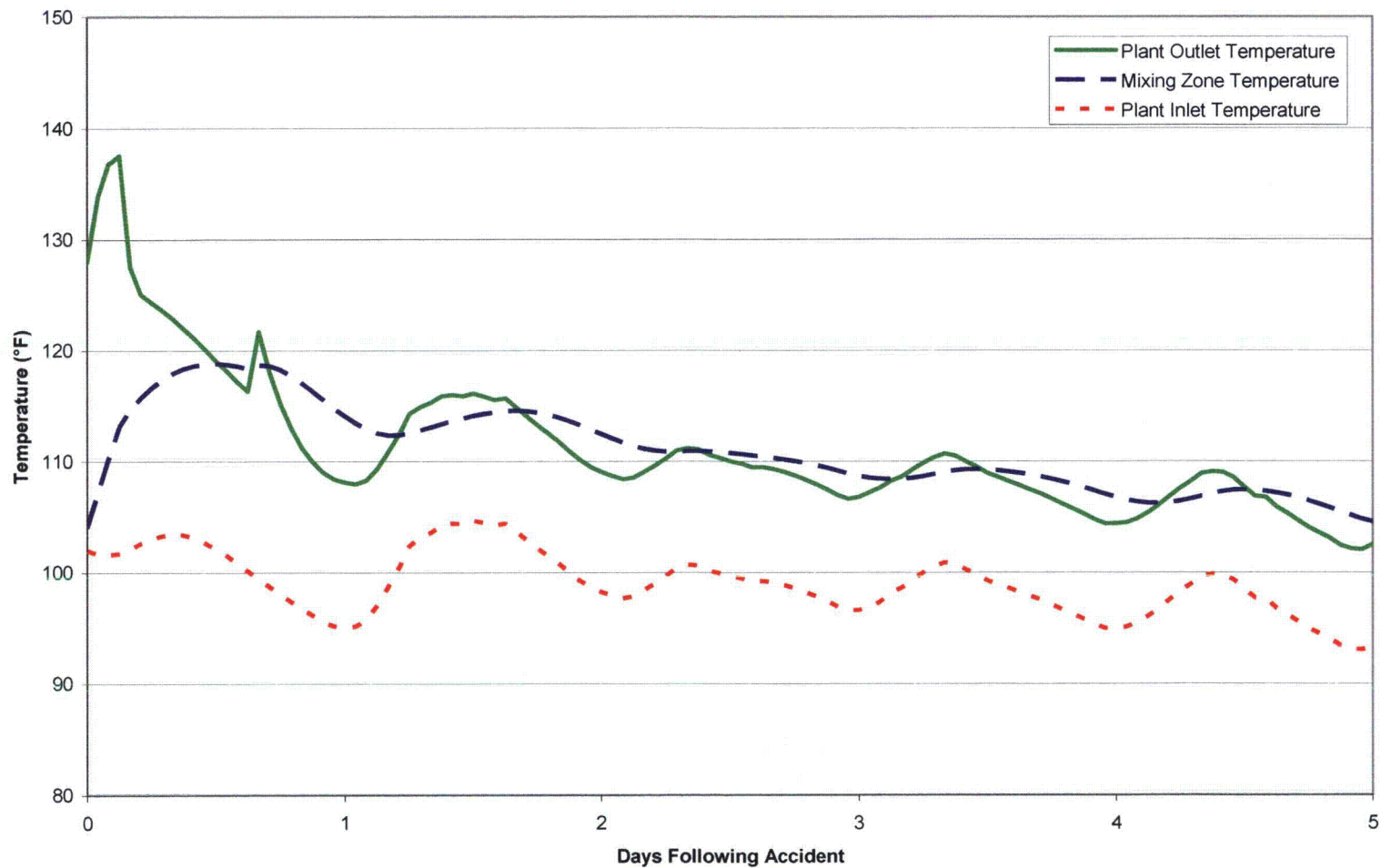


Fig. O8.2-2: Five Day Temperature Profile for the 20% Mixing Case

Appendix O8.2 - UHS Mixing Results and Equations

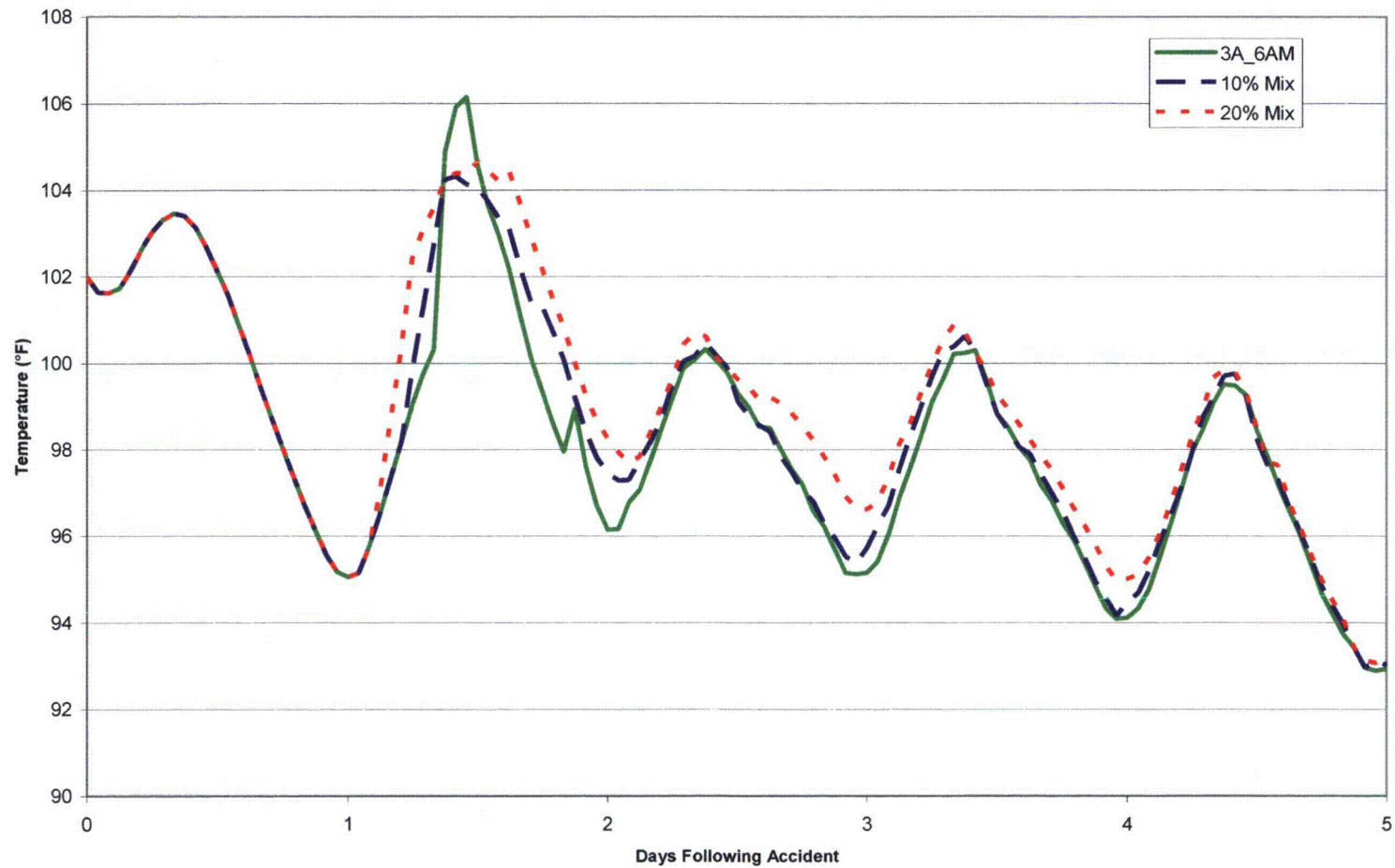


Fig. O8.2-3: Plant Inlet Temperature for 6AM Cases

Appendix O8.2 - UHS Mixing Results and Equations

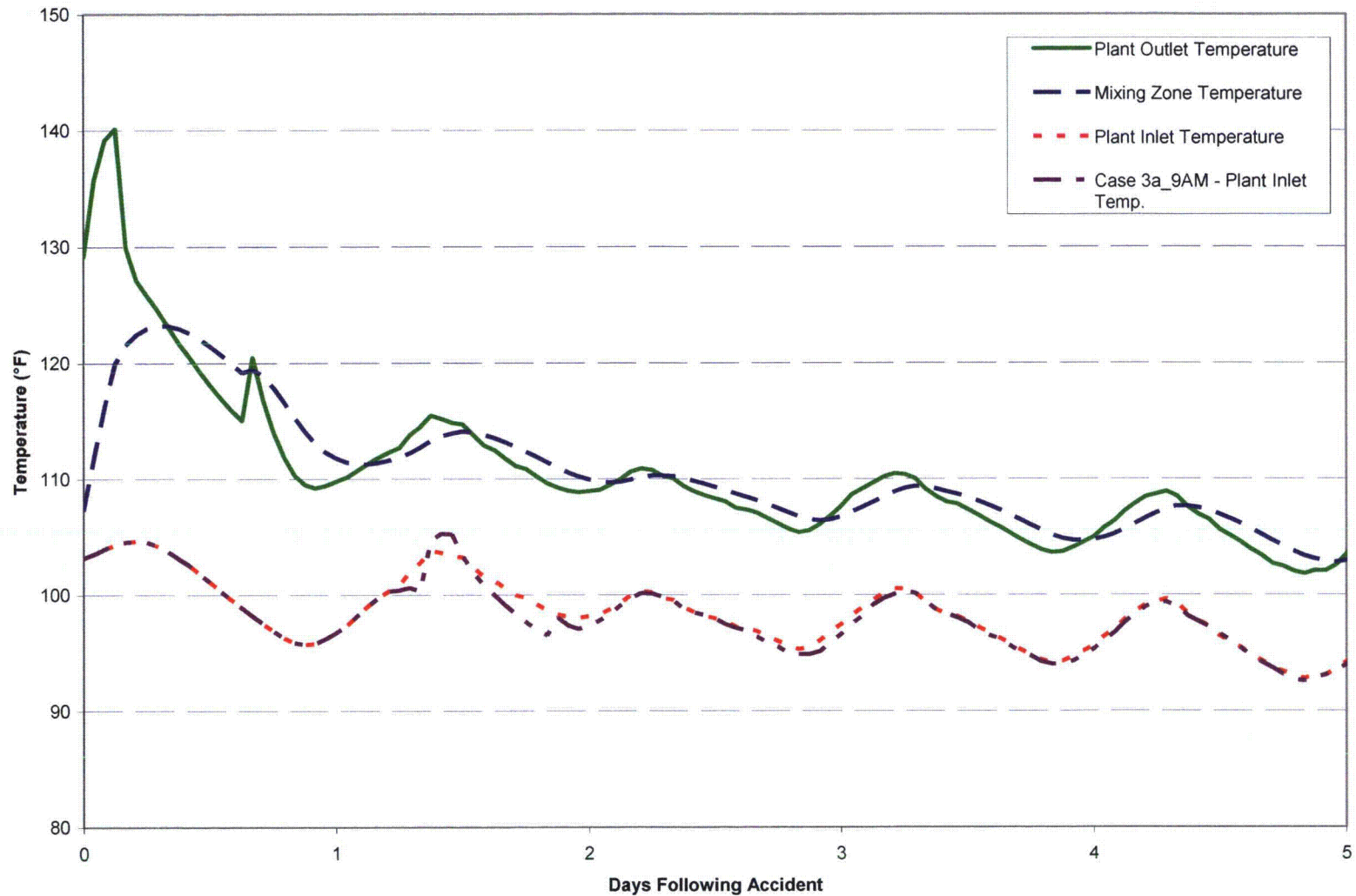


Fig. O8.2-4: Case Mixing - 10% - 9AM Results

Appendix O8.2 - UHS Mixing Results and Equations

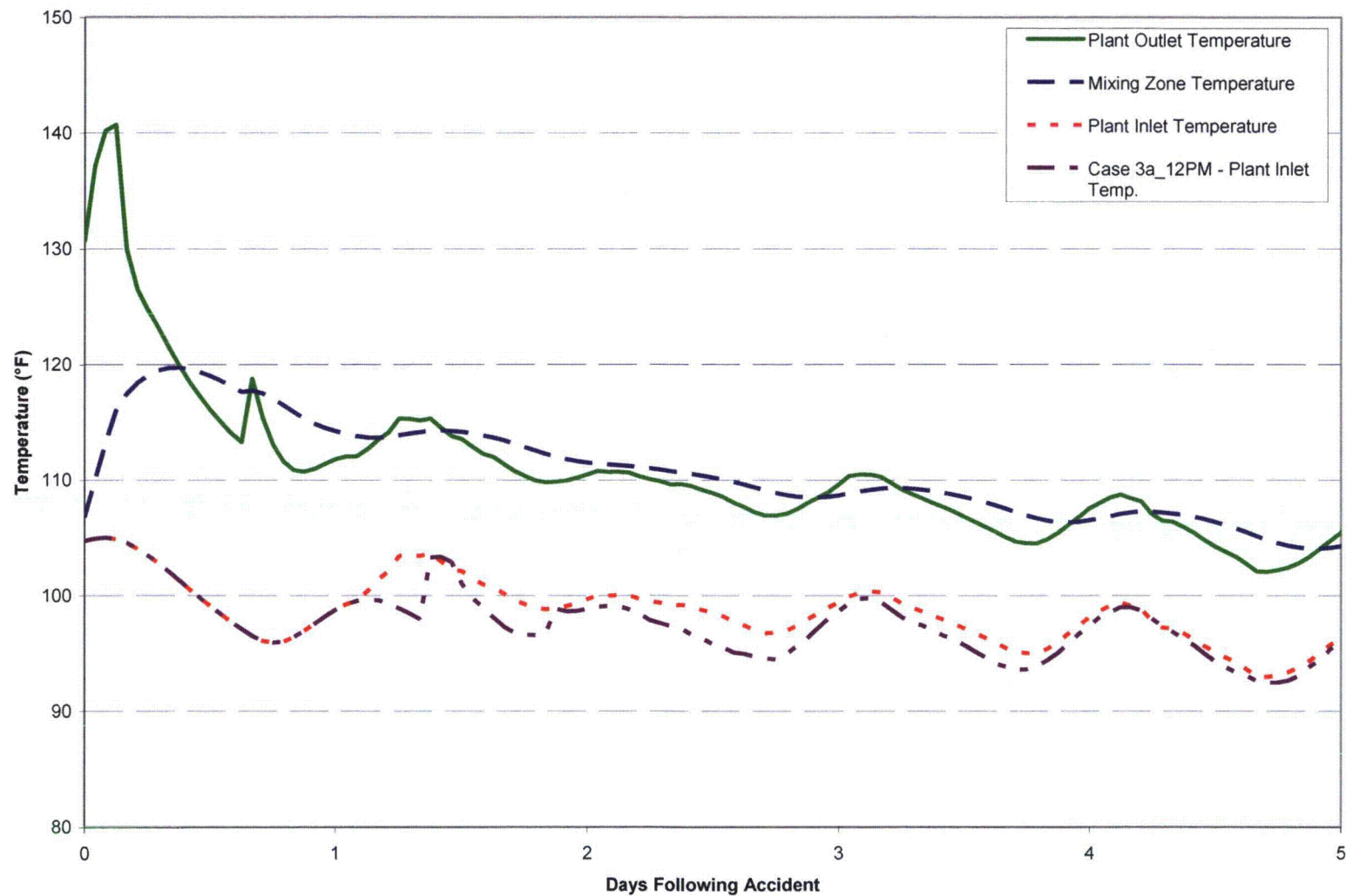


Fig. O8.2-5: Case Mixing - 20% - 12PM Results

Attachment P - Plant Temperature Rise for Rev. 8

Prepared: Daniel W. Nevill Date 9/24/2013
Daniel W. Nevill - Sargent & Lundy^{LLC}

Reviewed: [Signature] Date 9/24/13
Stephen J. Paarberg - Sargent & Lundy^{LLC}

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P1.0 PURPOSE

The purpose of this attachment is to determine the Core Standby Cooling System (CSCS) temperature rise across the plant based on the new heat load to the Ultimate Heat Sink (UHS) determined in Revision 4 of L-002453 [Ref. P5.1]. This temperature rise is to be used in the LAKET-PC [Ref. P5.3] model of the LaSalle County Station UHS.

P2.0 METHODOLOGY

The plant temperature rise is used in LAKET-PC [Ref. P5.3] to compute the rise in water temperature caused by the heat rejected to the UHS during the postulated accident.

The total heat load rejected to the UHS is determined in Attachment D of L-002453 [Ref. P5.1]. The heat rejection rate is determined for an operating scenario that would maximize the heat load to the UHS. This scenario considers a Design Basis Loss of Coolant Accident (LOCA) on one unit and a reactor SCRAM on the non-LOCA unit coincident with a UHS design event (loss of the cooling lake) occurring 100 days after refueling of the non-LOCA unit. Both Residual Heat Removal (RHR) heat exchangers are in service to remove reactor heat on the LOCA unit. For the non-LOCA unit, one RHR heat exchanger is placed into suppression pool cooling mode (and later shutdown cooling mode), while the other RHR heat exchanger is placed into fuel pool cooling assist mode 16 hours after the initiation of the event.

Once the total heat load rejected to the UHS is known, the temperature rise through the plant is determined by the following heat transfer equation:

$$\Delta T = \frac{Q}{c_p m} \quad (\text{Eq. P3-1})$$

where:

ΔT	= plant temperature rise [°F]
Q	= heat rejection rate to the UHS [BTU/hr]
c_p	= specific heat capacity of water [BTU/(lb _m -°F)]
m	= mass flow rate [lb _m /hr]

The mass flow rate is determined by converting the Core Standby Cooling System (CSCS) volumetric flow rates of 65.3 ft³/s and 86.0 ft³/s (Design Input P4.2) to a mass flow rate at a density of 62.0 lb_m/ft³ (Assumption P3.1).

P2.1 Computer Programs and Software

The analysis performed herein utilizes Microsoft Excel® 2003 [Ref. P5.4], which is commercially available. The validation of Excel is implicit in the detailed review of all spreadsheets used in this analysis. All computer runs were performed using PC No. ZD6661 under the Windows XP operating system. Excel Add-in function STMFUNC is used to calculate the thermal properties of water and steam at varying operating conditions [Ref. P5.5]. The Excel Add-in function STMFUNC has been validated and approved for use in accordance with the S&L Quality Assurance (QA) program.

P3.0 ASSUMPTIONS

- P3.1 Water Properties - The properties of water are evaluated at a temperature of 100°F and atmospheric pressure. The density and specific heat capacity of water at 100°F and 1 atm are 62.0 lb_m/ft³ and 0.998 BTU/lb_m-°F, respectively [Ref. P5.5].

P4.0 DESIGN INPUTS

- P4.1 Total Heat Load - The total heat load rejected to the UHS following a LOCA for one unit and a reactor SCRAM for the non-LOCA unit is determined in Attachment D of L-002453 [Ref. P5.1].
- P4.2 CSCS Volumetric Flow - The total plant flow during the UHS analysis is 29,300 GPM (65.3 ft³/s) for the first 16 hours of the event [Ref. P5.2, Attachment C]. The total plant flow is 38,600 gpm (86.0 ft³/s) after 16 hours [Ref. P5.2, Attachment C]. The total flow after 16 hours is based upon the cumulative flow contribution from thirteen CSCS pumps operating at design flow conditions (eight Residual Heat Removal (RHR)-Service Water pumps, 4,000 gpm each; three Diesel Generator (DG) pumps, two at 1,300 gpm and one at 2,000 gpm; and two High Pressure Core Spray DG pumps, 1000 gpm each) (See Attachment D). Prior to 16 hours, two RHR Service Water pumps and one of the 1,300 gpm DG pumps are not in operation [Ref. P5.2, Attachment C].

P5.0 REFERENCES

- P5.1 L-002453, "UHS Heat Load," Rev. 4.
- P5.2 SEAG 13-000074, "LaSalle County Station Transmittal of Design Information (TODI) for UHS Analyses," Rev. 0.
- P5.3 LAKET-PC Computer Program, Version 2.2, S&L Program No. 03.7.292-2.2, 7/31/2013.
- P5.4 Microsoft® Excel 2003, Sargent & Lundy LLC Program No. 03.2.286-1.0, dated 02/02/2004.
- P5.5 STMFUNC (Steam Table Function Dynamic Link Library) S&L Program Number 03.7.598-2.0, dated 5/15/2003.

P6.0 CALCULATIONS

P6.1 Total and Integrated Generated Heat Load Rejected to the UHS

The total heat load rejected to the UHS following a LOCA for one unit and a reactor SCRAM for the non-LOCA unit is determined in Attachment D of L-002453 [Ref. P5.1].

These values are integrated in order to determine the heat load rejected to the UHS over the entire event. The integration uses the average total heat load between the current time step and the preceding time step.

Exceptions to this method occur at two separate time steps. One exception to this method is for the integrated heat load at 16 hours, which is when fuel pool cooling begins. The heat load rejected to the UHS increases at hour 16 due to inclusion of the fuel pool heat load. Therefore, at the 16 hour time step only the UHS heat load from the preceding time step (15.21 hours) is utilized for integration.

The other exception occurs at the 4.13 hour time step. Sensible heat is rejected to the UHS until 3.5 hours (12,600 seconds) after the design basis event [Ref. P5.1]. To account for the sensible heat load rejected to the UHS between the 3.33 hour and 4.13 hour time step, the heat load at 3.33 hours is conservatively used for the UHS heat load integration.

These results are presented in Appendix P9.1 for MUR PU and are used to determine the temperature rise through the plant. The equations used in Excel for this calculation are included in Appendix P9.3.

P6.2 Plant Temperature Rise

In order to facilitate the creation of a LAKET-PC [Ref. P5.3] input file, the plant temperature rise results are determined in one hour increments. This requires linear interpolation of the integrated total generated heat load found in L-002453 [Ref. P5.1] to determine the integrated total generated heat load at hourly intervals. The plant temperature rise is calculated in Excel using Eq. P3-1. The results of this calculation are shown in Appendix P9.2, and equations used in Excel are included in Appendix P9.3.

P7.0 SUMMARY AND CONCLUSIONS

The CSCS temperature rise across the plant following a postulated accident is determined in hourly intervals in order to be used as input to LAKET-PC [Ref. P5.3]. These results are given in Appendix P9.2.

P8.0 LIMITATIONS AND OPEN ITEMS

P8.1 Limitations

None.

P8.2 Open Items

None.

P9.0 APPENDICES**LIST OF APPENDICES**

App.	Title	No. of Pages
P9.1	Integrated UHS Heat Load	27
P9.2	Plant Temperature Rise Results	18
P9.3	Excel Equations	2

(Total Appendix Pages – 47)

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
0.000E+00	0.00	1.97E+04	7.10E+07	0.00E+00
6.000E+01	0.02	6.32E+04	2.28E+08	2.49E+06
1.200E+02	0.03	7.64E+04	2.75E+08	6.68E+06
1.800E+02	0.05	7.75E+04	2.79E+08	1.13E+07
2.400E+02	0.07	7.85E+04	2.83E+08	1.60E+07
3.000E+02	0.08	7.95E+04	2.86E+08	2.07E+07
3.600E+02	0.10	8.05E+04	2.90E+08	2.55E+07
4.200E+02	0.12	8.15E+04	2.93E+08	3.04E+07
4.800E+02	0.13	8.24E+04	2.97E+08	3.53E+07
5.400E+02	0.15	9.54E+04	3.44E+08	4.06E+07
6.000E+02	0.17	9.63E+04	3.47E+08	4.64E+07
3.451E+03	0.96	1.23E+05	4.42E+08	3.59E+08
6.301E+03	1.75	1.31E+05	4.73E+08	7.21E+08
9.152E+03	2.54	1.47E+05	5.29E+08	1.12E+09
1.200E+04	3.33	1.44E+05	5.19E+08	1.53E+09
1.485E+04	4.13	9.98E+04	3.59E+08	1.94E+09
1.770E+04	4.92	9.42E+04	3.39E+08	2.22E+09
2.055E+04	5.71	8.95E+04	3.22E+08	2.48E+09
2.340E+04	6.50	8.57E+04	3.09E+08	2.73E+09
2.626E+04	7.29	8.26E+04	2.97E+08	2.97E+09
2.911E+04	8.09	7.99E+04	2.88E+08	3.20E+09
3.196E+04	8.88	7.69E+04	2.77E+08	3.43E+09
3.481E+04	9.67	7.46E+04	2.68E+08	3.64E+09
3.766E+04	10.46	7.26E+04	2.61E+08	3.85E+09
4.051E+04	11.25	7.08E+04	2.55E+08	4.06E+09
4.336E+04	12.04	6.94E+04	2.50E+08	4.26E+09
4.621E+04	12.84	6.81E+04	2.45E+08	4.45E+09
4.906E+04	13.63	6.71E+04	2.41E+08	4.64E+09
5.191E+04	14.42	6.61E+04	2.38E+08	4.83E+09
5.476E+04	15.21	6.53E+04	2.35E+08	5.02E+09
5.761E+04	16.00	1.30E+05	4.69E+08	5.21E+09
6.046E+04	16.79	1.13E+05	4.08E+08	5.56E+09
6.331E+04	17.59	1.01E+05	3.63E+08	5.86E+09
6.616E+04	18.38	9.16E+04	3.30E+08	6.13E+09
6.901E+04	19.17	8.47E+04	3.05E+08	6.39E+09
7.186E+04	19.96	7.97E+04	2.87E+08	6.62E+09
7.472E+04	20.76	7.59E+04	2.73E+08	6.84E+09

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
7.757E+04	21.55	7.30E+04	2.63E+08	7.05E+09
8.042E+04	22.34	7.13E+04	2.57E+08	7.26E+09
8.327E+04	23.13	7.06E+04	2.54E+08	7.46E+09
8.612E+04	23.92	7.00E+04	2.52E+08	7.66E+09
8.897E+04	24.71	6.94E+04	2.50E+08	7.86E+09
9.182E+04	25.51	6.81E+04	2.45E+08	8.06E+09
9.467E+04	26.30	6.68E+04	2.40E+08	8.25E+09
9.752E+04	27.09	6.57E+04	2.37E+08	8.44E+09
1.004E+05	27.89	6.49E+04	2.34E+08	8.63E+09
1.032E+05	28.67	6.43E+04	2.31E+08	8.81E+09
1.061E+05	29.47	6.37E+04	2.29E+08	8.99E+09
1.089E+05	30.25	6.33E+04	2.28E+08	9.17E+09
1.118E+05	31.06	6.29E+04	2.27E+08	9.35E+09
1.146E+05	31.83	6.26E+04	2.25E+08	9.53E+09
1.175E+05	32.64	6.23E+04	2.24E+08	9.71E+09
1.203E+05	33.42	6.20E+04	2.23E+08	9.88E+09
1.232E+05	34.22	6.17E+04	2.22E+08	1.01E+10
1.260E+05	35.00	6.14E+04	2.21E+08	1.02E+10
1.289E+05	35.81	6.12E+04	2.20E+08	1.04E+10
1.317E+05	36.58	6.09E+04	2.19E+08	1.06E+10
1.346E+05	37.39	6.07E+04	2.18E+08	1.08E+10
1.374E+05	38.17	6.04E+04	2.17E+08	1.09E+10
1.403E+05	38.97	6.02E+04	2.17E+08	1.11E+10
1.431E+05	39.75	5.99E+04	2.16E+08	1.13E+10
1.460E+05	40.56	5.97E+04	2.15E+08	1.14E+10
1.488E+05	41.33	5.94E+04	2.14E+08	1.16E+10
1.517E+05	42.14	5.92E+04	2.13E+08	1.18E+10
1.545E+05	42.92	5.89E+04	2.12E+08	1.20E+10
1.574E+05	43.72	5.87E+04	2.11E+08	1.21E+10
1.602E+05	44.50	5.85E+04	2.11E+08	1.23E+10
1.631E+05	45.31	5.83E+04	2.10E+08	1.25E+10
1.659E+05	46.08	5.80E+04	2.09E+08	1.26E+10
1.688E+05	46.89	5.78E+04	2.08E+08	1.28E+10
1.716E+05	47.67	5.76E+04	2.07E+08	1.29E+10
1.745E+05	48.47	5.74E+04	2.07E+08	1.31E+10
1.773E+05	49.25	5.73E+04	2.06E+08	1.33E+10
1.802E+05	50.06	5.71E+04	2.06E+08	1.34E+10
1.830E+05	50.83	5.69E+04	2.05E+08	1.36E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.859E+05	51.64	5.68E+04	2.04E+08	1.38E+10
1.887E+05	52.42	5.66E+04	2.04E+08	1.39E+10
1.916E+05	53.22	5.65E+04	2.03E+08	1.41E+10
1.944E+05	54.00	5.63E+04	2.03E+08	1.42E+10
1.973E+05	54.81	5.62E+04	2.02E+08	1.44E+10
2.001E+05	55.58	5.60E+04	2.02E+08	1.46E+10
2.030E+05	56.39	5.58E+04	2.01E+08	1.47E+10
2.058E+05	57.17	5.57E+04	2.00E+08	1.49E+10
2.087E+05	57.97	5.56E+04	2.00E+08	1.50E+10
2.115E+05	58.75	5.54E+04	1.99E+08	1.52E+10
2.144E+05	59.56	5.53E+04	1.99E+08	1.54E+10
2.172E+05	60.33	5.51E+04	1.98E+08	1.55E+10
2.201E+05	61.14	5.50E+04	1.98E+08	1.57E+10
2.229E+05	61.92	5.48E+04	1.97E+08	1.58E+10
2.258E+05	62.72	5.47E+04	1.97E+08	1.60E+10
2.286E+05	63.50	5.46E+04	1.96E+08	1.61E+10
2.315E+05	64.31	5.44E+04	1.96E+08	1.63E+10
2.343E+05	65.08	5.43E+04	1.95E+08	1.65E+10
2.372E+05	65.89	5.41E+04	1.95E+08	1.66E+10
2.401E+05	66.69	5.40E+04	1.94E+08	1.68E+10
2.429E+05	67.47	5.39E+04	1.94E+08	1.69E+10
2.458E+05	68.28	5.37E+04	1.93E+08	1.71E+10
2.486E+05	69.06	5.36E+04	1.93E+08	1.72E+10
2.515E+05	69.86	5.34E+04	1.92E+08	1.74E+10
2.543E+05	70.64	5.33E+04	1.92E+08	1.75E+10
2.572E+05	71.44	5.32E+04	1.91E+08	1.77E+10
2.600E+05	72.22	5.30E+04	1.91E+08	1.78E+10
2.629E+05	73.03	5.59E+04	2.01E+08	1.80E+10
2.657E+05	73.81	5.53E+04	1.99E+08	1.81E+10
2.686E+05	74.61	5.44E+04	1.96E+08	1.83E+10
2.714E+05	75.39	5.37E+04	1.93E+08	1.85E+10
2.743E+05	76.19	5.33E+04	1.92E+08	1.86E+10
2.771E+05	76.97	5.29E+04	1.91E+08	1.88E+10
2.800E+05	77.78	5.27E+04	1.90E+08	1.89E+10
2.828E+05	78.56	5.25E+04	1.89E+08	1.91E+10
2.857E+05	79.36	5.23E+04	1.88E+08	1.92E+10
2.885E+05	80.14	5.21E+04	1.88E+08	1.94E+10
2.914E+05	80.94	5.20E+04	1.87E+08	1.95E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.942E+05	81.72	5.19E+04	1.87E+08	1.97E+10
2.971E+05	82.53	5.18E+04	1.86E+08	1.98E+10
2.999E+05	83.31	5.16E+04	1.86E+08	1.99E+10
3.028E+05	84.11	5.15E+04	1.86E+08	2.01E+10
3.056E+05	84.89	5.14E+04	1.85E+08	2.02E+10
3.085E+05	85.69	5.13E+04	1.85E+08	2.04E+10
3.113E+05	86.47	5.12E+04	1.84E+08	2.05E+10
3.142E+05	87.28	5.11E+04	1.84E+08	2.07E+10
3.170E+05	88.06	5.10E+04	1.84E+08	2.08E+10
3.199E+05	88.86	5.09E+04	1.83E+08	2.10E+10
3.227E+05	89.64	5.08E+04	1.83E+08	2.11E+10
3.256E+05	90.44	5.07E+04	1.83E+08	2.13E+10
3.284E+05	91.22	5.06E+04	1.82E+08	2.14E+10
3.313E+05	92.03	5.05E+04	1.82E+08	2.16E+10
3.341E+05	92.81	5.04E+04	1.81E+08	2.17E+10
3.370E+05	93.61	5.03E+04	1.81E+08	2.18E+10
3.398E+05	94.39	5.02E+04	1.81E+08	2.20E+10
3.427E+05	95.19	5.01E+04	1.80E+08	2.21E+10
3.455E+05	95.97	5.00E+04	1.80E+08	2.23E+10
3.484E+05	96.78	4.99E+04	1.80E+08	2.24E+10
3.512E+05	97.56	4.99E+04	1.79E+08	2.26E+10
3.541E+05	98.36	4.98E+04	1.79E+08	2.27E+10
3.569E+05	99.14	4.97E+04	1.79E+08	2.28E+10
3.598E+05	99.94	4.96E+04	1.79E+08	2.30E+10
3.626E+05	100.72	4.95E+04	1.78E+08	2.31E+10
3.655E+05	101.53	4.95E+04	1.78E+08	2.33E+10
3.683E+05	102.31	4.94E+04	1.78E+08	2.34E+10
3.712E+05	103.11	4.93E+04	1.78E+08	2.35E+10
3.740E+05	103.89	4.92E+04	1.77E+08	2.37E+10
3.769E+05	104.69	4.92E+04	1.77E+08	2.38E+10
3.797E+05	105.47	4.91E+04	1.77E+08	2.40E+10
3.826E+05	106.28	4.90E+04	1.76E+08	2.41E+10
3.854E+05	107.06	4.89E+04	1.76E+08	2.42E+10
3.883E+05	107.86	4.89E+04	1.76E+08	2.44E+10
3.911E+05	108.64	4.88E+04	1.76E+08	2.45E+10
3.940E+05	109.44	4.87E+04	1.75E+08	2.47E+10
3.968E+05	110.22	4.86E+04	1.75E+08	2.48E+10
3.997E+05	111.03	4.85E+04	1.75E+08	2.49E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
4.025E+05	111.81	4.85E+04	1.75E+08	2.51E+10
4.054E+05	112.61	4.84E+04	1.74E+08	2.52E+10
4.082E+05	113.39	4.83E+04	1.74E+08	2.53E+10
4.111E+05	114.19	4.83E+04	1.74E+08	2.55E+10
4.139E+05	114.97	4.82E+04	1.74E+08	2.56E+10
4.168E+05	115.78	4.81E+04	1.73E+08	2.58E+10
4.196E+05	116.56	4.80E+04	1.73E+08	2.59E+10
4.225E+05	117.36	4.80E+04	1.73E+08	2.60E+10
4.253E+05	118.14	4.79E+04	1.72E+08	2.62E+10
4.282E+05	118.94	4.78E+04	1.72E+08	2.63E+10
4.310E+05	119.72	4.78E+04	1.72E+08	2.64E+10
4.339E+05	120.53	4.77E+04	1.72E+08	2.66E+10
4.367E+05	121.31	5.44E+04	1.96E+08	2.67E+10
4.396E+05	122.11	5.28E+04	1.90E+08	2.69E+10
4.424E+05	122.89	5.11E+04	1.84E+08	2.70E+10
4.453E+05	123.69	4.99E+04	1.80E+08	2.72E+10
4.481E+05	124.47	4.91E+04	1.77E+08	2.73E+10
4.510E+05	125.28	4.85E+04	1.75E+08	2.75E+10
4.538E+05	126.06	4.81E+04	1.73E+08	2.76E+10
4.567E+05	126.86	4.78E+04	1.72E+08	2.77E+10
4.595E+05	127.64	4.76E+04	1.71E+08	2.79E+10
4.624E+05	128.44	4.74E+04	1.71E+08	2.80E+10
4.652E+05	129.22	4.73E+04	1.70E+08	2.81E+10
4.681E+05	130.03	4.72E+04	1.70E+08	2.83E+10
4.709E+05	130.81	4.71E+04	1.70E+08	2.84E+10
4.738E+05	131.61	4.70E+04	1.69E+08	2.85E+10
4.767E+05	132.42	4.69E+04	1.69E+08	2.87E+10
4.795E+05	133.19	4.69E+04	1.69E+08	2.88E+10
4.824E+05	134.00	4.68E+04	1.69E+08	2.89E+10
4.852E+05	134.78	4.68E+04	1.68E+08	2.91E+10
4.881E+05	135.58	4.67E+04	1.68E+08	2.92E+10
4.909E+05	136.36	4.66E+04	1.68E+08	2.93E+10
4.938E+05	137.17	4.66E+04	1.68E+08	2.95E+10
4.966E+05	137.94	4.65E+04	1.67E+08	2.96E+10
4.995E+05	138.75	4.65E+04	1.67E+08	2.97E+10
5.023E+05	139.53	4.64E+04	1.67E+08	2.99E+10
5.052E+05	140.33	4.64E+04	1.67E+08	3.00E+10
5.080E+05	141.11	4.63E+04	1.67E+08	3.01E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
5.109E+05	141.92	4.63E+04	1.67E+08	3.03E+10
5.137E+05	142.69	4.62E+04	1.66E+08	3.04E+10
5.166E+05	143.50	4.62E+04	1.66E+08	3.05E+10
5.194E+05	144.28	4.61E+04	1.66E+08	3.07E+10
5.223E+05	145.08	5.91E+04	2.13E+08	3.08E+10
5.251E+05	145.86	5.77E+04	2.08E+08	3.10E+10
5.280E+05	146.67	5.38E+04	1.94E+08	3.11E+10
5.308E+05	147.44	5.13E+04	1.85E+08	3.13E+10
5.337E+05	148.25	4.95E+04	1.78E+08	3.14E+10
5.365E+05	149.03	4.83E+04	1.74E+08	3.16E+10
5.394E+05	149.83	4.75E+04	1.71E+08	3.17E+10
5.422E+05	150.61	4.69E+04	1.69E+08	3.18E+10
5.451E+05	151.42	4.65E+04	1.67E+08	3.20E+10
5.479E+05	152.19	4.62E+04	1.66E+08	3.21E+10
5.508E+05	153.00	4.60E+04	1.65E+08	3.22E+10
5.536E+05	153.78	4.58E+04	1.65E+08	3.24E+10
5.565E+05	154.58	4.57E+04	1.64E+08	3.25E+10
5.593E+05	155.36	4.56E+04	1.64E+08	3.26E+10
5.622E+05	156.17	4.55E+04	1.64E+08	3.28E+10
5.650E+05	156.94	4.54E+04	1.63E+08	3.29E+10
5.679E+05	157.75	4.53E+04	1.63E+08	3.30E+10
5.707E+05	158.53	4.53E+04	1.63E+08	3.31E+10
5.736E+05	159.33	4.52E+04	1.63E+08	3.33E+10
5.764E+05	160.11	4.52E+04	1.63E+08	3.34E+10
5.793E+05	160.92	4.51E+04	1.62E+08	3.35E+10
5.821E+05	161.69	4.51E+04	1.62E+08	3.37E+10
5.850E+05	162.50	4.50E+04	1.62E+08	3.38E+10
5.878E+05	163.28	4.50E+04	1.62E+08	3.39E+10
5.907E+05	164.08	4.49E+04	1.62E+08	3.40E+10
5.935E+05	164.86	4.49E+04	1.62E+08	3.42E+10
5.964E+05	165.67	4.48E+04	1.61E+08	3.43E+10
5.992E+05	166.44	4.48E+04	1.61E+08	3.44E+10
6.021E+05	167.25	4.47E+04	1.61E+08	3.46E+10
6.049E+05	168.03	4.47E+04	1.61E+08	3.47E+10
6.078E+05	168.83	4.46E+04	1.61E+08	3.48E+10
6.106E+05	169.61	4.46E+04	1.61E+08	3.49E+10
6.135E+05	170.42	4.46E+04	1.60E+08	3.51E+10
6.163E+05	171.19	4.45E+04	1.60E+08	3.52E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
6.192E+05	172.00	4.45E+04	1.60E+08	3.53E+10
6.220E+05	172.78	4.45E+04	1.60E+08	3.54E+10
6.249E+05	173.58	4.44E+04	1.60E+08	3.56E+10
6.277E+05	174.36	4.44E+04	1.60E+08	3.57E+10
6.306E+05	175.17	4.44E+04	1.60E+08	3.58E+10
6.334E+05	175.94	4.43E+04	1.60E+08	3.59E+10
6.363E+05	176.75	4.43E+04	1.59E+08	3.61E+10
6.391E+05	177.53	4.43E+04	1.59E+08	3.62E+10
6.420E+05	178.33	4.42E+04	1.59E+08	3.63E+10
6.448E+05	179.11	4.42E+04	1.59E+08	3.65E+10
6.477E+05	179.92	4.42E+04	1.59E+08	3.66E+10
6.505E+05	180.69	4.41E+04	1.59E+08	3.67E+10
6.534E+05	181.50	4.41E+04	1.59E+08	3.68E+10
6.562E+05	182.28	4.41E+04	1.59E+08	3.70E+10
6.591E+05	183.08	4.40E+04	1.58E+08	3.71E+10
6.619E+05	183.86	4.40E+04	1.58E+08	3.72E+10
6.648E+05	184.67	4.40E+04	1.58E+08	3.73E+10
6.676E+05	185.44	4.39E+04	1.58E+08	3.75E+10
6.705E+05	186.25	4.39E+04	1.58E+08	3.76E+10
6.733E+05	187.03	4.38E+04	1.58E+08	3.77E+10
6.762E+05	187.83	4.38E+04	1.58E+08	3.78E+10
6.790E+05	188.61	4.38E+04	1.58E+08	3.80E+10
6.819E+05	189.42	4.37E+04	1.57E+08	3.81E+10
6.847E+05	190.19	4.37E+04	1.57E+08	3.82E+10
6.876E+05	191.00	4.37E+04	1.57E+08	3.83E+10
6.904E+05	191.78	4.36E+04	1.57E+08	3.85E+10
6.933E+05	192.58	4.36E+04	1.57E+08	3.86E+10
6.961E+05	193.36	4.36E+04	1.57E+08	3.87E+10
6.990E+05	194.17	4.35E+04	1.57E+08	3.88E+10
7.018E+05	194.94	4.35E+04	1.57E+08	3.90E+10
7.047E+05	195.75	4.35E+04	1.57E+08	3.91E+10
7.075E+05	196.53	4.35E+04	1.56E+08	3.92E+10
7.104E+05	197.33	4.34E+04	1.56E+08	3.93E+10
7.132E+05	198.11	4.34E+04	1.56E+08	3.94E+10
7.161E+05	198.92	4.34E+04	1.56E+08	3.96E+10
7.190E+05	199.72	4.33E+04	1.56E+08	3.97E+10
7.218E+05	200.50	4.33E+04	1.56E+08	3.98E+10
7.247E+05	201.31	4.33E+04	1.56E+08	3.99E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
7.275E+05	202.08	4.32E+04	1.56E+08	4.01E+10
7.304E+05	202.89	4.32E+04	1.56E+08	4.02E+10
7.332E+05	203.67	4.32E+04	1.55E+08	4.03E+10
7.361E+05	204.47	4.31E+04	1.55E+08	4.04E+10
7.389E+05	205.25	4.31E+04	1.55E+08	4.06E+10
7.418E+05	206.06	4.31E+04	1.55E+08	4.07E+10
7.446E+05	206.83	4.30E+04	1.55E+08	4.08E+10
7.475E+05	207.64	4.30E+04	1.55E+08	4.09E+10
7.503E+05	208.42	4.30E+04	1.55E+08	4.10E+10
7.532E+05	209.22	4.29E+04	1.55E+08	4.12E+10
7.560E+05	210.00	4.29E+04	1.54E+08	4.13E+10
7.589E+05	210.81	4.29E+04	1.54E+08	4.14E+10
7.617E+05	211.58	4.29E+04	1.54E+08	4.15E+10
7.646E+05	212.39	4.28E+04	1.54E+08	4.17E+10
7.674E+05	213.17	4.28E+04	1.54E+08	4.18E+10
7.703E+05	213.97	4.28E+04	1.54E+08	4.19E+10
7.731E+05	214.75	4.27E+04	1.54E+08	4.20E+10
7.760E+05	215.56	4.27E+04	1.54E+08	4.22E+10
7.788E+05	216.33	4.27E+04	1.54E+08	4.23E+10
7.817E+05	217.14	4.26E+04	1.54E+08	4.24E+10
7.845E+05	217.92	4.26E+04	1.53E+08	4.25E+10
7.874E+05	218.72	4.26E+04	1.53E+08	4.26E+10
7.902E+05	219.50	4.26E+04	1.53E+08	4.28E+10
7.931E+05	220.31	4.25E+04	1.53E+08	4.29E+10
7.959E+05	221.08	4.25E+04	1.53E+08	4.30E+10
7.988E+05	221.89	4.25E+04	1.53E+08	4.31E+10
8.016E+05	222.67	4.24E+04	1.53E+08	4.32E+10
8.045E+05	223.47	4.24E+04	1.53E+08	4.34E+10
8.073E+05	224.25	4.24E+04	1.53E+08	4.35E+10
8.102E+05	225.06	4.24E+04	1.52E+08	4.36E+10
8.130E+05	225.83	4.23E+04	1.52E+08	4.37E+10
8.159E+05	226.64	4.23E+04	1.52E+08	4.38E+10
8.187E+05	227.42	4.23E+04	1.52E+08	4.40E+10
8.216E+05	228.22	4.23E+04	1.52E+08	4.41E+10
8.244E+05	229.00	4.22E+04	1.52E+08	4.42E+10
8.273E+05	229.81	4.22E+04	1.52E+08	4.43E+10
8.301E+05	230.58	4.22E+04	1.52E+08	4.44E+10
8.330E+05	231.39	4.22E+04	1.52E+08	4.46E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
8.358E+05	232.17	4.21E+04	1.52E+08	4.47E+10
8.387E+05	232.97	4.21E+04	1.52E+08	4.48E+10
8.415E+05	233.75	4.21E+04	1.52E+08	4.49E+10
8.444E+05	234.56	4.21E+04	1.51E+08	4.50E+10
8.472E+05	235.33	4.20E+04	1.51E+08	4.52E+10
8.501E+05	236.14	4.20E+04	1.51E+08	4.53E+10
8.529E+05	236.92	4.20E+04	1.51E+08	4.54E+10
8.558E+05	237.72	4.20E+04	1.51E+08	4.55E+10
8.586E+05	238.50	4.20E+04	1.51E+08	4.56E+10
8.615E+05	239.31	4.19E+04	1.51E+08	4.58E+10
8.643E+05	240.08	4.19E+04	1.51E+08	4.59E+10
8.672E+05	240.89	4.19E+04	1.51E+08	4.60E+10
8.700E+05	241.67	4.19E+04	1.51E+08	4.61E+10
8.729E+05	242.47	4.18E+04	1.51E+08	4.62E+10
8.757E+05	243.25	4.18E+04	1.51E+08	4.64E+10
8.786E+05	244.06	4.18E+04	1.50E+08	4.65E+10
8.814E+05	244.83	4.18E+04	1.50E+08	4.66E+10
8.843E+05	245.64	4.18E+04	1.50E+08	4.67E+10
8.871E+05	246.42	4.17E+04	1.50E+08	4.68E+10
8.900E+05	247.22	4.17E+04	1.50E+08	4.70E+10
8.928E+05	248.00	4.17E+04	1.50E+08	4.71E+10
8.957E+05	248.81	4.17E+04	1.50E+08	4.72E+10
8.985E+05	249.58	4.17E+04	1.50E+08	4.73E+10
9.014E+05	250.39	4.16E+04	1.50E+08	4.74E+10
9.042E+05	251.17	4.16E+04	1.50E+08	4.76E+10
9.071E+05	251.97	4.16E+04	1.50E+08	4.77E+10
9.099E+05	252.75	4.16E+04	1.50E+08	4.78E+10
9.128E+05	253.56	4.15E+04	1.50E+08	4.79E+10
9.156E+05	254.33	4.15E+04	1.49E+08	4.80E+10
9.185E+05	255.14	4.15E+04	1.49E+08	4.81E+10
9.213E+05	255.92	4.15E+04	1.49E+08	4.83E+10
9.242E+05	256.72	4.15E+04	1.49E+08	4.84E+10
9.270E+05	257.50	4.14E+04	1.49E+08	4.85E+10
9.299E+05	258.31	4.14E+04	1.49E+08	4.86E+10
9.327E+05	259.08	4.14E+04	1.49E+08	4.87E+10
9.356E+05	259.89	4.14E+04	1.49E+08	4.89E+10
9.384E+05	260.67	4.14E+04	1.49E+08	4.90E+10
9.413E+05	261.47	4.13E+04	1.49E+08	4.91E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
9.441E+05	262.25	4.13E+04	1.49E+08	4.92E+10
9.470E+05	263.06	4.13E+04	1.49E+08	4.93E+10
9.498E+05	263.83	4.13E+04	1.49E+08	4.94E+10
9.527E+05	264.64	4.12E+04	1.48E+08	4.96E+10
9.556E+05	265.44	4.12E+04	1.48E+08	4.97E+10
9.584E+05	266.22	4.12E+04	1.48E+08	4.98E+10
9.613E+05	267.03	4.12E+04	1.48E+08	4.99E+10
9.641E+05	267.81	4.12E+04	1.48E+08	5.00E+10
9.670E+05	268.61	4.11E+04	1.48E+08	5.01E+10
9.698E+05	269.39	4.11E+04	1.48E+08	5.03E+10
9.727E+05	270.19	4.11E+04	1.48E+08	5.04E+10
9.755E+05	270.97	4.11E+04	1.48E+08	5.05E+10
9.784E+05	271.78	4.11E+04	1.48E+08	5.06E+10
9.812E+05	272.56	4.10E+04	1.48E+08	5.07E+10
9.841E+05	273.36	4.10E+04	1.48E+08	5.09E+10
9.869E+05	274.14	4.10E+04	1.48E+08	5.10E+10
9.898E+05	274.94	4.10E+04	1.48E+08	5.11E+10
9.926E+05	275.72	4.10E+04	1.47E+08	5.12E+10
9.955E+05	276.53	4.09E+04	1.47E+08	5.13E+10
9.983E+05	277.31	4.09E+04	1.47E+08	5.14E+10
1.001E+06	278.06	4.09E+04	1.47E+08	5.15E+10
1.004E+06	278.89	4.09E+04	1.47E+08	5.17E+10
1.007E+06	279.72	4.09E+04	1.47E+08	5.18E+10
1.010E+06	280.56	4.09E+04	1.47E+08	5.19E+10
1.013E+06	281.39	4.08E+04	1.47E+08	5.20E+10
1.015E+06	281.94	4.08E+04	1.47E+08	5.21E+10
1.018E+06	282.78	4.08E+04	1.47E+08	5.22E+10
1.021E+06	283.61	4.08E+04	1.47E+08	5.24E+10
1.024E+06	284.44	4.08E+04	1.47E+08	5.25E+10
1.027E+06	285.28	4.07E+04	1.47E+08	5.26E+10
1.030E+06	286.11	4.07E+04	1.47E+08	5.27E+10
1.033E+06	286.94	4.07E+04	1.47E+08	5.28E+10
1.035E+06	287.50	4.07E+04	1.47E+08	5.29E+10
1.038E+06	288.33	4.07E+04	1.46E+08	5.31E+10
1.041E+06	289.17	4.07E+04	1.46E+08	5.32E+10
1.044E+06	290.00	4.07E+04	1.46E+08	5.33E+10
1.047E+06	290.83	4.06E+04	1.46E+08	5.34E+10
1.050E+06	291.67	4.06E+04	1.46E+08	5.35E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.052E+06	292.22	4.06E+04	1.46E+08	5.36E+10
1.055E+06	293.06	4.06E+04	1.46E+08	5.37E+10
1.058E+06	293.89	4.06E+04	1.46E+08	5.39E+10
1.061E+06	294.72	4.06E+04	1.46E+08	5.40E+10
1.064E+06	295.56	4.05E+04	1.46E+08	5.41E+10
1.067E+06	296.39	4.05E+04	1.46E+08	5.42E+10
1.070E+06	297.22	4.05E+04	1.46E+08	5.44E+10
1.072E+06	297.78	4.05E+04	1.46E+08	5.44E+10
1.075E+06	298.61	4.05E+04	1.46E+08	5.46E+10
1.078E+06	299.44	4.05E+04	1.46E+08	5.47E+10
1.081E+06	300.28	4.05E+04	1.46E+08	5.48E+10
1.084E+06	301.11	4.04E+04	1.46E+08	5.49E+10
1.087E+06	301.94	4.04E+04	1.46E+08	5.50E+10
1.090E+06	302.78	4.04E+04	1.45E+08	5.52E+10
1.092E+06	303.33	4.04E+04	1.45E+08	5.52E+10
1.095E+06	304.17	4.04E+04	1.45E+08	5.54E+10
1.098E+06	305.00	4.04E+04	1.45E+08	5.55E+10
1.101E+06	305.83	4.03E+04	1.45E+08	5.56E+10
1.104E+06	306.67	4.03E+04	1.45E+08	5.57E+10
1.107E+06	307.50	4.03E+04	1.45E+08	5.58E+10
1.109E+06	308.06	4.03E+04	1.45E+08	5.59E+10
1.112E+06	308.89	4.03E+04	1.45E+08	5.60E+10
1.115E+06	309.72	4.03E+04	1.45E+08	5.62E+10
1.118E+06	310.56	4.03E+04	1.45E+08	5.63E+10
1.121E+06	311.39	4.02E+04	1.45E+08	5.64E+10
1.124E+06	312.22	4.02E+04	1.45E+08	5.65E+10
1.127E+06	313.06	4.02E+04	1.45E+08	5.67E+10
1.129E+06	313.61	4.02E+04	1.45E+08	5.67E+10
1.132E+06	314.44	4.02E+04	1.45E+08	5.69E+10
1.135E+06	315.28	4.02E+04	1.45E+08	5.70E+10
1.138E+06	316.11	4.01E+04	1.45E+08	5.71E+10
1.141E+06	316.94	4.01E+04	1.44E+08	5.72E+10
1.144E+06	317.78	4.01E+04	1.44E+08	5.73E+10
1.147E+06	318.61	4.01E+04	1.44E+08	5.75E+10
1.149E+06	319.17	4.01E+04	1.44E+08	5.75E+10
1.152E+06	320.00	4.01E+04	1.44E+08	5.77E+10
1.155E+06	320.83	4.01E+04	1.44E+08	5.78E+10
1.158E+06	321.67	4.00E+04	1.44E+08	5.79E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.161E+06	322.50	4.00E+04	1.44E+08	5.80E+10
1.164E+06	323.33	4.00E+04	1.44E+08	5.81E+10
1.166E+06	323.89	4.00E+04	1.44E+08	5.82E+10
1.169E+06	324.72	4.00E+04	1.44E+08	5.83E+10
1.172E+06	325.56	4.00E+04	1.44E+08	5.85E+10
1.175E+06	326.39	4.00E+04	1.44E+08	5.86E+10
1.178E+06	327.22	3.99E+04	1.44E+08	5.87E+10
1.181E+06	328.06	3.99E+04	1.44E+08	5.88E+10
1.184E+06	328.89	3.99E+04	1.44E+08	5.89E+10
1.186E+06	329.44	3.99E+04	1.44E+08	5.90E+10
1.189E+06	330.28	3.99E+04	1.44E+08	5.91E+10
1.192E+06	331.11	3.99E+04	1.44E+08	5.93E+10
1.195E+06	331.94	3.99E+04	1.43E+08	5.94E+10
1.198E+06	332.78	3.98E+04	1.43E+08	5.95E+10
1.201E+06	333.61	3.98E+04	1.43E+08	5.96E+10
1.204E+06	334.44	3.98E+04	1.43E+08	5.97E+10
1.206E+06	335.00	3.98E+04	1.43E+08	5.98E+10
1.209E+06	335.83	3.98E+04	1.43E+08	5.99E+10
1.212E+06	336.67	3.98E+04	1.43E+08	6.01E+10
1.215E+06	337.50	3.97E+04	1.43E+08	6.02E+10
1.218E+06	338.33	3.97E+04	1.43E+08	6.03E+10
1.221E+06	339.17	3.97E+04	1.43E+08	6.04E+10
1.224E+06	340.00	3.97E+04	1.43E+08	6.05E+10
1.226E+06	340.56	3.97E+04	1.43E+08	6.06E+10
1.229E+06	341.39	3.97E+04	1.43E+08	6.07E+10
1.232E+06	342.22	3.97E+04	1.43E+08	6.08E+10
1.235E+06	343.06	3.97E+04	1.43E+08	6.10E+10
1.238E+06	343.89	3.96E+04	1.43E+08	6.11E+10
1.241E+06	344.72	3.96E+04	1.43E+08	6.12E+10
1.243E+06	345.28	3.96E+04	1.43E+08	6.13E+10
1.246E+06	346.11	3.96E+04	1.43E+08	6.14E+10
1.249E+06	346.94	3.96E+04	1.42E+08	6.15E+10
1.252E+06	347.78	3.96E+04	1.42E+08	6.16E+10
1.255E+06	348.61	3.96E+04	1.42E+08	6.18E+10
1.258E+06	349.44	3.95E+04	1.42E+08	6.19E+10
1.261E+06	350.28	3.95E+04	1.42E+08	6.20E+10
1.263E+06	350.83	3.95E+04	1.42E+08	6.21E+10
1.266E+06	351.67	3.95E+04	1.42E+08	6.22E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.269E+06	352.50	3.95E+04	1.42E+08	6.23E+10
1.272E+06	353.33	3.95E+04	1.42E+08	6.24E+10
1.275E+06	354.17	3.95E+04	1.42E+08	6.25E+10
1.278E+06	355.00	3.94E+04	1.42E+08	6.27E+10
1.281E+06	355.83	3.94E+04	1.42E+08	6.28E+10
1.283E+06	356.39	3.94E+04	1.42E+08	6.29E+10
1.286E+06	357.22	3.94E+04	1.42E+08	6.30E+10
1.289E+06	358.06	3.94E+04	1.42E+08	6.31E+10
1.292E+06	358.89	3.94E+04	1.42E+08	6.32E+10
1.295E+06	359.72	3.94E+04	1.42E+08	6.33E+10
1.298E+06	360.56	3.93E+04	1.42E+08	6.35E+10
1.300E+06	361.11	3.93E+04	1.42E+08	6.35E+10
1.303E+06	361.94	3.93E+04	1.42E+08	6.37E+10
1.306E+06	362.78	3.93E+04	1.41E+08	6.38E+10
1.309E+06	363.61	3.93E+04	1.41E+08	6.39E+10
1.312E+06	364.44	3.93E+04	1.41E+08	6.40E+10
1.315E+06	365.28	3.93E+04	1.41E+08	6.41E+10
1.318E+06	366.11	3.92E+04	1.41E+08	6.42E+10
1.320E+06	366.67	3.92E+04	1.41E+08	6.43E+10
1.323E+06	367.50	3.92E+04	1.41E+08	6.44E+10
1.326E+06	368.33	3.92E+04	1.41E+08	6.46E+10
1.329E+06	369.17	3.92E+04	1.41E+08	6.47E+10
1.332E+06	370.00	3.92E+04	1.41E+08	6.48E+10
1.335E+06	370.83	3.92E+04	1.41E+08	6.49E+10
1.338E+06	371.67	3.91E+04	1.41E+08	6.50E+10
1.340E+06	372.22	3.91E+04	1.41E+08	6.51E+10
1.343E+06	373.06	3.91E+04	1.41E+08	6.52E+10
1.346E+06	373.89	3.91E+04	1.41E+08	6.53E+10
1.349E+06	374.72	3.91E+04	1.41E+08	6.55E+10
1.352E+06	375.56	3.91E+04	1.41E+08	6.56E+10
1.355E+06	376.39	3.91E+04	1.41E+08	6.57E+10
1.357E+06	376.94	3.91E+04	1.41E+08	6.58E+10
1.360E+06	377.78	3.90E+04	1.41E+08	6.59E+10
1.363E+06	378.61	3.90E+04	1.40E+08	6.60E+10
1.366E+06	379.44	3.90E+04	1.40E+08	6.61E+10
1.369E+06	380.28	3.90E+04	1.40E+08	6.62E+10
1.372E+06	381.11	3.90E+04	1.40E+08	6.64E+10
1.375E+06	381.94	3.90E+04	1.40E+08	6.65E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.377E+06	382.50	3.90E+04	1.40E+08	6.65E+10
1.380E+06	383.33	3.90E+04	1.40E+08	6.67E+10
1.383E+06	384.17	3.89E+04	1.40E+08	6.68E+10
1.386E+06	385.00	3.89E+04	1.40E+08	6.69E+10
1.389E+06	385.83	3.89E+04	1.40E+08	6.70E+10
1.392E+06	386.67	3.89E+04	1.40E+08	6.71E+10
1.395E+06	387.50	3.89E+04	1.40E+08	6.72E+10
1.397E+06	388.06	3.89E+04	1.40E+08	6.73E+10
1.400E+06	388.89	3.89E+04	1.40E+08	6.74E+10
1.403E+06	389.72	3.88E+04	1.40E+08	6.76E+10
1.406E+06	390.56	3.88E+04	1.40E+08	6.77E+10
1.409E+06	391.39	3.88E+04	1.40E+08	6.78E+10
1.412E+06	392.22	3.88E+04	1.40E+08	6.79E+10
1.414E+06	392.78	3.88E+04	1.40E+08	6.80E+10
1.417E+06	393.61	3.88E+04	1.40E+08	6.81E+10
1.420E+06	394.44	3.88E+04	1.40E+08	6.82E+10
1.423E+06	395.28	3.87E+04	1.39E+08	6.83E+10
1.426E+06	396.11	3.87E+04	1.39E+08	6.85E+10
1.429E+06	396.94	3.87E+04	1.39E+08	6.86E+10
1.432E+06	397.78	3.87E+04	1.39E+08	6.87E+10
1.434E+06	398.33	3.87E+04	1.39E+08	6.88E+10
1.437E+06	399.17	3.87E+04	1.39E+08	6.89E+10
1.440E+06	400.00	3.87E+04	1.39E+08	6.90E+10
1.443E+06	400.83	3.87E+04	1.39E+08	6.91E+10
1.446E+06	401.67	3.86E+04	1.39E+08	6.92E+10
1.449E+06	402.50	3.86E+04	1.39E+08	6.93E+10
1.452E+06	403.33	3.86E+04	1.39E+08	6.95E+10
1.454E+06	403.89	3.86E+04	1.39E+08	6.95E+10
1.457E+06	404.72	3.86E+04	1.39E+08	6.96E+10
1.460E+06	405.56	3.86E+04	1.39E+08	6.98E+10
1.463E+06	406.39	3.86E+04	1.39E+08	6.99E+10
1.466E+06	407.22	3.86E+04	1.39E+08	7.00E+10
1.469E+06	408.06	3.85E+04	1.39E+08	7.01E+10
1.472E+06	408.89	3.85E+04	1.39E+08	7.02E+10
1.474E+06	409.44	3.85E+04	1.39E+08	7.03E+10
1.477E+06	410.28	3.85E+04	1.39E+08	7.04E+10
1.480E+06	411.11	3.85E+04	1.39E+08	7.05E+10
1.483E+06	411.94	3.85E+04	1.38E+08	7.07E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.486E+06	412.78	3.85E+04	1.38E+08	7.08E+10
1.489E+06	413.61	3.84E+04	1.38E+08	7.09E+10
1.491E+06	414.17	3.84E+04	1.38E+08	7.10E+10
1.494E+06	415.00	3.84E+04	1.38E+08	7.11E+10
1.497E+06	415.83	3.84E+04	1.38E+08	7.12E+10
1.500E+06	416.67	3.84E+04	1.38E+08	7.13E+10
1.503E+06	417.50	3.84E+04	1.38E+08	7.14E+10
1.506E+06	418.33	3.84E+04	1.38E+08	7.15E+10
1.509E+06	419.17	3.84E+04	1.38E+08	7.16E+10
1.511E+06	419.72	3.83E+04	1.38E+08	7.17E+10
1.514E+06	420.56	3.83E+04	1.38E+08	7.18E+10
1.517E+06	421.39	3.83E+04	1.38E+08	7.20E+10
1.520E+06	422.22	3.83E+04	1.38E+08	7.21E+10
1.523E+06	423.06	3.83E+04	1.38E+08	7.22E+10
1.526E+06	423.89	3.83E+04	1.38E+08	7.23E+10
1.529E+06	424.72	3.83E+04	1.38E+08	7.24E+10
1.531E+06	425.28	3.83E+04	1.38E+08	7.25E+10
1.534E+06	426.11	3.83E+04	1.38E+08	7.26E+10
1.537E+06	426.94	3.83E+04	1.38E+08	7.27E+10
1.540E+06	427.78	3.82E+04	1.38E+08	7.28E+10
1.543E+06	428.61	3.82E+04	1.38E+08	7.30E+10
1.546E+06	429.44	3.82E+04	1.38E+08	7.31E+10
1.548E+06	430.00	3.82E+04	1.38E+08	7.31E+10
1.551E+06	430.83	3.82E+04	1.38E+08	7.33E+10
1.554E+06	431.67	3.82E+04	1.37E+08	7.34E+10
1.557E+06	432.50	3.82E+04	1.37E+08	7.35E+10
1.560E+06	433.33	3.82E+04	1.37E+08	7.36E+10
1.563E+06	434.17	3.82E+04	1.37E+08	7.37E+10
1.566E+06	435.00	3.81E+04	1.37E+08	7.38E+10
1.568E+06	435.56	3.81E+04	1.37E+08	7.39E+10
1.571E+06	436.39	3.81E+04	1.37E+08	7.40E+10
1.574E+06	437.22	3.81E+04	1.37E+08	7.41E+10
1.577E+06	438.06	3.81E+04	1.37E+08	7.42E+10
1.580E+06	438.89	3.81E+04	1.37E+08	7.44E+10
1.583E+06	439.72	3.81E+04	1.37E+08	7.45E+10
1.586E+06	440.56	3.81E+04	1.37E+08	7.46E+10
1.588E+06	441.11	3.81E+04	1.37E+08	7.47E+10
1.591E+06	441.94	3.81E+04	1.37E+08	7.48E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.594E+06	442.78	3.81E+04	1.37E+08	7.49E+10
1.597E+06	443.61	3.80E+04	1.37E+08	7.50E+10
1.600E+06	444.44	3.80E+04	1.37E+08	7.51E+10
1.603E+06	445.28	3.80E+04	1.37E+08	7.52E+10
1.605E+06	445.83	3.80E+04	1.37E+08	7.53E+10
1.608E+06	446.67	3.80E+04	1.37E+08	7.54E+10
1.611E+06	447.50	3.80E+04	1.37E+08	7.55E+10
1.614E+06	448.33	3.80E+04	1.37E+08	7.57E+10
1.617E+06	449.17	3.80E+04	1.37E+08	7.58E+10
1.620E+06	450.00	3.80E+04	1.37E+08	7.59E+10
1.623E+06	450.83	3.80E+04	1.37E+08	7.60E+10
1.625E+06	451.39	3.79E+04	1.37E+08	7.61E+10
1.628E+06	452.22	3.79E+04	1.37E+08	7.62E+10
1.631E+06	453.06	3.79E+04	1.37E+08	7.63E+10
1.634E+06	453.89	3.79E+04	1.36E+08	7.64E+10
1.637E+06	454.72	3.79E+04	1.36E+08	7.65E+10
1.640E+06	455.56	3.79E+04	1.36E+08	7.66E+10
1.643E+06	456.39	3.79E+04	1.36E+08	7.68E+10
1.645E+06	456.94	3.79E+04	1.36E+08	7.68E+10
1.648E+06	457.78	3.79E+04	1.36E+08	7.69E+10
1.651E+06	458.61	3.79E+04	1.36E+08	7.71E+10
1.654E+06	459.44	3.78E+04	1.36E+08	7.72E+10
1.657E+06	460.28	3.78E+04	1.36E+08	7.73E+10
1.660E+06	461.11	3.78E+04	1.36E+08	7.74E+10
1.662E+06	461.67	3.78E+04	1.36E+08	7.75E+10
1.665E+06	462.50	3.78E+04	1.36E+08	7.76E+10
1.668E+06	463.33	3.78E+04	1.36E+08	7.77E+10
1.671E+06	464.17	3.78E+04	1.36E+08	7.78E+10
1.674E+06	465.00	3.78E+04	1.36E+08	7.79E+10
1.677E+06	465.83	3.78E+04	1.36E+08	7.80E+10
1.680E+06	466.67	3.78E+04	1.36E+08	7.82E+10
1.682E+06	467.22	3.78E+04	1.36E+08	7.82E+10
1.685E+06	468.06	3.77E+04	1.36E+08	7.83E+10
1.688E+06	468.89	3.77E+04	1.36E+08	7.85E+10
1.691E+06	469.72	3.77E+04	1.36E+08	7.86E+10
1.694E+06	470.56	3.77E+04	1.36E+08	7.87E+10
1.697E+06	471.39	3.77E+04	1.36E+08	7.88E+10
1.700E+06	472.22	3.77E+04	1.36E+08	7.89E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.702E+06	472.78	3.77E+04	1.36E+08	7.90E+10
1.705E+06	473.61	3.77E+04	1.36E+08	7.91E+10
1.708E+06	474.44	3.77E+04	1.36E+08	7.92E+10
1.711E+06	475.28	3.77E+04	1.36E+08	7.93E+10
1.714E+06	476.11	3.76E+04	1.36E+08	7.94E+10
1.717E+06	476.94	3.76E+04	1.35E+08	7.96E+10
1.720E+06	477.78	3.76E+04	1.35E+08	7.97E+10
1.722E+06	478.33	3.76E+04	1.35E+08	7.97E+10
1.725E+06	479.17	3.76E+04	1.35E+08	7.99E+10
1.728E+06	480.00	3.76E+04	1.35E+08	8.00E+10
1.731E+06	480.83	3.76E+04	1.35E+08	8.01E+10
1.734E+06	481.67	3.76E+04	1.35E+08	8.02E+10
1.737E+06	482.50	3.76E+04	1.35E+08	8.03E+10
1.739E+06	483.06	3.76E+04	1.35E+08	8.04E+10
1.742E+06	483.89	3.75E+04	1.35E+08	8.05E+10
1.745E+06	484.72	3.75E+04	1.35E+08	8.06E+10
1.748E+06	485.56	3.75E+04	1.35E+08	8.07E+10
1.751E+06	486.39	3.75E+04	1.35E+08	8.08E+10
1.754E+06	487.22	3.75E+04	1.35E+08	8.09E+10
1.757E+06	488.06	3.75E+04	1.35E+08	8.11E+10
1.759E+06	488.61	3.75E+04	1.35E+08	8.11E+10
1.762E+06	489.44	3.75E+04	1.35E+08	8.12E+10
1.765E+06	490.28	3.75E+04	1.35E+08	8.14E+10
1.768E+06	491.11	3.75E+04	1.35E+08	8.15E+10
1.771E+06	491.94	3.75E+04	1.35E+08	8.16E+10
1.774E+06	492.78	3.74E+04	1.35E+08	8.17E+10
1.777E+06	493.61	3.74E+04	1.35E+08	8.18E+10
1.779E+06	494.17	3.74E+04	1.35E+08	8.19E+10
1.782E+06	495.00	3.74E+04	1.35E+08	8.20E+10
1.785E+06	495.83	3.74E+04	1.35E+08	8.21E+10
1.788E+06	496.67	3.74E+04	1.35E+08	8.22E+10
1.791E+06	497.50	3.74E+04	1.35E+08	8.23E+10
1.794E+06	498.33	3.74E+04	1.35E+08	8.24E+10
1.796E+06	498.89	3.74E+04	1.35E+08	8.25E+10
1.799E+06	499.72	3.74E+04	1.35E+08	8.26E+10
1.802E+06	500.56	3.74E+04	1.35E+08	8.27E+10
1.805E+06	501.39	3.73E+04	1.34E+08	8.29E+10
1.808E+06	502.22	3.73E+04	1.34E+08	8.30E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.811E+06	503.06	3.73E+04	1.34E+08	8.31E+10
1.814E+06	503.89	3.73E+04	1.34E+08	8.32E+10
1.816E+06	504.44	3.73E+04	1.34E+08	8.33E+10
1.819E+06	505.28	4.34E+04	1.56E+08	8.34E+10
1.822E+06	506.11	4.24E+04	1.53E+08	8.35E+10
1.825E+06	506.94	4.07E+04	1.47E+08	8.36E+10
1.828E+06	507.78	3.96E+04	1.43E+08	8.38E+10
1.831E+06	508.61	3.89E+04	1.40E+08	8.39E+10
1.834E+06	509.44	3.83E+04	1.38E+08	8.40E+10
1.836E+06	510.00	3.80E+04	1.37E+08	8.41E+10
1.839E+06	510.83	3.78E+04	1.36E+08	8.42E+10
1.842E+06	511.67	3.76E+04	1.35E+08	8.43E+10
1.845E+06	512.50	3.75E+04	1.35E+08	8.44E+10
1.848E+06	513.33	3.74E+04	1.35E+08	8.45E+10
1.851E+06	514.17	3.73E+04	1.34E+08	8.46E+10
1.853E+06	514.72	3.73E+04	1.34E+08	8.47E+10
1.856E+06	515.56	3.72E+04	1.34E+08	8.48E+10
1.859E+06	516.39	3.72E+04	1.34E+08	8.49E+10
1.862E+06	517.22	3.72E+04	1.34E+08	8.50E+10
1.865E+06	518.06	3.72E+04	1.34E+08	8.52E+10
1.868E+06	518.89	3.72E+04	1.34E+08	8.53E+10
1.871E+06	519.72	3.72E+04	1.34E+08	8.54E+10
1.873E+06	520.28	3.71E+04	1.34E+08	8.54E+10
1.876E+06	521.11	3.71E+04	1.34E+08	8.56E+10
1.879E+06	521.94	3.71E+04	1.34E+08	8.57E+10
1.882E+06	522.78	3.71E+04	1.34E+08	8.58E+10
1.885E+06	523.61	3.71E+04	1.34E+08	8.59E+10
1.888E+06	524.44	3.71E+04	1.34E+08	8.60E+10
1.891E+06	525.28	3.71E+04	1.33E+08	8.61E+10
1.893E+06	525.83	3.71E+04	1.33E+08	8.62E+10
1.896E+06	526.67	3.71E+04	1.33E+08	8.63E+10
1.899E+06	527.50	3.71E+04	1.33E+08	8.64E+10
1.902E+06	528.33	3.70E+04	1.33E+08	8.65E+10
1.905E+06	529.17	3.70E+04	1.33E+08	8.66E+10
1.908E+06	530.00	3.70E+04	1.33E+08	8.67E+10
1.911E+06	530.83	3.70E+04	1.33E+08	8.69E+10
1.913E+06	531.39	3.70E+04	1.33E+08	8.69E+10
1.916E+06	532.22	3.70E+04	1.33E+08	8.70E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
1.919E+06	533.06	3.70E+04	1.33E+08	8.72E+10
1.922E+06	533.89	3.70E+04	1.33E+08	8.73E+10
1.925E+06	534.72	3.70E+04	1.33E+08	8.74E+10
1.928E+06	535.56	3.70E+04	1.33E+08	8.75E+10
1.930E+06	536.11	3.70E+04	1.33E+08	8.76E+10
1.933E+06	536.94	3.69E+04	1.33E+08	8.77E+10
1.936E+06	537.78	3.69E+04	1.33E+08	8.78E+10
1.939E+06	538.61	3.69E+04	1.33E+08	8.79E+10
1.942E+06	539.44	3.69E+04	1.33E+08	8.80E+10
1.945E+06	540.28	3.69E+04	1.33E+08	8.81E+10
1.948E+06	541.11	3.69E+04	1.33E+08	8.82E+10
1.950E+06	541.67	3.69E+04	1.33E+08	8.83E+10
1.953E+06	542.50	3.69E+04	1.33E+08	8.84E+10
1.956E+06	543.33	3.69E+04	1.33E+08	8.85E+10
1.959E+06	544.17	3.69E+04	1.33E+08	8.86E+10
1.962E+06	545.00	3.69E+04	1.33E+08	8.87E+10
1.965E+06	545.83	3.69E+04	1.33E+08	8.89E+10
1.968E+06	546.67	3.69E+04	1.33E+08	8.90E+10
1.970E+06	547.22	3.68E+04	1.33E+08	8.90E+10
1.973E+06	548.06	3.68E+04	1.33E+08	8.91E+10
1.976E+06	548.89	3.68E+04	1.33E+08	8.93E+10
1.979E+06	549.72	3.68E+04	1.33E+08	8.94E+10
1.982E+06	550.56	3.68E+04	1.32E+08	8.95E+10
1.985E+06	551.39	3.68E+04	1.32E+08	8.96E+10
1.987E+06	551.94	3.68E+04	1.32E+08	8.97E+10
1.990E+06	552.78	3.68E+04	1.32E+08	8.98E+10
1.993E+06	553.61	3.68E+04	1.32E+08	8.99E+10
1.996E+06	554.44	3.68E+04	1.32E+08	9.00E+10
1.999E+06	555.28	3.68E+04	1.32E+08	9.01E+10
2.002E+06	556.11	3.67E+04	1.32E+08	9.02E+10
2.005E+06	556.94	3.67E+04	1.32E+08	9.03E+10
2.007E+06	557.50	3.67E+04	1.32E+08	9.04E+10
2.010E+06	558.33	3.67E+04	1.32E+08	9.05E+10
2.013E+06	559.17	3.67E+04	1.32E+08	9.06E+10
2.016E+06	560.00	3.67E+04	1.32E+08	9.07E+10
2.019E+06	560.83	3.67E+04	1.32E+08	9.08E+10
2.022E+06	561.67	3.67E+04	1.32E+08	9.09E+10
2.025E+06	562.50	3.67E+04	1.32E+08	9.11E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.027E+06	563.06	3.67E+04	1.32E+08	9.11E+10
2.030E+06	563.89	3.67E+04	1.32E+08	9.12E+10
2.033E+06	564.72	3.67E+04	1.32E+08	9.14E+10
2.036E+06	565.56	3.67E+04	1.32E+08	9.15E+10
2.039E+06	566.39	3.67E+04	1.32E+08	9.16E+10
2.042E+06	567.22	3.66E+04	1.32E+08	9.17E+10
2.044E+06	567.78	3.66E+04	1.32E+08	9.18E+10
2.047E+06	568.61	3.66E+04	1.32E+08	9.19E+10
2.050E+06	569.44	3.66E+04	1.32E+08	9.20E+10
2.053E+06	570.28	3.66E+04	1.32E+08	9.21E+10
2.056E+06	571.11	3.66E+04	1.32E+08	9.22E+10
2.059E+06	571.94	3.66E+04	1.32E+08	9.23E+10
2.062E+06	572.78	3.66E+04	1.32E+08	9.24E+10
2.064E+06	573.33	3.66E+04	1.32E+08	9.25E+10
2.067E+06	574.17	3.66E+04	1.32E+08	9.26E+10
2.070E+06	575.00	3.66E+04	1.32E+08	9.27E+10
2.073E+06	575.83	3.66E+04	1.32E+08	9.28E+10
2.076E+06	576.67	3.66E+04	1.32E+08	9.29E+10
2.079E+06	577.50	3.65E+04	1.32E+08	9.30E+10
2.082E+06	578.33	3.65E+04	1.32E+08	9.31E+10
2.084E+06	578.89	3.65E+04	1.32E+08	9.32E+10
2.087E+06	579.72	3.65E+04	1.32E+08	9.33E+10
2.090E+06	580.56	3.65E+04	1.31E+08	9.34E+10
2.093E+06	581.39	3.65E+04	1.31E+08	9.35E+10
2.096E+06	582.22	3.65E+04	1.31E+08	9.37E+10
2.099E+06	583.06	3.65E+04	1.31E+08	9.38E+10
2.101E+06	583.61	3.65E+04	1.31E+08	9.38E+10
2.104E+06	584.44	3.65E+04	1.31E+08	9.39E+10
2.107E+06	585.28	3.65E+04	1.31E+08	9.41E+10
2.110E+06	586.11	3.65E+04	1.31E+08	9.42E+10
2.113E+06	586.94	3.65E+04	1.31E+08	9.43E+10
2.116E+06	587.78	3.65E+04	1.31E+08	9.44E+10
2.119E+06	588.61	3.65E+04	1.31E+08	9.45E+10
2.121E+06	589.17	3.64E+04	1.31E+08	9.46E+10
2.124E+06	590.00	3.64E+04	1.31E+08	9.47E+10
2.127E+06	590.83	3.64E+04	1.31E+08	9.48E+10
2.130E+06	591.67	3.64E+04	1.31E+08	9.49E+10
2.133E+06	592.50	3.64E+04	1.31E+08	9.50E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.136E+06	593.33	3.64E+04	1.31E+08	9.51E+10
2.139E+06	594.17	3.64E+04	1.31E+08	9.52E+10
2.141E+06	594.72	3.64E+04	1.31E+08	9.53E+10
2.144E+06	595.56	3.64E+04	1.31E+08	9.54E+10
2.147E+06	596.39	3.64E+04	1.31E+08	9.55E+10
2.150E+06	597.22	3.64E+04	1.31E+08	9.56E+10
2.153E+06	598.06	3.64E+04	1.31E+08	9.57E+10
2.156E+06	598.89	3.64E+04	1.31E+08	9.58E+10
2.159E+06	599.72	3.64E+04	1.31E+08	9.60E+10
2.161E+06	600.28	3.64E+04	1.31E+08	9.60E+10
2.164E+06	601.11	3.63E+04	1.31E+08	9.61E+10
2.167E+06	601.94	3.63E+04	1.31E+08	9.62E+10
2.170E+06	602.78	3.63E+04	1.31E+08	9.64E+10
2.173E+06	603.61	3.63E+04	1.31E+08	9.65E+10
2.176E+06	604.44	3.63E+04	1.31E+08	9.66E+10
2.178E+06	605.00	3.63E+04	1.31E+08	9.66E+10
2.181E+06	605.83	3.63E+04	1.31E+08	9.68E+10
2.184E+06	606.67	3.63E+04	1.31E+08	9.69E+10
2.187E+06	607.50	3.63E+04	1.31E+08	9.70E+10
2.190E+06	608.33	3.63E+04	1.31E+08	9.71E+10
2.193E+06	609.17	3.63E+04	1.31E+08	9.72E+10
2.196E+06	610.00	3.63E+04	1.31E+08	9.73E+10
2.198E+06	610.56	3.63E+04	1.31E+08	9.74E+10
2.201E+06	611.39	3.63E+04	1.31E+08	9.75E+10
2.204E+06	612.22	3.63E+04	1.31E+08	9.76E+10
2.207E+06	613.06	3.62E+04	1.30E+08	9.77E+10
2.210E+06	613.89	3.62E+04	1.30E+08	9.78E+10
2.213E+06	614.72	3.62E+04	1.30E+08	9.79E+10
2.216E+06	615.56	3.62E+04	1.30E+08	9.80E+10
2.218E+06	616.11	3.62E+04	1.30E+08	9.81E+10
2.221E+06	616.94	3.62E+04	1.30E+08	9.82E+10
2.224E+06	617.78	3.62E+04	1.30E+08	9.83E+10
2.227E+06	618.61	3.62E+04	1.30E+08	9.84E+10
2.230E+06	619.44	3.62E+04	1.30E+08	9.85E+10
2.233E+06	620.28	3.62E+04	1.30E+08	9.86E+10
2.235E+06	620.83	3.62E+04	1.30E+08	9.87E+10
2.238E+06	621.67	3.62E+04	1.30E+08	9.88E+10
2.241E+06	622.50	3.62E+04	1.30E+08	9.89E+10

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.244E+06	623.33	3.62E+04	1.30E+08	9.90E+10
2.247E+06	624.17	3.61E+04	1.30E+08	9.91E+10
2.250E+06	625.00	3.61E+04	1.30E+08	9.92E+10
2.253E+06	625.83	3.61E+04	1.30E+08	9.94E+10
2.255E+06	626.39	3.61E+04	1.30E+08	9.94E+10
2.258E+06	627.22	3.61E+04	1.30E+08	9.95E+10
2.261E+06	628.06	3.61E+04	1.30E+08	9.96E+10
2.264E+06	628.89	3.61E+04	1.30E+08	9.98E+10
2.267E+06	629.72	3.61E+04	1.30E+08	9.99E+10
2.270E+06	630.56	3.61E+04	1.30E+08	1.00E+11
2.273E+06	631.39	3.61E+04	1.30E+08	1.00E+11
2.275E+06	631.94	3.61E+04	1.30E+08	1.00E+11
2.278E+06	632.78	3.61E+04	1.30E+08	1.00E+11
2.281E+06	633.61	3.61E+04	1.30E+08	1.00E+11
2.284E+06	634.44	3.61E+04	1.30E+08	1.00E+11
2.287E+06	635.28	3.61E+04	1.30E+08	1.01E+11
2.290E+06	636.11	3.60E+04	1.30E+08	1.01E+11
2.292E+06	636.67	3.60E+04	1.30E+08	1.01E+11
2.295E+06	637.50	3.60E+04	1.30E+08	1.01E+11
2.298E+06	638.33	3.60E+04	1.30E+08	1.01E+11
2.301E+06	639.17	3.60E+04	1.30E+08	1.01E+11
2.304E+06	640.00	3.60E+04	1.30E+08	1.01E+11
2.307E+06	640.83	3.60E+04	1.30E+08	1.01E+11
2.310E+06	641.67	3.60E+04	1.30E+08	1.01E+11
2.312E+06	642.22	3.60E+04	1.30E+08	1.01E+11
2.315E+06	643.06	3.60E+04	1.30E+08	1.02E+11
2.318E+06	643.89	3.60E+04	1.30E+08	1.02E+11
2.321E+06	644.72	3.60E+04	1.29E+08	1.02E+11
2.324E+06	645.56	3.60E+04	1.29E+08	1.02E+11
2.327E+06	646.39	3.60E+04	1.29E+08	1.02E+11
2.330E+06	647.22	3.60E+04	1.29E+08	1.02E+11
2.332E+06	647.78	3.59E+04	1.29E+08	1.02E+11
2.335E+06	648.61	3.59E+04	1.29E+08	1.02E+11
2.338E+06	649.44	3.59E+04	1.29E+08	1.02E+11
2.341E+06	650.28	3.59E+04	1.29E+08	1.03E+11
2.344E+06	651.11	3.59E+04	1.29E+08	1.03E+11
2.347E+06	651.94	3.59E+04	1.29E+08	1.03E+11
2.349E+06	652.50	3.59E+04	1.29E+08	1.03E+11

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.352E+06	653.33	3.59E+04	1.29E+08	1.03E+11
2.355E+06	654.17	3.59E+04	1.29E+08	1.03E+11
2.358E+06	655.00	3.59E+04	1.29E+08	1.03E+11
2.361E+06	655.83	3.59E+04	1.29E+08	1.03E+11
2.364E+06	656.67	3.59E+04	1.29E+08	1.03E+11
2.367E+06	657.50	3.59E+04	1.29E+08	1.03E+11
2.369E+06	658.06	3.59E+04	1.29E+08	1.04E+11
2.372E+06	658.89	3.59E+04	1.29E+08	1.04E+11
2.375E+06	659.72	3.58E+04	1.29E+08	1.04E+11
2.378E+06	660.56	3.58E+04	1.29E+08	1.04E+11
2.381E+06	661.39	3.58E+04	1.29E+08	1.04E+11
2.384E+06	662.22	3.58E+04	1.29E+08	1.04E+11
2.387E+06	663.06	3.58E+04	1.29E+08	1.04E+11
2.389E+06	663.61	3.58E+04	1.29E+08	1.04E+11
2.392E+06	664.44	3.58E+04	1.29E+08	1.04E+11
2.395E+06	665.28	3.58E+04	1.29E+08	1.04E+11
2.398E+06	666.11	3.58E+04	1.29E+08	1.05E+11
2.401E+06	666.94	3.58E+04	1.29E+08	1.05E+11
2.404E+06	667.78	3.58E+04	1.29E+08	1.05E+11
2.407E+06	668.61	3.58E+04	1.29E+08	1.05E+11
2.409E+06	669.17	3.58E+04	1.29E+08	1.05E+11
2.412E+06	670.00	3.58E+04	1.29E+08	1.05E+11
2.415E+06	670.83	3.58E+04	1.29E+08	1.05E+11
2.418E+06	671.67	3.58E+04	1.29E+08	1.05E+11
2.421E+06	672.50	3.57E+04	1.29E+08	1.05E+11
2.424E+06	673.33	3.57E+04	1.29E+08	1.06E+11
2.426E+06	673.89	3.57E+04	1.29E+08	1.06E+11
2.429E+06	674.72	3.57E+04	1.29E+08	1.06E+11
2.432E+06	675.56	3.57E+04	1.29E+08	1.06E+11
2.435E+06	676.39	3.57E+04	1.29E+08	1.06E+11
2.438E+06	677.22	3.57E+04	1.29E+08	1.06E+11
2.441E+06	678.06	3.57E+04	1.29E+08	1.06E+11
2.444E+06	678.89	3.57E+04	1.28E+08	1.06E+11
2.446E+06	679.44	3.57E+04	1.28E+08	1.06E+11
2.449E+06	680.28	3.57E+04	1.28E+08	1.06E+11
2.452E+06	681.11	3.57E+04	1.28E+08	1.07E+11
2.455E+06	681.94	3.57E+04	1.28E+08	1.07E+11
2.458E+06	682.78	3.57E+04	1.28E+08	1.07E+11

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.461E+06	683.61	3.57E+04	1.28E+08	1.07E+11
2.464E+06	684.44	3.57E+04	1.28E+08	1.07E+11
2.466E+06	685.00	3.56E+04	1.28E+08	1.07E+11
2.469E+06	685.83	3.56E+04	1.28E+08	1.07E+11
2.472E+06	686.67	3.56E+04	1.28E+08	1.07E+11
2.475E+06	687.50	3.56E+04	1.28E+08	1.07E+11
2.478E+06	688.33	3.56E+04	1.28E+08	1.07E+11
2.481E+06	689.17	3.56E+04	1.28E+08	1.08E+11
2.483E+06	689.72	3.56E+04	1.28E+08	1.08E+11
2.486E+06	690.56	3.56E+04	1.28E+08	1.08E+11
2.489E+06	691.39	3.56E+04	1.28E+08	1.08E+11
2.492E+06	692.22	3.56E+04	1.28E+08	1.08E+11
2.495E+06	693.06	3.56E+04	1.28E+08	1.08E+11
2.498E+06	693.89	3.56E+04	1.28E+08	1.08E+11
2.501E+06	694.72	3.56E+04	1.28E+08	1.08E+11
2.503E+06	695.28	3.56E+04	1.28E+08	1.08E+11
2.506E+06	696.11	3.56E+04	1.28E+08	1.08E+11
2.509E+06	696.94	3.56E+04	1.28E+08	1.09E+11
2.512E+06	697.78	3.55E+04	1.28E+08	1.09E+11
2.515E+06	698.61	3.55E+04	1.28E+08	1.09E+11
2.518E+06	699.44	3.55E+04	1.28E+08	1.09E+11
2.521E+06	700.28	3.55E+04	1.28E+08	1.09E+11
2.523E+06	700.83	3.55E+04	1.28E+08	1.09E+11
2.526E+06	701.67	3.55E+04	1.28E+08	1.09E+11
2.529E+06	702.50	3.55E+04	1.28E+08	1.09E+11
2.532E+06	703.33	3.55E+04	1.28E+08	1.09E+11
2.535E+06	704.17	3.55E+04	1.28E+08	1.09E+11
2.538E+06	705.00	3.55E+04	1.28E+08	1.10E+11
2.540E+06	705.56	3.55E+04	1.28E+08	1.10E+11
2.543E+06	706.39	3.55E+04	1.28E+08	1.10E+11
2.546E+06	707.22	3.55E+04	1.28E+08	1.10E+11
2.549E+06	708.06	3.55E+04	1.28E+08	1.10E+11
2.552E+06	708.89	3.55E+04	1.28E+08	1.10E+11
2.555E+06	709.72	3.55E+04	1.28E+08	1.10E+11
2.558E+06	710.56	3.54E+04	1.28E+08	1.10E+11
2.560E+06	711.11	3.54E+04	1.28E+08	1.10E+11
2.563E+06	711.94	3.54E+04	1.28E+08	1.10E+11
2.566E+06	712.78	3.54E+04	1.28E+08	1.11E+11

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.569E+06	713.61	3.54E+04	1.28E+08	1.11E+11
2.572E+06	714.44	3.54E+04	1.27E+08	1.11E+11
2.575E+06	715.28	3.54E+04	1.27E+08	1.11E+11
2.578E+06	716.11	3.54E+04	1.27E+08	1.11E+11
2.580E+06	716.67	3.54E+04	1.27E+08	1.11E+11
2.583E+06	717.50	3.54E+04	1.27E+08	1.11E+11
2.586E+06	718.33	3.54E+04	1.27E+08	1.11E+11
2.589E+06	719.17	3.54E+04	1.27E+08	1.11E+11
2.592E+06	720.00	3.54E+04	1.27E+08	1.11E+11
2.595E+06	720.83	3.54E+04	1.27E+08	1.12E+11
2.597E+06	721.39	3.54E+04	1.27E+08	1.12E+11
2.600E+06	722.22	3.54E+04	1.27E+08	1.12E+11
2.603E+06	723.06	3.53E+04	1.27E+08	1.12E+11
2.606E+06	723.89	3.53E+04	1.27E+08	1.12E+11
2.609E+06	724.72	3.53E+04	1.27E+08	1.12E+11
2.612E+06	725.56	3.53E+04	1.27E+08	1.12E+11
2.615E+06	726.39	3.53E+04	1.27E+08	1.12E+11
2.617E+06	726.94	3.53E+04	1.27E+08	1.12E+11
2.620E+06	727.78	3.53E+04	1.27E+08	1.12E+11
2.623E+06	728.61	3.53E+04	1.27E+08	1.13E+11
2.626E+06	729.44	3.53E+04	1.27E+08	1.13E+11
2.629E+06	730.28	3.53E+04	1.27E+08	1.13E+11
2.632E+06	731.11	3.53E+04	1.27E+08	1.13E+11
2.635E+06	731.94	3.53E+04	1.27E+08	1.13E+11
2.637E+06	732.50	3.53E+04	1.27E+08	1.13E+11
2.640E+06	733.33	3.53E+04	1.27E+08	1.13E+11
2.643E+06	734.17	3.53E+04	1.27E+08	1.13E+11
2.646E+06	735.00	3.53E+04	1.27E+08	1.13E+11
2.649E+06	735.83	3.53E+04	1.27E+08	1.13E+11
2.652E+06	736.67	3.53E+04	1.27E+08	1.14E+11
2.655E+06	737.50	3.53E+04	1.27E+08	1.14E+11
2.657E+06	738.06	3.52E+04	1.27E+08	1.14E+11
2.660E+06	738.89	3.52E+04	1.27E+08	1.14E+11
2.663E+06	739.72	3.52E+04	1.27E+08	1.14E+11
2.666E+06	740.56	3.52E+04	1.27E+08	1.14E+11
2.669E+06	741.39	3.52E+04	1.27E+08	1.14E+11
2.672E+06	742.22	3.52E+04	1.27E+08	1.14E+11
2.674E+06	742.78	3.52E+04	1.27E+08	1.14E+11

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.677E+06	743.61	3.52E+04	1.27E+08	1.14E+11
2.680E+06	744.44	3.52E+04	1.27E+08	1.15E+11
2.683E+06	745.28	3.52E+04	1.27E+08	1.15E+11
2.686E+06	746.11	3.52E+04	1.27E+08	1.15E+11
2.689E+06	746.94	3.52E+04	1.27E+08	1.15E+11
2.692E+06	747.78	3.52E+04	1.27E+08	1.15E+11
2.694E+06	748.33	3.52E+04	1.27E+08	1.15E+11
2.697E+06	749.17	3.52E+04	1.27E+08	1.15E+11
2.700E+06	750.00	3.52E+04	1.27E+08	1.15E+11
2.703E+06	750.83	3.52E+04	1.27E+08	1.15E+11
2.706E+06	751.67	3.52E+04	1.27E+08	1.15E+11
2.709E+06	752.50	3.52E+04	1.27E+08	1.16E+11
2.712E+06	753.33	3.52E+04	1.27E+08	1.16E+11
2.714E+06	753.89	3.51E+04	1.27E+08	1.16E+11
2.717E+06	754.72	3.51E+04	1.27E+08	1.16E+11
2.720E+06	755.56	3.51E+04	1.26E+08	1.16E+11
2.723E+06	756.39	3.51E+04	1.26E+08	1.16E+11
2.726E+06	757.22	3.51E+04	1.26E+08	1.16E+11
2.729E+06	758.06	3.51E+04	1.26E+08	1.16E+11
2.731E+06	758.61	3.51E+04	1.26E+08	1.16E+11
2.734E+06	759.44	3.51E+04	1.26E+08	1.16E+11
2.737E+06	760.28	3.51E+04	1.26E+08	1.17E+11
2.740E+06	761.11	3.51E+04	1.26E+08	1.17E+11
2.743E+06	761.94	3.51E+04	1.26E+08	1.17E+11
2.746E+06	762.78	3.51E+04	1.26E+08	1.17E+11
2.749E+06	763.61	3.51E+04	1.26E+08	1.17E+11
2.751E+06	764.17	3.51E+04	1.26E+08	1.17E+11
2.754E+06	765.00	3.51E+04	1.26E+08	1.17E+11
2.757E+06	765.83	3.51E+04	1.26E+08	1.17E+11
2.760E+06	766.67	3.51E+04	1.26E+08	1.17E+11
2.763E+06	767.50	3.51E+04	1.26E+08	1.17E+11
2.766E+06	768.33	3.51E+04	1.26E+08	1.18E+11
2.769E+06	769.17	3.51E+04	1.26E+08	1.18E+11
2.771E+06	769.72	3.50E+04	1.26E+08	1.18E+11
2.774E+06	770.56	3.50E+04	1.26E+08	1.18E+11
2.777E+06	771.39	3.50E+04	1.26E+08	1.18E+11
2.780E+06	772.22	3.50E+04	1.26E+08	1.18E+11
2.783E+06	773.06	3.50E+04	1.26E+08	1.18E+11

Appendix P9.1: Integrated UHS Heat Load

Time (seconds)	Time (hours)	Total UHS Heat Load (Btu/s) [Ref. P5.1]	Total UHS Heat Load (Btu/hr)	Integrated UHS Heat Load (Btu)
2.786E+06	773.89	3.50E+04	1.26E+08	1.18E+11
2.788E+06	774.44	3.50E+04	1.26E+08	1.18E+11
2.791E+06	775.28	3.50E+04	1.26E+08	1.18E+11
2.794E+06	776.11	3.50E+04	1.26E+08	1.19E+11
2.797E+06	776.94	3.50E+04	1.26E+08	1.19E+11
2.800E+06	777.78	3.50E+04	1.26E+08	1.19E+11
2.803E+06	778.61	3.50E+04	1.26E+08	1.19E+11
2.806E+06	779.44	3.50E+04	1.26E+08	1.19E+11
2.808E+06	780.00	3.50E+04	1.26E+08	1.19E+11
2.811E+06	780.83	3.50E+04	1.26E+08	1.19E+11
2.814E+06	781.67	3.50E+04	1.26E+08	1.19E+11
2.817E+06	782.50	3.50E+04	1.26E+08	1.19E+11
2.820E+06	783.33	3.50E+04	1.26E+08	1.19E+11
2.823E+06	784.17	3.50E+04	1.26E+08	1.20E+11
2.826E+06	785.00	3.49E+04	1.26E+08	1.20E+11
2.828E+06	785.56	3.49E+04	1.26E+08	1.20E+11
2.831E+06	786.39	3.49E+04	1.26E+08	1.20E+11
2.834E+06	787.22	3.49E+04	1.26E+08	1.20E+11
2.837E+06	788.06	3.49E+04	1.26E+08	1.20E+11
2.840E+06	788.89	3.49E+04	1.26E+08	1.20E+11
2.843E+06	789.72	3.49E+04	1.26E+08	1.20E+11
2.845E+06	790.28	3.49E+04	1.26E+08	1.20E+11
2.848E+06	791.11	3.49E+04	1.26E+08	1.20E+11
2.851E+06	791.94	3.49E+04	1.26E+08	1.21E+11

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
0	1	65.3	3.78E+08	3.78E+08	25.95
1	2	65.3	8.46E+08	4.68E+08	32.20
2	3	65.3	1.36E+09	5.11E+08	35.16
3	4	65.3	1.88E+09	5.21E+08	35.80
4	5	65.3	2.25E+09	3.69E+08	25.36
5	6	65.3	2.57E+09	3.26E+08	22.43
6	7	65.3	2.88E+09	3.09E+08	21.26
7	8	65.3	3.18E+09	2.96E+08	20.32
8	9	65.3	3.46E+09	2.82E+08	19.39
9	10	65.3	3.73E+09	2.70E+08	18.57
10	11	65.3	3.99E+09	2.61E+08	17.96
11	12	65.3	4.24E+09	2.54E+08	17.45
12	13	65.3	4.49E+09	2.47E+08	16.98
13	14	65.3	4.73E+09	2.42E+08	16.64
14	15	65.3	4.97E+09	2.38E+08	16.35
15	16	65.3	5.21E+09	2.35E+08	16.17
16	17	86.0	5.63E+09	4.27E+08	22.29
17	18	86.0	6.00E+09	3.69E+08	19.27
18	19	86.0	6.33E+09	3.28E+08	17.13
19	20	86.0	6.63E+09	2.99E+08	15.60
20	21	86.0	6.91E+09	2.77E+08	14.46
21	22	86.0	7.17E+09	2.64E+08	13.79
22	23	86.0	7.43E+09	2.57E+08	13.42
23	24	86.0	7.68E+09	2.53E+08	13.22
24	25	86.0	7.93E+09	2.50E+08	13.05
25	26	86.0	8.18E+09	2.45E+08	12.80
26	27	86.0	8.42E+09	2.40E+08	12.52
27	28	86.0	8.65E+09	2.35E+08	12.27
28	29	86.0	8.88E+09	2.32E+08	12.10
29	30	86.0	9.11E+09	2.30E+08	11.98
30	31	86.0	9.34E+09	2.28E+08	11.88
31	32	86.0	9.57E+09	2.26E+08	11.79
32	33	86.0	9.79E+09	2.24E+08	11.71
33	34	86.0	1.00E+10	2.23E+08	11.65
34	35	86.0	1.02E+10	2.22E+08	11.58
35	36	86.0	1.05E+10	2.21E+08	11.51
36	37	86.0	1.07E+10	2.19E+08	11.45
37	38	86.0	1.09E+10	2.18E+08	11.39
38	39	86.0	1.11E+10	2.17E+08	11.33
39	40	86.0	1.13E+10	2.16E+08	11.27
40	41	86.0	1.15E+10	2.15E+08	11.21
41	42	86.0	1.18E+10	2.14E+08	11.16
42	43	86.0	1.20E+10	2.13E+08	11.10
43	44	86.0	1.22E+10	2.12E+08	11.04
44	45	86.0	1.24E+10	2.11E+08	10.99

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
45	46	86.0	1.26E+10	2.10E+08	10.94
46	47	86.0	1.28E+10	2.09E+08	10.89
47	48	86.0	1.30E+10	2.08E+08	10.84
48	49	86.0	1.32E+10	2.07E+08	10.79
49	50	86.0	1.34E+10	2.06E+08	10.75
50	51	86.0	1.36E+10	2.05E+08	10.71
51	52	86.0	1.38E+10	2.05E+08	10.68
52	53	86.0	1.40E+10	2.04E+08	10.64
53	54	86.0	1.42E+10	2.03E+08	10.60
54	55	86.0	1.44E+10	2.02E+08	10.56
55	56	86.0	1.46E+10	2.02E+08	10.53
56	57	86.0	1.49E+10	2.01E+08	10.49
57	58	86.0	1.51E+10	2.00E+08	10.46
58	59	86.0	1.53E+10	2.00E+08	10.42
59	60	86.0	1.54E+10	1.99E+08	10.39
60	61	86.0	1.56E+10	1.98E+08	10.35
61	62	86.0	1.58E+10	1.98E+08	10.32
62	63	86.0	1.60E+10	1.97E+08	10.29
63	64	86.0	1.62E+10	1.96E+08	10.25
64	65	86.0	1.64E+10	1.96E+08	10.22
65	66	86.0	1.66E+10	1.95E+08	10.19
66	67	86.0	1.68E+10	1.95E+08	10.15
67	68	86.0	1.70E+10	1.94E+08	10.12
68	69	86.0	1.72E+10	1.93E+08	10.09
69	70	86.0	1.74E+10	1.93E+08	10.06
70	71	86.0	1.76E+10	1.92E+08	10.02
71	72	86.0	1.78E+10	1.91E+08	9.99
72	73	86.0	1.80E+10	1.95E+08	10.18
73	74	86.0	1.82E+10	1.99E+08	10.41
74	75	86.0	1.84E+10	1.96E+08	10.25
75	76	86.0	1.86E+10	1.93E+08	10.10
76	77	86.0	1.88E+10	1.91E+08	9.99
77	78	86.0	1.90E+10	1.90E+08	9.91
78	79	86.0	1.91E+10	1.89E+08	9.86
79	80	86.0	1.93E+10	1.88E+08	9.82
80	81	86.0	1.95E+10	1.87E+08	9.79
81	82	86.0	1.97E+10	1.87E+08	9.75
82	83	86.0	1.99E+10	1.86E+08	9.73
83	84	86.0	2.01E+10	1.86E+08	9.70
84	85	86.0	2.03E+10	1.85E+08	9.67
85	86	86.0	2.04E+10	1.85E+08	9.65
86	87	86.0	2.06E+10	1.84E+08	9.62
87	88	86.0	2.08E+10	1.84E+08	9.60
88	89	86.0	2.10E+10	1.83E+08	9.58
89	90	86.0	2.12E+10	1.83E+08	9.55

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
90	91	86.0	2.14E+10	1.83E+08	9.53
91	92	86.0	2.15E+10	1.82E+08	9.51
92	93	86.0	2.17E+10	1.82E+08	9.48
93	94	86.0	2.19E+10	1.81E+08	9.46
94	95	86.0	2.21E+10	1.81E+08	9.43
95	96	86.0	2.23E+10	1.80E+08	9.41
96	97	86.0	2.25E+10	1.80E+08	9.39
97	98	86.0	2.26E+10	1.79E+08	9.37
98	99	86.0	2.28E+10	1.79E+08	9.35
99	100	86.0	2.30E+10	1.79E+08	9.33
100	101	86.0	2.32E+10	1.78E+08	9.31
101	102	86.0	2.33E+10	1.78E+08	9.30
102	103	86.0	2.35E+10	1.78E+08	9.28
103	104	86.0	2.37E+10	1.77E+08	9.26
104	105	86.0	2.39E+10	1.77E+08	9.24
105	106	86.0	2.41E+10	1.77E+08	9.22
106	107	86.0	2.42E+10	1.76E+08	9.21
107	108	86.0	2.44E+10	1.76E+08	9.19
108	109	86.0	2.46E+10	1.76E+08	9.17
109	110	86.0	2.48E+10	1.75E+08	9.15
110	111	86.0	2.49E+10	1.75E+08	9.13
111	112	86.0	2.51E+10	1.75E+08	9.11
112	113	86.0	2.53E+10	1.74E+08	9.10
113	114	86.0	2.55E+10	1.74E+08	9.08
114	115	86.0	2.56E+10	1.74E+08	9.07
115	116	86.0	2.58E+10	1.73E+08	9.05
116	117	86.0	2.60E+10	1.73E+08	9.03
117	118	86.0	2.61E+10	1.73E+08	9.01
118	119	86.0	2.63E+10	1.72E+08	9.00
119	120	86.0	2.65E+10	1.72E+08	8.98
120	121	86.0	2.67E+10	1.78E+08	9.27
121	122	86.0	2.69E+10	1.90E+08	9.93
122	123	86.0	2.70E+10	1.87E+08	9.76
123	124	86.0	2.72E+10	1.81E+08	9.43
124	125	86.0	2.74E+10	1.77E+08	9.23
125	126	86.0	2.76E+10	1.74E+08	9.10
126	127	86.0	2.78E+10	1.73E+08	9.01
127	128	86.0	2.79E+10	1.71E+08	8.95
128	129	86.0	2.81E+10	1.71E+08	8.91
129	130	86.0	2.83E+10	1.70E+08	8.88
130	131	86.0	2.84E+10	1.70E+08	8.86
131	132	86.0	2.86E+10	1.69E+08	8.84
132	133	86.0	2.88E+10	1.69E+08	8.82
133	134	86.0	2.89E+10	1.69E+08	8.81
134	135	86.0	2.91E+10	1.68E+08	8.79

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
135	136	86.0	2.93E+10	1.68E+08	8.78
136	137	86.0	2.94E+10	1.68E+08	8.76
137	138	86.0	2.96E+10	1.68E+08	8.75
138	139	86.0	2.98E+10	1.67E+08	8.74
139	140	86.0	2.99E+10	1.67E+08	8.72
140	141	86.0	3.01E+10	1.67E+08	8.71
141	142	86.0	3.03E+10	1.67E+08	8.70
142	143	86.0	3.04E+10	1.66E+08	8.68
143	144	86.0	3.06E+10	1.66E+08	8.67
144	145	86.0	3.08E+10	1.83E+08	9.55
145	146	86.0	3.10E+10	2.07E+08	10.82
146	147	86.0	3.12E+10	1.97E+08	10.28
147	148	86.0	3.14E+10	1.85E+08	9.65
148	149	86.0	3.16E+10	1.77E+08	9.26
149	150	86.0	3.17E+10	1.72E+08	8.98
150	151	86.0	3.19E+10	1.69E+08	8.83
151	152	86.0	3.21E+10	1.67E+08	8.73
152	153	86.0	3.22E+10	1.66E+08	8.67
153	154	86.0	3.24E+10	1.65E+08	8.62
154	155	86.0	3.26E+10	1.64E+08	8.59
155	156	86.0	3.27E+10	1.64E+08	8.56
156	157	86.0	3.29E+10	1.64E+08	8.54
157	158	86.0	3.31E+10	1.63E+08	8.52
158	159	86.0	3.32E+10	1.63E+08	8.51
159	160	86.0	3.34E+10	1.63E+08	8.50
160	161	86.0	3.35E+10	1.63E+08	8.48
161	162	86.0	3.37E+10	1.62E+08	8.47
162	163	86.0	3.39E+10	1.62E+08	8.46
163	164	86.0	3.40E+10	1.62E+08	8.45
164	165	86.0	3.42E+10	1.62E+08	8.44
165	166	86.0	3.44E+10	1.61E+08	8.43
166	167	86.0	3.45E+10	1.61E+08	8.41
167	168	86.0	3.47E+10	1.61E+08	8.40
168	169	86.0	3.48E+10	1.61E+08	8.39
169	170	86.0	3.50E+10	1.61E+08	8.38
170	171	86.0	3.52E+10	1.60E+08	8.38
171	172	86.0	3.53E+10	1.60E+08	8.37
172	173	86.0	3.55E+10	1.60E+08	8.36
173	174	86.0	3.56E+10	1.60E+08	8.35
174	175	86.0	3.58E+10	1.60E+08	8.34
175	176	86.0	3.60E+10	1.60E+08	8.33
176	177	86.0	3.61E+10	1.60E+08	8.33
177	178	86.0	3.63E+10	1.59E+08	8.32
178	179	86.0	3.64E+10	1.59E+08	8.31
179	180	86.0	3.66E+10	1.59E+08	8.30

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
180	181	86.0	3.68E+10	1.59E+08	8.29
181	182	86.0	3.69E+10	1.59E+08	8.29
182	183	86.0	3.71E+10	1.59E+08	8.28
183	184	86.0	3.72E+10	1.58E+08	8.27
184	185	86.0	3.74E+10	1.58E+08	8.26
185	186	86.0	3.75E+10	1.58E+08	8.25
186	187	86.0	3.77E+10	1.58E+08	8.24
187	188	86.0	3.79E+10	1.58E+08	8.24
188	189	86.0	3.80E+10	1.58E+08	8.23
189	190	86.0	3.82E+10	1.57E+08	8.22
190	191	86.0	3.83E+10	1.57E+08	8.21
191	192	86.0	3.85E+10	1.57E+08	8.20
192	193	86.0	3.86E+10	1.57E+08	8.20
193	194	86.0	3.88E+10	1.57E+08	8.19
194	195	86.0	3.90E+10	1.57E+08	8.18
195	196	86.0	3.91E+10	1.57E+08	8.17
196	197	86.0	3.93E+10	1.56E+08	8.17
197	198	86.0	3.94E+10	1.56E+08	8.16
198	199	86.0	3.96E+10	1.56E+08	8.15
199	200	86.0	3.97E+10	1.56E+08	8.14
200	201	86.0	3.99E+10	1.56E+08	8.14
201	202	86.0	4.01E+10	1.56E+08	8.13
202	203	86.0	4.02E+10	1.56E+08	8.12
203	204	86.0	4.04E+10	1.55E+08	8.11
204	205	86.0	4.05E+10	1.55E+08	8.11
205	206	86.0	4.07E+10	1.55E+08	8.10
206	207	86.0	4.08E+10	1.55E+08	8.09
207	208	86.0	4.10E+10	1.55E+08	8.08
208	209	86.0	4.11E+10	1.55E+08	8.08
209	210	86.0	4.13E+10	1.55E+08	8.07
210	211	86.0	4.14E+10	1.54E+08	8.06
211	212	86.0	4.16E+10	1.54E+08	8.05
212	213	86.0	4.18E+10	1.54E+08	8.05
213	214	86.0	4.19E+10	1.54E+08	8.04
214	215	86.0	4.21E+10	1.54E+08	8.03
215	216	86.0	4.22E+10	1.54E+08	8.02
216	217	86.0	4.24E+10	1.54E+08	8.02
217	218	86.0	4.25E+10	1.53E+08	8.01
218	219	86.0	4.27E+10	1.53E+08	8.00
219	220	86.0	4.28E+10	1.53E+08	8.00
220	221	86.0	4.30E+10	1.53E+08	7.99
221	222	86.0	4.31E+10	1.53E+08	7.98
222	223	86.0	4.33E+10	1.53E+08	7.98
223	224	86.0	4.34E+10	1.53E+08	7.97
224	225	86.0	4.36E+10	1.53E+08	7.96

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
225	226	86.0	4.37E+10	1.52E+08	7.96
226	227	86.0	4.39E+10	1.52E+08	7.95
227	228	86.0	4.41E+10	1.52E+08	7.95
228	229	86.0	4.42E+10	1.52E+08	7.94
229	230	86.0	4.44E+10	1.52E+08	7.93
230	231	86.0	4.45E+10	1.52E+08	7.93
231	232	86.0	4.47E+10	1.52E+08	7.92
232	233	86.0	4.48E+10	1.52E+08	7.92
233	234	86.0	4.50E+10	1.52E+08	7.91
234	235	86.0	4.51E+10	1.51E+08	7.91
235	236	86.0	4.53E+10	1.51E+08	7.90
236	237	86.0	4.54E+10	1.51E+08	7.90
237	238	86.0	4.56E+10	1.51E+08	7.89
238	239	86.0	4.57E+10	1.51E+08	7.88
239	240	86.0	4.59E+10	1.51E+08	7.88
240	241	86.0	4.60E+10	1.51E+08	7.87
241	242	86.0	4.62E+10	1.51E+08	7.87
242	243	86.0	4.63E+10	1.51E+08	7.86
243	244	86.0	4.65E+10	1.51E+08	7.86
244	245	86.0	4.66E+10	1.50E+08	7.85
245	246	86.0	4.68E+10	1.50E+08	7.85
246	247	86.0	4.69E+10	1.50E+08	7.84
247	248	86.0	4.71E+10	1.50E+08	7.84
248	249	86.0	4.72E+10	1.50E+08	7.83
249	250	86.0	4.74E+10	1.50E+08	7.83
250	251	86.0	4.75E+10	1.50E+08	7.82
251	252	86.0	4.77E+10	1.50E+08	7.82
252	253	86.0	4.78E+10	1.50E+08	7.81
253	254	86.0	4.80E+10	1.50E+08	7.81
254	255	86.0	4.81E+10	1.49E+08	7.80
255	256	86.0	4.83E+10	1.49E+08	7.80
256	257	86.0	4.84E+10	1.49E+08	7.79
257	258	86.0	4.86E+10	1.49E+08	7.79
258	259	86.0	4.87E+10	1.49E+08	7.78
259	260	86.0	4.89E+10	1.49E+08	7.78
260	261	86.0	4.90E+10	1.49E+08	7.77
261	262	86.0	4.92E+10	1.49E+08	7.77
262	263	86.0	4.93E+10	1.49E+08	7.76
263	264	86.0	4.95E+10	1.49E+08	7.76
264	265	86.0	4.96E+10	1.48E+08	7.75
265	266	86.0	4.98E+10	1.48E+08	7.75
266	267	86.0	4.99E+10	1.48E+08	7.74
267	268	86.0	5.01E+10	1.48E+08	7.74
268	269	86.0	5.02E+10	1.48E+08	7.73
269	270	86.0	5.04E+10	1.48E+08	7.73

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
270	271	86.0	5.05E+10	1.48E+08	7.72
271	272	86.0	5.07E+10	1.48E+08	7.72
272	273	86.0	5.08E+10	1.48E+08	7.71
273	274	86.0	5.09E+10	1.48E+08	7.71
274	275	86.0	5.11E+10	1.48E+08	7.70
275	276	86.0	5.12E+10	1.47E+08	7.70
276	277	86.0	5.14E+10	1.47E+08	7.69
277	278	86.0	5.15E+10	1.47E+08	7.69
278	279	86.0	5.17E+10	1.47E+08	7.69
279	280	86.0	5.18E+10	1.47E+08	7.68
280	281	86.0	5.20E+10	1.47E+08	7.68
281	282	86.0	5.21E+10	1.47E+08	7.67
282	283	86.0	5.23E+10	1.47E+08	7.67
283	284	86.0	5.24E+10	1.47E+08	7.67
284	285	86.0	5.26E+10	1.47E+08	7.66
285	286	86.0	5.27E+10	1.47E+08	7.66
286	287	86.0	5.29E+10	1.47E+08	7.65
287	288	86.0	5.30E+10	1.47E+08	7.65
288	289	86.0	5.32E+10	1.46E+08	7.65
289	290	86.0	5.33E+10	1.46E+08	7.64
290	291	86.0	5.34E+10	1.46E+08	7.64
291	292	86.0	5.36E+10	1.46E+08	7.63
292	293	86.0	5.37E+10	1.46E+08	7.63
293	294	86.0	5.39E+10	1.46E+08	7.63
294	295	86.0	5.40E+10	1.46E+08	7.62
295	296	86.0	5.42E+10	1.46E+08	7.62
296	297	86.0	5.43E+10	1.46E+08	7.62
297	298	86.0	5.45E+10	1.46E+08	7.61
298	299	86.0	5.46E+10	1.46E+08	7.61
299	300	86.0	5.48E+10	1.46E+08	7.61
300	301	86.0	5.49E+10	1.46E+08	7.60
301	302	86.0	5.50E+10	1.46E+08	7.60
302	303	86.0	5.52E+10	1.45E+08	7.59
303	304	86.0	5.53E+10	1.45E+08	7.59
304	305	86.0	5.55E+10	1.45E+08	7.59
305	306	86.0	5.56E+10	1.45E+08	7.58
306	307	86.0	5.58E+10	1.45E+08	7.58
307	308	86.0	5.59E+10	1.45E+08	7.58
308	309	86.0	5.61E+10	1.45E+08	7.57
309	310	86.0	5.62E+10	1.45E+08	7.57
310	311	86.0	5.64E+10	1.45E+08	7.57
311	312	86.0	5.65E+10	1.45E+08	7.56
312	313	86.0	5.66E+10	1.45E+08	7.56
313	314	86.0	5.68E+10	1.45E+08	7.55
314	315	86.0	5.69E+10	1.45E+08	7.55

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
315	316	86.0	5.71E+10	1.45E+08	7.55
316	317	86.0	5.72E+10	1.45E+08	7.54
317	318	86.0	5.74E+10	1.44E+08	7.54
318	319	86.0	5.75E+10	1.44E+08	7.54
319	320	86.0	5.77E+10	1.44E+08	7.53
320	321	86.0	5.78E+10	1.44E+08	7.53
321	322	86.0	5.79E+10	1.44E+08	7.53
322	323	86.0	5.81E+10	1.44E+08	7.52
323	324	86.0	5.82E+10	1.44E+08	7.52
324	325	86.0	5.84E+10	1.44E+08	7.52
325	326	86.0	5.85E+10	1.44E+08	7.51
326	327	86.0	5.87E+10	1.44E+08	7.51
327	328	86.0	5.88E+10	1.44E+08	7.51
328	329	86.0	5.90E+10	1.44E+08	7.50
329	330	86.0	5.91E+10	1.44E+08	7.50
330	331	86.0	5.92E+10	1.44E+08	7.49
331	332	86.0	5.94E+10	1.44E+08	7.49
332	333	86.0	5.95E+10	1.43E+08	7.49
333	334	86.0	5.97E+10	1.43E+08	7.48
334	335	86.0	5.98E+10	1.43E+08	7.48
335	336	86.0	6.00E+10	1.43E+08	7.48
336	337	86.0	6.01E+10	1.43E+08	7.47
337	338	86.0	6.02E+10	1.43E+08	7.47
338	339	86.0	6.04E+10	1.43E+08	7.47
339	340	86.0	6.05E+10	1.43E+08	7.46
340	341	86.0	6.07E+10	1.43E+08	7.46
341	342	86.0	6.08E+10	1.43E+08	7.46
342	343	86.0	6.10E+10	1.43E+08	7.45
343	344	86.0	6.11E+10	1.43E+08	7.45
344	345	86.0	6.12E+10	1.43E+08	7.45
345	346	86.0	6.14E+10	1.43E+08	7.44
346	347	86.0	6.15E+10	1.43E+08	7.44
347	348	86.0	6.17E+10	1.42E+08	7.44
348	349	86.0	6.18E+10	1.42E+08	7.43
349	350	86.0	6.20E+10	1.42E+08	7.43
350	351	86.0	6.21E+10	1.42E+08	7.43
351	352	86.0	6.22E+10	1.42E+08	7.42
352	353	86.0	6.24E+10	1.42E+08	7.42
353	354	86.0	6.25E+10	1.42E+08	7.42
354	355	86.0	6.27E+10	1.42E+08	7.41
355	356	86.0	6.28E+10	1.42E+08	7.41
356	357	86.0	6.29E+10	1.42E+08	7.41
357	358	86.0	6.31E+10	1.42E+08	7.40
358	359	86.0	6.32E+10	1.42E+08	7.40
359	360	86.0	6.34E+10	1.42E+08	7.40

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
360	361	86.0	6.35E+10	1.42E+08	7.39
361	362	86.0	6.37E+10	1.42E+08	7.39
362	363	86.0	6.38E+10	1.42E+08	7.39
363	364	86.0	6.39E+10	1.41E+08	7.38
364	365	86.0	6.41E+10	1.41E+08	7.38
365	366	86.0	6.42E+10	1.41E+08	7.38
366	367	86.0	6.44E+10	1.41E+08	7.37
367	368	86.0	6.45E+10	1.41E+08	7.37
368	369	86.0	6.46E+10	1.41E+08	7.37
369	370	86.0	6.48E+10	1.41E+08	7.36
370	371	86.0	6.49E+10	1.41E+08	7.36
371	372	86.0	6.51E+10	1.41E+08	7.36
372	373	86.0	6.52E+10	1.41E+08	7.35
373	374	86.0	6.54E+10	1.41E+08	7.35
374	375	86.0	6.55E+10	1.41E+08	7.35
375	376	86.0	6.56E+10	1.41E+08	7.34
376	377	86.0	6.58E+10	1.41E+08	7.34
377	378	86.0	6.59E+10	1.41E+08	7.34
378	379	86.0	6.61E+10	1.41E+08	7.33
379	380	86.0	6.62E+10	1.40E+08	7.33
380	381	86.0	6.63E+10	1.40E+08	7.33
381	382	86.0	6.65E+10	1.40E+08	7.33
382	383	86.0	6.66E+10	1.40E+08	7.32
383	384	86.0	6.68E+10	1.40E+08	7.32
384	385	86.0	6.69E+10	1.40E+08	7.32
385	386	86.0	6.70E+10	1.40E+08	7.31
386	387	86.0	6.72E+10	1.40E+08	7.31
387	388	86.0	6.73E+10	1.40E+08	7.31
388	389	86.0	6.75E+10	1.40E+08	7.30
389	390	86.0	6.76E+10	1.40E+08	7.30
390	391	86.0	6.77E+10	1.40E+08	7.30
391	392	86.0	6.79E+10	1.40E+08	7.29
392	393	86.0	6.80E+10	1.40E+08	7.29
393	394	86.0	6.82E+10	1.40E+08	7.29
394	395	86.0	6.83E+10	1.40E+08	7.28
395	396	86.0	6.84E+10	1.39E+08	7.28
396	397	86.0	6.86E+10	1.39E+08	7.28
397	398	86.0	6.87E+10	1.39E+08	7.28
398	399	86.0	6.89E+10	1.39E+08	7.27
399	400	86.0	6.90E+10	1.39E+08	7.27
400	401	86.0	6.91E+10	1.39E+08	7.27
401	402	86.0	6.93E+10	1.39E+08	7.26
402	403	86.0	6.94E+10	1.39E+08	7.26
403	404	86.0	6.95E+10	1.39E+08	7.26
404	405	86.0	6.97E+10	1.39E+08	7.25

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
405	406	86.0	6.98E+10	1.39E+08	7.25
406	407	86.0	7.00E+10	1.39E+08	7.25
407	408	86.0	7.01E+10	1.39E+08	7.24
408	409	86.0	7.02E+10	1.39E+08	7.24
409	410	86.0	7.04E+10	1.39E+08	7.24
410	411	86.0	7.05E+10	1.39E+08	7.23
411	412	86.0	7.07E+10	1.39E+08	7.23
412	413	86.0	7.08E+10	1.38E+08	7.23
413	414	86.0	7.09E+10	1.38E+08	7.23
414	415	86.0	7.11E+10	1.38E+08	7.22
415	416	86.0	7.12E+10	1.38E+08	7.22
416	417	86.0	7.14E+10	1.38E+08	7.22
417	418	86.0	7.15E+10	1.38E+08	7.21
418	419	86.0	7.16E+10	1.38E+08	7.21
419	420	86.0	7.18E+10	1.38E+08	7.21
420	421	86.0	7.19E+10	1.38E+08	7.20
421	422	86.0	7.20E+10	1.38E+08	7.20
422	423	86.0	7.22E+10	1.38E+08	7.20
423	424	86.0	7.23E+10	1.38E+08	7.20
424	425	86.0	7.25E+10	1.38E+08	7.19
425	426	86.0	7.26E+10	1.38E+08	7.19
426	427	86.0	7.27E+10	1.38E+08	7.19
427	428	86.0	7.29E+10	1.38E+08	7.19
428	429	86.0	7.30E+10	1.38E+08	7.19
429	430	86.0	7.31E+10	1.38E+08	7.18
430	431	86.0	7.33E+10	1.38E+08	7.18
431	432	86.0	7.34E+10	1.38E+08	7.18
432	433	86.0	7.36E+10	1.37E+08	7.18
433	434	86.0	7.37E+10	1.37E+08	7.17
434	435	86.0	7.38E+10	1.37E+08	7.17
435	436	86.0	7.40E+10	1.37E+08	7.17
436	437	86.0	7.41E+10	1.37E+08	7.17
437	438	86.0	7.42E+10	1.37E+08	7.16
438	439	86.0	7.44E+10	1.37E+08	7.16
439	440	86.0	7.45E+10	1.37E+08	7.16
440	441	86.0	7.47E+10	1.37E+08	7.16
441	442	86.0	7.48E+10	1.37E+08	7.15
442	443	86.0	7.49E+10	1.37E+08	7.15
443	444	86.0	7.51E+10	1.37E+08	7.15
444	445	86.0	7.52E+10	1.37E+08	7.15
445	446	86.0	7.53E+10	1.37E+08	7.14
446	447	86.0	7.55E+10	1.37E+08	7.14
447	448	86.0	7.56E+10	1.37E+08	7.14
448	449	86.0	7.57E+10	1.37E+08	7.14
449	450	86.0	7.59E+10	1.37E+08	7.14

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
450	451	86.0	7.60E+10	1.37E+08	7.13
451	452	86.0	7.62E+10	1.37E+08	7.13
452	453	86.0	7.63E+10	1.37E+08	7.13
453	454	86.0	7.64E+10	1.37E+08	7.13
454	455	86.0	7.66E+10	1.36E+08	7.12
455	456	86.0	7.67E+10	1.36E+08	7.12
456	457	86.0	7.68E+10	1.36E+08	7.12
457	458	86.0	7.70E+10	1.36E+08	7.12
458	459	86.0	7.71E+10	1.36E+08	7.11
459	460	86.0	7.72E+10	1.36E+08	7.11
460	461	86.0	7.74E+10	1.36E+08	7.11
461	462	86.0	7.75E+10	1.36E+08	7.11
462	463	86.0	7.77E+10	1.36E+08	7.11
463	464	86.0	7.78E+10	1.36E+08	7.10
464	465	86.0	7.79E+10	1.36E+08	7.10
465	466	86.0	7.81E+10	1.36E+08	7.10
466	467	86.0	7.82E+10	1.36E+08	7.10
467	468	86.0	7.83E+10	1.36E+08	7.09
468	469	86.0	7.85E+10	1.36E+08	7.09
469	470	86.0	7.86E+10	1.36E+08	7.09
470	471	86.0	7.87E+10	1.36E+08	7.09
471	472	86.0	7.89E+10	1.36E+08	7.08
472	473	86.0	7.90E+10	1.36E+08	7.08
473	474	86.0	7.92E+10	1.36E+08	7.08
474	475	86.0	7.93E+10	1.36E+08	7.08
475	476	86.0	7.94E+10	1.36E+08	7.08
476	477	86.0	7.96E+10	1.35E+08	7.07
477	478	86.0	7.97E+10	1.35E+08	7.07
478	479	86.0	7.98E+10	1.35E+08	7.07
479	480	86.0	8.00E+10	1.35E+08	7.07
480	481	86.0	8.01E+10	1.35E+08	7.06
481	482	86.0	8.02E+10	1.35E+08	7.06
482	483	86.0	8.04E+10	1.35E+08	7.06
483	484	86.0	8.05E+10	1.35E+08	7.06
484	485	86.0	8.06E+10	1.35E+08	7.05
485	486	86.0	8.08E+10	1.35E+08	7.05
486	487	86.0	8.09E+10	1.35E+08	7.05
487	488	86.0	8.10E+10	1.35E+08	7.05
488	489	86.0	8.12E+10	1.35E+08	7.05
489	490	86.0	8.13E+10	1.35E+08	7.04
490	491	86.0	8.15E+10	1.35E+08	7.04
491	492	86.0	8.16E+10	1.35E+08	7.04
492	493	86.0	8.17E+10	1.35E+08	7.04
493	494	86.0	8.19E+10	1.35E+08	7.04
494	495	86.0	8.20E+10	1.35E+08	7.03

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
495	496	86.0	8.21E+10	1.35E+08	7.03
496	497	86.0	8.23E+10	1.35E+08	7.03
497	498	86.0	8.24E+10	1.35E+08	7.03
498	499	86.0	8.25E+10	1.35E+08	7.02
499	500	86.0	8.27E+10	1.35E+08	7.02
500	501	86.0	8.28E+10	1.34E+08	7.02
501	502	86.0	8.29E+10	1.34E+08	7.02
502	503	86.0	8.31E+10	1.34E+08	7.02
503	504	86.0	8.32E+10	1.34E+08	7.01
504	505	86.0	8.33E+10	1.40E+08	7.33
505	506	86.0	8.35E+10	1.52E+08	7.93
506	507	86.0	8.36E+10	1.50E+08	7.83
507	508	86.0	8.38E+10	1.44E+08	7.51
508	509	86.0	8.39E+10	1.40E+08	7.33
509	510	86.0	8.41E+10	1.38E+08	7.20
510	511	86.0	8.42E+10	1.36E+08	7.11
511	512	86.0	8.43E+10	1.35E+08	7.07
512	513	86.0	8.45E+10	1.35E+08	7.04
513	514	86.0	8.46E+10	1.35E+08	7.02
514	515	86.0	8.47E+10	1.34E+08	7.01
515	516	86.0	8.49E+10	1.34E+08	7.00
516	517	86.0	8.50E+10	1.34E+08	6.99
517	518	86.0	8.51E+10	1.34E+08	6.99
518	519	86.0	8.53E+10	1.34E+08	6.99
519	520	86.0	8.54E+10	1.34E+08	6.98
520	521	86.0	8.55E+10	1.34E+08	6.98
521	522	86.0	8.57E+10	1.34E+08	6.98
522	523	86.0	8.58E+10	1.34E+08	6.97
523	524	86.0	8.59E+10	1.34E+08	6.97
524	525	86.0	8.61E+10	1.34E+08	6.97
525	526	86.0	8.62E+10	1.33E+08	6.97
526	527	86.0	8.63E+10	1.33E+08	6.97
527	528	86.0	8.65E+10	1.33E+08	6.96
528	529	86.0	8.66E+10	1.33E+08	6.96
529	530	86.0	8.67E+10	1.33E+08	6.96
530	531	86.0	8.69E+10	1.33E+08	6.96
531	532	86.0	8.70E+10	1.33E+08	6.95
532	533	86.0	8.71E+10	1.33E+08	6.95
533	534	86.0	8.73E+10	1.33E+08	6.95
534	535	86.0	8.74E+10	1.33E+08	6.95
535	536	86.0	8.75E+10	1.33E+08	6.95
536	537	86.0	8.77E+10	1.33E+08	6.95
537	538	86.0	8.78E+10	1.33E+08	6.94
538	539	86.0	8.79E+10	1.33E+08	6.94
539	540	86.0	8.81E+10	1.33E+08	6.94

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
540	541	86.0	8.82E+10	1.33E+08	6.94
541	542	86.0	8.83E+10	1.33E+08	6.93
542	543	86.0	8.85E+10	1.33E+08	6.93
543	544	86.0	8.86E+10	1.33E+08	6.93
544	545	86.0	8.87E+10	1.33E+08	6.93
545	546	86.0	8.89E+10	1.33E+08	6.93
546	547	86.0	8.90E+10	1.33E+08	6.92
547	548	86.0	8.91E+10	1.33E+08	6.92
548	549	86.0	8.93E+10	1.33E+08	6.92
549	550	86.0	8.94E+10	1.33E+08	6.92
550	551	86.0	8.95E+10	1.32E+08	6.92
551	552	86.0	8.97E+10	1.32E+08	6.91
552	553	86.0	8.98E+10	1.32E+08	6.91
553	554	86.0	8.99E+10	1.32E+08	6.91
554	555	86.0	9.01E+10	1.32E+08	6.91
555	556	86.0	9.02E+10	1.32E+08	6.91
556	557	86.0	9.03E+10	1.32E+08	6.90
557	558	86.0	9.05E+10	1.32E+08	6.90
558	559	86.0	9.06E+10	1.32E+08	6.90
559	560	86.0	9.07E+10	1.32E+08	6.90
560	561	86.0	9.09E+10	1.32E+08	6.90
561	562	86.0	9.10E+10	1.32E+08	6.90
562	563	86.0	9.11E+10	1.32E+08	6.89
563	564	86.0	9.13E+10	1.32E+08	6.89
564	565	86.0	9.14E+10	1.32E+08	6.89
565	566	86.0	9.15E+10	1.32E+08	6.89
566	567	86.0	9.17E+10	1.32E+08	6.89
567	568	86.0	9.18E+10	1.32E+08	6.89
568	569	86.0	9.19E+10	1.32E+08	6.88
569	570	86.0	9.20E+10	1.32E+08	6.88
570	571	86.0	9.22E+10	1.32E+08	6.88
571	572	86.0	9.23E+10	1.32E+08	6.88
572	573	86.0	9.24E+10	1.32E+08	6.88
573	574	86.0	9.26E+10	1.32E+08	6.88
574	575	86.0	9.27E+10	1.32E+08	6.87
575	576	86.0	9.28E+10	1.32E+08	6.87
576	577	86.0	9.30E+10	1.32E+08	6.87
577	578	86.0	9.31E+10	1.32E+08	6.87
578	579	86.0	9.32E+10	1.32E+08	6.87
579	580	86.0	9.34E+10	1.32E+08	6.86
580	581	86.0	9.35E+10	1.31E+08	6.86
581	582	86.0	9.36E+10	1.31E+08	6.86
582	583	86.0	9.38E+10	1.31E+08	6.86
583	584	86.0	9.39E+10	1.31E+08	6.86
584	585	86.0	9.40E+10	1.31E+08	6.86

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
585	586	86.0	9.42E+10	1.31E+08	6.86
586	587	86.0	9.43E+10	1.31E+08	6.85
587	588	86.0	9.44E+10	1.31E+08	6.85
588	589	86.0	9.45E+10	1.31E+08	6.85
589	590	86.0	9.47E+10	1.31E+08	6.85
590	591	86.0	9.48E+10	1.31E+08	6.85
591	592	86.0	9.49E+10	1.31E+08	6.85
592	593	86.0	9.51E+10	1.31E+08	6.84
593	594	86.0	9.52E+10	1.31E+08	6.84
594	595	86.0	9.53E+10	1.31E+08	6.84
595	596	86.0	9.55E+10	1.31E+08	6.84
596	597	86.0	9.56E+10	1.31E+08	6.84
597	598	86.0	9.57E+10	1.31E+08	6.84
598	599	86.0	9.59E+10	1.31E+08	6.83
599	600	86.0	9.60E+10	1.31E+08	6.83
600	601	86.0	9.61E+10	1.31E+08	6.83
601	602	86.0	9.62E+10	1.31E+08	6.83
602	603	86.0	9.64E+10	1.31E+08	6.83
603	604	86.0	9.65E+10	1.31E+08	6.83
604	605	86.0	9.66E+10	1.31E+08	6.82
605	606	86.0	9.68E+10	1.31E+08	6.82
606	607	86.0	9.69E+10	1.31E+08	6.82
607	608	86.0	9.70E+10	1.31E+08	6.82
608	609	86.0	9.72E+10	1.31E+08	6.82
609	610	86.0	9.73E+10	1.31E+08	6.82
610	611	86.0	9.74E+10	1.31E+08	6.81
611	612	86.0	9.76E+10	1.31E+08	6.81
612	613	86.0	9.77E+10	1.30E+08	6.81
613	614	86.0	9.78E+10	1.30E+08	6.81
614	615	86.0	9.79E+10	1.30E+08	6.81
615	616	86.0	9.81E+10	1.30E+08	6.81
616	617	86.0	9.82E+10	1.30E+08	6.81
617	618	86.0	9.83E+10	1.30E+08	6.80
618	619	86.0	9.85E+10	1.30E+08	6.80
619	620	86.0	9.86E+10	1.30E+08	6.80
620	621	86.0	9.87E+10	1.30E+08	6.80
621	622	86.0	9.89E+10	1.30E+08	6.80
622	623	86.0	9.90E+10	1.30E+08	6.80
623	624	86.0	9.91E+10	1.30E+08	6.79
624	625	86.0	9.92E+10	1.30E+08	6.79
625	626	86.0	9.94E+10	1.30E+08	6.79
626	627	86.0	9.95E+10	1.30E+08	6.79
627	628	86.0	9.96E+10	1.30E+08	6.79
628	629	86.0	9.98E+10	1.30E+08	6.79
629	630	86.0	9.99E+10	1.30E+08	6.78

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
630	631	86.0	1.00E+11	1.30E+08	6.78
631	632	86.0	1.00E+11	1.30E+08	6.78
632	633	86.0	1.00E+11	1.30E+08	6.78
633	634	86.0	1.00E+11	1.30E+08	6.78
634	635	86.0	1.01E+11	1.30E+08	6.78
635	636	86.0	1.01E+11	1.30E+08	6.77
636	637	86.0	1.01E+11	1.30E+08	6.77
637	638	86.0	1.01E+11	1.30E+08	6.77
638	639	86.0	1.01E+11	1.30E+08	6.77
639	640	86.0	1.01E+11	1.30E+08	6.77
640	641	86.0	1.01E+11	1.30E+08	6.77
641	642	86.0	1.01E+11	1.30E+08	6.77
642	643	86.0	1.02E+11	1.30E+08	6.76
643	644	86.0	1.02E+11	1.30E+08	6.76
644	645	86.0	1.02E+11	1.30E+08	6.76
645	646	86.0	1.02E+11	1.29E+08	6.76
646	647	86.0	1.02E+11	1.29E+08	6.76
647	648	86.0	1.02E+11	1.29E+08	6.76
648	649	86.0	1.02E+11	1.29E+08	6.75
649	650	86.0	1.02E+11	1.29E+08	6.75
650	651	86.0	1.03E+11	1.29E+08	6.75
651	652	86.0	1.03E+11	1.29E+08	6.75
652	653	86.0	1.03E+11	1.29E+08	6.75
653	654	86.0	1.03E+11	1.29E+08	6.75
654	655	86.0	1.03E+11	1.29E+08	6.74
655	656	86.0	1.03E+11	1.29E+08	6.74
656	657	86.0	1.03E+11	1.29E+08	6.74
657	658	86.0	1.04E+11	1.29E+08	6.74
658	659	86.0	1.04E+11	1.29E+08	6.74
659	660	86.0	1.04E+11	1.29E+08	6.74
660	661	86.0	1.04E+11	1.29E+08	6.74
661	662	86.0	1.04E+11	1.29E+08	6.73
662	663	86.0	1.04E+11	1.29E+08	6.73
663	664	86.0	1.04E+11	1.29E+08	6.73
664	665	86.0	1.04E+11	1.29E+08	6.73
665	666	86.0	1.05E+11	1.29E+08	6.73
666	667	86.0	1.05E+11	1.29E+08	6.73
667	668	86.0	1.05E+11	1.29E+08	6.73
668	669	86.0	1.05E+11	1.29E+08	6.72
669	670	86.0	1.05E+11	1.29E+08	6.72
670	671	86.0	1.05E+11	1.29E+08	6.72
671	672	86.0	1.05E+11	1.29E+08	6.72
672	673	86.0	1.05E+11	1.29E+08	6.72
673	674	86.0	1.06E+11	1.29E+08	6.72
674	675	86.0	1.06E+11	1.29E+08	6.71

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
675	676	86.0	1.06E+11	1.29E+08	6.71
676	677	86.0	1.06E+11	1.29E+08	6.71
677	678	86.0	1.06E+11	1.29E+08	6.71
678	679	86.0	1.06E+11	1.29E+08	6.71
679	680	86.0	1.06E+11	1.28E+08	6.71
680	681	86.0	1.06E+11	1.28E+08	6.71
681	682	86.0	1.07E+11	1.28E+08	6.70
682	683	86.0	1.07E+11	1.28E+08	6.70
683	684	86.0	1.07E+11	1.28E+08	6.70
684	685	86.0	1.07E+11	1.28E+08	6.70
685	686	86.0	1.07E+11	1.28E+08	6.70
686	687	86.0	1.07E+11	1.28E+08	6.70
687	688	86.0	1.07E+11	1.28E+08	6.69
688	689	86.0	1.08E+11	1.28E+08	6.69
689	690	86.0	1.08E+11	1.28E+08	6.69
690	691	86.0	1.08E+11	1.28E+08	6.69
691	692	86.0	1.08E+11	1.28E+08	6.69
692	693	86.0	1.08E+11	1.28E+08	6.69
693	694	86.0	1.08E+11	1.28E+08	6.69
694	695	86.0	1.08E+11	1.28E+08	6.68
695	696	86.0	1.08E+11	1.28E+08	6.68
696	697	86.0	1.09E+11	1.28E+08	6.68
697	698	86.0	1.09E+11	1.28E+08	6.68
698	699	86.0	1.09E+11	1.28E+08	6.68
699	700	86.0	1.09E+11	1.28E+08	6.68
700	701	86.0	1.09E+11	1.28E+08	6.68
701	702	86.0	1.09E+11	1.28E+08	6.67
702	703	86.0	1.09E+11	1.28E+08	6.67
703	704	86.0	1.09E+11	1.28E+08	6.67
704	705	86.0	1.10E+11	1.28E+08	6.67
705	706	86.0	1.10E+11	1.28E+08	6.67
706	707	86.0	1.10E+11	1.28E+08	6.67
707	708	86.0	1.10E+11	1.28E+08	6.67
708	709	86.0	1.10E+11	1.28E+08	6.66
709	710	86.0	1.10E+11	1.28E+08	6.66
710	711	86.0	1.10E+11	1.28E+08	6.66
711	712	86.0	1.10E+11	1.28E+08	6.66
712	713	86.0	1.11E+11	1.28E+08	6.66
713	714	86.0	1.11E+11	1.28E+08	6.66
714	715	86.0	1.11E+11	1.27E+08	6.65
715	716	86.0	1.11E+11	1.27E+08	6.65
716	717	86.0	1.11E+11	1.27E+08	6.65
717	718	86.0	1.11E+11	1.27E+08	6.65
718	719	86.0	1.11E+11	1.27E+08	6.65
719	720	86.0	1.11E+11	1.27E+08	6.65

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
720	721	86.0	1.12E+11	1.27E+08	6.65
721	722	86.0	1.12E+11	1.27E+08	6.64
722	723	86.0	1.12E+11	1.27E+08	6.64
723	724	86.0	1.12E+11	1.27E+08	6.64
724	725	86.0	1.12E+11	1.27E+08	6.64
725	726	86.0	1.12E+11	1.27E+08	6.64
726	727	86.0	1.12E+11	1.27E+08	6.64
727	728	86.0	1.12E+11	1.27E+08	6.64
728	729	86.0	1.13E+11	1.27E+08	6.64
729	730	86.0	1.13E+11	1.27E+08	6.63
730	731	86.0	1.13E+11	1.27E+08	6.63
731	732	86.0	1.13E+11	1.27E+08	6.63
732	733	86.0	1.13E+11	1.27E+08	6.63
733	734	86.0	1.13E+11	1.27E+08	6.63
734	735	86.0	1.13E+11	1.27E+08	6.63
735	736	86.0	1.14E+11	1.27E+08	6.63
736	737	86.0	1.14E+11	1.27E+08	6.63
737	738	86.0	1.14E+11	1.27E+08	6.62
738	739	86.0	1.14E+11	1.27E+08	6.62
739	740	86.0	1.14E+11	1.27E+08	6.62
740	741	86.0	1.14E+11	1.27E+08	6.62
741	742	86.0	1.14E+11	1.27E+08	6.62
742	743	86.0	1.14E+11	1.27E+08	6.62
743	744	86.0	1.15E+11	1.27E+08	6.62
744	745	86.0	1.15E+11	1.27E+08	6.62
745	746	86.0	1.15E+11	1.27E+08	6.62
746	747	86.0	1.15E+11	1.27E+08	6.61
747	748	86.0	1.15E+11	1.27E+08	6.61
748	749	86.0	1.15E+11	1.27E+08	6.61
749	750	86.0	1.15E+11	1.27E+08	6.61
750	751	86.0	1.15E+11	1.27E+08	6.61
751	752	86.0	1.16E+11	1.27E+08	6.61
752	753	86.0	1.16E+11	1.27E+08	6.61
753	754	86.0	1.16E+11	1.27E+08	6.61
754	755	86.0	1.16E+11	1.27E+08	6.60
755	756	86.0	1.16E+11	1.26E+08	6.60
756	757	86.0	1.16E+11	1.26E+08	6.60
757	758	86.0	1.16E+11	1.26E+08	6.60
758	759	86.0	1.16E+11	1.26E+08	6.60
759	760	86.0	1.17E+11	1.26E+08	6.60
760	761	86.0	1.17E+11	1.26E+08	6.60
761	762	86.0	1.17E+11	1.26E+08	6.60
762	763	86.0	1.17E+11	1.26E+08	6.59
763	764	86.0	1.17E+11	1.26E+08	6.59
764	765	86.0	1.17E+11	1.26E+08	6.59

Appendix P9.2: Plant Temperature Rise Results

Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated UHS Heat Load (BTU)	Heat Rate per Timestep (BTU/hr)	Plant Temperature Rise (°F)
765	766	86.0	1.17E+11	1.26E+08	6.59
766	767	86.0	1.17E+11	1.26E+08	6.59
767	768	86.0	1.18E+11	1.26E+08	6.59
768	769	86.0	1.18E+11	1.26E+08	6.59
769	770	86.0	1.18E+11	1.26E+08	6.59
770	771	86.0	1.18E+11	1.26E+08	6.58
771	772	86.0	1.18E+11	1.26E+08	6.58
772	773	86.0	1.18E+11	1.26E+08	6.58
773	774	86.0	1.18E+11	1.26E+08	6.58
774	775	86.0	1.18E+11	1.26E+08	6.58
775	776	86.0	1.19E+11	1.26E+08	6.58
776	777	86.0	1.19E+11	1.26E+08	6.58
777	778	86.0	1.19E+11	1.26E+08	6.58
778	779	86.0	1.19E+11	1.26E+08	6.58
779	780	86.0	1.19E+11	1.26E+08	6.57
780	781	86.0	1.19E+11	1.26E+08	6.57
781	782	86.0	1.19E+11	1.26E+08	6.57
782	783	86.0	1.19E+11	1.26E+08	6.57
783	784	86.0	1.20E+11	1.26E+08	6.57
784	785	86.0	1.20E+11	1.26E+08	6.57
785	786	86.0	1.20E+11	1.26E+08	6.57
786	787	86.0	1.20E+11	1.26E+08	6.57
787	788	86.0	1.20E+11	1.26E+08	6.57
788	789	86.0	1.20E+11	1.26E+08	6.57
789	790	86.0	1.20E+11	1.26E+08	6.57
790	791	86.0	1.20E+11	1.26E+08	6.57
791	792	86.0	1.21E+11	1.26E+08	6.57

Appendix P9.3: Excel Equations

Integrated UHS Heat Load Equations

	A	B	C	D
1	Time	Time	Total UHS Heat Load	Integrated UHS Heat Load
2	Seconds	Hours	BTU/hr	BTU
3	0	=A3/3600	70974500	0
4	60	=A4/3600	227506921.442497	=(C3+C4)/2*(B4-B3)+D3
5	120	=A5/3600	275031004.627322	=(C4+C5)/2*(B5-B4)+D4
6	180	=A6/3600	278889380.509937	=(C5+C6)/2*(B6-B5)+D5
7	240	=A7/3600	282644648.159748	=(C6+C7)/2*(B7-B6)+D6
8	300	=A8/3600	286299374.760107	=(C7+C8)/2*(B8-B7)+D7
9	360	=A9/3600	289856095.608311	=(C8+C9)/2*(B9-B8)+D8
10	420	=A10/3600	293317314.115603	=(C9+C10)/2*(B10-B9)+D9
11	480	=A11/3600	296685501.807169	=(C10+C11)/2*(B11-B10)+D10
12	540	=A12/3600	343523098.322145	=(C11+C12)/2*(B12-B11)+D11
13	600	=A13/3600	346712511.413607	=(C12+C13)/2*(B13-B12)+D12
14	3451	=A14/3600	441783283.320893	=(C13+C14)/2*(B14-B13)+D13
15	6301	=A15/3600	473170223.236624	=(C14+C15)/2*(B15-B14)+D14
16	9152	=A16/3600	528760943.735491	=(C15+C16)/2*(B16-B15)+D15
17	12000	=A17/3600	519091778.174626	=(C16+C17)/2*(B17-B16)+D16
18	14850	=A18/3600	359428890	=(C17)*(B18-B17)+D17
19	17700	=A19/3600	339095598.333333	=(C18+C19)/2*(B19-B18)+D18
20	20550	=A20/3600	322295431.666667	=(C19+C20)/2*(B20-B19)+D19
21	23400	=A21/3600	308557015	=(C20+C21)/2*(B21-B20)+D20
22	26260	=A22/3600	297328342.777778	=(C21+C22)/2*(B22-B21)+D21
23	29110	=A23/3600	287571967.777778	=(C22+C23)/2*(B23-B22)+D22
24	31960	=A24/3600	276985259.444444	=(C23+C24)/2*(B24-B23)+D23
25	34810	=A25/3600	268393440	=(C24+C25)/2*(B25-B24)+D24
26	37660	=A26/3600	261201865	=(C25+C26)/2*(B26-B25)+D25
27	40510	=A27/3600	254949342.777778	=(C26+C27)/2*(B27-B26)+D26
28	43360	=A28/3600	249681781.666667	=(C27+C28)/2*(B28-B27)+D27
29	46210	=A29/3600	245278781.666667	=(C28+C29)/2*(B29-B28)+D28
30	49060	=A30/3600	241448815	=(C29+C30)/2*(B30-B29)+D29
31	51910	=A31/3600	238054990	=(C30+C31)/2*(B31-B30)+D30
32	54760	=A32/3600	234938259.444444	=(C31+C32)/2*(B32-B31)+D31
33	57610	=A33/3600	469308546.541219	=(C32)*(B33-B32)+D32
34	60460	=A34/3600	407852051.111111	=(C33+C34)/2*(B34-B33)+D33
35	63310	=A35/3600	362828250.483871	=(C34+C35)/2*(B35-B34)+D34
36	66160	=A36/3600	329583531.935484	=(C35+C36)/2*(B36-B35)+D35
37	69010	=A37/3600	305037949.52381	=(C36+C37)/2*(B37-B36)+D36
38	71860	=A38/3600	286794408.27957	=(C37+C38)/2*(B38-B37)+D37
39	74720	=A39/3600	273077790	=(C38+C39)/2*(B39-B38)+D38
40	77570	=A40/3600	262786654.784946	=(C39+C40)/2*(B40-B39)+D39
41	80420	=A41/3600	256810372.258065	=(C40+C41)/2*(B41-B40)+D40

Appendix P9.3: Excel Equations

Plant Temperature Rise Equations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1		S Flowrate		65.3	cfs		Mass Flow	=D\$1*\$D\$2*3600	lbm/hr		S Flowrate	86	cfs		Mass Flow	=L\$1*\$L\$2*3600	lbm/hr
2		Density		62	lbm/R3		cp	=CPT(14.3,100)	BTU/lbm-F		Density	62	lbm/R3		cp	=CPT(14.3,100)	BTU/lbm-F
	A	B	C	D											E		F
	Starting Time (hr)	Ending Time (hr)	Flow Rate (cfs)	Integrated Generated Heat Load (BTU)											Heat Rate per Timestep (BTU/hr)		Plant Temperature Rise (Deg F)
1																	
2	0	1	=65.3	=FORECAST(SB2,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB2,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB2,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=D2/(B2-A2)		=SE2/SHS1/SHS2
3	=B2	=A3+1	=65.3	=FORECAST(SB3,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB3,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB3,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D3-D2)/(B3-A3)		=SE3/SHS1/SHS2
4	=B3	=A4+1	=65.3	=FORECAST(SB4,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB4,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB4,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D4-D3)/(B4-A4)		=SE4/SHS1/SHS2
5	=B4	=A5+1	=65.3	=FORECAST(SB5,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB5,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB5,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D5-D4)/(B5-A5)		=SE5/SHS1/SHS2
6	=B5	=A6+1	=65.3	=FORECAST(SB6,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB6,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB6,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D6-D5)/(B6-A6)		=SE6/SHS1/SHS2
7	=B6	=A7+1	=65.3	=FORECAST(SB7,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB7,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB7,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D7-D6)/(B7-A7)		=SE7/SHS1/SHS2
8	=B7	=A8+1	=65.3	=FORECAST(SB8,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB8,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB8,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D8-D7)/(B8-A8)		=SE8/SHS1/SHS2
9	=B8	=A9+1	=65.3	=FORECAST(SB9,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB9,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB9,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D9-D8)/(B9-A9)		=SE9/SHS1/SHS2
10	=B9	=A10+1	=65.3	=FORECAST(SB10,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB10,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB10,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D10-D9)/(B10-A10)		=SE10/SHS1/SHS2
11	=B10	=A11+1	=65.3	=FORECAST(SB11,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB11,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB11,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D11-D10)/(B11-A11)		=SE11/SHS1/SHS2
12	=B11	=A12+1	=65.3	=FORECAST(SB12,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB12,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB12,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D12-D11)/(B12-A12)		=SE12/SHS1/SHS2
13	=B12	=A13+1	=65.3	=FORECAST(SB13,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB13,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB13,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D13-D12)/(B13-A13)		=SE13/SHS1/SHS2
14	=B13	=A14+1	=65.3	=FORECAST(SB14,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB14,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB14,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D14-D13)/(B14-A14)		=SE14/SHS1/SHS2
15	=B14	=A15+1	=65.3	=FORECAST(SB15,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB15,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB15,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D15-D14)/(B15-A15)		=SE15/SHS1/SHS2
16	=B15	=A16+1	=65.3	=FORECAST(SB16,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB16,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB16,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D16-D15)/(B16-A16)		=SE16/SHS1/SHS2
17	=B16	=A17+1	=65.3	=FORECAST(SB17,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB17,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB17,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D17-D16)/(B17-A17)		=SE17/SHS1/SHS2
18	=B17	=A18+1	=86	=FORECAST(SB18,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB18,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB18,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D18-D17)/(B18-A18)		=SE18/SPS1/SPS2
19	=B18	=A19+1	=86	=FORECAST(SB19,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB19,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB19,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D19-D18)/(B19-A19)		=SE19/SPS1/SPS2
20	=B19	=A20+1	=86	=FORECAST(SB20,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB20,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB20,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D20-D19)/(B20-A20)		=SE20/SPS1/SPS2
21	=B20	=A21+1	=86	=FORECAST(SB21,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB21,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB21,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D21-D20)/(B21-A21)		=SE21/SPS1/SPS2
22	=B21	=A22+1	=86	=FORECAST(SB22,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB22,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB22,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D22-D21)/(B22-A22)		=SE22/SPS1/SPS2
23	=B22	=A23+1	=86	=FORECAST(SB23,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB23,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB23,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D23-D22)/(B23-A23)		=SE23/SPS1/SPS2
24	=B23	=A24+1	=86	=FORECAST(SB24,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB24,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB24,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D24-D23)/(B24-A24)		=SE24/SPS1/SPS2
25	=B24	=A25+1	=86	=FORECAST(SB25,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB25,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB25,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D25-D24)/(B25-A25)		=SE25/SPS1/SPS2
26	=B25	=A26+1	=86	=FORECAST(SB26,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB26,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB26,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D26-D25)/(B26-A26)		=SE26/SPS1/SPS2
27	=B26	=A27+1	=86	=FORECAST(SB27,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB27,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB27,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D27-D26)/(B27-A27)		=SE27/SPS1/SPS2
28	=B27	=A28+1	=86	=FORECAST(SB28,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB28,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB28,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D28-D27)/(B28-A28)		=SE28/SPS1/SPS2
29	=B28	=A29+1	=86	=FORECAST(SB29,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB29,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB29,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D29-D28)/(B29-A29)		=SE29/SPS1/SPS2
30	=B29	=A30+1	=86	=FORECAST(SB30,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB30,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB30,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D30-D29)/(B30-A30)		=SE30/SPS1/SPS2
31	=B30	=A31+1	=86	=FORECAST(SB31,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB31,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB31,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D31-D30)/(B31-A31)		=SE31/SPS1/SPS2
32	=B31	=A32+1	=86	=FORECAST(SB32,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB32,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB32,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D32-D31)/(B32-A32)		=SE32/SPS1/SPS2
33	=B32	=A33+1	=86	=FORECAST(SB33,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB33,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB33,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D33-D32)/(B33-A33)		=SE33/SPS1/SPS2
34	=B33	=A34+1	=86	=FORECAST(SB34,OFFSET(Total!\$D\$3:\$D\$1003,MATCH(SB34,Total!\$B\$3:\$B\$1003,1)-1.0,2),OFFSET(Total!\$B\$3:\$B\$1003,MATCH(SB34,Total!\$B\$3:\$B\$1003,1)-1.0,2))											=(D34-D33)/(B34-A34)		=SE34/SPS1/SPS2