HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2016
File No. 128064-003

SUBJECT: Inflow Design Flood Control System Plan
Pond 001 - Cell 004
Associated Electric Cooperative, Inc.
Thomas Hill Energy Center
Clifton Hill, Missouri

Haley & Aldrich, Inc. (Haley & Aldrich) has developed this Inflow Design Flood (IDF) Control System Plan (Plan) on behalf of Associated Electric Cooperative, Inc. (AECI) for the existing coal combustion residuals (CCR) surface impoundment referred to as Pond 1 - Cell 004 (Cell 004) at the Thomas Hill Energy Center (THEC) in Clifton Hill, Missouri. This has been completed based on requirements of the Environmental Protection Agency (EPA) 40 CFR Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities" (CCR Rule), specifically section §257.82. The Cell 004 existing conditions and supporting documentation has been reviewed and associated stormwater modeling and analysis performed to satisfy the Inflow Design Flood Control System Plan requirements of CCR Rule section §257.82 as described below.

§257.82(a): The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (a)(2) of this section.

§257.82(a)(1): The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.

Cell 004 is a coal combustion residuals (CCR) surface impoundment located to the south of the Thomas Hill power plant. Cell 004 provides final settling and polishing for the Pond 001 system prior to discharging to the Middle Fork of the Little Chariton River. Cell 004 receives decant water and a limited quantity of CCR material from Cell 003. Decant water enter a rectangular concrete decant structure equipped with two 61-inch wide concrete stop logs, and flow via a 48-in. diameter concrete outlet pipe to a drainage channel which discharges to NPDES Outfall 001. Water can also discharge to Outfall 001 via the 2-ft. deep trapezoidal emergency spillway

Hydrologic and hydraulic modeling for this Cell 004 IDF Control System Plan was performed using HydroCAD Stormwater Modeling System, version 10.00-12 (HydroCAD) in conjunction with the appropriate IDF as determined per the Hazard Potential Classification Assessment performed by under separate cover.

When Cell 004 is maintained at its normal WSEL (El. 700.0), the results of the HydroCAD analysis confirm the IDF control system for Cell 004 adequately manage flow into the impoundment during and following the IDF peak discharge. **Table 1** summarizes the effects of the IDF peak discharge during normal operation of the impoundment. The output from the two HydroCAD model simulations is provided as **Appendix 1**. See **Figure 1** for the Cell 004 for the existing site plan.

Table 1: HydroCAD Output Summary

Peak flood level (ft)	703.8
Minimum Dike Elevation	705.0
Minimum freeboard (ft)	1.2
Peak inflow (cfs)	251.9

§257.82(a)(2): The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.

The outlet control structure is detailed in the Burns & McDonnell Thomas Hill Power Plan Ash Pond Facilities #2 dated 01 December 1978. Pertinent pages providing the required information have been provided as **Appendix 2**. Based on the HydroCAD analysis, the IDF control system for Cell 004 was determined to adequately manage flow from the impoundment by collecting and controlling the IDF peak discharge. The peak level and resulting freeboard in Cell 004 during the 100-year flood is noted in Table 1 (above). The HydroCAD model simulation output is provided as **Appendix 1**.

§257.82(a)(3): The inflow design flood is:

- *i. For a high hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the probable maximum flood;*
- *ii. For a significant hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 1,000-year flood;*
- *iii. For a low hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 100-year flood; or*
- *iv. For an incised CCR surface impoundment, the 25-year flood.*

Cell 004 was determined to be low hazard potential; therefore, the design event is the 100-year storm. The basis of the determination is discussed in Initial Hazard Potential Classification Assessment, Cell 004 dated October 2016. The 100-year storm characteristics were detailed in the NOAA Atlas 14 Point Precipitation Frequency Estimates: MO dated 27 August 2014 and prepared by the National Weather Service. Pertinent pages providing the required information have been provided as **Appendix 3**.

<u>§257.82(b):</u> Discharge from the CCR unit must be handled in accordance with the surface water requirements under § 257.3–3.

<u>§257.3-3(a):</u> For purposed of section 4004(a) of the Act, a facility shall not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) under section 402 of the Clean Water Act, as amended.

<u>§257.3-3(b):</u> For purposed of section 4004(a) of the Act, a facility shall not cause a discharge of dredged material or fill material to waters of the United States that is in violation of the requirements under section 404 of the Clean Water Act, as amended.

<u>§257.3-3(c):</u> A facility or practice shall not cause non-point source pollution of waters of the United States that violates applicable legal requirements implementing an areawide or Statewide water quality management plan that has been approved by the Administrator under section 208 of the Clean Water Act, as amended.

Discharge from the Cell 004 is managed through plant National Pollution Discharge Elimination System permit which was prepared by the Missouri Department of Natural Resources. Pertinent pages providing the required information have been provided as **Appendix 4**.

<u>§257.82(c)(1)</u>: Content of the plan. The owner or operator must prepare initial and periodic inflow design flood control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4) of this section. These plans must document how the inflow design flood control system has been designed and constructed to meet the requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator of the CCR unit has completed the inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).

This document and all attachments serve as the initial IDF Plan. Periodic inflow design flood control system plans will be prepared and placed in the facility operating record at 5-year increments or whenever there is a change in conditions that would affect the Plan.

<u>§257.82(c)(2)</u>: Amendment of the plan. The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(g)(4). The owner or operator must amend the written inflow

design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.

The IDF Plan will be amended at least 60 days prior to a planned change in the operation of the facility or the CCR impoundment, or no later than 60 days after an unanticipated event requires the need to revise the IDF Plan. If the Plan needs to be revised after closure activities have commenced, the Plan will be revised no later than 30 days following the triggering event.

Any amendments to the Plan will include written certification from a qualified professional engineer that the initial and any amendments to the IDF Plan meet the requirements of the CCR Rule.

A record of amendments to the Plan will be tracked below. The latest version of the IDF Plan will be noted on the front cover of the Plan.

Version	Date	Description of Changes Made
1	16 October 2016	Initial Issuance

§257.82(c)(3): Timeframes for preparing the initial plan

i. Existing CCR surface impoundments. The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.

This IDF control system plan has been prepared within the specified timeframe.

ii. New CCR surface impoundments and any lateral expansion of a CCR surface impoundment. The owner or operator must prepare the initial inflow design flood control system plan no later than the date of initial receipt of CCR in the CCR unit.

N/A – Cell 004 is an existing CCR impoundment.

§257.82(c)(4): Frequency for revising the plan. The owner or operator must prepare periodic inflow design flood control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first periodic plan. The owner or operator may complete any required plan prior to the required deadline provided the

owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed an inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).

This IDF Plan or any subsequent IDF Plan will be assessed and amended whenever there is a change in operation of the CCR impoundment that would substantially affect the IDF Plan or when unanticipated events necessitate a revision of the Plan either before or after closure activities have commenced.

§257.82(c)(5): The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic inflow design flood control system plans meet the requirements of this section.

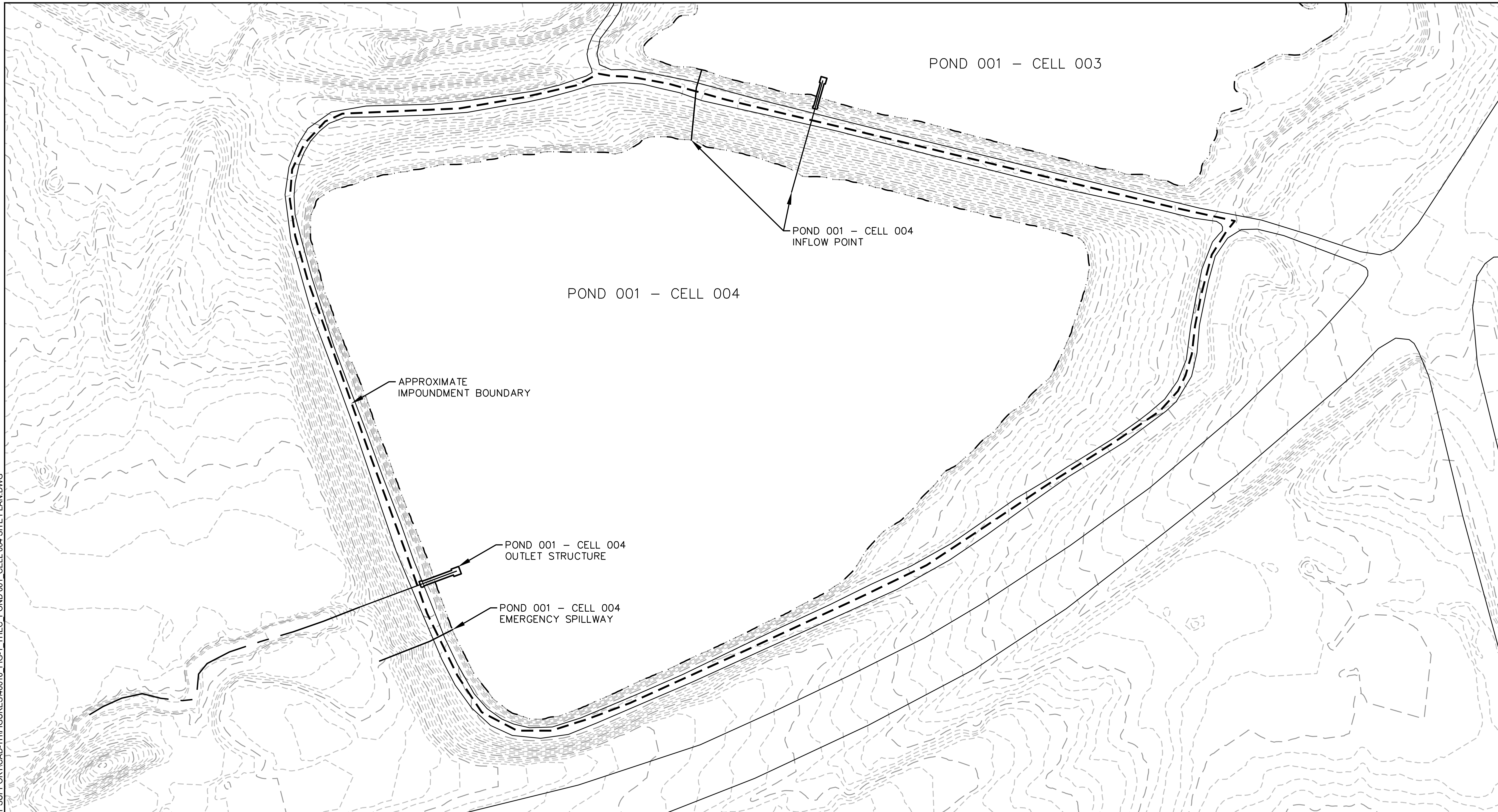
I certify that the design of the flood control system referenced in this Inflow Design Flood Control System Plan for AECI's Pond 001 - Cell 004 at the Thomas Hill Energy Center meets the USEPA's CCR Rule requirements of §257.82.

Signed:______________________________
Consulting Engineer

Print Name: Steven F. Putrich
Missouri License No.: 2014035813
Title: Project Principal
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal and date:

STATE OF MISSOURI
STEVEN F. PUTRICH
NUMBER
PE-2014035813
10-16-16
PROFESSIONAL ENGINEER



LEGEND

- - - - -	EXISTING MINOR CONTOUR
—745—	EXISTING MAJOR CONTOUR
— — —	APPROXIMATE IMPOUNDMENT BOUNDARY
———	PIPE
———	DITCH
———	ROAD
- - · · · - -	WATER

NOTES

1. EXISTING TOPOGRAPHY FROM ASSOCIATED ELECTRIC COOPERATIVE, INC. DATED AUGUST 2016. HORIZONTAL IS BASED ON NAD83 ZONE 15N. VERTICAL CONTROL IS BASED ON NAVD88.

N

0 120 240

SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER
CLIFTON HILL, MISSOURI

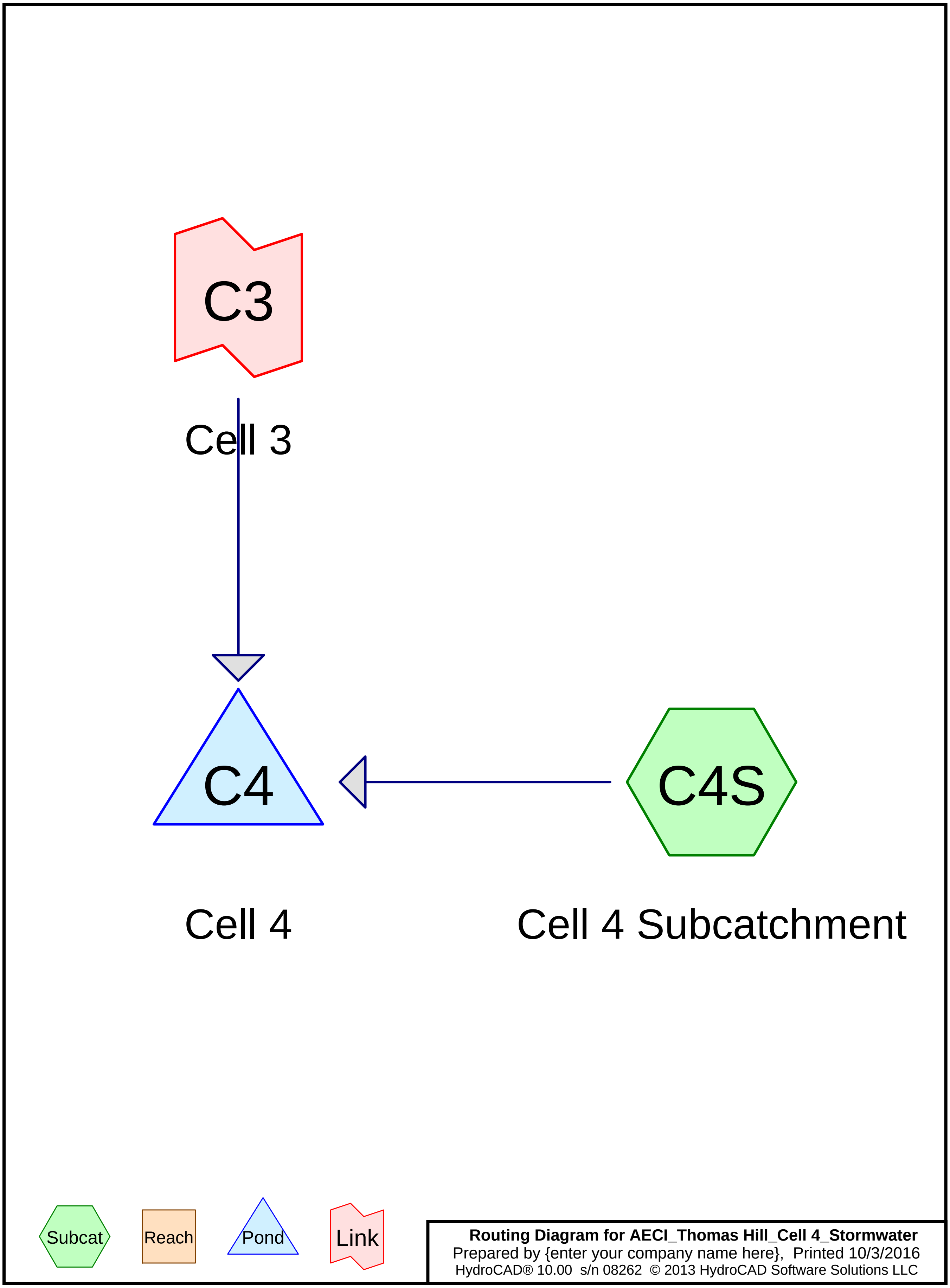
POND 001 - CELL 004
SITE PLAN

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 1

LUCAS, ANDY Printed: 9/16/2016 5:11 PM Layout: HA-FIG-B-L-H
G:\40616_AECI-CCR ELG MANAGEMENT SUPPORT\CAD-TH\FIGURES\40616_FIG-1_THEC_POND 001_CELL 004 SITE PLAN.DWG

Appendix 1



Routing Diagram for AECI_Thomas Hill_Cell 4_Stormwater
Prepared by {enter your company name here}, Printed 10/3/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.630	84	50-75% Grass cover, Fair, HSG D (C4S)
10.614	98	Water Surface, HSG A (C4S)
15.244	**94**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
10.614	HSG A	C4S
0.000	HSG B	
0.000	HSG C	
4.630	HSG D	C4S
0.000	Other	
15.244		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	4.630	0.000	4.630	50-75% Grass cover, Fair	C4S
10.614	0.000	0.000	0.000	0.000	10.614	Water Surface	C4S
10.614	**0.000**	**0.000**	**4.630**	**0.000**	**15.244**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	C4	682.00	680.60	140.0	0.0100	0.012	48.0	0.0	0.0

Time span=0.00-144.00 hrs, dt=0.01 hrs, 14401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment C4S: Cell 4 Subcatchment Runoff Area=15.244 ac 69.63% Impervious Runoff Depth=7.20"
Flow Length=189' Tc=8.5 min CN=94 Runoff=156.54 cfs 9.149 af

Pond C4: Cell 4 Peak Elev=703.79' Storage=41.241 af Inflow=251.88 cfs 582.161 af
Primary=102.42 cfs 548.951 af Secondary=25.28 cfs 11.497 af Outflow=127.71 cfs 560.447 af

Link 100-Yr Primary Imported from AECI_Thomas Hill_Cell 3_Stormwater Link~Pond C3.csv Inflow=156.09 cfs 573.083 af
Primary=156.09 cfs 573.047 af

Total Runoff Area = 15.244 ac Runoff Volume = 9.149 af Average Runoff Depth = 7.20"
30.37% Pervious = 4.630 ac 69.63% Impervious = 10.614 ac

Summary for Subcatchment C4S: Cell 4 Subcatchment

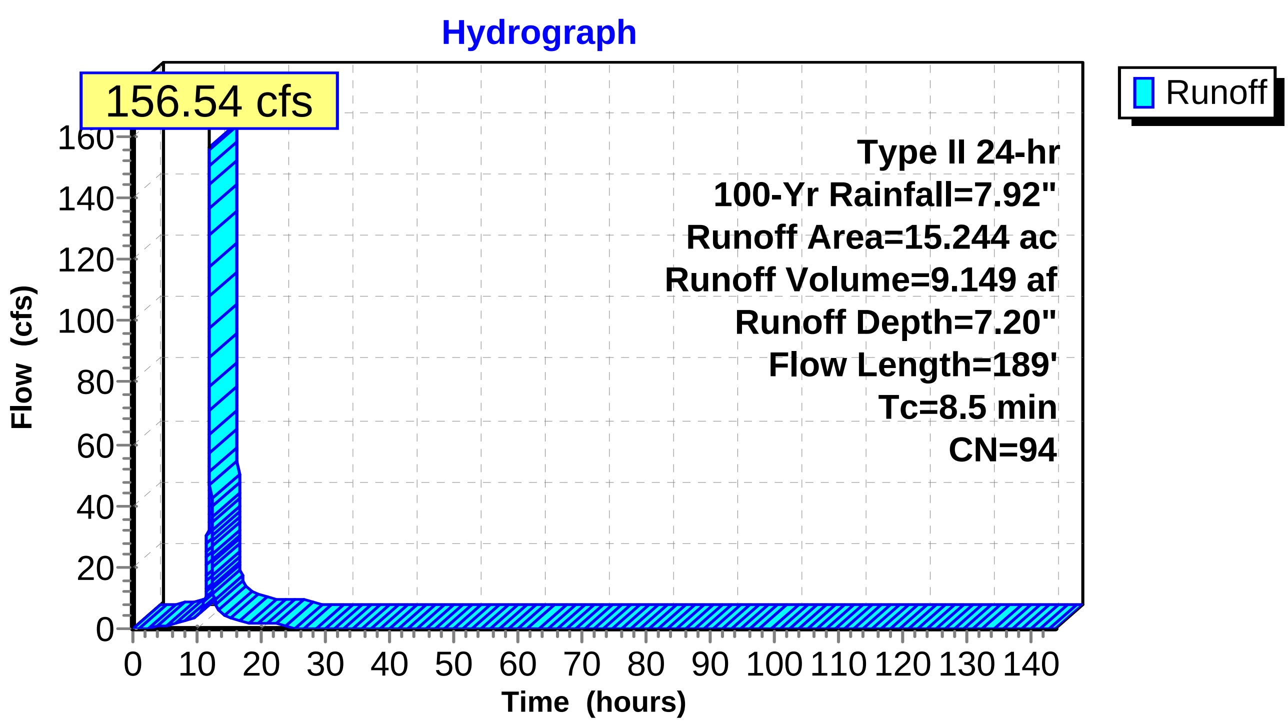
Runoff = 156.54 cfs @ 11.99 hrs, Volume= 9.149 af, Depth= 7.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=7.92"

Area (ac)	CN	Description
10.614	98	Water Surface, HSG A
4.630	84	50-75% Grass cover, Fair, HSG D
15.244	94	Weighted Average
4.630		30.37% Pervious Area
10.614		69.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0450	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.56"
0.6	89	0.1404	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.5	189	Total			

Subcatchment C4S: Cell 4 Subcatchment



Summary for Pond C4: Cell 4

Pimary outlet pipe slope, upstream invert, downstream invert, size, and material per Burns & McDonnell Ash Pond Modifications Drawing Y12 (10/17/1985).

Weir overflow elevation based on water level at time of survey.

Weir length per 2016 H&A Hazard Potential Classification.

Emergency spillway elevation and bottom width per Ash Pond #001 Specs provided by AECI. Side slopes per Burns & McDonnell Dike Profile and Grading Section Drawing Y12 (5/10/1980).

Inflow Area = 15.244 ac, 69.63% Impervious, Inflow Depth >458.27" for 100-Yr event
Inflow = 251.88 cfs @ 12.00 hrs, Volume= 582.161 af
Outflow = 127.71 cfs @ 15.86 hrs, Volume= 560.447 af, Atten= 49%, Lag= 231.5 min
Primary = 102.42 cfs @ 15.86 hrs, Volume= 548.951 af
Secondary = 25.28 cfs @ 15.86 hrs, Volume= 11.497 af

Routing by Sim-Route method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 703.79' @ 15.86 hrs Surf.Area= 11.146 ac Storage= 41.241 af

Plug-Flow detention time= 339.2 min calculated for 560.408 af (96% of inflow)
Center-of-Mass det. time= 164.7 min (4,118.4 - 3,953.7)

Volume	Invert	Avail.Storage	Storage Description
#1	700.00'	54.879 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

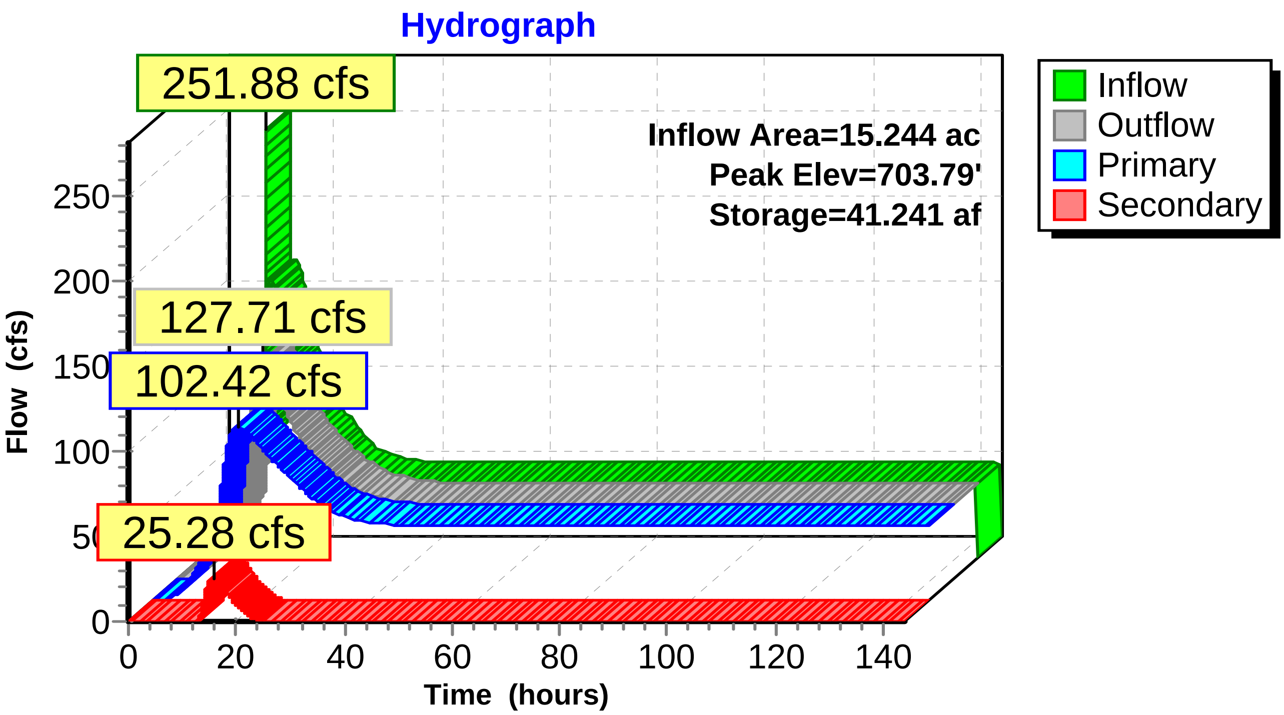
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
700.00	10.614	0.000	0.000
701.00	10.774	10.694	10.694
702.00	10.885	10.830	21.523
703.00	11.005	10.945	32.468
704.00	11.183	11.094	43.562
705.00	11.450	11.316	54.879

Device	Routing	Invert	Outlet Devices
#1	Primary	682.00'	**48.0" Round Culvert** L= 140.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 682.00' / 680.60' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 12.57 sf
#2	Device 1	700.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Secondary	703.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 2.00 Width (feet) 10.00 16.00

Primary OutFlow Max=102.42 cfs @ 15.86 hrs HW=703.79' (Free Discharge)
└─**1=Culvert** (Passes 102.42 cfs of 339.82 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 102.42 cfs @ 6.37 fps)

Secondary OutFlow Max=25.28 cfs @ 15.86 hrs HW=703.79' (Free Discharge)
└─**3=Custom Weir/Orifice** (Weir Controls 25.28 cfs @ 2.85 fps)

Pond C4: Cell 4



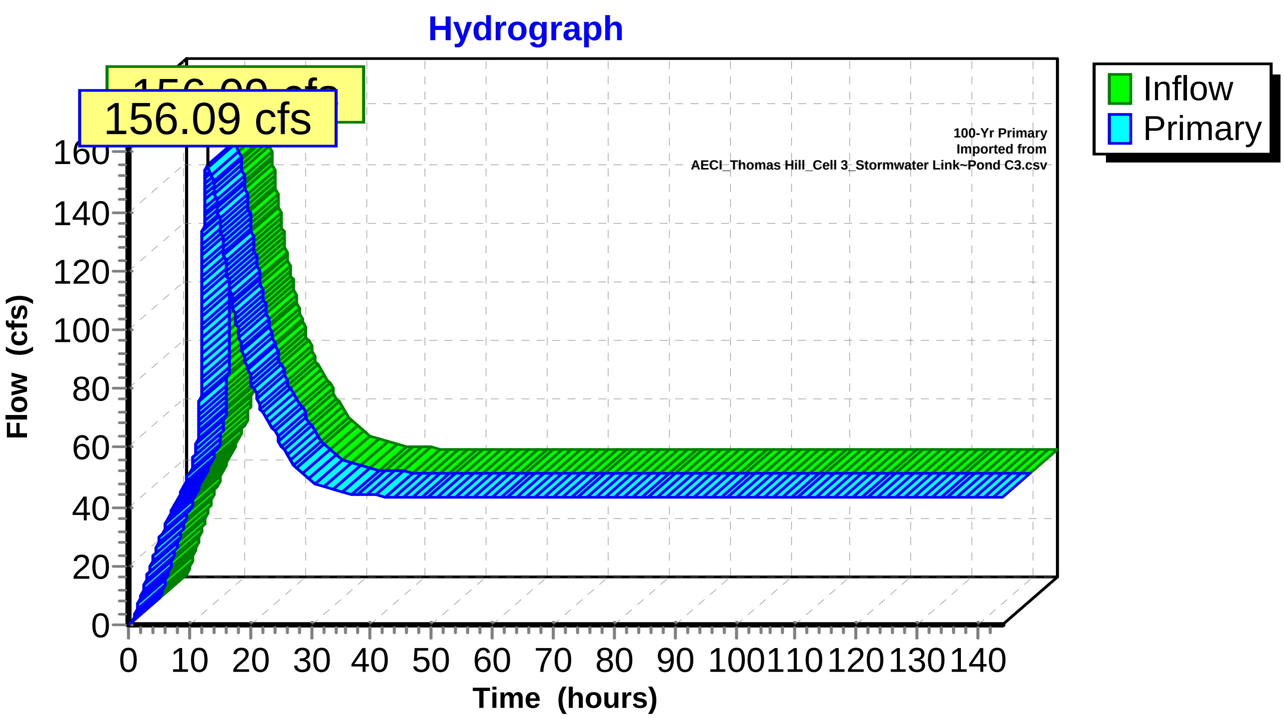
Summary for Link C3: Cell 3

Inflow	=	156.09 cfs @	13.05 hrs, Volume=	573.083 af
Primary	=	156.09 cfs @	13.06 hrs, Volume=	573.047 af, Atten= 0%, Lag= 0.6 min

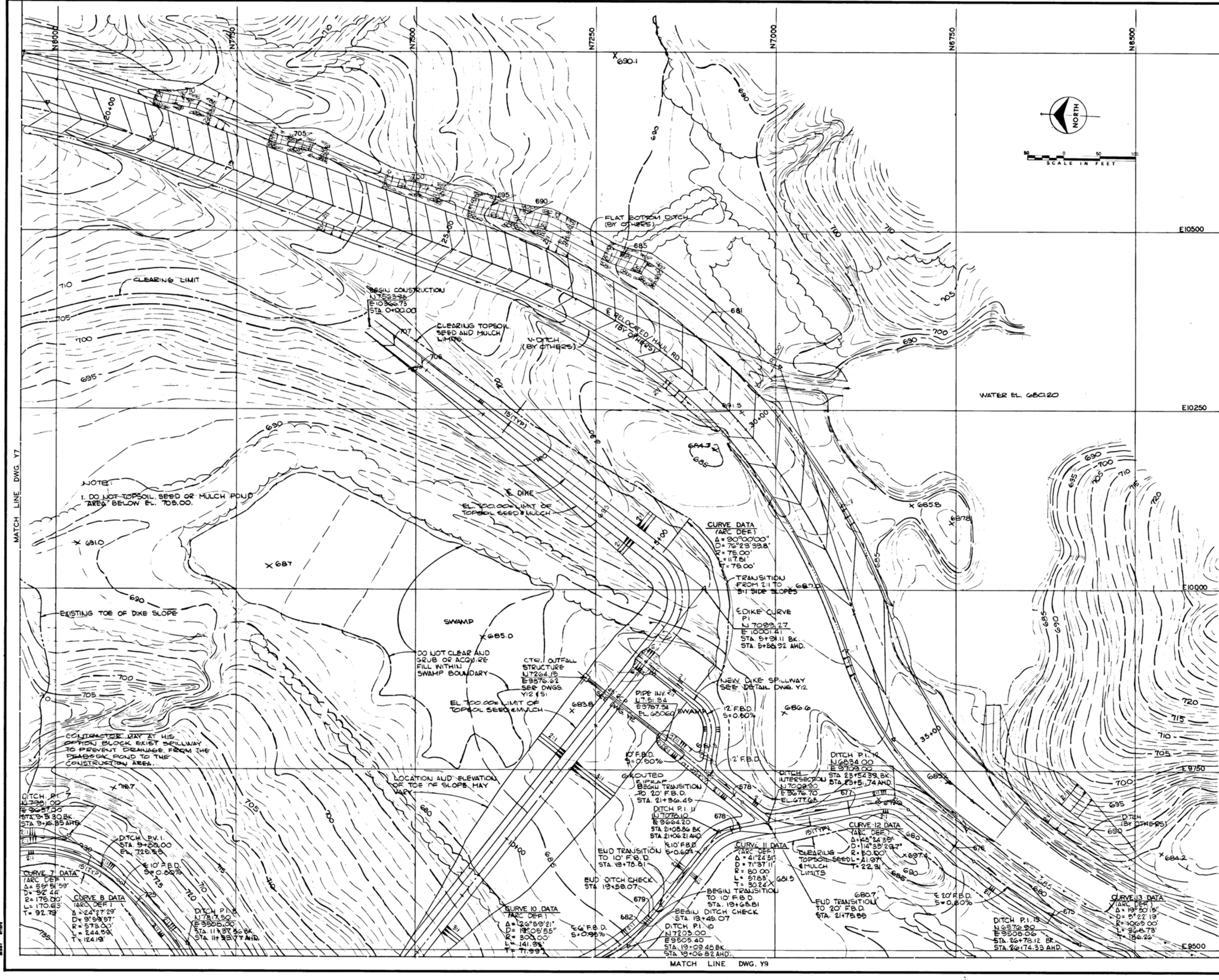
Primary outflow = Inflow, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

100-Yr Primary Imported from AECI_Thomas Hill_Cell 3_Stormwater Link~Pond C3.csv

Link C3: Cell 3



Appendix 2



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS B.D
1	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

REGISTERED PROFESSIONAL ENGINEER — RICHARD A. WHEATON — NUMBER E-12309

THOMAS HILL POWER PLANT

ASH POND FACILITIES #2

ASSOCIATED ELECTRIC COOPERATIVE

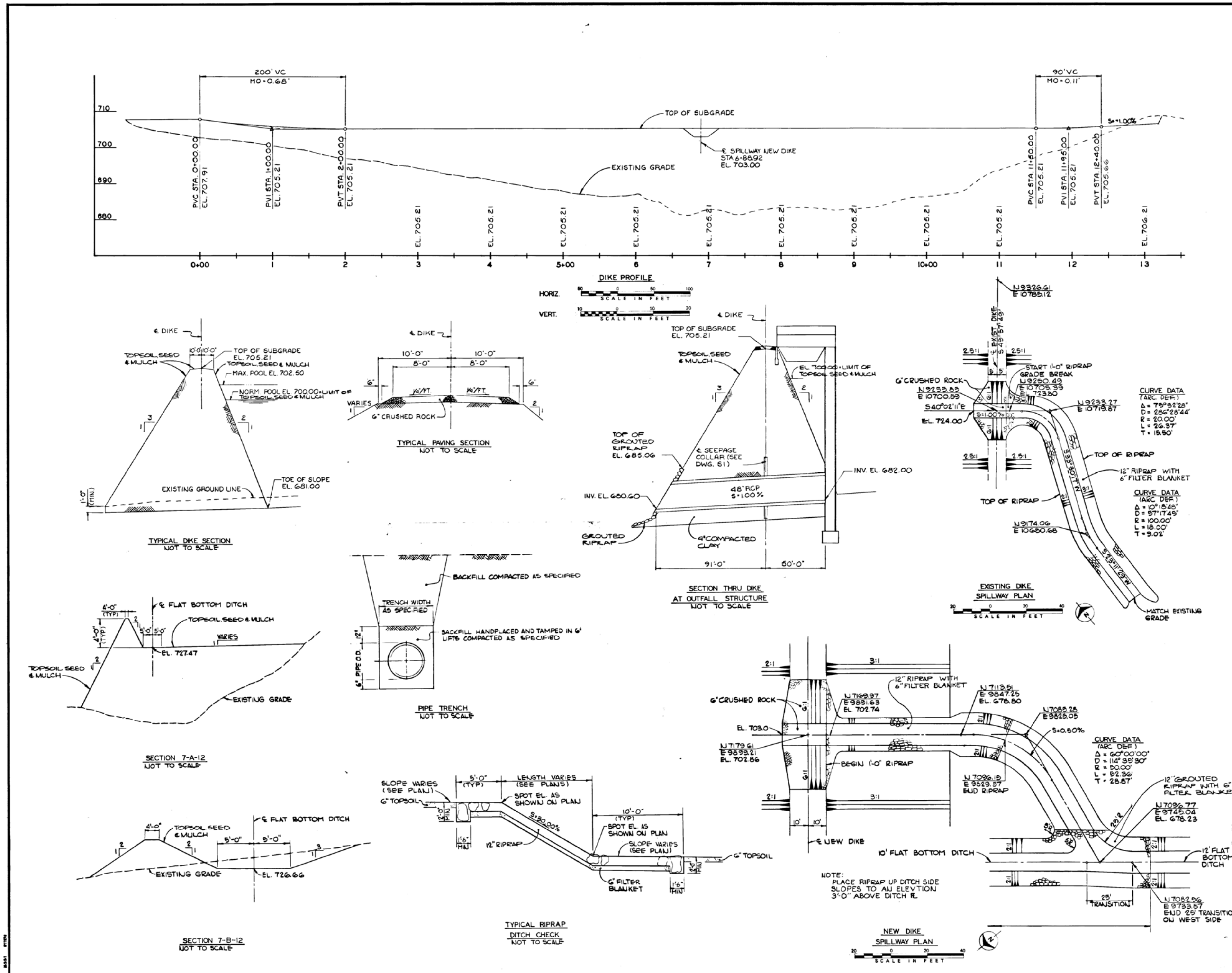
MISSOURI 73

CONTRACT NO. 142

GRADING PLAN II

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE	DEC. 1, 1978	DRAWING NO. Y8	REV. 1
DESIGNED	WHEATON		
DETAILED	MADDOCK	PROJECT	75-077-1-032
CHECKED	WWH	SHEET OF SHEETS	



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS B:D
⚠1	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI — RICHARD A. WHEATON — NUMBER E-12309 — REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT

ASH POND FACILITIES #2

ASSOCIATED ELECTRIC COOPERATIVE

MISSOURI 73

CONTRACT NO. 142

DIKE PROFILE AND GRADING SECTION

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE	DEC. 1, 1978	DRAWING NO.	Y12 — REV. 1
DESIGNED	GAGNE		
DETAILED	MADDOCK	PROJECT	75-077-1-0??
CHECKED	WWH	SHEET OF SHEETS	

Appendix 3

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: MO

DATA DESCRIPTION

Data type: precipitation depth **Units:** english **Time series type:** partial duration

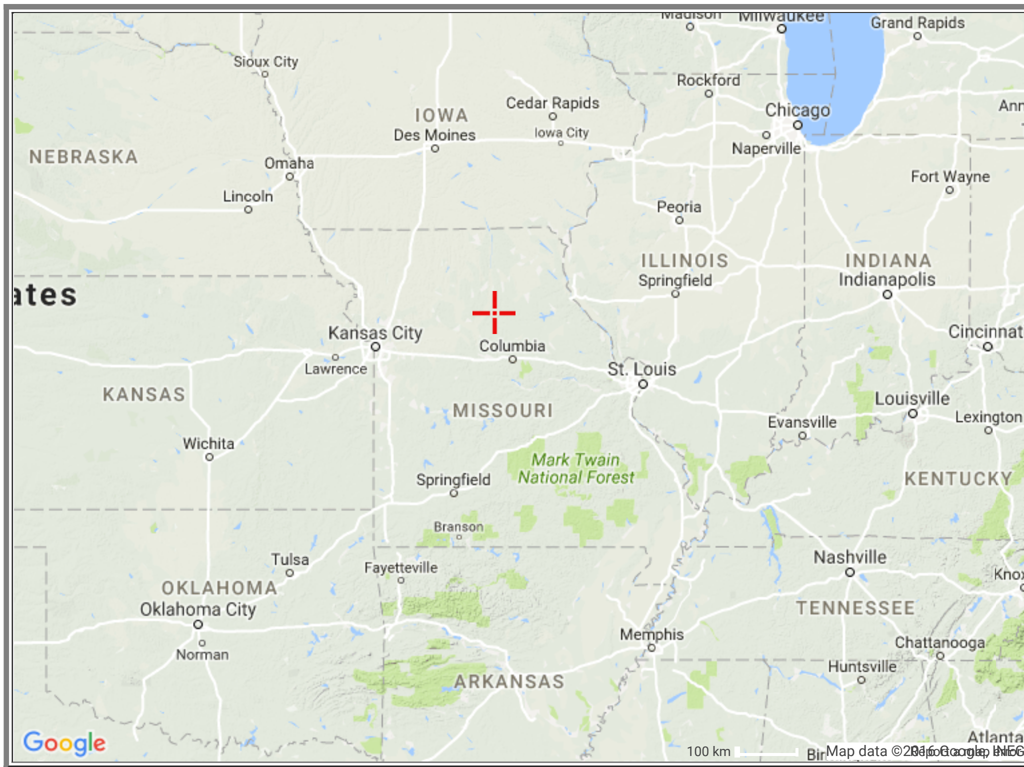
SELECT LOCATION

1. Manually:

a) Enter location (decimal degrees, use "-" for S and W): latitude: 39.544661 longitude: -92.635891 submit

b) Select station (click here for a list of stations used in frequency analysis for MO): select station

2. Use map:



a) Select location
(move crosshair or double click)
b) Click on station icon
(show stations on map)

LOCATION INFORMATION:
Name: Clifton Hill, Missouri, US*
Latitude: 39.5447°
Longitude: -92.6359°
Elevation: 733 ft*

* source: Google Maps

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 8, Version 2

PF tabular | PF graphical | Supplementary information | Print Page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.405 (0.328-0.498)	0.468 (0.378-0.576)	0.570 (0.459-0.703)	0.654 (0.524-0.810)	0.769 (0.594-0.975)	0.857 (0.647-1.10)	0.944 (0.688-1.24)	1.03 (0.721-1.39)	1.15 (0.770-1.58)	1.23 (0.808-1.72)
10-min	0.593 (0.480-0.729)	0.685 (0.554-0.843)	0.834 (0.673-1.03)	0.958 (0.767-1.19)	1.13 (0.870-1.43)	1.25 (0.947-1.61)	1.38 (1.01-1.81)	1.51 (1.05-2.03)	1.68 (1.13-2.31)	1.80 (1.18-2.52)
15-min	0.723 (0.585-0.890)	0.835 (0.676-1.03)	1.02 (0.820-1.26)	1.17 (0.936-1.45)	1.37 (1.06-1.74)	1.53 (1.16-1.96)	1.69 (1.23-2.21)	1.84 (1.29-2.47)	2.05 (1.38-2.81)	2.20 (1.44-3.08)
30-min	1.02 (0.827-1.26)	1.19 (0.965-1.47)	1.47 (1.19-1.81)	1.70 (1.36-2.10)	2.00 (1.54-2.53)	2.23 (1.68-2.86)	2.45 (1.79-3.21)	2.68 (1.87-3.59)	2.97 (1.99-4.08)	3.18 (2.08-4.44)
60-min	1.29 (1.05-1.59)	1.54 (1.25-1.90)	1.96 (1.58-2.41)	2.30 (1.84-2.85)	2.79 (2.16-3.56)	3.17 (2.40-4.09)	3.56 (2.60-4.68)	3.96 (2.77-5.33)	4.49 (3.02-6.20)	4.91 (3.21-6.85)
2-hr	1.57 (1.28-1.92)	1.89 (1.54-2.31)	2.44 (1.98-2.99)	2.91 (2.35-3.58)	3.58 (2.79-4.55)	4.11 (3.13-5.28)	4.66 (3.43-6.11)	5.24 (3.69-7.02)	6.02 (4.08-8.26)	6.63 (4.38-9.20)
3-hr	1.73 (1.41-2.10)	2.10 (1.72-2.56)	2.75 (2.24-3.36)	3.31 (2.68-4.06)	4.14 (3.25-5.26)	4.81 (3.68-6.17)	5.51 (4.08-7.21)	6.25 (4.43-8.37)	7.28 (4.96-9.97)	8.09 (5.36-11.2)
6-hr	2.06 (1.70-2.49)	2.50 (2.06-3.03)	3.27 (2.68-3.97)	3.96 (3.22-4.82)	4.97 (3.95-6.31)	5.81 (4.49-7.43)	6.71 (5.00-8.74)	7.66 (5.48-10.2)	9.00 (6.19-12.3)	10.1 (6.72-13.8)

12-hr	**2.49** (2.06-2.99)	**2.95** (2.44-3.55)	**3.77** (3.11-4.54)	**4.50** (3.69-5.44)	**5.57** (4.45-7.01)	**6.46** (5.03-8.20)	**7.41** (5.57-9.59)	**8.42** (6.06-11.1)	**9.83** (6.81-13.3)	**11.0** (7.38-14.9)
24-hr	**2.95** (2.46-3.52)	**3.42** (2.85-4.08)	**4.24** (3.52-5.08)	**4.97** (4.11-5.98)	**6.06** (4.88-7.57)	**6.97** (5.46-8.77)	**7.92** (6.00-10.2)	**8.95** (6.50-11.8)	**10.4** (7.25-13.9)	**11.5** (7.82-15.6)
2-day	**3.38** (2.84-4.01)	**3.88** (3.25-4.61)	**4.76** (3.98-5.66)	**5.54** (4.61-6.62)	**6.70** (5.43-8.30)	**7.66** (6.05-9.58)	**8.68** (6.61-11.1)	**9.77** (7.14-12.7)	**11.3** (7.94-15.0)	**12.5** (8.54-16.8)
3-day	**3.67** (3.10-4.34)	**4.22** (3.56-4.99)	**5.17** (4.34-6.13)	**6.02** (5.02-7.16)	**7.26** (5.89-8.94)	**8.28** (6.55-10.3)	**9.35** (7.15-11.9)	**10.5** (7.70-13.6)	**12.1** (8.54-16.0)	**13.4** (9.17-17.9)
4-day	**3.94** (3.33-4.64)	**4.52** (3.81-5.33)	**5.52** (4.65-6.53)	**6.41** (5.37-7.61)	**7.72** (6.28-9.47)	**8.79** (6.97-10.9)	**9.91** (7.60-12.5)	**11.1** (8.17-14.4)	**12.8** (9.04-16.9)	**14.1** (9.70-18.8)
7-day	**4.64** (3.94-5.44)	**5.28** (4.48-6.19)	**6.38** (5.40-7.50)	**7.37** (6.20-8.69)	**8.80** (7.21-10.7)	**9.98** (7.97-12.3)	**11.2** (8.66-14.1)	**12.5** (9.29-16.1)	**14.4** (10.2-18.9)	**15.9** (11.0-21.0)
10-day	**5.28** (4.50-6.16)	**5.97** (5.09-6.98)	**7.17** (6.09-8.40)	**8.23** (6.95-9.68)	**9.79** (8.04-11.9)	**11.1** (8.86-13.6)	**12.4** (9.60-15.5)	**13.8** (10.3-17.7)	**15.8** (11.3-20.7)	**17.4** (12.1-22.9)
20-day	**7.11** (6.10-8.24)	**8.02** (6.88-9.31)	**9.57** (8.18-11.1)	**10.9** (9.27-12.7)	**12.8** (10.6-15.4)	**14.3** (11.6-17.4)	**15.9** (12.4-19.7)	**17.6** (13.1-22.3)	**19.8** (14.3-25.7)	**21.6** (15.1-28.3)
30-day	**8.64** (7.45-9.98)	**9.78** (8.42-11.3)	**11.7** (10.0-13.5)	**13.2** (11.3-15.4)	**15.5** (12.8-18.4)	**17.2** (13.9-20.7)	**18.9** (14.8-23.3)	**20.8** (15.6-26.1)	**23.2** (16.7-29.9)	**25.1** (17.6-32.7)
45-day	**10.6** (9.17-12.2)	**12.0** (10.4-13.8)	**14.3** (12.4-16.5)	**16.2** (13.9-18.8)	**18.8** (15.6-22.3)	**20.8** (16.9-24.9)	**22.8** (17.8-27.9)	**24.8** (18.6-30.9)	**27.3** (19.8-35.0)	**29.3** (20.7-38.0)
60-day	**12.3** (10.6-14.1)	**14.0** (12.1-16.0)	**16.6** (14.4-19.2)	**18.8** (16.2-21.7)	**21.7** (18.0-25.6)	**23.9** (19.4-28.5)	**26.1** (20.4-31.7)	**28.1** (21.2-35.0)	**30.8** (22.4-39.2)	**32.8** (23.2-42.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in csv format: precipitation frequency estimates ▼ Submit

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Appendix 4

NOTES:

1. ALL FLOWS INDICATE MILLION GALLONS PER DAY.
2. NUMBERS IN PARENTHESIS () INDICATE INSTANTANEOUS OR DAILY MAXIMUM FLOWS BECAUSE ALL MAXIMUM FLOWS MAY NOT OCCUR SIMULTANEOUSLY. FLOWS WILL NOT BALANCE UNDER MAXIMUM CONDITIONS.
3. ALL OTHER FLOW RATES ARE INTENDED TO REPRESENT THE AVERAGE MONTHLY DAY.

REV	DATE	DESCRIPTION	APP
3	6/08	REV. AS IS	JRE
2	9/99	REV. AS IS	JRE
1	6/97	REV. AS IS	JRE

aeci
associated electric cooperative, inc.

HEADQUARTERS

PROJECT TITLE

DRAWING TITLE

THOMAS HILL POWER PLANT
N. P. D. E. S. FLOW DIAGRAM

CONTRACTOR NAME:

DWG. NO. EOJEBAC	
PROJECT NO.	DESIGN BY: JEB
DATE: 21-JAN-1992	DRAWN BY: DAB
CAD FILE NO. EOJEBAC	APPROVED BY: — REV. 3

LEGEND

EXISTING SYSTEM

INTERMITTENT OR ABNORMAL FLOWS

THIS IS A CADD GENERATED DRAWING
MAGNIFICATION FACTOR (1)