

**Recommendations for Modification of Emergency Spillway
at Lake Ross Collins Dam**

(MS #05883)

LOCATED IN

Lauderdale County, Mississippi

FOR

Lake Ross Collins Homeowners Association
9161 Collinsville Circle
Collinsville, MS 39325

ENGINEER

ENGINEERING PLUS, INC.
1724-B 23rd AVENUE
MERIDIAN, MS 39301
(601) 693-4234
keithm@engineeringplus.com



DATE OF REPORT: August 26, 2017

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No. 5	Lake Ross Collins - Proposed Emergency Spillway Modification (DN: 16-270-004)

A. Existing Situation:

Lake Ross Collins was constructed in 1995 for fishing and recreational use. The location of this lake is indicated on attached Exhibit No. 1. Characteristics of the lake are as follows:

Surface Elevation (normal pool)	-	398.6' msl
Top of Dam Elevation	-	405.0' msl
Surface Area (normal pool)	-	36.9 acres
Drainage Area	-	1335 acres
Height of Dam (at outlet structure)	-	21.4'±

The principal spillway consists of 2 -21" steel trickle pipes which maintain the lake normal pool at elevation 398.6' msl. The top of the pipes are set at the normal pool elevation. The 2 – 21" steel conduits then convey the water through the dam for discharge into an unnamed tributary of Suqualena Creek..

The emergency spillway is a lower section of the existing roadway traversing the dam. The spillway is approximately 70' in width with an invert elevation of 399.6' msl. Wave protection for the dam face is provided by stone rip-rap.

The purpose of this study is to provide a recommendation for modification of the existing emergency spillway such that runoff from common rainfall events may be passed at a lower water surface elevation thereby reducing the possibility of flooding for homeowners located adjacent to the lake. Properties which appear to be subject to flooding are in the general vicinity of house number 9357 located on Collinsville Lake Drive. These properties have structures or out buildings which are located at or near elevation 402' msl.

B. Dam Classification:

Lake Ross Collins Dam (MS #05883) is classified as a low hazard dam, according to information provided by the Mississippi Department of Environmental Quality – Dam Safety Division.

C. Sources of Information:

The following sources of information were used to compile data for use in this report:

- Google Aerial Photograph
- Lidar DEM model
- Field Survey performed by Engineering Plus, Inc.

D. Rational for Analysis:

To prevent the flooding of adjacent properties the obvious approach would be to simultaneously lower and increase the size of the emergency spillway thereby reducing

the resultant water elevation of the lake for various frequency storm events. To this end – an analysis was performed to determine the **existing** principal and emergency spillway’s characteristics when storing and or passing various rainfall events. The results of this analysis are as follows;

<u>Storm Frequency</u>	<u>Inches Rainfall /24 Hours</u>	<u>Inflow (CFS)</u>	<u>Outflow (CFS)</u>	<u>Peak Water Elevation</u>
1 Year	3.8”	74	51	399.8’
2 Year	4.6”	146	91	400.1’
5 Year	5.7”	273	158	400.4’
10 Year	6.7”	409	240	400.7’
25 Year	7.6”	546	329	401.0’
50 Year	8.5”	692	429	401.2’
100 Year	9.4”	846	541	401.6’
50% PMP	22.3”	3430	3100	404.3’

As noted from the analysis, which assumes the starting lake level at its normal pool elevation of 398.6’ msl and the emergency spillway invert of 399.6’ msl, the 1 Year Storm Frequency (3.8” rain in 24 hours) will activate the emergency spillway. Information for the 100 Year Storm Frequency event depicted above is shown as Exhibit No. 2.

To release more water from the lake at a lower water surface elevation, an analysis was performed assuming the emergency spillway invert is lowered to elevation 399.1’ msl or approximately 0.5’ lower than the existing spillway invert of 399.6’ msl. The emergency spillway length was widened - primarily on the east end from 70’ to 116’. The results of the **proposed** analysis are as follows;

<u>Storm Frequency</u>	<u>Inches Rainfall /24 Hours</u>	<u>Inflow (CFS)</u>	<u>Outflow (CFS)</u>	<u>Peak Water Elevation</u>
1 Year	3.8”	74	62	399.3
2 Year	4.6”	146	128	399.6
5 Year	5.7”	273	253	399.9’
10 Year	6.7”	409	345	400.1’
25 Year	7.6”	546	441	400.3’
50 Year	8.5”	692	552	400.5’
100 Year	9.4”	846	675	400.7’
50% PMP	22.3”	3430	3189	403.2’

As noted from the proposed analysis which again assumes the starting lake level at its normal pool elevation of 398.6’ msl, the 1 Year Storm Frequency (3.8” rain in 24 hours) will activate the emergency spillway. Information for the 100 Year Storm Frequency event depicted above is shown as Exhibit No. 3.

E. Conclusions and Recommendations:

Decreasing the emergency spillway invert from 399.6' msl to 399.1' msl and widening the emergency spillway from 70' to 116' should provide additional flood protection to adjoining lake residents whose properties are constructed lower than elevation 402'. Please note that these properties will still be at risk if greater than a 100 year storm event occurs.

It is our recommendation that the emergency spillway be modified as described on Drawing No. 16-270-004 which is included as Exhibit No. 5. A cost estimate for the proposed work is attached as Exhibit No. 4.

Please note that any change to the emergency spillway as described in this report or shown on Drawing No. 16-270-004 will require submission of a dam permit modification to the Mississippi Department of Environmental Quality and their subsequent review and approval prior to construction.

F. Additional Considerations:

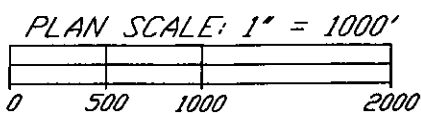
The following considerations should be investigated and resolved prior to commencement of the project;

1. It is anticipated that Lauderdale County will participate in the reconstruction of the dam spillway. Does this participation include roadway excavation and reconstruction at the lower elevation including replacement of the asphalt or will the Owner be required to repave the roadway?
2. The Owner has determined (from Mississippi One Call) that utilities along Collinsville Circle are generally located south of the construction area. However, the underground electric supplying the adjacent street lights would appear to be in conflict with the roadway excavation required to widen and lower the existing spillway. The electric utility should be contacted to determine if any conflicts exist and, if so, the subsequent cost required for resolution.



LOCATION PLAN - LAKE ROSS COLLINS

EXHIBIT NO. 1



SECTION 34, T8N-R14E
LAUDERDALE COUNTY, MS

Engineering Plus

Planning • Surveying • Testing • Landscape Design
1724-B 23rd Ave. Meridian, Mississippi 39301 (601) 693-4234

LOCATION MAP OF
LAKE ROSS COLLINS (MS#05883)
COLLINSVILLE, MS

FOR:

LAKE ROSS COLLINS HOMEOWNERS ASSN.
COLLINSVILLE, LAUDERDALE COUNTY, MS

F.B. P.
DWG FILE: Civil 3D Projects\Private Projects\2016
16-270 Lake Ross Collins Hydrologic Study\Cad\
ACAD-Lake Ross Collins Dam Area Topo Insert
Insert Imperial.dwg
JOB NO. 16-270
DRAWING NO. 16-270-003

DATE: 8/26/2017

DRAWN BY: KHM

CHECKED BY: KHM

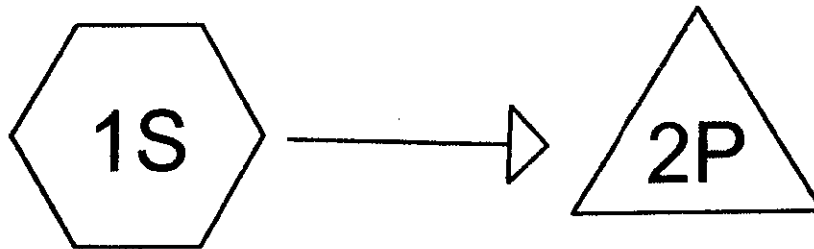
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SHEET

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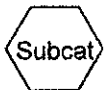
OF

1



Drainage Area

Lake Ross Collins



Drainage Diagram for 16-270 Lake Ross Collins
Prepared by Engineering Plus 8/28/2017
HydroCAD® 7.00 s/n 002899 © 1986-2003 Applied Microcomputer Systems

EXHIBIT NO. 2

16-270 Lake Ross Collins

Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

Prepared by Engineering Plus

Page 2

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8/28/2017

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Drainage Area

Runoff Area=1,335.000 ac Runoff Depth=4.16"

Flow Length=12,305' Tc=138.4 min CN=58 Runoff=845.68 cfs 462.949 af

Pond 2P: Lake Ross Collins

Peak Elev=401.55' Storage=288.296 af Inflow=845.68 cfs 462.949 af

Outflow=541.38 cfs 447.988 af

Total Runoff Area = 1,335.000 ac Runoff Volume = 462.949 af Average Runoff Depth = 4.16"

EXHIBIT NO. 2

16-270 Lake Ross Collins

Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

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Page 3

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Subcatchment 1S: Drainage Area

Runoff = 845.68 cfs @ 11.50 hrs, Volume= 462.949 af, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
 Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

Area (ac)	CN	Description
1,335.000	58	Woods/grass comb., Good, HSG B

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
138.4	12,305	0.0970	1.5		Lag/CN Method, Drainage Area Contour Length= 1,127,589' Interval= 5'

Subcatchment 1S: Drainage Area

Hydrograph

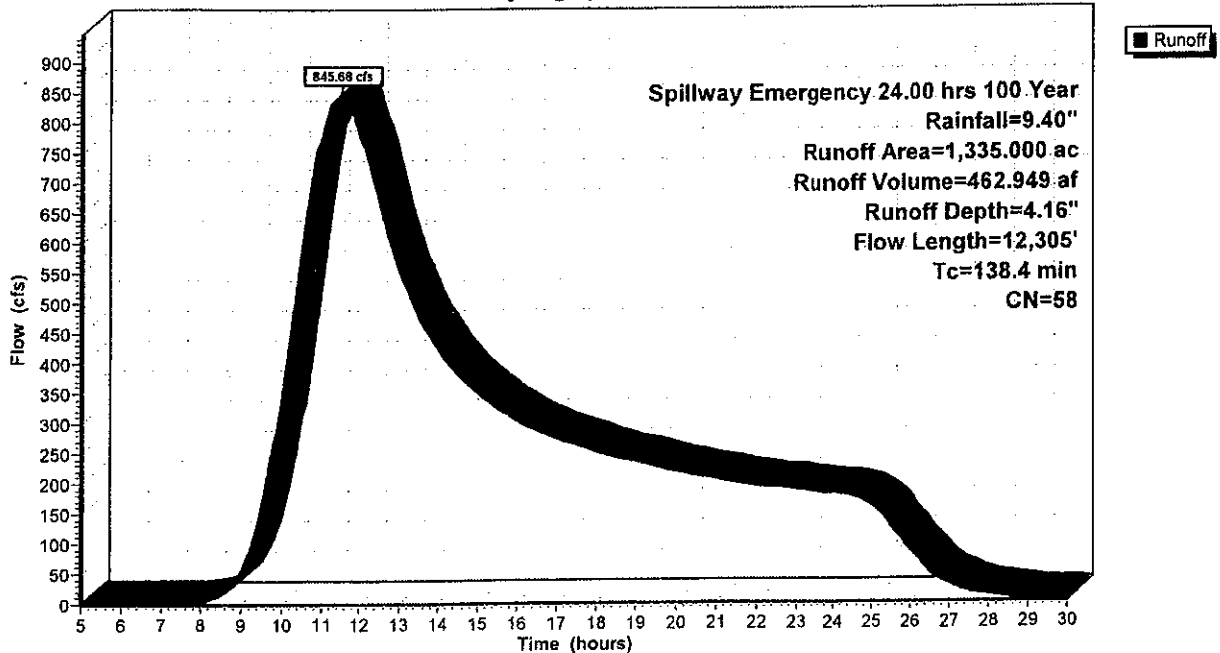


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16-270 Lake Ross Collins

Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

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Page 4

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Pond 2P: Lake Ross Collins

Inflow Area = 1,335.000 ac, Inflow Depth = 4.16" for 100 Year event
 Inflow = 845.68 cfs @ 11.50 hrs, Volume= 462.949 af
 Outflow = 541.38 cfs @ 13.09 hrs, Volume= 447.988 af, Atten= 36%, Lag= 95.0 min
 Primary = 541.38 cfs @ 13.09 hrs, Volume= 447.988 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
 Starting Elev= 398.60' Surf.Area= 36.901 ac Storage= 184.507 af
 Peak Elev= 401.55' @ 13.09 hrs Surf.Area= 49.786 ac Storage= 288.296 af (103.790 af above start)
 Flood Elev= 405.00' Surf.Area= 70.000 ac Storage= 476.960 af (292.453 af above start)
 Plug-Flow detention time= 528.9 min calculated for 263.481 af (57% of inflow)
 Center-of-Mass det. time= 130.7 min (1,067.1 - 936.4)

#	Invert	Avail.Storage	Storage Description			
1	385.00'	931.815 af	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
385.00	0.000	0.0	0.000	0.000	0.000	
400.00	40.700	10,645.0	203.500	203.500	207.019	
405.00	70.000	15,538.0	273.460	476.960	441.068	
410.00	113.700	26,510.0	454.855	931.815	1,283.888	

#	Routing	Invert	Outlet Devices									
1	Primary	398.60'	21.0" Horiz. Orifice/Grate Limited to weir flow C= 0.600									
2	Primary	398.60'	21.0" Horiz. Orifice/Grate Limited to weir flow C= 0.600									
3	Primary	399.60'	70.0' long x 20.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									
4	Primary	401.60'	96.0' long x 20.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									
5	Primary	405.00'	881.0' long x 20.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63									

Primary OutFlow Max=541.24 cfs @ 13.09 hrs HW=401.55' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 19.89 cfs @ 8.3 fps)
- 2=Orifice/Grate (Orifice Controls 19.89 cfs @ 8.3 fps)
- 3=Broad-Crested Rectangular Weir (Weir Controls 501.45 cfs @ 3.7 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

EXHIBIT NO. 2

16-270 Lake Ross Collins

Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

Prepared by Engineering Plus

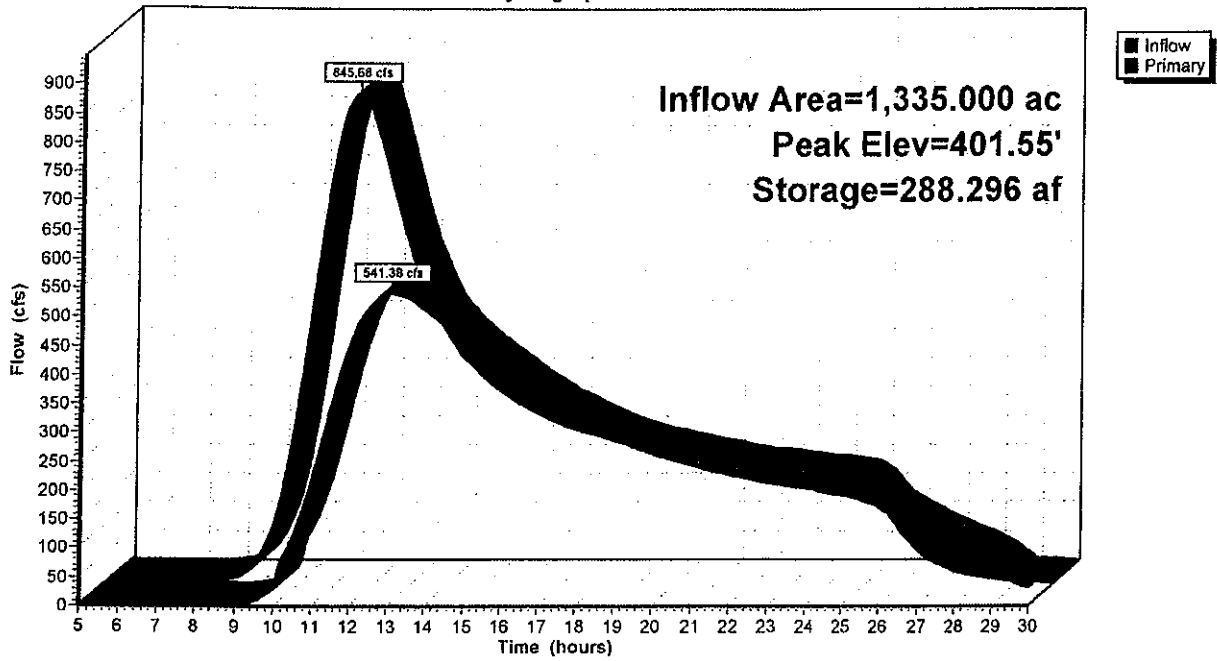
Page 5

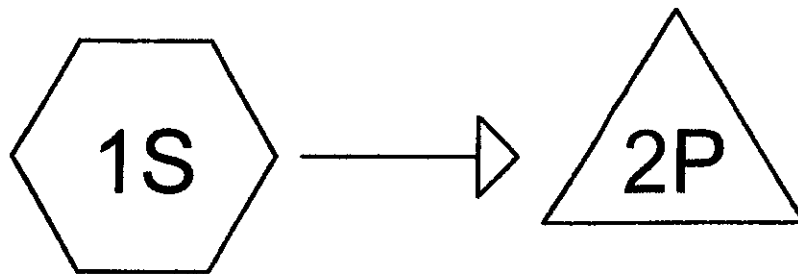
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Pond 2P: Lake Ross Collins

Hydrograph





Drainage Area Lake Ross Collins



Drainage Diagram for 16-270 Lake Ross Collins Proposed
Prepared by Engineering Plus 8/28/2017
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EXHIBIT NO. 3

16-270 Lake Ross Collins Proposed *Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"*

Prepared by Engineering Plus

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Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Drainage Area

Runoff Area=1,335.000 ac Runoff Depth=4.16"

Flow Length=12,305' Tc=138.4 min CN=58 Runoff=845.68 cfs 462.949 af

Pond 2P: Lake Ross Collins

Peak Elev=400.74' Storage=243.952 af Inflow=845.68 cfs 462.949 af

Outflow=674.71 cfs 456.907 af

Total Runoff Area = 1,335.000 ac Runoff Volume = 462.949 af Average Runoff Depth = 4.16"

EXHIBIT NO. 3

16-270 Lake Ross Collins Proposed Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"
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Subcatchment 1S: Drainage Area

Runoff = 845.68 cfs @ 11.50 hrs, Volume= 462.949 af, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
 Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

Area (ac)	CN	Description
1,335.000	58	Woods/grass comb., Good, HSG B

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
138.4	12,305	0.0970	1.5		Lag/CN Method, Drainage Area Contour Length= 1,127,589' Interval= 5'

Subcatchment 1S: Drainage Area

Hydrograph

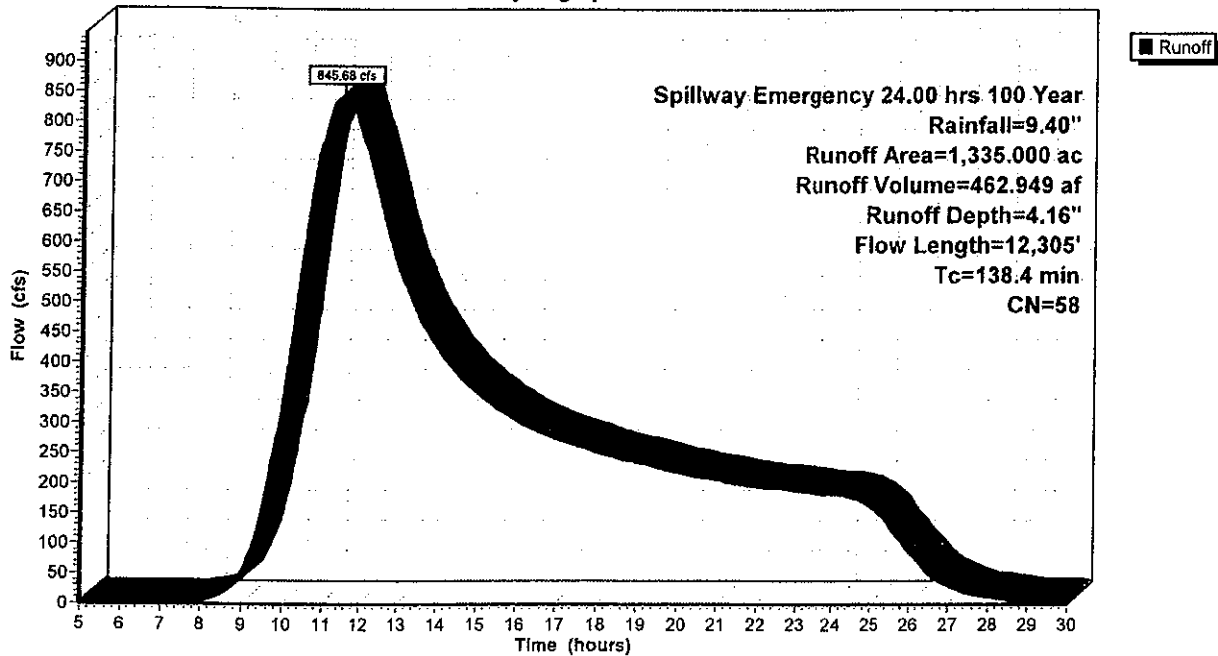


EXHIBIT NO. 3

16-270 Lake Ross Collins Proposed Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"
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Pond 2P: Lake Ross Collins

Inflow Area = 1,335.000 ac, Inflow Depth = 4.16" for 100 Year event
 Inflow = 845.68 cfs @ 11.50 hrs, Volume= 462.949 af
 Outflow = 674.71 cfs @ 12.45 hrs, Volume= 456.907 af, Atten= 20%, Lag= 57.0 min
 Primary = 674.71 cfs @ 12.45 hrs, Volume= 456.907 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
 Starting Elev= 398.60' Surf.Area= 36.901 ac Storage= 184.507 af
 Peak Elev= 400.74' @ 12.45 hrs Surf.Area= 45.034 ac Storage= 243.952 af (59.445 af above start)
 Flood Elev= 405.00' Surf.Area= 70.000 ac Storage= 476.960 af (292.453 af above start)
 Plug-Flow detention time= 418.7 min calculated for 271.856 af (59% of inflow)
 Center-of-Mass det. time= 51.0 min (987.5 - 936.4)

#	Invert	Avail.Storage	Storage Description
1	385.00'	931.815 af	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
385.00	0.000	0.0	0.000	0.000	0.000
400.00	40.700	10,645.0	203.500	203.500	207.019
405.00	70.000	15,538.0	273.460	476.960	441.068
410.00	113.700	26,510.0	454.855	931.815	1,283.888

#	Routing	Invert	Outlet Devices
1	Primary	398.60'	21.0" Horiz. Orifice/Grate Limited to weir flow C= 0.600
2	Primary	398.60'	21.0" Horiz. Orifice/Grate Limited to weir flow C= 0.600
3	Primary	399.10'	116.0' long x 20.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
4	Primary	401.60'	116.0' long x 20.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
5	Primary	405.00'	818.0' long x 20.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=674.38 cfs @ 12.45 hrs HW=400.74' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 16.94 cfs @ 7.0 fps)
 2=Orifice/Grate (Orifice Controls 16.94 cfs @ 7.0 fps)
 3=Broad-Crested Rectangular Weir (Weir Controls 640.50 cfs @ 3.4 fps)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

EXHIBIT NO. 3

16-270 Lake Ross Collins Proposed Spillway Emergency 24.00 hrs 100 Year Rainfall=9.40"

Prepared by Engineering Plus

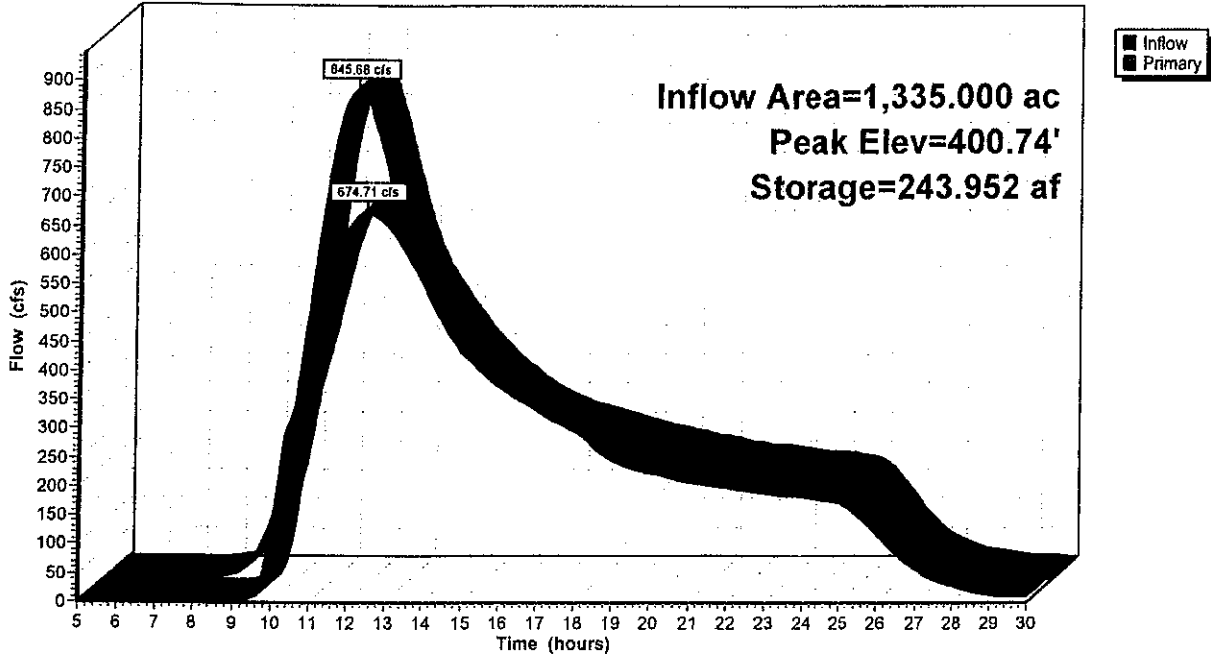
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Pond 2P: Lake Ross Collins

Hydrograph



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Phone (601)-693-4234
FAX (601)-485-3884
engplus@bellsouth.net

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Planning ~ Surveying ~ Testing ~ Landscape Design

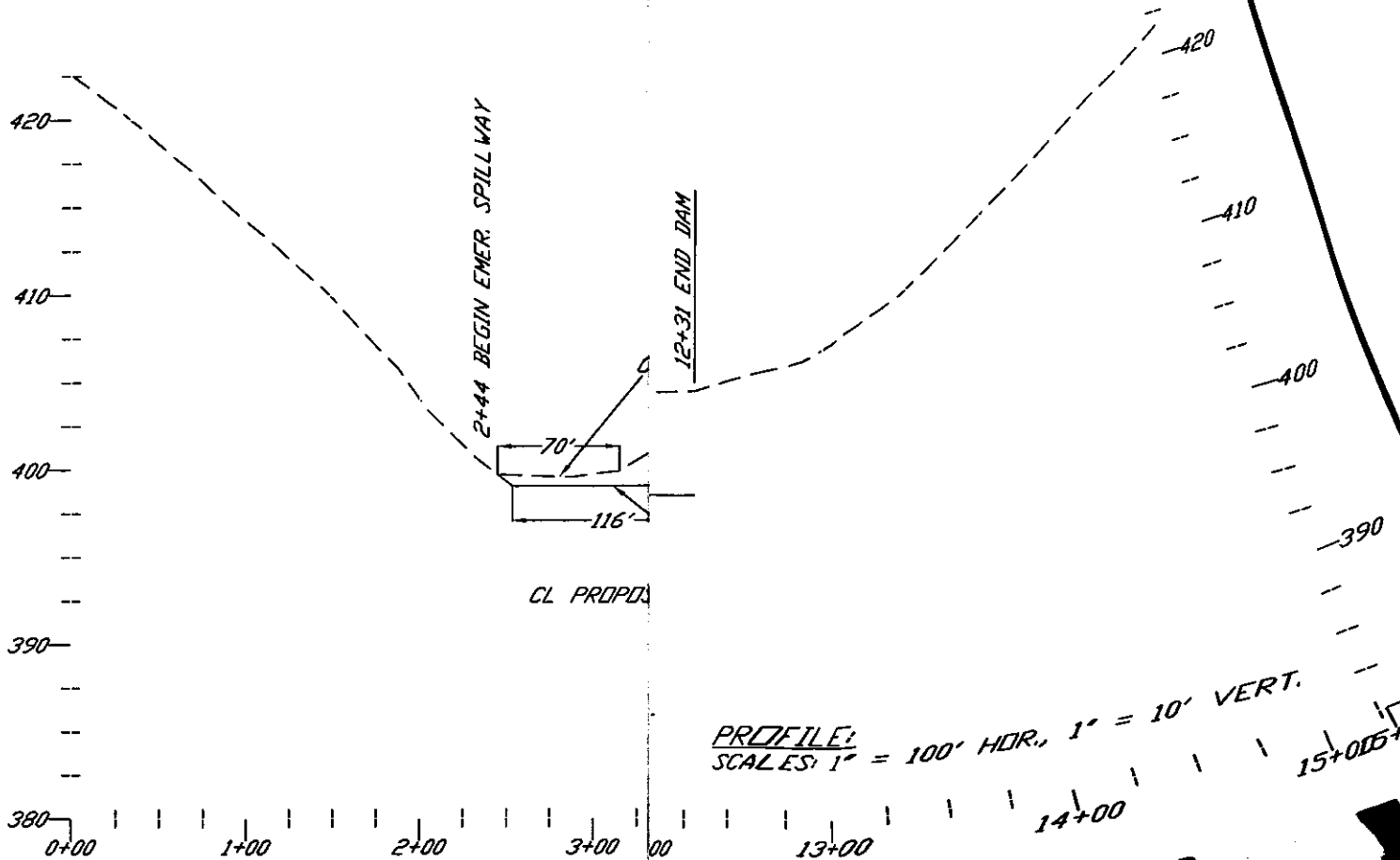
EXHIBIT 4

**PRELIMINARY COST ESTIMATE
MODIFICATION OF LAKE ROSS COLLINS EMERGENCY SPILLWAY
COLLINSVILLE, LAUDERDALE COUNTY, MISSISSIPPI
August 26, 2017**

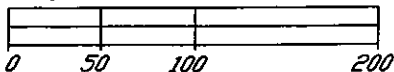
DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	TOTAL
Mobilization	1	L.S.	\$3,000.00	\$ 3,000
Demolition (Existing Asphalt Pavement)	1	L.S.	\$1,500.00	\$ 1,500
Excavation (Grading Roadway for new spillway)	300	C.Y.	\$12.00	\$ 3,600
Stone Rip-Rap	110	Tons	\$55.00	\$ 6,050
Asphalt Pavement	115	Tons	\$120.00	\$ 13,800
Grassing	1.0	L.S.	\$2,000.00	\$ 2,000
Erosion Control	1	L.S.	\$1,000.00	\$ 1,000
			Subtotal:	\$ 30,950
			Contingency	\$ 3,050
			Total:	\$ 34,000

*This probable cost estimate is intended for budgeting purposes only

Note: Utility Relocation (if any) **has not** been included in this estimate.



PLAN SCALE: 1" = 100'



MODIFICATIONS TO
EMERGENCY
COLLINS (MS D)

LAKE ROSS COLLINS
COLLINSVILLE, V

P.
FILE: Civil 3D Projects
70 Lake Ross Collins Hy
Lake Ross Collins Dam
imperial.dwg
NO. 16-270
WING NO. 15-270