Stantec Consulting Services Inc.
3052 Beaumont Centre Circle Lexington, Kentucky 40513

March 26, 2018
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Revision 0

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

RE: Initial Inflow Design Flood Control System Plan
Stilling Pond
EPA Final Coal Combustion Residuals (CCR) Rule
TVA Kingston Fossil Plant
Harriman, Tennessee

1.0 PURPOSE

This letter documents Stantec's certification of the initial inflow design flood control system plan for the TVA Kingston Fossil Plant's Stilling Pond. Based on the assessment, the Stilling Pond complies with the inflow design flood control requirements in the EPA Final CCR Rule at 40 CFR 257.82.

2.0 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

On April 17, 2015, the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (RIN-2050AE81; FRL-9149-4) (EPA Final CCR Rule) was published in the Federal Register. The Stilling Pond is considered an inactive surface impoundment based on the definitions in the EPA Final CCR Rule. A Direct Final Rule in response to a partial vacatur became effective on October 4, 2016. This revision eliminated the exemption for inactive surface impoundments to meet the same requirements as active surface impoundments. An extended timeline was given to inactive surface impoundments with a Notice of Intent (NOI) that complied with §257.105(i)(1), §257.106(i)(1) and §257.107(i)(1).

As described in 40 CFR 257.82(c), an inflow design flood control system plan must be prepared to document how the inflow design flood control system has been designed and constructed to manage the design storm required by the hazard classification. Stantec has assigned the Stilling Pond a low hazard potential classification rating. Thus, the inflow design storm event was selected from §257.82(a)(3) as the 100-year flood event based upon a hazard potential classification of "low".

3.0 SUMMARY OF FINDINGS

The attached plan presents the analysis of the inflow design flood control system for the Kingston Stilling Pond. The resulting water surface elevations are shown in the following table. The plan and results show that the impoundment meets the requirements set forth in 40 CFR 257.82(a) and (b).

Re: **Initial Inflow Design Flood Control System Plan**
Stilling Pond
EPA Final Coal Combustion Residuals (CCR) Rule
TVA Kingston Fossil Plant
Harriman, Tennessee

Plant	Facility	Inflow Design Storm	Water Surface Elevation (feet)	Minimum Embankment Elevation (feet)
KIF	Stilling Pond	100-year storm	751.7	754.5

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Don W. Fuller II, being a Professional Engineer in good standing in the State of Tennessee do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

2. that the information contained herein is accurate as of the date of my signature below; and

3. that the inflow design flood control system plan for the TVA Kingston Fossil Plant's Stilling Pond meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE Don W. Fuller II DATE 03/26/18

ADDRESS: Stantec Consulting Services Inc.
3052 Beaumont Centre Circle
Lexington, Kentucky 40513

TELEPHONE: (859) 422-3000

ATTACHMENTS: Inflow Design Flood Control System Plan

DON W FULLER II
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 113120
STATE OF TENNESSEE

Initial Inflow Design Flood Control System Plan

Kingston – Stilling Pond
Harriman, Tennessee

Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:
Stantec Consulting Services Inc.
Lexington, Kentucky

March 26, 2018
Revision 0

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1.0 BACKGROUND

On April 17, 2015, the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (RIN-2050AE81; FRL-9149-4) (EPA Final CCR Rule) was published in the Federal Register. A Direct Final Rule in response to a partial vacatur became effective on October 4, 2016. This revision eliminated the exemption for inactive surface impoundments to meet the same requirements as active surface impoundments. An extended timeline was given to inactive surface impoundments with a Notice of Intent (NOI) that complied with §257.105(i)(1), §257.106(i)(1) and §257.107(i)(1). Stantec Consulting Services Inc. (Stantec) was contracted by the Tennessee Valley Authority (TVA) to analyze the inflow design flood for Kingston Fossil Plant's (KIF) Stilling Pond CCR surface impoundment and evaluate compliance with section §257.82 of the Environmental Protection Agency (EPA) Final CCR Rule.

KIF is a coal-fired, electric generating plant located in Roane County, Tennessee, approximately 2.5 miles southeast of Harriman, Tennessee. The plant was constructed adjacent to Watts Bar Lake of the Emory River. Historically, the Stilling Pond was the final collection point for stormwater and process water for the site prior to discharging into the Emory River.

The Stilling Pond is an Inactive CCR Surface Impoundment as defined by the EPA Final CCR Rule that meets the requirements for an extended timeline under the Direct Final Rule and closure activities are expected to be completed in May 2018. The Stilling Pond Closure Project consisted of initial ash subgrade stabilization, structural fill, and final cover consisting of a geomembrane, geocomposite, and soil cover. The Stilling Pond approximate closure limits are shown in Figure 1.

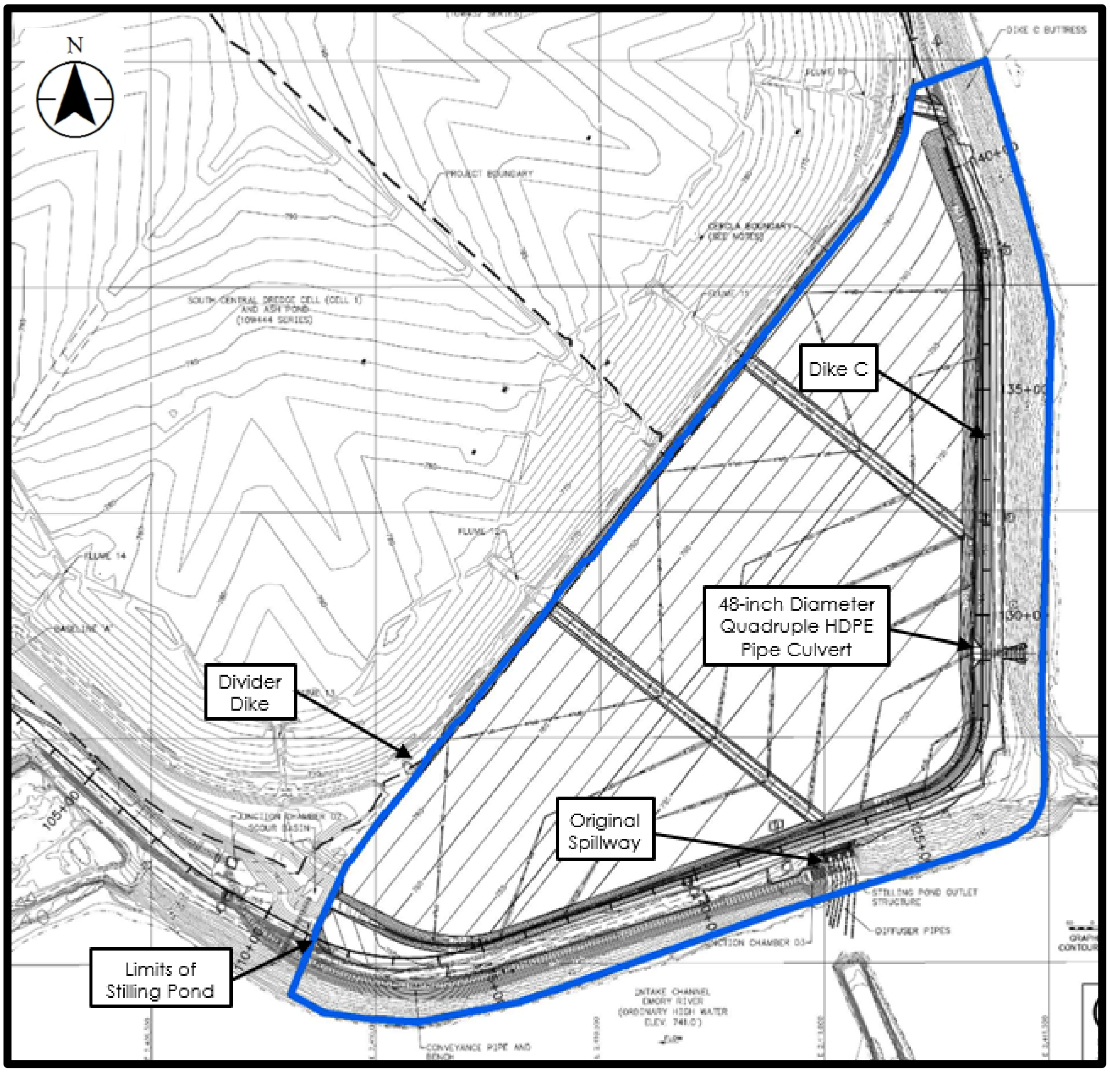


Figure 1 Stilling Pond Limits

2.0 EXISTING CONDITIONS

The Stilling Pond will be closed by placing fill within the pond to establish subgrade and promote positive drainage and then constructing an engineered cap system over the pond.

Stormwater runoff drains to two flumes and a perimeter ditch. The perimeter ditch conveys stormwater to a culvert on the eastern edge of the closed pond. This culvert consists of four 48-inch diameter High Density Polyethylene (HDPE) pipes and discharges to the Emory River.

Figure 2 shows the location of the hydraulic structures for the closed Stilling Pond configuration.

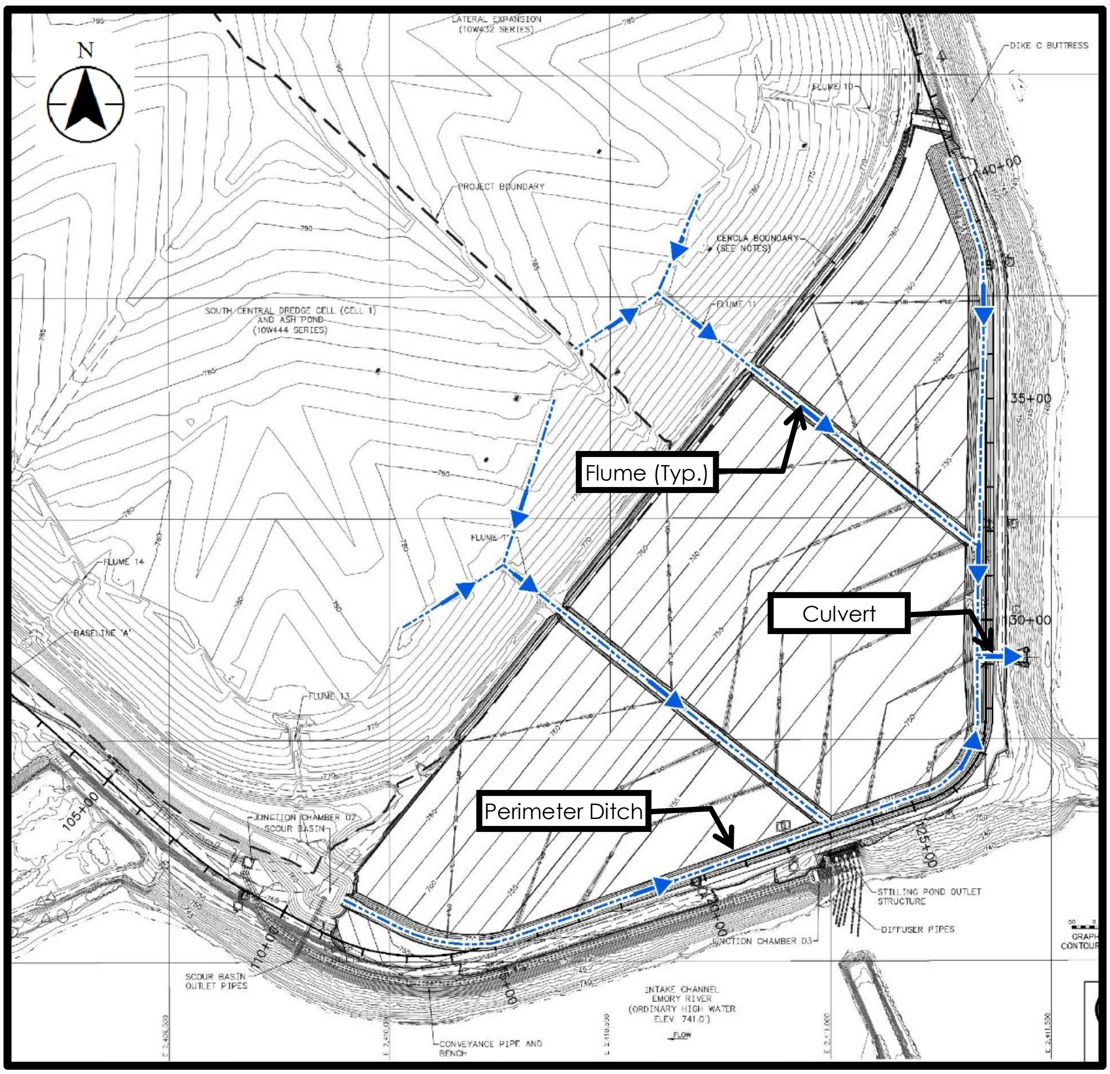


Figure 2 Hydraulic Structures

3.0 METHODS / DESIGN CRITERIA

This Inflow Design Flood Control System Plan has been developed to document how the inflow design flood control system has been designed and constructed to meet the requirements of §257.82. The Stilling Pond was classified as a Low Hazard structure in April, 2018 based on the report from Stantec to TVA dated April 6, 2018. This plan has been developed based on that classification and the following EPA Final CCR Rule criteria apply:

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. (Ref. §257.82(a)(1)),
2. The inflow design flood control system must collect and control flow from the CCR unit during and following the peak discharge of the inflow design flood. (Ref. §257.82(a)(2)),
3. The inflow design flood for a low hazard potential CCR surface impoundment is the 100-year flood. (Ref. §257.82(a)(3)(iii)),
4. Discharge from the CCR Unit must be handled in accordance with the surface water requirements under §257.3-3.
5. The owner or operator must prepare an initial inflow design flood control system plan by April 17, 2018. (Ref. §257.100(e)(3)(v)),
6. The plan must be revised every 5 years, and amendments must be made whenever there is a change in condition(s) that would substantially affect the written plan in effect. (Ref. §257.82)(c)(4) & (2)),
7. This plan will be considered complete upon its placement in the facility's operating record. (Ref. §257.82(c)(1)),
8. 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 §257.82.

The pond will be closed and is designed not to impound stormwater. A culvert controls discharge through the former impoundment. Hydrological calculations were performed as part of the closure design based on Soil Conservation Service Technical Release 55 (TR-55) methods. The Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) software (version 4.0) and the HY-8 Culvert Hydraulic Analysis Program (Version 7.3) were used to analyze the performance of the culvert for the design storm event. A 25-year storm event was used as the design storm event for the closure design. A 100-year storm event is the inflow design flood specified by the CCR Rule for low hazard surface impoundments. The closure design model was modified and re-run for a 100-year storm event, as described in Section 3.1, in order to evaluate the design against the CCR Rule criteria.

Modeling assumptions and hydrologic parameter inputs are described in the Basis of Design Report prepared by Stantec dated March 29, 2017.

3.1 MODELING UPDATES

The HEC-HMS model was modified for this analysis by changing the precipitation depth from 5.5 inches (25-year, 24-hour storm from NOAA Atlas 14) to 6.8 inches (100-year, 24-hour storm from NOAA Atlas 14). In addition, a constant flowrate of 68.74 cfs was added to the HEC-HMS model. This flowrate was obtained from the Flow Management Downstream Hydraulic Model prepared by AECOM and represents the 100-year, 24-hour peak flow over the emergency weir that discharges into the perimeter ditch. The HY-8 model was modified by changing the tailwater elevation to 748 feet, which represents the 100-year flood elevation of the Emory River. Other parameters in the HEC-HMS model and the HY-8 model are as described in the Basis of Design Report.

The flow computed by the HEC-HMS model at the outfall was compared against the rating curve developed by HY-8 to determine the headwater elevation.

4.0 CALCULATION RESULTS

The hydrologic modeling results were used to determine the performance of the Stilling Pond for the 100-year, 24-hour storm. The HEC-HMS model output is included in Appendix A. The rating curve computed in HY-8 is included in Appendix B.

4.1 CAPACITY AND FREEBOARD RESULTS

The peak headwater elevation and outflow is summarized in Table 1. The results show that the Stilling Pond can safely pass the flow from the 100-year 24-hour storm through the culvert without overtopping the crest of Dike C.

Table 1 Hydrologic and Hydraulic Modeling Results

Storm	Peak Inflow (cubic feet per second)	Peak Water Surface Elevation (feet)	Dike Crest Elevation (feet)	Freeboard (feet)
100-year, 24-hour	403	751.7	754.5	2.8

5.0 CONCLUSIONS

The calculations included in this report demonstrate that the inflow design flood control system adequately manages flow into and from the to be closed CCR Unit during and following the peak discharge of the inflow design flood (100-year flood). In addition, the closed CCR Unit will discharge to permitted stormwater outfalls, and is therefore handled in accordance with the surface water requirements under §257.3-3. Therefore, the Stilling Pond at KIF meets the requirements of Section §257.82 of the EPA Final CCR Rule.

6.0 REFERENCES

Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (RIN-2050-AE81; FRL-9149-4) (EPA Final CCR Rule) April 2015.

Stantec Consulting Services Inc., "Basis of Design Report (Revision 0) Kingston Fossil Plant Stilling Pond Closure", March 29, 2017.

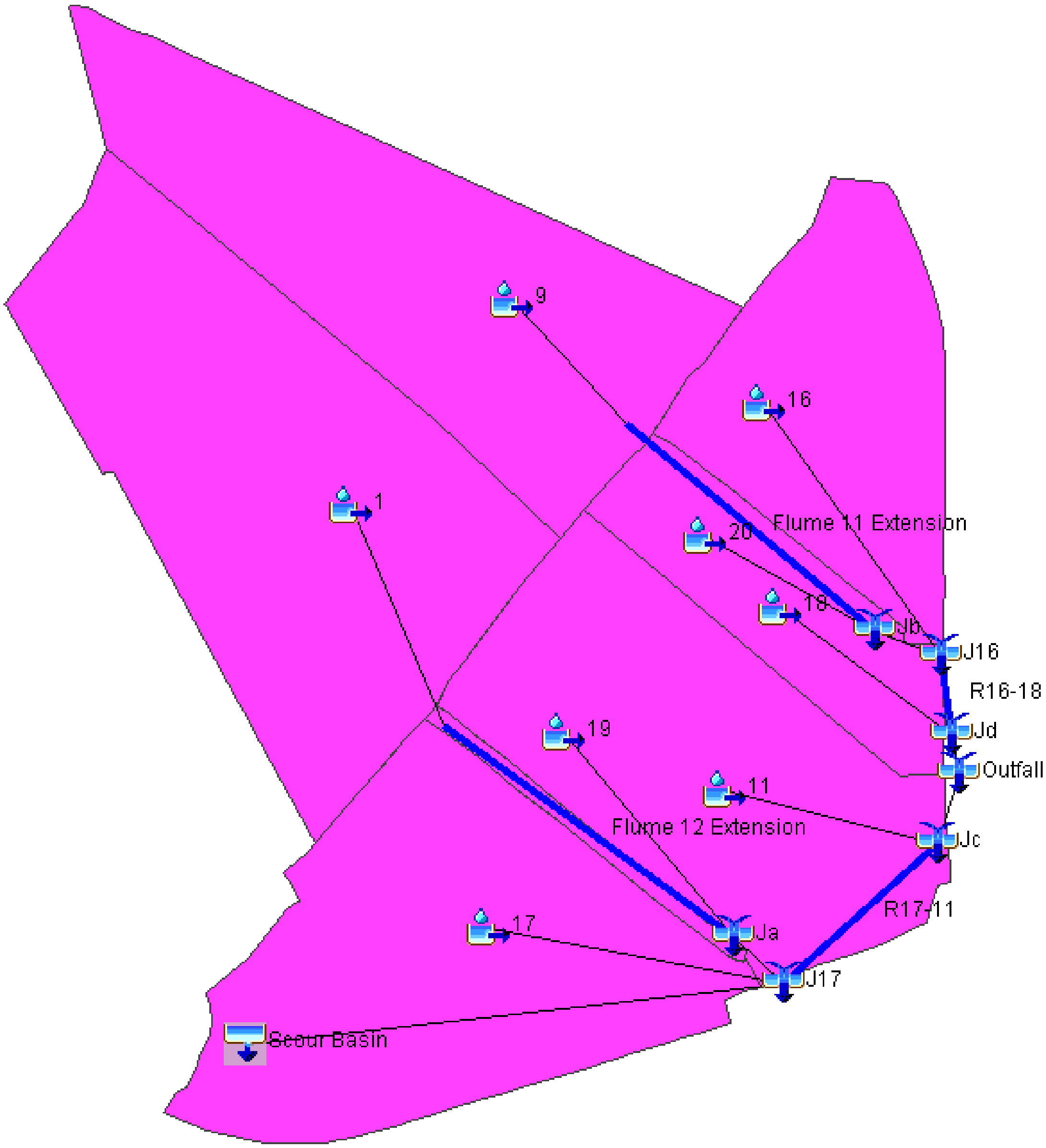
AECOM, June 1, 2016. Polishing Pond Engineering Report – Drainage and Flow Management Project (Downstream), Kingston Fossil Plant.

AECOM, February 22, 2018. Flow Management Downstream Hydraulic Model.

Stantec Consulting Services Inc., "Initial, Hazard Potential Classification Assessment – Stilling Pond", April 2018.

APPENDIX A
HEC-HMS MODEL OUTPUT

Basin Model


9
16
1
20
Flume 11 Extension
18
Jb
J16
R16-18
Jd
19
Outfall
11
Flume 12 Extension
Jc
R17-11
17
Ja
J17
Scour Basin

100-year 24-hour Results

Global Summary Results for Run "100-year, 24-hour"

Project: KIF_Closure Simulation Run: 100-year, 24-hour

Start of Run: 01Jan2015, 00:00 Basin Model: Proposed Conditions
End of Run: 02Jan2015, 00:01 Meteorologic Model: 100-year, 24-hour
Compute Time: 22Feb2018, 11:55:04 Control Specifications: 24-hr

Show Elements: All Elements Volume ... IN AC-F Sorting: Hydrologic

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
1	0.0239	85.3	01Jan2015, 12:03	4.51
Flume 12 Extension	0.0239	85.1	01Jan2015, 12:05	4.51
19	0.0009	3.9	01Jan2015, 11:58	4.52
Ja	0.0248	87.4	01Jan2015, 12:04	4.51
17	0.0191	81.8	01Jan2015, 11:59	4.63
Scour Basin	Not Specified	68.7	01Jan2015, 00:00	n/a
J17	Not Specified	227.5	01Jan2015, 12:02	n/a
R17-11	Not Specified	222.4	01Jan2015, 12:04	n/a
11	0.0169	60.3	01Jan2015, 12:03	4.51
Jc	Not Specified	282.3	01Jan2015, 12:04	n/a
9	0.0186	61.2	01Jan2015, 12:05	4.51
Flume 11 Extension	0.0186	61.1	01Jan2015, 12:06	4.51
20	0.0008	3.5	01Jan2015, 11:58	4.52
Jb	0.0194	62.8	01Jan2015, 12:06	4.51
16	0.0111	47.5	01Jan2015, 11:59	4.63
J16	0.0305	100.4	01Jan2015, 12:02	4.55
R16-18	0.0305	100.1	01Jan2015, 12:03	4.55
18	0.0058	22.4	01Jan2015, 12:01	4.52
Jd	0.0363	121.9	01Jan2015, 12:03	4.55
Outfall	Not Specified	402.8	01Jan2015, 12:03	n/a

APPENDIX B
RATING CURVE

HY-8 Analysis Results

Culvert Summary Table - Culvert 2_100yr

Culvert Crossing: Crossing 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	748.00	0.00	2.60	0-NF	0.00	0.00	3.08	53.00	0.00	0.00
50.00	50.00	748.06	1.46	2.66	1-S1t	0.93	1.06	3.08	53.00	1.35	0.00
100.00	100.00	748.24	2.18	2.84	1-S1t	1.34	1.52	3.08	53.00	2.70	0.00
150.00	150.00	748.53	2.79	3.13	1-S1t	1.69	1.88	3.08	53.00	4.06	0.00
200.00	200.00	748.95	3.35	3.55	1-S1t	2.00	2.19	3.08	53.00	5.41	0.00
250.00	250.00	749.46	3.92	4.06	1-S1t	2.32	2.46	3.08	53.00	6.76	0.00
300.00	300.00	750.03	4.57	4.63	1-S1t	2.66	2.69	3.08	53.00	8.11	0.00
350.00	350.00	750.73	5.33~	5.15	3-M2t	3.15	2.90	3.08	53.00	9.44	0.00
400.00	400.00	751.61	6.21~	5.77	3-M2t	3.60	3.07	3.08	53.00	10.78	0.00
450.00	450.00	752.62	7.22~	6.64	7-M2c	3.60	3.21	3.21	53.00	11.74	0.00
500.00	500.00	753.77	8.37~	7.57	7-M2c	3.60	3.32	3.32	53.00	12.75	0.00