

Duke Energy Company  
Marshall Steam Station - Ash Basin Forecasting  
2014 Wet Weather Detention Volume Calculation

Determination of Wet Weather Detention Volume: Wet Weather Detention Volume is the sum of the runoff accumulated in the ash basin which results from a 10-yr 24-hr storm (assuming 100% runoff) plus the maximum 24-hr dry weather waste stream which discharges to the Ash Basin (refer to NPDES Permit NC0004961)

I. Estimate Runoff to the Ash Basin from a 10-yr 24-hr storm:

|    |  |  |
|----|--|--|
| 1. | Natural Drainage Area of Ash Basin =                             | 1180.0 Acres   |
|    | Station Yard Drainage Area Pumped to Ash Basin =                 | 14.7 Acres   |
|    | Total =  | 1194.7 Acres   |
| 2. | Precipitation from 10-yr 24-hr storm =                           | 5.0 Inches   |
| 3. | Total Stormwater Runoff to Ash Basin =<br>(Assuming 100% runoff) | <span style="border: 1px solid black;">497.79 Acre-feet</span> |

II. Estimated Maximum 24-hr Dry Weather Waste Stream Discharging to Ash Basin:

|    |   |   |
|----|---|---|
| 1. | Maximum recorded Ash Basin Discharge =  | 11,200,000 Gallons/day  |
| 2. | Increase maximum daily discharge by 10% for conservatism and convert units to acre-feet = | <span style="border: 1px solid black;">37.81 Acre-feet</span> |

III. Wet Weather Detention Volume:

|                           |  |
|---------------------------|--|
| Sum of Parts I. and II. = | <span style="border: 1px solid black;">535.60 Acre-feet</span> |
|---------------------------|--|

IV. Estimated Quantity of Solids (Ash) to be discharged to Ash Basin through December 31, 2020.

Note: NPDES Permit expiration date is 4/30/2015.

| Time Period    | Actual or Estimated Coal Consumption (1000's tons) | % Ash  | Estimated Total Ash Production (1000's tons) | Estimated Ash Sent to Structural Fill or Lined Land Fills (1000's tons) | Estimated Ash Discharged to Ash basin (1000's tons) | Estimated Ash Discharged to Ash basin (Acre-feet) |
|----------------|--|--------|--|---|---|---|
| 2014 (Jun-Dec) | 2744.79  | 10.00% | 274.48                                       | 233.31  | 41.17   | 34.37   |
| 2015           | 3642.73  | 10.00% | 364.27                                       | 309.63  | 54.64   | 45.61   |
| 2016           | 4106.74  | 10.00% | 410.67                                       | 349.07  | 61.60   | 51.42   |
| 2017           | 3495.78  | 10.00% | 349.58                                       | 297.14  | 52.44   | 43.77   |
| 2018           | 2442.76  | 10.00% | 244.28                                       | 207.63  | 36.64   | 30.59   |
| 2019           | 2371.18  | 10.00% | 237.12                                       | 201.55  | 35.57   | 29.69   |
| 2020           | 2406.97  | 10.00% | 240.70                                       | 204.59  | 36.10   | 30.14   |
| Total          | 21210.94   | 10.00% | 2121.09                                      | 1802.93   | 318.16  | 265.60  |

\* Calculation assumes an in-place ash density of 55 lbs. per cubic foot.

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V. Estimated Total Storage Volume Required through 2015:

|  |   |   |
|--|---|---|
| Wet Weather Detention Volume =               | 535.6   | Acre-feet   |
| Estimated Solids to Ash Basin =              | 265.6   | Acre-feet   |
| Required Storage Volume Through 12/31/2020 = | <span style="border: 1px solid black; padding: 2px;">801.2</span> | <span style="border: 1px solid black; padding: 2px;">Acre-feet</span> |

VI. Results:

|                                      |   |   |
|--------------------------------------|---|---|
| Ash Basin @ Pond Elevation 793'+9" = | 849.9   | Acre-feet   |
| Total Available Storage =            | <span style="border: 1px solid black; padding: 2px;">849.9</span> | <span style="border: 1px solid black; padding: 2px;">Acre-feet</span> |

Note: Available Storage based on basin survey dated 8/13/2014

**Available Storage > Required Storage**

Based on these calculations, there is sufficient capacity in the ash basin to provide the retention volume specified in the permit through the year 2020.