**Closure Completion Notification for Closure by Removal**

September 26, 2024
Closure Completion Notification
John E. Amos Plant
Bottom Ash Pond Complex

On September 4, 2024, the John E. Amos Plant Bottom Ash Pond Complex was transitioned to closure status in accordance with 40 CFR 257.102. This notice of completion of closure is being placed in the operating record in accordance with 40 CFR 257.102(h).

Effective with the Closure Completion Notification, the former ash storage site is no longer a CCR unit. The following operating record documents are no longer required going forward:

- Hazard Potential Classification
- Emergency Action Plan
- Face to Face Meeting Documentation for EAP
- History of Construction and Revisions for Surface Impoundments
- Structural Stability Assessments
- Safety Factor Assessments
- Fugitive Dust Plan
- Inflow Design Flood System Control Plan

**CLOSURE CERTIFICATION BY QUALIFIED PROFESSIONAL ENGINEER**

I certify that the John E. Amos Bottom Ash Pond Complex has been closed in accordance with the most recent written closure plan specified by paragraph §257.102(b) and the requirements of section §257.102.

David Anthony Miller
_______________________________________
Printed Name of Licensed Professional Engineer


David Anthony Miller
_______________________________________
Signature

| 22663 | West Virginia | 09.26.2024 |
|---|---|---|
| License Number | Licensing State | Date |

gai consultants

Charleston Office
500 Lee Street, East, Suite 700
Charleston, West Virginia 25301

T 304.926.8100
F 304.926.8180

August 5, 2024

Project No. R210487.00

Mr. Brian G Palmer, PE
Principal Engineer
AEP
1 Riverside Plaza
Columbus, Ohio 43215

**AEP – John E. Amos**
**Bottom Ash Complex**
**Pond Closure - Completion**
**Putnam County, West Virginia**

Dear Mr. Palmer:

GAI Consultants, Inc. (GAI) appreciates the opportunity to provide American Electric Power Service Corporation (AEP) with the Quality Assurance / Quality Control and certification services for the closure of the Bottom Ash Complex at the John E. Amos Plant located in Putnam County, West Virginia.

This letter documents that removal of the coal combustion residual material from the bottom ash complex was completed in substantial compliance with the Construction Documents completed by Worley, the Closure Plan and 40 CFR 257.102(c).

The areas of the bottom ash complex were certified as they were completed. The following presents the areas and certification date:

- Pond 1B – April 21, 2023
- Clearwater and Reclaim Ponds – July 24, 2023
- Pond 1A – August 5, 2024

If you have any questions or require additional information, please contact me at 681.245.8866 (c.straley@gaiconsultants.com).

Respectfully submitted.,

**GAI Consultants, Inc.**

Charles F. Straley, PE

Digitally signed by Charles F. Straley, PE
DN: C=US, E=c.straley@gaiconsultants.com, O="GAI Consultants, Inc.", CN="Charles F. Straley, PE"
Date: 2024.08.05 15:16:48-04'00'

Charles F. Straley, PE, PLS
Quality Assurance Officer / Certifying Engineer
Engineering Director / Senior Associate

CFS

## 5.0 PE Certification

Based on the observations performed by GAI Consultants, Inc. personnel, I hereby certify that the removal of CCR material to be visually removed and one-foot additional undercut within Pond 1B and along the southern edge of Pond 1A of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project at the John E. Amos Plant near Winfield, West Virginia (WV), as shown on the Worley Construction Drawings has been completed in substantial compliance with the Construction Documents, the Closure Plan and 40 CFR 257.102(c).

This document clarifies "certification" for the excavation of CCR material to be visually removed and an additional one-foot of undercut within Pond 1B and along the southern edge of Pond 1A of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project. This certification is strictly limited to CQA observations of CCR removal and does not include the groundwater monitoring and compliance aspect of the CCR Unit closure by removal criteria, as required by 40 CFR 257.102(c).

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly accepted industry practices.

Bearing the above in mind and based on the results of monitoring of construction efforts during the project and review of the survey points; GAI's professional opinion is that the CCR material within Pond 1B and along the southern edge of Pond 1A and additional one-foot undercut of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project meets the requirements as set forth by the project documents and the CCR Rule.

Charles F. Straley, PE
West Virginia Number 11842

## 5.0 PE Certification

Based on the observations performed by GAI Consultants, Inc. personnel, I hereby certify that the removal of CCR material to be visually removed and one-foot additional undercut within Clearwater & Reclaim Ponds of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project at the John E. Amos Plant near Winfield, West Virginia (WV), as shown on the Worley Construction Drawings has been completed in substantial compliance with the Construction Documents, the Closure Plan and 40 CFR 257.102(c).

This document clarifies "certification" for the excavation of CCR material to be visually removed and an additional one-foot of undercut within Clearwater & Reclaim Ponds of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project. This certification is strictly limited to CQA observations of CCR removal and does not include the groundwater monitoring and compliance aspect of the CCR Unit closure by removal criteria, as required by 40 CFR 257.102(c).

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Bearing the above in mind and based on the results of monitoring of construction efforts during the project and review of the survey points; GAI's professional opinion is that the removal of CCR material within Clearwater & Reclaim Ponds and additional one-foot undercut of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project meets the requirements as set forth by the project documents and the CCR Rule.

Charles F. Straley, PE
West Virginia Number 11842

CHARLES F. STRALEY
REGISTERED
11842
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
7-24-23

## 5.0 PE Certification

Based on the observations performed by GAI Consultants, Inc. personnel, I hereby certify that the removal of CCR material to be visually removed and one-foot additional undercut within Pond 1A of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project at the John E. Amos Plant near Winfield, West Virginia (WV), as shown on the Worley Construction Drawings has been completed in substantial compliance with the Construction Documents, the Closure Plan and 40 CFR 257.102(c).

This document clarifies "certification" for the excavation of CCR material to be visually removed and an additional one-foot of undercut within Pond 1A of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project. This certification is strictly limited to CQA observations of CCR removal and does not include the groundwater monitoring and compliance aspect of the CCR Unit closure by removal criteria, as required by 40 CFR 257.102(c).

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly accepted industry practices.

Bearing the above in mind and based on the results of monitoring of construction efforts during the project and review of the survey points; GAI's professional opinion is that the CCR material within Pond 1A and additional one-foot undercut of the CCR/ELG Project Bottom Ash Pond Closure and Repurposing Project meets the requirements as set forth by the project documents and the CCR Rule.

Charles F. Straley, PE
West Virginia Number 11842

# INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN PERIODIC 5-YEAR REVIEW

**CFR 257.82(c)**

Bottom Ash Pond Complex

Amos Power Plant
Winfield, West Virginia

October, 2021

Prepared for : Appalachian Power Company – Amos Plant

Winfield, West Virginia

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

Document ID: GERS-21-057

# Inflow Design Flood Control System Plan
# Periodic 5-year Review
# CFR 257.82(c)
# Amos Plant
# Bottom Ash Complex

PREPARED BY ______________ DATE 10/08/2021
Brian G. Palmer, P.E.

REVIEWED BY ______________ DATE 10/8/2021
Brett Dreger, P.E.

APPROVED BY ______________ DATE 10/8/2021
Gary F. Zych, P.E.
Manager – AEP Geotechnical Engineering

GARY F. ZYCH
REGISTERED
21201
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

10/8/2021

I certify to the best of my knowledge, information, and belief that the information contained in this Inflow Design Flood Control System Plan meets the requirements of 40 CFR § 257.82.

# Table of Contents



**Attachments**

## 1.0 OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of CFR 257.82(c) for the Inflow Design Flood Control System Plan. This is the first periodic 5-year review of the inflow design flood control plan

## 2.0 DESCRIPTIONS OF CCR IMPOUNDMENT

The John E. Amos Plant is located in Putnam County, West Virginia. It is owned and operated by Appalachian Power Company (APCO). The facility operates a surface impoundment for storing CCR called the Bottom Ash Pond Complex.

The Bottom Ash Complex consists of Bottom Ash Pond 1A, Bottom Ash Pond 1B, Reclaim Water pond (RCWP) and the Treatment pond (TP). The Main Perimeter Dike is located on three sides of the impoundment and grades into native ground along the southern boundary. The BAP-1B pond is bounded on the west by the filled former sedimentation pond and on the east by the BAP-1A. A splitter dike separates the BAP-1A and BAP-1B and the Reclaim Water pond. Figure 1 (aerial image – plan view) illustrates the bottom ash pond complex (Attachment A).

## 3.0 DESCRIPTION OF DESIGN FLOOD 257.82(a)(3)

The Bottom Ash Pond Complex has been determined to be a Significant Hazard potential CCR impoundment. Based on this hazard classification, the design flood as determined by section 257.82(a)(3) is to be the 1,000-year storm which corresponds to 7 inches for this site. The State of West Virginia regulations for Class II dams requires the dam to be able to pass the ½ PMP (Probable Maximum Precipitation), 6 hour storm event which is equivalent to 14 inches of rain. This plan includes an analysis for the ½ PMP event which exceeds the requirements of section 257.82(a)(3).

## 4.0 DESCRIPTION OF INFLOW DESIGN FLOOD CONTROL SYSTEM 257.82(c)

The Amos Bottom Ash Complex is comprised of diked embankments on three sides which directs storm water away from the impoundment and limits runoff to that which falls directly on the pond surface. The watershed area to the south is approximately 50 acres and drains into the pond. Inflows into the pond complex are collected and discharged though outlet structures within each area. No changes to the watershed or operations since the last assessment.

Discharge water from either bottom ash pond flows into the reclaim water pond through a 36 inch diameter pipes. A portion of the flow into the reclaim water pond is pumped backed to the plant for reuse.

The remaining portion flows through a 36 inch diameter pipe into the treatment / clear water pond that decants into a concrete weir connected to a 24 in x 38 in elliptical reinforced concrete pipe. The 24 x 38 concrete elliptical pipe transitions to a 36 inch diameter steel pipe to a 36 inch diameter HDPE pipe that extends into the Kanawha River along the river bed allowing the flow to be discharged into a mixing zone.

The 24 x 38 concrete elliptical pipe discharge pipe was slip lined in 2013 due to leakage at the joints.

An overflow spillway pipe, 36 inch diameter, is located along the reclaim pond with an invert elevation set modeled at 583.2 ft. Bottom ash pond 1B also has a 36 in diameter overflow spillway pipe that discharges to Bill's Creek that was modeled with an invert elevation of 583.7 feet.

The interior splitter dikes between the pond 1A, 1B, the Reclaim Water Pond and the Treatment Basin will be inundated during the ½ PMF event. The dike between the Reclaim Pond and the Treatment Pond will be inundated from a smaller storm event.

## <u>5.0</u> SUMMARY OF INFLOWS, OUTFLOWS AND FLOOD ELEVATIONS

The following table provides the maximum inflows, outflows and flood elevations for each portion of the pond complex. See the analysis included in Attachment B for detailed calculations.

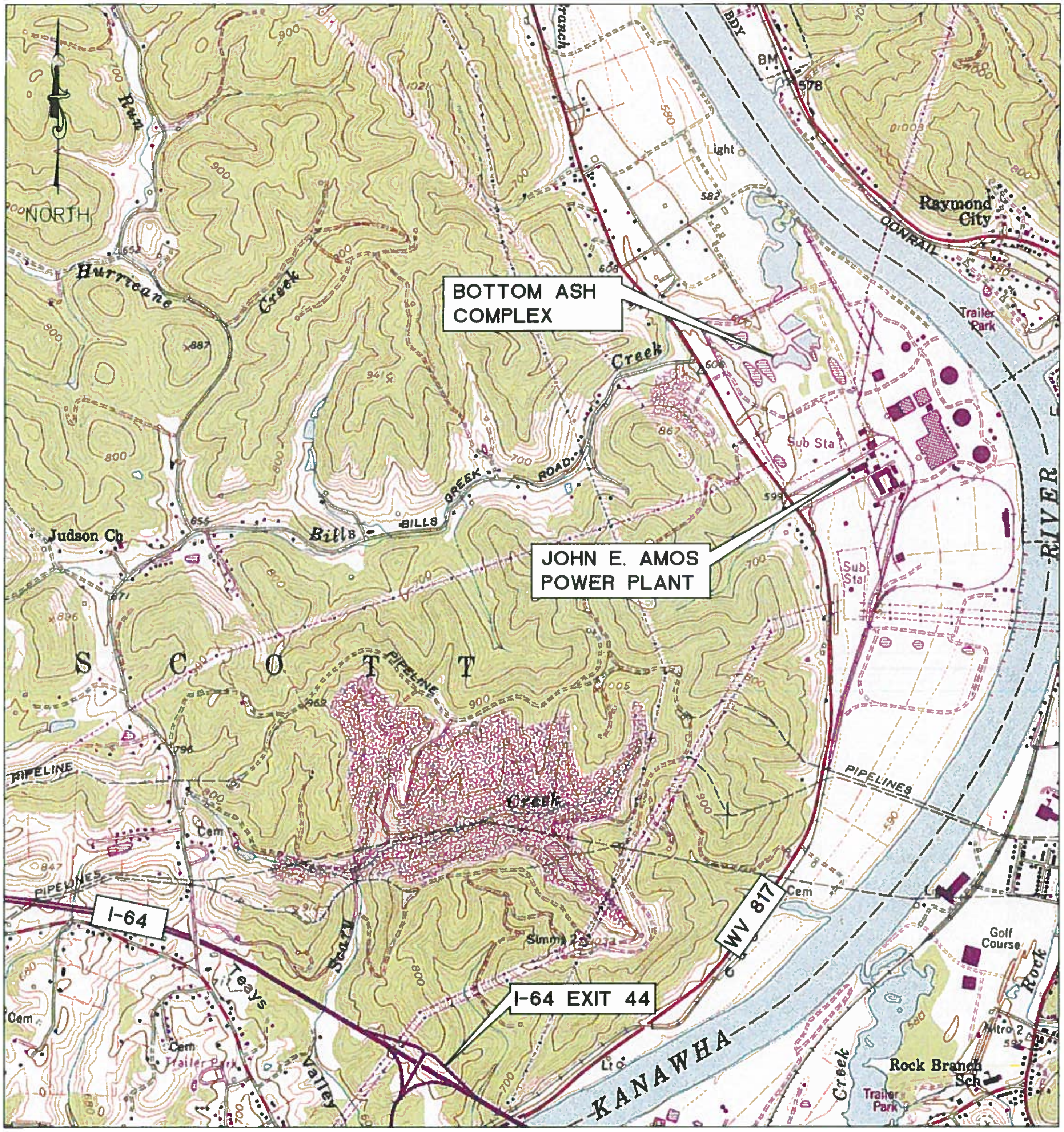
| **Bottom Ash Pond 1A & Reclaim Pond** | |
|---|---|
| Storm Event | ½ 6-hour PMP |
| Peak Inflow | 243 cfs |
| Peak Outflow | 19 cfs |
| Maximum Pool Elevation | 585.4 ft. |
| Crest Elevation | 588 ft. |

| **Bottom Pond 1B & Reclaim Pond** | |
|---|---|
| Storm Event | ½ 6-hour PMP |
| Peak Inflow | 225 cfs |
| Peak Outflow | 14 cfs |
| Maximum Pool Elevation | 585.5 ft. |
| Crest Elevation | 588 ft. |

Ref: Geo/Environmental Assc., Inc. December 2015, "CCR Rules Certification Report, John Amos Plant-Bottom Ash Complex, Putnam County West Virginia" GA Project No. 15055009, GA Assc. Knoxville TN.

# ATTACHMENT A

## LOCATION MAPS




SAINT ALBANS, WV
7.5 MINUTE SERIES
UPDATED 1976

SCALE 1" = 2000'

0 2000' 4000'

**JOHN E. AMOS PLANT**
**BOTTOM ASH COMPLEX**

LOCATION MAP

PUTNAM COUNTY

REV NO.

DATE

DESC.

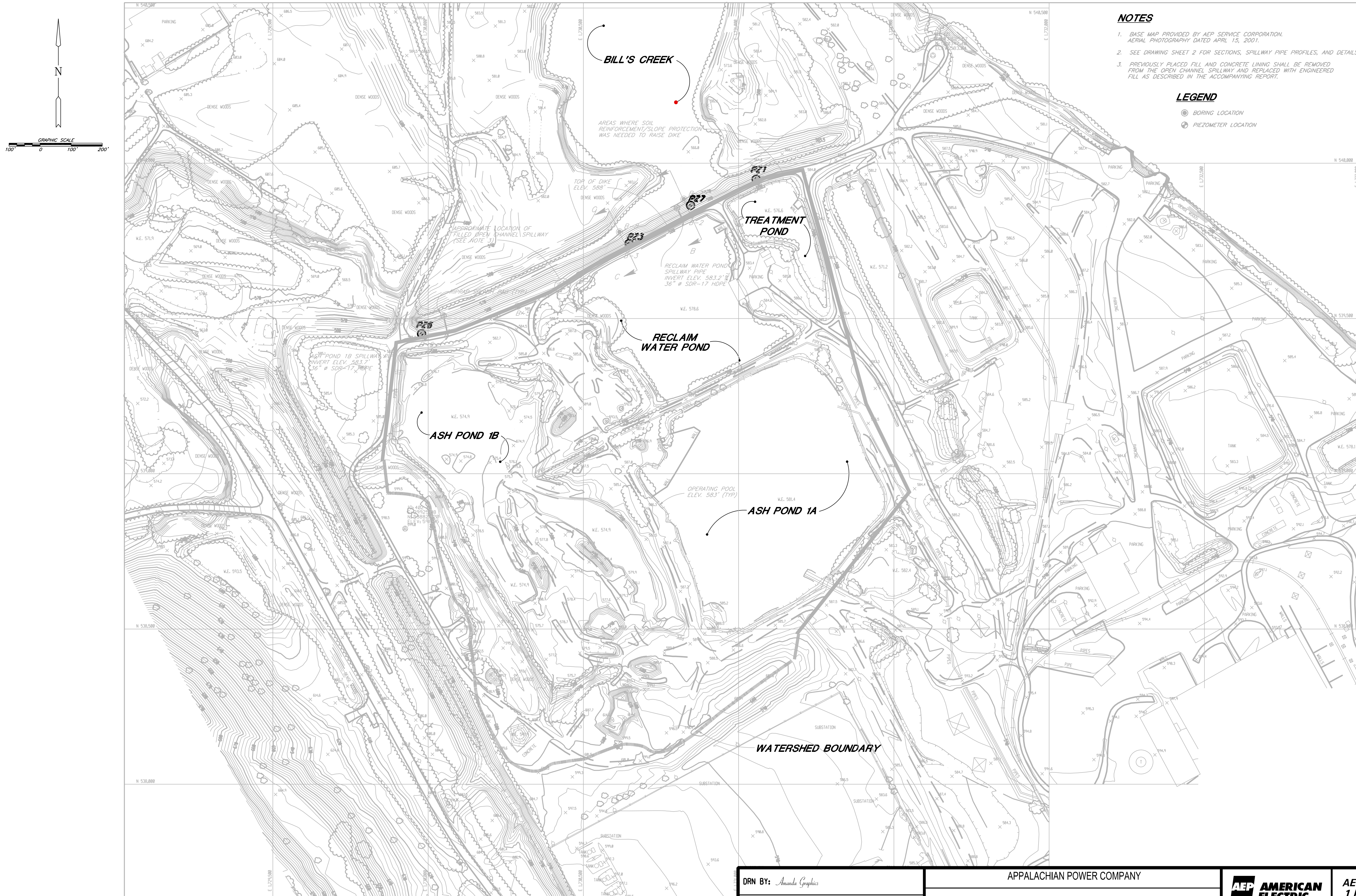
gai consultants

CHARLESTON OFFICE
300 SUMMERS STREET,
SUITE 1100
CHARLESTON, WV 25301
304-926-8100

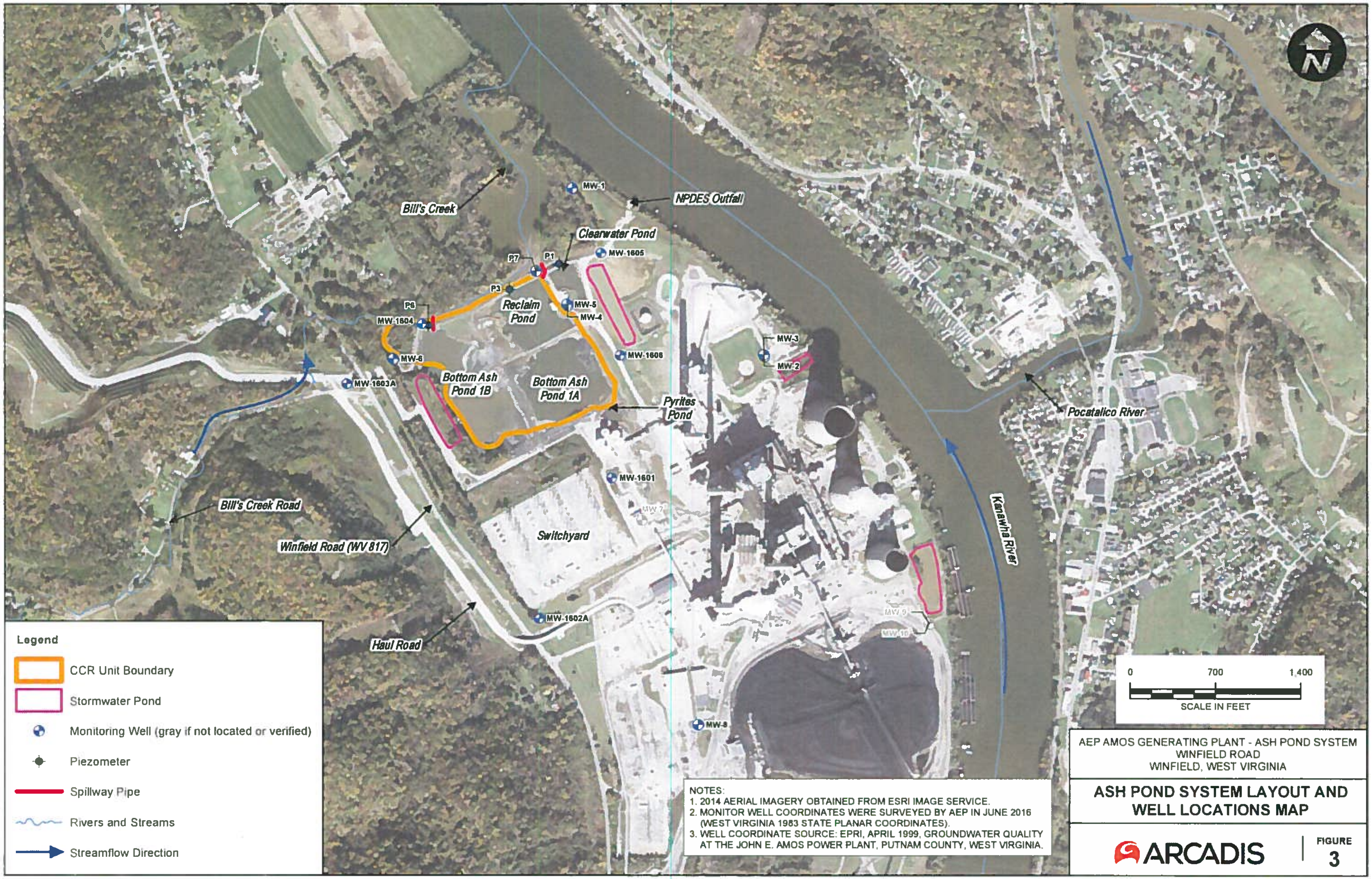
| DATE | SCALE |
|---|---|
| 7/8/13 | 1"=2000' |

FIGURE NUMBER

1




| DRN BY: Amanda Graphics | APPALACHIAN POWER COMPANY | AEP AMERICAN ELECTRIC POWER | AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215 |
|---|---|---|---|
| DATE: 07/12/2016 | SCARY — AMOS PLANT — WEST VIRGINIA | | |
| SCALE: N. T. S | BOTTOM ASH POND COMPLEX | FIGURE 2 | |




NOTES:
1. 2014 AERIAL IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. MONITOR WELL COORDINATES WERE SURVEYED BY AEP IN JUNE 2016 (WEST VIRGINIA 1983 STATE PLANAR COORDINATES).
3. WELL COORDINATE SOURCE: EPRI, APRIL 1999, GROUNDWATER QUALITY AT THE JOHN E. AMOS POWER PLANT, PUTNAM COUNTY, WEST VIRGINIA.

AEP AMOS GENERATING PLANT - ASH POND SYSTEM
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

**ASH POND SYSTEM LAYOUT AND WELL LOCATIONS MAP**

ARCADIS

FIGURE 3

City: CITRIX Div/Group: IM/DV Created By: K Ives Last Saved By: webb
OH015978.0009.00001 (Mountaineer Ash Pond)
Z:\GISPROJECTS_ENV\AEP\Amos\mxd\Ash Pond Report\F3_ Amos Ash Pond Well Network Ash Pond Layout and Well Location Map_v3.mxd 8/29/2016 10:08:48 AM

# ATTACHMENT B

# DESIGN REPORT

# CCR RULES CERTIFICATION REPORT
# JOHN AMOS PLANT - BOTTOM ASH COMPLEX
# PUTNAM COUNTY, WEST VIRGINIA

**Prepared For:**

**AEP Service Corporation**
**Geotechnical Engineering Group**
**1 Riverside Plaza**
**Columbus, OH 43215-2373**

**Prepared By:**

**Geo/Environmental Associates, Inc.**
**3502 Overlook Circle**
**Knoxville, TN 37909**

**GA Project No. 15055009**
**December 21, 2015**

GA

## TABLE OF CONTENTS



## APPENDICES

**CCR RULES ASSESSMENT AND CERTIFICATION**
**JOHN AMOS PLANT - BOTTOM ASH COMPLEX**
**POCA, PUTNAM COUNTY, WEST VIRGINIA**
**DECEMBER 21, 2015**

## INTRODUCTION

Geo/Environmental Associates, Inc. (GA) has performed a site visit, conducted an engineering assessment, and prepared a certification statement for the John Amos Plant - Bottom Ash Complex. These services were performed to meet specific requirements set forth in the Environmental Protection Agency's CCR Rules (i.e., 40 CFR Parts 257 and 261, "Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals From Electric Utilities, Final Rule," dated April 17, 2015). Provided in this report is a discussion of GA's findings and a certification statement pertaining to the facility. Photographs, supplemental field and laboratory data, engineering analyses, and a drawing are included in the appendices.

## REVIEW OF PREVIOUS ANALYSES AND SITE DESCRIPTION

The Amos Power Plant is situated in Putnam County, West Virginia within the physiographic province of the Appalachian Plateau. A more detailed description of the site geology is included in Appendix II. The Amos Power Plant primary and ancillary facilities are located along the southern bank of the Kanawha River along S.R. 35 approximately two miles northwest of Interstate I-64 at Scary, WV. The Bottom Ash Complex consists of two dams #1A WVA ID #07918 and #1B WVA ID #07919. The dams share a common earthen embankment across Bill's Creek with a series of splitter dikes to create four distinct cells referred to as Bottom Ash Pond No. 1A, Bottom Ash Pond No. 1B, Reclaim Water Pond and the Treatment Basin.

The earliest record available of the Bottom Ash Complex is dated June 28, 1970. There was an open channel that acted as the emergency spillway of an earthen dike structure on the northwest corner of the Bottom Ash Pond No. 1B.

Modifications to the site include: the 1977 construction of a road embankment on the northwest corner of the Bottom Ash Pond No. 1B, a sedimentation pond, and a splitter dike constructed on the southeast corner of the Bottom Ash Pond No. 1A for the sedimentation of pyrites (referred to as the Pyrites Pond). The construction of the roadway embankment effectively eliminated the northwest corner of the Bottom Ash Pond No. 1B from collecting additional bottom ash and from ponding water. An open channel spillway, that was part of the original construction, was abandoned prior to 1977.

Subsequent modifications, mostly associated with the operations of the ponds, have taken place since 1977. Perhaps the most relevant has been the elimination, from active use, of the sedimentation pond located along the west side of the Bottom Ash Pond No. 1B, illustrated on the 1977 drawing. In addition, higher than anticipated operating water levels could occur sporadically in the ponds during certain plant maintenance operations. Ash handling operations can also result in the localized accumulation of bottom ash at or above the operational water levels. The current configuration of the Bottom Ash Complex is shown on the drawings in Appendix VI.

Current operations of the ponds consist of sluicing bottom ash into ponds #1A or #1B, allowing the particles to settle and the overflow to circulate to the reclaim pond from where the majority of the water is pumped back to the plant and the remaining water is allowed to overflow into the treatment pond before it is released into the Kanawha River at outfall No. 003. During the course of the year, the Bottom Ash Ponds are alternately taken out of service to allow for the removal of the bottom ash for beneficial re-use. Thus, it is commonly expected that, at the same time bottom ash slurry is sluiced into one pond, the other pond is being excavated.

The Bottom Ash Pond Complex is inspected by Plant personnel on a monthly basis and, under the direct supervision of a professional engineer, it is inspected annually. Reports of the engineer's inspection are forwarded to the West Virginia DEP Dam Safety office with the frequency established in the regulations for Class II facilities.

The main dike of the facility is about 1350 feet long. We were provided with a copy of a report titled "Report on Dam Safety Inspection Amos Fly Ash Dam and Amos Bottom Ash Dikes" dated March 1981, prepared by Woodward-Clyde Consultants. According to that report, the maximum height of the main dike above natural ground is about 24 feet.

GA performed design and analysis services for the facility in 2005 and 2008. We provided two reports, "Responses to February 15, 2005 DEP Review Letter," dated December 5, 2005 and "Responses to May 12, 2008 DEP Review Letter," dated May 22, 2008. Our work involved addressing West Virginia DEP concerns and also raising the main dikes from a minimum crest elevation of about 584 feet with a minimum crest width of about 15 feet, to a minimum elevation of 588 feet. The increased dike elevation was needed to operate the pool levels in Ash Ponds 1A and 1B and the Reclaim Pond as high as elevation 583 feet under certain operating conditions while providing adequate storm storage and routing and maintaining at least one foot of freeboard during the design storm. Our work at the time included hydrologic, hydraulic, and stability analyses. The facility previously had an open channel spillway with bottom elevation 581 feet through the main dike at the Reclaim Water Pond. In our design we proposed two 36-inch diameter polyethylene spillway pipes, both with inlet elevations of 583.5 feet.

In 2010, the main dikes were raised to the minimum proposed crest elevation of 588 feet. In addition to the main dike, the eastern side of the complex was raised to elevation 588 feet. In some areas the elevation 584 crest was wide enough such that it could be raised with 4 feet of soil fill and still maintain a minimum 10-foot-wide crest. In other areas that were too narrow to raise the crest with soil fill, a segmented retaining block system (Redi-rock) was used to achieve the elevation 588 feet crest. The drawings in Appendix VI show the areas where the block walls were constructed and a construction detail of the block wall system.

**Field Investigation and Laboratory Testing**

At the direction of AEPSC, eight borings were drilled through the main dike in August 2005 by H.C. Nutting Company of Charleston, West Virginia. The boring locations are shown on the drawings in Appendix VI. Boring logs are included in Appendix III. Standard Penetration Tests (SPT) were performed generally on 5-foot intervals. Relatively undisturbed samples were collected at selected locations using a thin walled sampler. Additionally, three standpipe piezometers were installed in the main dike during the drilling.

Borings B-1 through B-6 were drilled from the crest of the main dike. These borings generally encountered a stiff, lean clay, referred to as shale fill, from the ground surface to a depth of about 15 to 20 feet. Below the shale fill an interval of clayey gravel fill 8 to 10 feet thick was encountered. Below the clayey gravel, a 4 to 6-foot thick layer of soft clay and about a 20-foot thick layer of silty sand, both likely alluvial in origin, were encountered. Below the silty sand, residual weathered shale was encountered to the boring termination depths. Borings B-7 and B-8 were drilled on the downstream face of the main dike, near the water level of Bill's Creek. These two borings encountered strata consistent with borings B-1 through B-6.

Laboratory testing was performed by AEPSC on the SPT split-spoon samples and relatively undisturbed samples. Laboratory testing included moisture content, grain size analysis, classification, permeability, and strength testing. Laboratory test results are included in Appendix III. Laboratory test results are discussed in our comments regarding the stability of the dike.

## SITE VISIT BY A PROFESSIONAL ENGINEER

At the request of AEPSC, GA personnel performed a site visit of the Bottom Ash Complex to observe and document the prevalent site conditions. Specifically, Seth W. Frank, P.E. (GA), performed a site inspection of the Bottom Ash Complex on August, 18, 2015. GA believes that the conditions observed, during the August 18, 2015, site visit, are representative of the conditions modeled in the assessment and analyses provided in this report. Pictures taken during the site visit are included in Appendix I.

## HYDROLOGIC AND HYDRAULIC ANALYSES

GA's 2008 report included hydrologic and hydraulic analyses to meet WVDEP's design storm requirements for a Class II structure, which is one-half of the 6-hour Probable Maximum Precipitation (PMP) event (about 14 inches of rainfall in 6 hours). The spillway pipes, pool levels, and crest elevation were designed based on this event. GA used the U.S. Army Corps of Engineers HEC-1 computer program for the analyses. A summary of the results are shown in Table 1, and complete results are included in Appendix IV. As shown, the facility passes the design storm while maintaining adequate freeboard.

**Table 1. Summary of Hydrologic Analyses**

| Pond | Crest Elev., ft | Normal Pool Elev., ft | Peak Pool Elev. During Storm, ft | Minimum Freeboard During Storm, ft |
|---|---|---|---|---|
| 1A and Reclaim | 588 | 583.2 | 585.43 | 2.57 |
| 1B | 588 | 583.7 | 585.47 | 2.53 |

## STABILITY ANALYSES AND ACTION VALUES

We have performed stability analyses in general accordance to EPA's CCR requirements.

The requirements specify the following stability assessments:

1. Static factor of safety under the long-term, maximum storage pool condition,
2. Static factor of safety under the maximum surcharge pool condition,
3. Seismic factor of safety,
4. Liquefaction factor of safety,
5. End-of-construction factor of safety,

Limit equilibrium stability analyses were performed on sections B-B and C-C to assess the stability of the embankment. The stability analyses were performed with *SLOPE/W*, a component of the *GeoStudio* software package. *SLOPE/W* is formulated in terms of moment and force equilibrium factor of safety equations. Specifically, the Morgenstern-Price method was used to calculate the factor of safety of each section.

Strength parameters for the various materials used in the analyses are listed in Table 2. The properties of the various materials that comprise the embankment were determined from laboratory tests where appropriate samples could be obtained for testing. The parameters for other materials are based on typical material properties and our experience with similar materials. The Redi-rock reinforced embankment was conservatively assumed to have the strength parameters of the shale fill.

**Table 2. Summary of Strength Parameters**

| Material | EFFECTIVE STRENGTH PARAMETERS | |
|---|---|---|
| | c′ (psf) | φ′ (°) |
| Bottom Ash (2) | 0 | 28 |
| Shale Fill (1) | 370 | 27.2 |
| Clayey Gravel Fill (1) | 300 | 32 |
| Clay (natural) (1) | 150 | 35.2 |
| Silty Sand (natural) (1) | 0 | 36.8 |

(1) Estimated from laboratory tests (See Appendix III).
(2) Estimated based on material properties and experience with similar materials.

Stability analyses were performed with phreatic conditions at the maximum level measured in piezometers or during drilling. A summary of the safety factors is shown in Table 4. Stability analysis results are included in Appendix V.

**<u>Static Factor of Safety under the Long-Term Storage Pool Condition</u>**

The CCR regulations specify the factor of safety should meet or exceed 1.5 when the pool is at the maximum, long-term level (i.e., normal pool) and a steady state seepage condition has developed. GA selected two critical sections, designated as B-B and C-C, for the analyses. The sections and their locations are shown on the drawings in Appendix VI. GA determined the embankment material types and stratigraphy from the aforementioned drilling and laboratory testing performed by AEPSC.

**<u>Static Factor of Safety under the Maximum Surcharge Pool Condition</u>**

The CCR regulations specify the factor of safety should meet or exceed 1.4 when the pool is at the maximum surcharg pool condition. We performed the stability analyses with the pool at the peak level during the one-half PMP design storm event, discussed previously. As shown in Table 1, the peak level in either pond was elevation 585.5 feet. We used this level for the stability analyses of both B-B and C-C.

A summary of the safety factors, from the maximum surcharge stability analyses, is shown in Table 4. Stability analysis results are included in Appendix V.

**Seismic Factor of Safety**

The CCR regulations specify the factor of safety should meet or exceed 1.0 under seismic conditions. Furthermore, the recommended design earthquake event should have a 2% exceedance in 50 years (an approximate return period of 2,475 years). GA performed pseudo-static stability analyses on sections B-B and C-C with the elevation 583.5 normal pool level and steady state seepage conditions based on maximum, measured piezometric levels.

Based on the *2008 Interactive Deaggregations* website, provided online through the USGS Geologic Hazards Science Center, the Amos Bottom Ash Complex facility has a peak ground acceleration of 0.065g for a seismic loading event with a mean return time of 2,475 years. Conservatively assuming soft soil ground conditions above rock, translates to a peak horizontal ground surface acceleration of approximately 0.15g. Using a commonly applied factor of 0.5 times the peak horizontal acceleration yields the conservative horizontal seismic coefficient of 0.075 that was applied in the slope stability analyses.

A summary of the pseudo-static safety factors is shown in Table 4. Stability analysis results are included in Appendix V.

**Liquefaction Assessment**

The CCR regulations specify the liquefaction factor of safety should meet or exceed 1.2. This requirement applies to facilities with embankment materials that have been determined to contain soils susceptible to liquefaction.

We used the Standard Penetration Testing (SPT) results from the exploratory drilling program and laboratory testing results to determine the embankment soils' susceptibility to liquefaction. We used methods from Mine Safety and Health Administration's *Engineering and Design Manual for Coal Refuse Disposal Facilities* (2010) to make the determination. First, the SPT blow counts were corrected to $N_{1,60}$ values for each soil layer and a median value was calculated. Calculation spreadsheets are included in Appendix V, and the median values for embankment materials are in shown in Table 3.

**Table 3. Corrected SPT Data and Soil Type**

| Soil | Median Corrected SPT Blow Count | Sand-like or Clay-like |
|---|---|---|
| Shale Fill | 19.6 | clay-like |
| Clayey Gravel | 15.2 | clay-like |

MSHA manual guidelines state a clay-like soil can be susceptible to liquefaction if the corrected SPT value is less than 6. As shown in Table 3, using these guidelines, the shale fill and clayey gravel should not be susceptible to liquefaction. Because the embankment materials are not susceptible to liquefaction, no additional analyses were performed for this assessment. Note that this assessment does not extend to foundation materials, below the embankment.

**End-of-construction Factor of Safety**

The CCR regulations specify the factor of safety should meet or exceed 1.3 for the end-of-construction loading condition. End of construction factors of safety are typically calculated for new construction. Given that the facility has been in service for more than 40 years and is considered to be in its long-term condition, no additional analyses were performed.

**Summary of Results**

A summary of results from the slope stability analyses is provided in Table 4. *SLOPE/W* computer output, showing the modeled profiles, loading conditions, and critical failure surfaces are provided in Appendix V. As shown in the slope stability analysis results in Table 4, the factors of safety satisfy the requirements set forth in the CCR Rules.

**Table 4. Summary of Slope Stability Analyses Results**

| Analysis Condition | Section B-B | Section C-C |
|---|---|---|
| Maximum Long Term Pool | 2.1 | 2.2 |
| Maximum Surcharge Pool | 2.0 | 2.2 |
| Pseudo Static (Downstream) | 1.6 | 1.8 |
| Pseudo Static (Upstream) | 3.1 | 3.2 |

## CERTIFICATION STATEMENT

Based on the site visit, the results of the field and laboratory testing of the materials used in the embankment construction, and our review of the as-built embankment geometry; it is our opinion that the Amos Plant Bottom Ash Complex has slope stability factors of safety that meet or exceed the requirements in the CCR Rules. Furthermore, based on our review of the as-built embankment geometry, current operating pool levels, and the spillway system; we believe that the facility is capable of storing/routing the runoff from one-half of the 6-hour PMP design storm event.

Accordingly, I hereby certify that the John Amos Plant – Bottom Ash Complex meets the applicable requirements in the CCR Rules. It should be clearly noted that this certification is not a legal guarantee. This certification is merely a statement by a registered professional engineer that, to the best of his knowledge, the facility meets the applicable requirements set forth in the CCR Rules. No warranties, expressed or implied, are provided.

Seth W. Frank

12-21-2015

Seth W. Frank, P.E.
West Virginia R.P.E. No. 20574

Date

SETH W. FRANK
REGISTERED
20574
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER



GA

# APPENDIX IV
# HYDROLOGIC AND HYDRAULIC ANALYSES

**COMPUTATION OF INFLOW HYDROGRAPH (1/2 6-Hour PMP)
AND FLOOD ROUTING THROUGH THE
PROPOSED PIPE SPILLWAY**

**Pond 1A**

| | | |
|---|---|---|
| Crest Elevation | = | 588 ft |
| Pipe Spillway Invert Elevation | = | 583.2 ft |
| Normal Pool Elevation used for Routing | = | 583.2 ft |
| Peak Inflow During Design Storm | = | 242.86 cfs |
| Peak Outflow During Design Storm | = | 18.91 cfs |
| Maximum Pool Elevation During Design Storm | = | 585.43 ft |
| Minimum Freeboard During Design Storm | = | 2.57 ft |
| Peak Storage Volume | = | 24.43 ac-ft |
| Days to Decant 90% of Peak Storage Volume | = | 1.44 days |

# POND 1A SPILLWAY PIPE

## Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|---|---|---|---|---|---|---|
| 31.51 | 50.00 | 26.00 | 0.0100 | 583.20 | 0.90 | 0.00 |

## Detailed Discharge Table

| Elevation (ft) | Straight Pipe (cfs) | Combined Total Discharge (cfs) |
|---|---|---|
| 581.00 | 0.000 | 0.000 |
| 581.50 | 0.000 | 0.000 |
| 582.00 | 0.000 | 0.000 |
| 582.50 | 0.000 | 0.000 |
| 583.00 | 0.000 | 0.000 |
| 583.20 | 0.000 | 0.000 |
| 583.50 | (3)>0.929 | 0.929 |
| 584.00 | (3)>3.997 | 3.997 |
| 584.50 | (3)>8.280 | 8.280 |
| 585.00 | (3)>13.485 | 13.485 |
| 585.50 | (3)>19.484 | 19.484 |
| 586.00 | (3)>26.165 | 26.165 |
| 586.50 | (5)>32.642 | 32.642 |
| 587.00 | (5)>38.091 | 38.091 |

```
1***************************************                                                ***************************************
 *                                     *                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                              *   U.S. ARMY CORPS OF ENGINEERS       *
 *           SEPTEMBER 1990            *                                                *   HYDROLOGIC ENGINEERING CENTER      *
 *             VERSION 4.0             *                                                *         609 SECOND STREET           *
 *                                     *                                                *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/10/2015  TIME  11:22:48 *                                              *          (916) 756-1104             *
 *                                     *                                                *                                     *
 ***************************************                                                ***************************************


                                                  X     X  XXXXXXX   XXXXX          X
                                                  X     X  X        X     X        XX
                                                  X     X  X        X               X
                                                  XXXXXXX  XXXX     X       XXXXX   X
                                                  X     X  X        X               X
                                                  X     X  X        X     X         X
                                                  X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

*** FREE ***
              ID  *****************************************************************************
              ID  *                                                                           *
              ID  *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPA1.inp             *
              ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                       *
              ID  *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.2'                         *
              ID  *      GA Project No. 05-361                                                *
              ID  *                                                                           *
              ID  *      Analyses by: Geo/Environmental Associates                            *
              ID  *                   Knoxville, TN                                           *
              ID  *                   December 12, 2015                                       *
              ID  *                                                                           *
              ID  *****************************************************************************
              IT      15       0       0     300
              IO       3
              JR    FLOW     0.5
              VS   BASIN     IMP     IMP     IMP
              VV    2.11    2.11    6.11    7.11
              IN      15

              KK   BASIN
              KM   PRECIPITATION
              PB       0
              PI   0.287   0.373   0.445   0.502   0.545   0.573   0.653   0.834   0.825   0.980
              PI   2.322   4.564   4.922   3.344   1.264   0.834   0.864   0.763   0.581   0.560
              PI   0.525   0.475   0.411   0.332
              BA   0.040
              LU       0    0.05      60
              UD     0.0

              KK     IMP
              KM   ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT
              RS       1    ELEV   583.2
              SA    6.01    6.25   17.65   19.97   22.28
              SQ       0    4.00   13.48   26.16   38.09
              SE   583.2     584     585     586     587
              ZZ
```

```
1***************************************                                                       ***************************************
 *                                     *                                                       *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                     *    U.S. ARMY CORPS OF ENGINEERS     *
 *           SEPTEMBER 1990            *                                                       *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.0              *                                                       *         609 SECOND STREET           *
 *                                     *                                                       *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/10/2015  TIME  11:22:48 *                                                     *         (916) 756-1104              *
 *                                     *                                                       *                                     *
 ***************************************                                                       ***************************************



                           ***************************************************************************
                           *                                                                         *
                           *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPA1.inp           *
                           *      Flood Routing for Ash Pond 1A and Reclaim Pond                     *
                           *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.2'                       *
                           *      GA Project No. 05-361                                              *
                           *                                                                         *
                           *      Analyses by: Geo/Environmental Associates                          *
                           *                   Knoxville, TN                                         *
                           *                   December 12, 2015                                     *
                           *                                                                         *
                           ***************************************************************************

  14 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4    0  ENDING DATE
                      NDTIME       0245  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .25 HOURS
                      TOTAL TIME BASE   74.75 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

                USER-DEFINED OUTPUT SPECIFICATIONS

        TABLE 1
     VS       STATION     BASIN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF RUNOFF
                     .50


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  19 KK    *     BASIN  *
           *            *
           **************
                           PRECIPITATION

  18 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
```

```
                   JXTIME           0  STARTING TIME

             SUBBASIN RUNOFF DATA

  25 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

               PRECIPITATION DATA

  21 PB                STORM       27.78  BASIN TOTAL PRECIPITATION

  22 PI            INCREMENTAL PRECIPITATION PATTERN
                         .29       .37       .45       .50       .54       .57       .65       .83       .82       .98
                        2.32      4.56      4.92      3.34      1.26       .83       .86       .76       .58       .56
                         .52       .48       .41       .33

  26 LU          UNIFORM LOSS RATE
                       STRTL         .00  INITIAL LOSS
                       CNSTL         .05  UNIFORM LOSS RATE
                       RTIMP       60.00  PERCENT IMPERVIOUS AREA

  27 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .00  LAG

                                                                       ***

                                                                UNIT HYDROGRAPH
                                                            5 END-OF-PERIOD ORDINATES
              77.       21.        4.        1.        0.

      ***            ***              ***              ***              ***

                         HYDROGRAPH AT STATION    BASIN
                           FOR PLAN 1, RATIO =  .50

    TOTAL RAINFALL =   27.78, TOTAL LOSS =     .12, TOTAL EXCESS =   27.66

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                              (CFS)
+     486.      3.25                118.         30.         10.          10.
                           (INCHES)   27.490      27.658      27.658       27.658
                            (AC-FT)       59.         59.         59.          59.

                            CUMULATIVE AREA =     .04 SQ MI


      ***            ***              ***              ***              ***

                         HYDROGRAPH AT STATION    BASIN
                           FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                              (CFS)
+     243.      3.25                 59.         15.          5.           5.
                           (INCHES)   13.745      13.829      13.829       13.829
                            (AC-FT)       29.         30.         30.          30.

                            CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  28 KK    *       IMP  *
           *            *
           **************
                          ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT

             HYDROGRAPH ROUTING DATA

  30 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
```

```
                    RSVRIC      583.20  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

   31 SA              AREA         6.0       6.3      17.6      20.0      22.3

   32 SQ         DISCHARGE          0.        4.       13.       26.       38.

   33 SE         ELEVATION      583.20    584.00    585.00    586.00    587.00

                                                                     ***

                                                      COMPUTED STORAGE-ELEVATION DATA

           STORAGE        .00      4.90     16.37     35.17     56.28
         ELEVATION     583.20    584.00    585.00    586.00    587.00

      ***            ***             ***              ***              ***

                       HYDROGRAPH AT STATION      IMP
                         FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                       6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                             (CFS)
+      19.      6.00                    18.         12.          5.           5.
                          (INCHES)     4.099      10.751      13.695       13.716
                           (AC-FT)        9.         23.         29.          29.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                       6-HR       24-HR       72-HR     74.75-HR
+  (AC-FT)      (HR)
       24.      6.00                    23.         14.          6.           6.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                       6-HR       24-HR       72-HR     74.75-HR
+   (FEET)      (HR)
    585.43      6.00                  585.33      584.77      583.93      583.91

                          CUMULATIVE AREA =     .04 SQ MI
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

```
                                                              RATIOS APPLIED TO FLOWS
 OPERATION       STATION     AREA    PLAN           RATIO 1
                                                        .50

 HYDROGRAPH AT
+                  BASIN       .04     1   FLOW         243.
                                           TIME         3.25

 ROUTED TO
+                    IMP       .04     1   FLOW          19.
                                           TIME         6.00

                                      ** PEAK STAGES IN FEET **
                                       1   STAGE      585.43
                                           TIME         6.00
```

1TABLE 1

| | | | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE | |
|---|---|---|---|---|---|---|---|---|
| | | | PLAN | 1 | 1 | 1 | 1 | |
| | | | RATIO | .50 | .50 | .50 | .50 | |
| PER | DAY | MON | HRMN | | | | | |
| 1 | 1 | | 0000 | .00 | .00 | .00 | 583.20 | |
| 2 | 1 | | 0015 | 10.82 | .09 | .11 | 583.22 | |
| 3 | 1 | | 0030 | 17.14 | .32 | .40 | 583.26 | |
| 4 | 1 | | 0045 | 21.42 | .64 | .78 | 583.33 | |
| 5 | 1 | | 0100 | 24.68 | 1.01 | 1.24 | 583.40 | |
| 6 | 1 | | 0115 | 27.13 | 1.43 | 1.75 | 583.49 | |
| 7 | 1 | | 0130 | 28.82 | 1.87 | 2.30 | 583.57 | |
| 8 | 1 | | 0145 | 32.30 | 2.35 | 2.88 | 583.67 | |
| 9 | 1 | | 0200 | 40.18 | 2.92 | 3.58 | 583.78 | |
| 10 | 1 | | 0215 | 41.96 | 3.56 | 4.36 | 583.91 | |
| 11 | 1 | | 0230 | 48.23 | 4.25 | 5.21 | 584.03 | |
| 12 | 1 | | 0245 | 101.42 | 5.45 | 6.66 | 584.15 | |
| 13 | 1 | | 0300 | 202.15 | 7.93 | 9.66 | 584.41 | |
| 14 | 1 | | 0315 | 242.86 | 11.56 | 14.05 | 584.80 | |
| 15 | 1 | | 0330 | 191.47 | 14.76 | 18.27 | 585.10 | |
| 16 | 1 | | 0345 | 96.45 | 16.55 | 20.92 | 585.24 | |
| 17 | 1 | | 0400 | 54.44 | 17.36 | 22.13 | 585.31 | |
| 18 | 1 | | 0415 | 45.92 | 17.82 | 22.80 | 585.34 | |
| 19 | 1 | | 0430 | 40.58 | 18.17 | 23.32 | 585.37 | |
| 20 | 1 | | 0445 | 32.40 | 18.42 | 23.70 | 585.39 | |
| 21 | 1 | | 0500 | 29.43 | 18.59 | 23.95 | 585.40 | |
| 22 | 1 | | 0515 | 27.44 | 18.73 | 24.15 | 585.41 | |
| 23 | 1 | | 0530 | 25.03 | 18.83 | 24.31 | 585.42 | |
| 24 | 1 | | 0545 | 21.95 | 18.90 | 24.40 | 585.43 | |
| 25 | 1 | | 0600 | 18.11 | 18.91 | **24.43** | **585.43** | ← **Maximum Stage/Storage 6.0 Hours after onset of event** |
| 26 | 1 | | 0615 | 4.57 | 18.81 | 24.27 | 585.42 | |
| 27 | 1 | | 0630 | .86 | 18.59 | 23.94 | 585.40 | |
| 28 | 1 | | 0645 | .14 | 18.34 | 23.57 | 585.38 | |
| 29 | 1 | | 0700 | .00 | 18.08 | 23.20 | 585.36 | |
| 30 | 1 | | 0715 | .00 | 17.83 | 22.82 | 585.34 | |
| 31 | 1 | | 0730 | .00 | 17.59 | 22.46 | 585.32 | |
| 32 | 1 | | 0745 | .00 | 17.34 | 22.10 | 585.30 | |
| 33 | 1 | | 0800 | .00 | 17.10 | 21.74 | 585.29 | |
| 34 | 1 | | 0815 | .00 | 16.87 | 21.39 | 585.27 | |
| 35 | 1 | | 0830 | .00 | 16.63 | 21.05 | 585.25 | |
| 36 | 1 | | 0845 | .00 | 16.40 | 20.70 | 585.23 | |
| 37 | 1 | | 0900 | .00 | 16.18 | 20.37 | 585.21 | |
| 38 | 1 | | 0915 | .00 | 15.95 | 20.04 | 585.19 | |
| 39 | 1 | | 0930 | .00 | 15.73 | 19.71 | 585.18 | |
| 40 | 1 | | 0945 | .00 | 15.51 | 19.39 | 585.16 | |
| 41 | 1 | | 1000 | .00 | 15.30 | 19.07 | 585.14 | |
| 42 | 1 | | 1015 | .00 | 15.09 | 18.75 | 585.13 | |
| 43 | 1 | | 1030 | .00 | 14.88 | 18.44 | 585.11 | |
| 44 | 1 | | 1045 | .00 | 14.67 | 18.14 | 585.09 | |
| 45 | 1 | | 1100 | .00 | 14.47 | 17.84 | 585.08 | |
| 46 | 1 | | 1115 | .00 | 14.27 | 17.54 | 585.06 | |
| 47 | 1 | | 1130 | .00 | 14.07 | 17.25 | 585.05 | |
| 48 | 1 | | 1145 | .00 | 13.88 | 16.96 | 585.03 | |
| 49 | 1 | | 1200 | .00 | 13.68 | 16.67 | 585.02 | |
| 50 | 1 | | 1215 | .00 | 13.50 | 16.39 | 585.00 | |

| 1TABLE 1 (CONT.) | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|
| | PLAN | 1 | 1 | 1 | 1 |
| | RATIO | .50 | .50 | .50 | .50 |

| PER | DAY MON | HRMN | | | | |
|---|---|---|---|---|---|---|
| 51 | 1 | 1230 | .00 | 13.27 | 16.12 | 584.98 |
| 52 | 1 | 1245 | .00 | 13.05 | 15.85 | 584.95 |
| 53 | 1 | 1300 | .00 | 12.82 | 15.58 | 584.93 |
| 54 | 1 | 1315 | .00 | 12.61 | 15.32 | 584.91 |
| 55 | 1 | 1330 | .00 | 12.39 | 15.06 | 584.89 |
| 56 | 1 | 1345 | .00 | 12.18 | 14.80 | 584.86 |
| 57 | 1 | 1400 | .00 | 11.98 | 14.55 | 584.84 |
| 58 | 1 | 1415 | .00 | 11.77 | 14.31 | 584.82 |
| 59 | 1 | 1430 | .00 | 11.58 | 14.07 | 584.80 |
| 60 | 1 | 1445 | .00 | 11.38 | 13.83 | 584.78 |
| 61 | 1 | 1500 | .00 | 11.19 | 13.60 | 584.76 |
| 62 | 1 | 1515 | .00 | 11.00 | 13.37 | 584.74 |
| 63 | 1 | 1530 | .00 | 10.81 | 13.14 | 584.72 |
| 64 | 1 | 1545 | .00 | 10.63 | 12.92 | 584.70 |
| 65 | 1 | 1600 | .00 | 10.45 | 12.70 | 584.68 |
| 66 | 1 | 1615 | .00 | 10.27 | 12.49 | 584.66 |
| 67 | 1 | 1630 | .00 | 10.10 | 12.28 | 584.64 |
| 68 | 1 | 1645 | .00 | 9.93 | 12.07 | 584.63 |
| 69 | 1 | 1700 | .00 | 9.76 | 11.87 | 584.61 |
| 70 | 1 | 1715 | .00 | 9.59 | 11.67 | 584.59 |
| 71 | 1 | 1730 | .00 | 9.43 | 11.47 | 584.57 |
| 72 | 1 | 1745 | .00 | 9.27 | 11.28 | 584.56 |
| 73 | 1 | 1800 | .00 | 9.11 | 11.09 | 584.54 |
| 74 | 1 | 1815 | .00 | 8.96 | 10.90 | 584.52 |
| 75 | 1 | 1830 | .00 | 8.81 | 10.72 | 584.51 |
| 76 | 1 | 1845 | .00 | 8.66 | 10.54 | 584.49 |
| 77 | 1 | 1900 | .00 | 8.51 | 10.36 | 584.48 |
| 78 | 1 | 1915 | .00 | 8.37 | 10.19 | 584.46 |
| 79 | 1 | 1930 | .00 | 8.23 | 10.02 | 584.45 |
| 80 | 1 | 1945 | .00 | 8.09 | 9.85 | 584.43 |
| 81 | 1 | 2000 | .00 | 7.95 | 9.68 | 584.42 |
| 82 | 1 | 2015 | .00 | 7.81 | 9.52 | 584.40 |
| 83 | 1 | 2030 | .00 | 7.68 | 9.36 | 584.39 |
| 84 | 1 | 2045 | .00 | 7.55 | 9.20 | 584.37 |
| 85 | 1 | 2100 | .00 | 7.42 | 9.05 | 584.36 |
| 86 | 1 | 2115 | .00 | 7.30 | 8.89 | 584.35 |
| 87 | 1 | 2130 | .00 | 7.17 | 8.74 | 584.33 |
| 88 | 1 | 2145 | .00 | 7.05 | 8.60 | 584.32 |
| 89 | 1 | 2200 | .00 | 6.93 | 8.45 | 584.31 |
| 90 | 1 | 2215 | .00 | 6.82 | 8.31 | 584.30 |
| 91 | 1 | 2230 | .00 | 6.70 | 8.17 | 584.28 |
| 92 | 1 | 2245 | .00 | 6.59 | 8.03 | 584.27 |
| 93 | 1 | 2300 | .00 | 6.48 | 7.90 | 584.26 |
| 94 | 1 | 2315 | .00 | 6.37 | 7.77 | 584.25 |
| 95 | 1 | 2330 | .00 | 6.26 | 7.64 | 584.24 |
| 96 | 1 | 2345 | .00 | 6.15 | 7.51 | 584.23 |
| 97 | 2 | 0000 | .00 | 6.05 | 7.38 | 584.22 |
| 98 | 2 | 0015 | .00 | 5.95 | 7.26 | 584.21 |
| 99 | 2 | 0030 | .00 | 5.85 | 7.14 | 584.19 |
| 100 | 2 | 0045 | .00 | 5.75 | 7.02 | 584.18 |

| 1TABLE 1 (CONT.) | | | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|---|
| | | | PLAN | 1 | 1 | 1 | 1 |
| | | | RATIO | .50 | .50 | .50 | .50 |
| PER | DAY | MON | HRMN | | | | |
| 101 | 2 | | 0100 | .00 | 5.65 | 6.90 | 584.17 |
| 102 | 2 | | 0115 | .00 | 5.55 | 6.78 | 584.16 |
| 103 | 2 | | 0130 | .00 | 5.46 | 6.67 | 584.15 |
| 104 | 2 | | 0145 | .00 | 5.37 | 6.56 | 584.14 |
| 105 | 2 | | 0200 | .00 | 5.28 | 6.45 | 584.13 |
| 106 | 2 | | 0215 | .00 | 5.19 | 6.34 | 584.13 |
| 107 | 2 | | 0230 | .00 | 5.10 | 6.23 | 584.12 |
| 108 | 2 | | 0245 | .00 | 5.01 | 6.13 | 584.11 |
| 109 | 2 | | 0300 | .00 | 4.93 | 6.03 | 584.10 |
| 110 | 2 | | 0315 | .00 | 4.84 | 5.92 | 584.09 |
| 111 | 2 | | 0330 | .00 | 4.76 | 5.83 | 584.08 |
| 112 | 2 | | 0345 | .00 | 4.68 | 5.73 | 584.07 |
| 113 | 2 | | 0400 | .00 | 4.60 | 5.63 | 584.06 |
| 114 | 2 | | 0415 | .00 | 4.52 | 5.54 | 584.06 |
| 115 | 2 | | 0430 | .00 | 4.45 | 5.44 | 584.05 |
| 116 | 2 | | 0445 | .00 | 4.37 | 5.35 | 584.04 |
| 117 | 2 | | 0500 | .00 | 4.30 | 5.26 | 584.03 |
| 118 | 2 | | 0515 | .00 | 4.23 | 5.18 | 584.02 |
| 119 | 2 | | 0530 | .00 | 4.15 | 5.09 | 584.02 |
| 120 | 2 | | 0545 | .00 | 4.08 | 5.00 | 584.01 |
| 121 | 2 | | 0600 | .00 | 4.01 | 4.92 | 584.00 |
| 122 | 2 | | 0615 | .00 | 3.95 | 4.84 | 583.99 |
| 123 | 2 | | 0630 | .00 | 3.88 | 4.76 | 583.98 |
| 124 | 2 | | 0645 | .00 | 3.82 | 4.68 | 583.96 |
| 125 | 2 | | 0700 | .00 | 3.75 | 4.60 | 583.95 |
| 126 | 2 | | 0715 | .00 | 3.69 | 4.52 | 583.94 |
| 127 | 2 | | 0730 | .00 | 3.63 | 4.45 | 583.93 |
| 128 | 2 | | 0745 | .00 | 3.57 | 4.37 | 583.91 |
| 129 | 2 | | 0800 | .00 | 3.51 | 4.30 | 583.90 |
| 130 | 2 | | 0815 | .00 | 3.45 | 4.23 | 583.89 |
| 131 | 2 | | 0830 | .00 | 3.39 | 4.16 | 583.88 |
| 132 | 2 | | 0845 | .00 | 3.33 | 4.09 | 583.87 |
| 133 | 2 | | 0900 | .00 | 3.28 | 4.02 | 583.86 |
| 134 | 2 | | 0915 | .00 | 3.22 | 3.95 | 583.84 |
| 135 | 2 | | 0930 | .00 | 3.17 | 3.89 | 583.83 |
| 136 | 2 | | 0945 | .00 | 3.12 | 3.82 | 583.82 |
| 137 | 2 | | 1000 | .00 | 3.07 | 3.76 | 583.81 |
| 138 | 2 | | 1015 | .00 | 3.01 | 3.69 | 583.80 |
| 139 | 2 | | 1030 | .00 | 2.96 | 3.63 | 583.79 |
| 140 | 2 | | 1045 | .00 | 2.91 | 3.57 | 583.78 |
| 141 | 2 | | 1100 | .00 | 2.87 | 3.51 | 583.77 |
| 142 | 2 | | 1115 | .00 | 2.82 | 3.45 | 583.76 |
| 143 | 2 | | 1130 | .00 | 2.77 | 3.40 | 583.75 |
| 144 | 2 | | 1145 | .00 | 2.72 | 3.34 | 583.74 |
| 145 | 2 | | 1200 | .00 | 2.68 | 3.28 | 583.74 |
| 146 | 2 | | 1215 | .00 | 2.63 | 3.23 | 583.73 |
| 147 | 2 | | 1230 | .00 | 2.59 | 3.17 | 583.72 |
| 148 | 2 | | 1245 | .00 | 2.55 | 3.12 | 583.71 |
| 149 | 2 | | 1300 | .00 | 2.50 | 3.07 | 583.70 |
| 150 | 2 | | 1315 | .00 | 2.46 | 3.02 | 583.69 |

| 1TABLE 1 (CONT.) | | | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|---|
| | | | PLAN | 1 | 1 | 1 | 1 |
| | | | RATIO | .50 | .50 | .50 | .50 |
| PER | DAY | MON | HRMN | | | | |
| 151 | 2 | | 1330 | .00 | 2.42 | 2.97 | 583.68 |
| 152 | 2 | | 1345 | .00 | 2.38 | 2.92 | 583.68 |
| 153 | 2 | | 1400 | .00 | 2.34 | 2.87 | 583.67 |
| 154 | 2 | | 1415 | .00 | 2.30 | 2.82 | 583.66 |
| 155 | 2 | | 1430 | .00 | 2.26 | 2.77 | 583.65 |
| 156 | 2 | | 1445 | .00 | 2.23 | 2.73 | 583.65 |
| 157 | 2 | | 1500 | .00 | 2.19 | 2.68 | 583.64 |
| 158 | 2 | | 1515 | .00 | 2.15 | 2.64 | 583.63 |
| 159 | 2 | | 1530 | .00 | 2.12 | 2.59 | 583.62 |
| 160 | 2 | | 1545 | .00 | 2.08 | 2.55 | 583.62 |
| 161 | 2 | | 1600 | .00 | 2.05 | 2.51 | 583.61 |
| 162 | 2 | | 1615 | .00 | 2.01 | 2.47 | 583.60 |
| 163 | **2** | | **1630** | **.00** | **1.98** | **2.42** | **583.60** ← **Time to decant 90% maximum storage = 34.5 hours (1.44 days)** |
| 164 | 2 | | 1645 | .00 | 1.94 | 2.38 | 583.59 |
| 165 | 2 | | 1700 | .00 | 1.91 | 2.34 | 583.58 |
| 166 | 2 | | 1715 | .00 | 1.88 | 2.30 | 583.58 |
| 167 | 2 | | 1730 | .00 | 1.85 | 2.27 | 583.57 |
| 168 | 2 | | 1745 | .00 | 1.82 | 2.23 | 583.56 |
| 169 | 2 | | 1800 | .00 | 1.79 | 2.19 | 583.56 |
| 170 | 2 | | 1815 | .00 | 1.76 | 2.15 | 583.55 |
| 171 | 2 | | 1830 | .00 | 1.73 | 2.12 | 583.55 |
| 172 | 2 | | 1845 | .00 | 1.70 | 2.08 | 583.54 |
| 173 | 2 | | 1900 | .00 | 1.67 | 2.05 | 583.53 |
| 174 | 2 | | 1915 | .00 | 1.64 | 2.01 | 583.53 |
| 175 | 2 | | 1930 | .00 | 1.62 | 1.98 | 583.52 |
| 176 | 2 | | 1945 | .00 | 1.59 | 1.95 | 583.52 |
| 177 | 2 | | 2000 | .00 | 1.56 | 1.91 | 583.51 |
| 178 | 2 | | 2015 | .00 | 1.54 | 1.88 | 583.51 |
| 179 | 2 | | 2030 | .00 | 1.51 | 1.85 | 583.50 |
| 180 | 2 | | 2045 | .00 | 1.49 | 1.82 | 583.50 |
| 181 | 2 | | 2100 | .00 | 1.46 | 1.79 | 583.49 |
| 182 | 2 | | 2115 | .00 | 1.44 | 1.76 | 583.49 |
| 183 | 2 | | 2130 | .00 | 1.41 | 1.73 | 583.48 |
| 184 | 2 | | 2145 | .00 | 1.39 | 1.70 | 583.48 |
| 185 | 2 | | 2200 | .00 | 1.36 | 1.67 | 583.47 |
| 186 | 2 | | 2215 | .00 | 1.34 | 1.65 | 583.47 |
| 187 | 2 | | 2230 | .00 | 1.32 | 1.62 | 583.46 |
| 188 | 2 | | 2245 | .00 | 1.30 | 1.59 | 583.46 |
| 189 | 2 | | 2300 | .00 | 1.28 | 1.56 | 583.46 |
| 190 | 2 | | 2315 | .00 | 1.25 | 1.54 | 583.45 |
| 191 | 2 | | 2330 | .00 | 1.23 | 1.51 | 583.45 |
| 192 | 2 | | 2345 | .00 | 1.21 | 1.49 | 583.44 |
| 193 | 3 | | 0000 | .00 | 1.19 | 1.46 | 583.44 |
| 194 | 3 | | 0015 | .00 | 1.17 | 1.44 | 583.43 |
| 195 | 3 | | 0030 | .00 | 1.15 | 1.41 | 583.43 |
| 196 | 3 | | 0045 | .00 | 1.13 | 1.39 | 583.43 |
| 197 | 3 | | 0100 | .00 | 1.12 | 1.37 | 583.42 |
| 198 | 3 | | 0115 | .00 | 1.10 | 1.34 | 583.42 |
| 199 | 3 | | 0130 | .00 | 1.08 | 1.32 | 583.42 |
| 200 | 3 | | 0145 | .00 | 1.06 | 1.30 | 583.41 |

| 1TABLE 1 (CONT.) | | | STATION PLAN RATIO | BASIN FLOW 1 .50 | IMP FLOW 1 .50 | IMP STORAGE 1 .50 | IMP STAGE 1 .50 |
|---|---|---|---|---|---|---|---|
| PER | DAY | MON | HRMN | | | | |
| 201 | 3 | | 0200 | .00 | 1.04 | 1.28 | 583.41 |
| 202 | 3 | | 0215 | .00 | 1.02 | 1.26 | 583.40 |
| 203 | 3 | | 0230 | .00 | 1.01 | 1.24 | 583.40 |
| 204 | 3 | | 0245 | .00 | .99 | 1.21 | 583.40 |
| 205 | 3 | | 0300 | .00 | .97 | 1.19 | 583.39 |
| 206 | 3 | | 0315 | .00 | .96 | 1.17 | 583.39 |
| 207 | 3 | | 0330 | .00 | .94 | 1.15 | 583.39 |
| 208 | 3 | | 0345 | .00 | .93 | 1.14 | 583.39 |
| 209 | 3 | | 0400 | .00 | .91 | 1.12 | 583.38 |
| 210 | 3 | | 0415 | .00 | .90 | 1.10 | 583.38 |
| 211 | 3 | | 0430 | .00 | .88 | 1.08 | 583.38 |
| 212 | 3 | | 0445 | .00 | .87 | 1.06 | 583.37 |
| 213 | 3 | | 0500 | .00 | .85 | 1.04 | 583.37 |
| 214 | 3 | | 0515 | .00 | .84 | 1.03 | 583.37 |
| 215 | 3 | | 0530 | .00 | .82 | 1.01 | 583.36 |
| 216 | 3 | | 0545 | .00 | .81 | .99 | 583.36 |
| 217 | 3 | | 0600 | .00 | .80 | .98 | 583.36 |
| 218 | 3 | | 0615 | .00 | .78 | .96 | 583.36 |
| 219 | 3 | | 0630 | .00 | .77 | .94 | 583.35 |
| 220 | 3 | | 0645 | .00 | .76 | .93 | 583.35 |
| 221 | 3 | | 0700 | .00 | .74 | .91 | 583.35 |
| 222 | 3 | | 0715 | .00 | .73 | .90 | 583.35 |
| 223 | 3 | | 0730 | .00 | .72 | .88 | 583.34 |
| 224 | 3 | | 0745 | .00 | .71 | .87 | 583.34 |
| 225 | 3 | | 0800 | .00 | .70 | .85 | 583.34 |
| 226 | 3 | | 0815 | .00 | .68 | .84 | 583.34 |
| 227 | 3 | | 0830 | .00 | .67 | .82 | 583.33 |
| 228 | 3 | | 0845 | .00 | .66 | .81 | 583.33 |
| 229 | 3 | | 0900 | .00 | .65 | .80 | 583.33 |
| 230 | 3 | | 0915 | .00 | .64 | .78 | 583.33 |
| 231 | 3 | | 0930 | .00 | .63 | .77 | 583.33 |
| 232 | 3 | | 0945 | .00 | .62 | .76 | 583.32 |
| 233 | 3 | | 1000 | .00 | .61 | .75 | 583.32 |
| 234 | 3 | | 1015 | .00 | .60 | .73 | 583.32 |
| 235 | 3 | | 1030 | .00 | .59 | .72 | 583.32 |
| 236 | 3 | | 1045 | .00 | .58 | .71 | 583.32 |
| 237 | 3 | | 1100 | .00 | .57 | .70 | 583.31 |
| 238 | 3 | | 1115 | .00 | .56 | .68 | 583.31 |
| 239 | 3 | | 1130 | .00 | .55 | .67 | 583.31 |
| 240 | 3 | | 1145 | .00 | .54 | .66 | 583.31 |
| 241 | 3 | | 1200 | .00 | .53 | .65 | 583.31 |
| 242 | 3 | | 1215 | .00 | .52 | .64 | 583.30 |
| 243 | 3 | | 1230 | .00 | .51 | .63 | 583.30 |
| 244 | 3 | | 1245 | .00 | .50 | .62 | 583.30 |
| 245 | 3 | | 1300 | .00 | .50 | .61 | 583.30 |
| 246 | 3 | | 1315 | .00 | .49 | .60 | 583.30 |
| 247 | 3 | | 1330 | .00 | .48 | .59 | 583.30 |
| 248 | 3 | | 1345 | .00 | .47 | .58 | 583.29 |
| 249 | 3 | | 1400 | .00 | .46 | .57 | 583.29 |
| 250 | 3 | | 1415 | .00 | .46 | .56 | 583.29 |

| 1TABLE 1 (CONT.) | STATION | | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|
| | PLAN | | 1 | 1 | 1 | 1 |
| | RATIO | | .50 | .50 | .50 | .50 |
| PER | DAY MON | HRMN | | | | |
| 251 | 3 | 1430 | .00 | .45 | .55 | 583.29 |
| 252 | 3 | 1445 | .00 | .44 | .54 | 583.29 |
| 253 | 3 | 1500 | .00 | .43 | .53 | 583.29 |
| 254 | 3 | 1515 | .00 | .43 | .52 | 583.29 |
| 255 | 3 | 1530 | .00 | .42 | .51 | 583.28 |
| 256 | 3 | 1545 | .00 | .41 | .51 | 583.28 |
| 257 | 3 | 1600 | .00 | .41 | .50 | 583.28 |
| 258 | 3 | 1615 | .00 | .40 | .49 | 583.28 |
| 259 | 3 | 1630 | .00 | .39 | .48 | 583.28 |
| 260 | 3 | 1645 | .00 | .39 | .47 | 583.28 |
| 261 | 3 | 1700 | .00 | .38 | .46 | 583.28 |
| 262 | 3 | 1715 | .00 | .37 | .46 | 583.27 |
| 263 | 3 | 1730 | .00 | .37 | .45 | 583.27 |
| 264 | 3 | 1745 | .00 | .36 | .44 | 583.27 |
| 265 | 3 | 1800 | .00 | .35 | .43 | 583.27 |
| 266 | 3 | 1815 | .00 | .35 | .43 | 583.27 |
| 267 | 3 | 1830 | .00 | .34 | .42 | 583.27 |
| 268 | 3 | 1845 | .00 | .34 | .41 | 583.27 |
| 269 | 3 | 1900 | .00 | .33 | .41 | 583.27 |
| 270 | 3 | 1915 | .00 | .33 | .40 | 583.27 |
| 271 | 3 | 1930 | .00 | .32 | .39 | 583.26 |
| 272 | 3 | 1945 | .00 | .32 | .39 | 583.26 |
| 273 | 3 | 2000 | .00 | .31 | .38 | 583.26 |
| 274 | 3 | 2015 | .00 | .30 | .37 | 583.26 |
| 275 | 3 | 2030 | .00 | .30 | .37 | 583.26 |
| 276 | 3 | 2045 | .00 | .29 | .36 | 583.26 |
| 277 | 3 | 2100 | .00 | .29 | .35 | 583.26 |
| 278 | 3 | 2115 | .00 | .28 | .35 | 583.26 |
| 279 | 3 | 2130 | .00 | .28 | .34 | 583.26 |
| 280 | 3 | 2145 | .00 | .28 | .34 | 583.26 |
| 281 | 3 | 2200 | .00 | .27 | .33 | 583.25 |
| 282 | 3 | 2215 | .00 | .27 | .33 | 583.25 |
| 283 | 3 | 2230 | .00 | .26 | .32 | 583.25 |
| 284 | 3 | 2245 | .00 | .26 | .32 | 583.25 |
| 285 | 3 | 2300 | .00 | .25 | .31 | 583.25 |
| 286 | 3 | 2315 | .00 | .25 | .30 | 583.25 |
| 287 | 3 | 2330 | .00 | .24 | .30 | 583.25 |
| 288 | 3 | 2345 | .00 | .24 | .29 | 583.25 |
| 289 | 4 | 0000 | .00 | .24 | .29 | 583.25 |
| 290 | 4 | 0015 | .00 | .23 | .29 | 583.25 |
| 291 | 4 | 0030 | .00 | .23 | .28 | 583.25 |
| 292 | 4 | 0045 | .00 | .22 | .28 | 583.24 |
| 293 | 4 | 0100 | .00 | .22 | .27 | 583.24 |
| 294 | 4 | 0115 | .00 | .22 | .27 | 583.24 |
| 295 | 4 | 0130 | .00 | .21 | .26 | 583.24 |
| 296 | 4 | 0145 | .00 | .21 | .26 | 583.24 |
| 297 | 4 | 0200 | .00 | .21 | .25 | 583.24 |
| 298 | 4 | 0215 | .00 | .20 | .25 | 583.24 |
| 299 | 4 | 0230 | .00 | .20 | .24 | 583.24 |
| 300 | 4 | 0245 | .00 | .20 | .24 | 583.24 |
| | | MAX | 242.86 | 18.91 | 24.43 | 585.43 |
| | | MIN | .00 | .00 | .00 | 583.20 |
| | | AVE | 4.76 | 4.72 | 5.85 | 583.90 |

*** NORMAL END OF HEC-1 ***

**COMPUTATION OF INFLOW HYDROGRAPH (1/2 6-Hour PMP)**
**AND FLOOD ROUTING THROUGH THE**
**PROPOSED PIPE SPILLWAY**

**POND 1B**

| | | |
|---|---|---|
| Crest Elevation | = | 588 ft |
| Pipe Spillway Invert Elevation | = | 583.7 ft |
| Normal Pool Elevation used for Routing | = | 583.7 ft |
| Peak Inflow During Design Storm | = | 224.68 cfs |
| Peak Outflow During Design Storm | = | 13.51 cfs |
| Maximum Pool Elevation During Design Storm | = | 585.47 ft |
| Minimum Freeboard During Design Storm | = | 2.53 ft |
| Peak Storage Volume | = | 25.05 ac-ft |
| Days to Decant 90% of Peak Storage Volume | = | 3.25 days |

# POND 1B SPILLWAY PIPE

## Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|---|---|---|---|---|---|---|
| 31.51 | 55.00 | 18.00 | 0.0100 | 583.70 | 0.90 | 0.00 |

## Detailed Discharge Table

| Elevation (ft) | Straight Pipe (cfs) | Combined Total Discharge (cfs) |
|---|---|---|
| 581.00 | 0.000 | 0.000 |
| 581.50 | 0.000 | 0.000 |
| 582.00 | 0.000 | 0.000 |
| 582.50 | 0.000 | 0.000 |
| 583.00 | 0.000 | 0.000 |
| 583.50 | 0.000 | 0.000 |
| 583.70 | 0.000 | 0.000 |
| 584.00 | (3)>0.929 | 0.929 |
| 584.50 | (3)>3.997 | 3.997 |
| 585.00 | (3)>8.280 | 8.280 |
| 585.50 | (3)>13.485 | 13.485 |
| 586.00 | (3)>19.484 | 19.484 |
| 586.50 | (3)>26.165 | 26.165 |
| 587.00 | (5)>32.642 | 32.642 |

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1***************************************                                                  **************************************
 *                                      *                                                  *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS    *
 *           SEPTEMBER 1990             *                                                  *    HYDROLOGIC ENGINEERING CENTER   *
 *             VERSION 4.0              *                                                  *          609 SECOND STREET         *
 *                                      *                                                  *       DAVIS, CALIFORNIA 95616      *
 *  RUN DATE  12/10/2015  TIME  11:52:36 *                                                 *           (916) 756-1104           *
 *                                      *                                                  *                                    *
 ***************************************                                                  **************************************


                                                 X     X  XXXXXXX   XXXXX           X
                                                 X     X  X        X     X         XX
                                                 X     X  X        X                X
                                                 XXXXXXX  XXXX     X        XXXXX   X
                                                 X     X  X        X                X
                                                 X     X  X        X     X          X
                                                 X     X  XXXXXXX   XXXXX          XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

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        LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
          1            ID  ****************************************************************************
          2            ID  *                                                                          *
          3            ID  *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPB1.inp            *
          4            ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                      *
          5            ID  *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.7'                        *
          6            ID  *      GA Project No. 05-361                                               *
          7            ID  *                                                                          *
          8            ID  *      Analyses by: Geo/Environmental Associates                           *
          9            ID  *                   Knoxville, TN                                          *
         10            ID  *                   December 12, 2015                                      *
         11            ID  *                                                                          *
         12            ID  ****************************************************************************
         13            IT      15       0       0     300
         14            IO       3
         15            JR    FLOW     0.5
         16            VS   BASIN     IMP     IMP     IMP
         17            VV    2.11    2.11    6.11    7.11
         18            IN      15

         19            KK   BASIN
         20            KM   PRECIPITATION
         21            PB       0
         22            PI   0.287   0.373   0.445   0.502   0.545   0.573   0.653   0.834   0.825   0.980
         23            PI   2.322   4.564   4.922   3.344   1.264   0.834   0.864   0.763   0.581   0.560
         24            PI   0.525   0.475   0.411   0.332
         25            BA   0.037
         26            LU       0    0.05      66
         27            UD     0.0

         28            KK     IMP
         29            KM   ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT
         30            RS       1    ELEV   583.7
         31            SA   12.75   13.00   13.93   14.87   15.80
         32            SQ       0    0.93    8.28   19.48   32.64
         33            SE   583.7     584     585     586     587
         34            ZZ
```

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1***************************************                                        ***************************************
 *                                     *                                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                      *   U.S. ARMY CORPS OF ENGINEERS      *
 *           SEPTEMBER 1990            *                                        *   HYDROLOGIC ENGINEERING CENTER     *
 *             VERSION 4.0             *                                        *         609 SECOND STREET           *
 *                                     *                                        *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/10/2015  TIME  11:52:36 *                                      *          (916) 756-1104             *
 *                                     *                                        *                                     *
***************************************                                         ***************************************



                          ***************************************************************************
                          *                                                                         *
                          *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPB1.inp           *
                          *      Flood Routing for Ash Pond 1A and Reclaim Pond                     *
                          *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.7'                       *
                          *      GA Project No. 05-361                                              *
                          *                                                                         *
                          *      Analyses by: Geo/Environmental Associates                          *
                          *                   Knoxville, TN                                         *
                          *                   December 12, 2015                                     *
                          *                                                                         *
                          ***************************************************************************

  14 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4    0  ENDING DATE
                      NDTIME       0245  ENDING TIME
                       ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL      .25 HOURS
                      TOTAL TIME BASE   74.75 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

                 USER-DEFINED OUTPUT SPECIFICATIONS

         TABLE 1
     VS       STATION     BASIN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF RUNOFF
                     .50


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


             **************
             *            *
  19 KK      *     BASIN  *
             *            *
             **************
                          PRECIPITATION

  18 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
```

```
                    JXTIME          0  STARTING TIME

              SUBBASIN RUNOFF DATA

 25 BA          SUBBASIN CHARACTERISTICS
                      TAREA        .04  SUBBASIN AREA

                PRECIPITATION DATA

 21 PB                STORM      27.78  BASIN TOTAL PRECIPITATION

 22 PI            INCREMENTAL PRECIPITATION PATTERN
                      .29       .37       .45       .50       .54       .57       .65       .83       .82       .98
                     2.32      4.56      4.92      3.34      1.26       .83       .86       .76       .58       .56
                      .52       .48       .41       .33

 26 LU          UNIFORM LOSS RATE
                      STRTL        .00  INITIAL LOSS
                      CNSTL        .05  UNIFORM LOSS RATE
                      RTIMP      66.00  PERCENT IMPERVIOUS AREA

 27 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG        .00  LAG

                                                                      ***

                                                                UNIT HYDROGRAPH
                                                            5 END-OF-PERIOD ORDINATES
              71.       20.        4.        1.        0.

     ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

   TOTAL RAINFALL =   27.78, TOTAL LOSS =     .10, TOTAL EXCESS =   27.68

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                          (CFS)
+     449.      3.25                 109.         28.          9.           9.
                        (INCHES)    27.507      27.676      27.676       27.676
                         (AC-FT)       54.         55.         55.          55.

                         CUMULATIVE AREA =     .04 SQ MI


     ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                          (CFS)
+     225.      3.25                  55.         14.          5.           4.
                        (INCHES)    13.754      13.838      13.838       13.838
                         (AC-FT)       27.         27.         27.          27.

                         CUMULATIVE AREA =     .04 SQ MI



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 28 KK      *      IMP   *
            *            *
            **************
                          ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT

              HYDROGRAPH ROUTING DATA

 30 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
```

```
                    RSVRIC      583.70  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

   31 SA              AREA        12.8      13.0      13.9      14.9      15.8

   32 SQ         DISCHARGE          0.        1.        8.       19.       33.

   33 SE         ELEVATION      583.70    584.00    585.00    586.00    587.00

                                                                     ***

                                                     COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00      3.86     17.32     31.72     47.05
          ELEVATION     583.70    584.00    585.00    586.00    587.00

       ***             ***             ***              ***              ***

                       HYDROGRAPH AT STATION      IMP
                         FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR        24-HR        72-HR     74.75-HR
+   (CFS)       (HR)
                            (CFS)
+      14.      6.00                   12.           8.           4.           4.
                         (INCHES)     3.095        8.391       12.260       12.310
                          (AC-FT)        6.          17.          24.          24.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR        24-HR        72-HR     74.75-HR
+  (AC-FT)      (HR)
       24.      6.00                   23.          17.           9.           9.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                     6-HR        24-HR        72-HR     74.75-HR
+   (FEET)      (HR)
    585.47      6.00                585.36       584.95       584.40       584.38

                          CUMULATIVE AREA =     .04 SQ MI
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

| OPERATION | STATION | AREA | PLAN | | RATIOS APPLIED TO FLOWS<br>RATIO 1<br>.50 |
|---|---|---|---|---|---|
| HYDROGRAPH AT | | | | | |
| + | BASIN | .04 | 1 | FLOW | 225. |
| | | | | TIME | 3.25 |
| ROUTED TO | | | | | |
| + | IMP | .04 | 1 | FLOW | 14. |
| | | | | TIME | 6.00 |
| | | | ** PEAK STAGES IN FEET ** | | |
| | | | 1 | STAGE | 585.47 |
| | | | | TIME | 6.00 |

| 1TABLE 1 | STATION | | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE | |
|---|---|---|---|---|---|---|---|
| | PLAN | | 1 | 1 | 1 | 1 | |
| | RATIO | | .50 | .50 | .50 | .50 | |
| PER | DAY MON | HRMN | | | | | |
| 1 | 1 | 0000 | .00 | .00 | .00 | 583.70 | |
| 2 | 1 | 0015 | 10.03 | .02 | .10 | 583.71 | |
| 3 | 1 | 0030 | 15.89 | .09 | .37 | 583.73 | |
| 4 | 1 | 0045 | 19.85 | .18 | .74 | 583.76 | |
| 5 | 1 | 0100 | 22.87 | .28 | 1.17 | 583.79 | |
| 6 | 1 | 0115 | 25.13 | .40 | 1.66 | 583.83 | |
| 7 | 1 | 0130 | 26.69 | .53 | 2.19 | 583.87 | |
| 8 | 1 | 0145 | 29.92 | .66 | 2.76 | 583.91 | |
| 9 | 1 | 0200 | 37.20 | .83 | 3.44 | 583.97 | |
| 10 | 1 | 0215 | 38.85 | 1.12 | 4.20 | 584.03 | |
| 11 | 1 | 0230 | 44.64 | 1.57 | 5.04 | 584.09 | |
| 12 | 1 | 0245 | 93.85 | 2.33 | 6.43 | 584.19 | |
| 13 | 1 | 0300 | 187.02 | 3.88 | 9.27 | 584.40 | |
| 14 | 1 | 0315 | 224.68 | 6.15 | 13.42 | 584.71 | |
| 15 | 1 | 0330 | 177.15 | 8.35 | 17.42 | 585.01 | |
| 16 | 1 | 0345 | 89.25 | 10.34 | 19.98 | 585.18 | |
| 17 | 1 | 0400 | 50.39 | 11.29 | 21.20 | 585.27 | |
| 18 | 1 | 0415 | 42.51 | 11.85 | 21.92 | 585.32 | |
| 19 | 1 | 0430 | 37.57 | 12.30 | 22.49 | 585.36 | |
| 20 | 1 | 0445 | 30.00 | 12.64 | 22.93 | 585.39 | |
| 21 | 1 | 0500 | 27.26 | 12.90 | 23.26 | 585.41 | |
| 22 | 1 | 0515 | 25.42 | 13.11 | 23.54 | 585.43 | |
| 23 | 1 | 0530 | 23.18 | 13.29 | 23.77 | 585.45 | |
| 24 | 1 | 0545 | 20.34 | 13.43 | 23.94 | 585.46 | |
| 25 | 1 | 0600 | 16.79 | 13.51 | **24.05** | **585.47** | ← **Maximum Stage/Storage 6 hours after onset of event** |
| 26 | 1 | 0615 | 4.23 | 13.46 | 23.98 | 585.46 | |
| 27 | 1 | 0630 | .80 | 13.29 | 23.76 | 585.45 | |
| 28 | 1 | 0645 | .13 | 13.08 | 23.50 | 585.43 | |
| 29 | 1 | 0700 | .00 | 12.87 | 23.23 | 585.41 | |
| 30 | 1 | 0715 | .00 | 12.67 | 22.97 | 585.39 | |
| 31 | 1 | 0730 | .00 | 12.47 | 22.71 | 585.37 | |
| 32 | 1 | 0745 | .00 | 12.27 | 22.45 | 585.36 | |
| 33 | 1 | 0800 | .00 | 12.07 | 22.20 | 585.34 | |
| 34 | 1 | 0815 | .00 | 11.88 | 21.95 | 585.32 | |
| 35 | 1 | 0830 | .00 | 11.69 | 21.71 | 585.30 | |
| 36 | 1 | 0845 | .00 | 11.50 | 21.47 | 585.29 | |
| 37 | 1 | 0900 | .00 | 11.32 | 21.23 | 585.27 | |
| 38 | 1 | 0915 | .00 | 11.14 | 21.00 | 585.26 | |
| 39 | 1 | 0930 | .00 | 10.96 | 20.77 | 585.24 | |
| 40 | 1 | 0945 | .00 | 10.79 | 20.55 | 585.22 | |
| 41 | 1 | 1000 | .00 | 10.62 | 20.33 | 585.21 | |
| 42 | 1 | 1015 | .00 | 10.45 | 20.11 | 585.19 | |
| 43 | 1 | 1030 | .00 | 10.28 | 19.90 | 585.18 | |
| 44 | 1 | 1045 | .00 | 10.12 | 19.68 | 585.16 | |
| 45 | 1 | 1100 | .00 | 9.95 | 19.48 | 585.15 | |
| 46 | 1 | 1115 | .00 | 9.80 | 19.27 | 585.14 | |
| 47 | 1 | 1130 | .00 | 9.64 | 19.07 | 585.12 | |
| 48 | 1 | 1145 | .00 | 9.49 | 18.87 | 585.11 | |
| 49 | 1 | 1200 | .00 | 9.33 | 18.68 | 585.09 | |
| 50 | 1 | 1215 | .00 | 9.19 | 18.49 | 585.08 | |

| 1TABLE 1 (CONT.) | | | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|---|
| | | | PLAN | 1 | 1 | 1 | 1 |
| | | | RATIO | .50 | .50 | .50 | .50 |
| PER | DAY | MON | HRMN | | | | |
| 51 | 1 | | 1230 | .00 | 9.04 | 18.30 | 585.07 |
| 52 | 1 | | 1245 | .00 | 8.90 | 18.12 | 585.05 |
| 53 | 1 | | 1300 | .00 | 8.75 | 17.93 | 585.04 |
| 54 | 1 | | 1315 | .00 | 8.61 | 17.75 | 585.03 |
| 55 | 1 | | 1330 | .00 | 8.48 | 17.58 | 585.02 |
| 56 | 1 | | 1345 | .00 | 8.34 | 17.40 | 585.01 |
| 57 | 1 | | 1400 | .00 | 8.23 | 17.23 | 584.99 |
| 58 | 1 | | 1415 | .00 | 8.14 | 17.06 | 584.98 |
| 59 | 1 | | 1430 | .00 | 8.05 | 16.90 | 584.97 |
| 60 | 1 | | 1445 | .00 | 7.96 | 16.73 | 584.96 |
| 61 | 1 | | 1500 | .00 | 7.87 | 16.57 | 584.94 |
| 62 | 1 | | 1515 | .00 | 7.78 | 16.41 | 584.93 |
| 63 | 1 | | 1530 | .00 | 7.69 | 16.25 | 584.92 |
| 64 | 1 | | 1545 | .00 | 7.60 | 16.09 | 584.91 |
| 65 | 1 | | 1600 | .00 | 7.52 | 15.93 | 584.90 |
| 66 | 1 | | 1615 | .00 | 7.44 | 15.78 | 584.89 |
| 67 | 1 | | 1630 | .00 | 7.35 | 15.62 | 584.87 |
| 68 | 1 | | 1645 | .00 | 7.27 | 15.47 | 584.86 |
| 69 | 1 | | 1700 | .00 | 7.19 | 15.32 | 584.85 |
| 70 | 1 | | 1715 | .00 | 7.11 | 15.18 | 584.84 |
| 71 | 1 | | 1730 | .00 | 7.03 | 15.03 | 584.83 |
| 72 | 1 | | 1745 | .00 | 6.95 | 14.89 | 584.82 |
| 73 | 1 | | 1800 | .00 | 6.87 | 14.74 | 584.81 |
| 74 | 1 | | 1815 | .00 | 6.79 | 14.60 | 584.80 |
| 75 | 1 | | 1830 | .00 | 6.72 | 14.46 | 584.79 |
| 76 | 1 | | 1845 | .00 | 6.64 | 14.32 | 584.78 |
| 77 | 1 | | 1900 | .00 | 6.57 | 14.19 | 584.77 |
| 78 | 1 | | 1915 | .00 | 6.49 | 14.05 | 584.76 |
| 79 | 1 | | 1930 | .00 | 6.42 | 13.92 | 584.75 |
| 80 | 1 | | 1945 | .00 | 6.35 | 13.79 | 584.74 |
| 81 | 1 | | 2000 | .00 | 6.28 | 13.66 | 584.73 |
| 82 | 1 | | 2015 | .00 | 6.21 | 13.53 | 584.72 |
| 83 | 1 | | 2030 | .00 | 6.14 | 13.40 | 584.71 |
| 84 | 1 | | 2045 | .00 | 6.07 | 13.27 | 584.70 |
| 85 | 1 | | 2100 | .00 | 6.00 | 13.15 | 584.69 |
| 86 | 1 | | 2115 | .00 | 5.93 | 13.03 | 584.68 |
| 87 | 1 | | 2130 | .00 | 5.87 | 12.90 | 584.67 |
| 88 | 1 | | 2145 | .00 | 5.80 | 12.78 | 584.66 |
| 89 | 1 | | 2200 | .00 | 5.74 | 12.67 | 584.65 |
| 90 | 1 | | 2215 | .00 | 5.67 | 12.55 | 584.65 |
| 91 | 1 | | 2230 | .00 | 5.61 | 12.43 | 584.64 |
| 92 | 1 | | 2245 | .00 | 5.55 | 12.32 | 584.63 |
| 93 | 1 | | 2300 | .00 | 5.48 | 12.20 | 584.62 |
| 94 | 1 | | 2315 | .00 | 5.42 | 12.09 | 584.61 |
| 95 | 1 | | 2330 | .00 | 5.36 | 11.98 | 584.60 |
| 96 | 1 | | 2345 | .00 | 5.30 | 11.87 | 584.59 |
| 97 | 2 | | 0000 | .00 | 5.24 | 11.76 | 584.59 |
| 98 | 2 | | 0015 | .00 | 5.18 | 11.65 | 584.58 |
| 99 | 2 | | 0030 | .00 | 5.12 | 11.54 | 584.57 |
| 100 | 2 | | 0045 | .00 | 5.07 | 11.44 | 584.56 |

| 1TABLE 1 (CONT.) | STATION | | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|
| | PLAN | | 1 | 1 | 1 | 1 |
| | RATIO | | .50 | .50 | .50 | .50 |
| PER | DAY MON | HRMN | | | | |
| 101 | 2 | 0100 | .00 | 5.01 | 11.33 | 584.56 |
| 102 | 2 | 0115 | .00 | 4.95 | 11.23 | 584.55 |
| 103 | 2 | 0130 | .00 | 4.90 | 11.13 | 584.54 |
| 104 | 2 | 0145 | .00 | 4.84 | 11.03 | 584.53 |
| 105 | 2 | 0200 | .00 | 4.79 | 10.93 | 584.53 |
| 106 | 2 | 0215 | .00 | 4.74 | 10.83 | 584.52 |
| 107 | 2 | 0230 | .00 | 4.68 | 10.73 | 584.51 |
| 108 | 2 | 0245 | .00 | 4.63 | 10.64 | 584.50 |
| 109 | 2 | 0300 | .00 | 4.58 | 10.54 | 584.50 |
| 110 | 2 | 0315 | .00 | 4.53 | 10.45 | 584.49 |
| 111 | 2 | 0330 | .00 | 4.48 | 10.36 | 584.48 |
| 112 | 2 | 0345 | .00 | 4.43 | 10.26 | 584.48 |
| 113 | 2 | 0400 | .00 | 4.38 | 10.17 | 584.47 |
| 114 | 2 | 0415 | .00 | 4.33 | 10.08 | 584.46 |
| 115 | 2 | 0430 | .00 | 4.28 | 9.99 | 584.46 |
| 116 | 2 | 0445 | .00 | 4.23 | 9.91 | 584.45 |
| 117 | 2 | 0500 | .00 | 4.18 | 9.82 | 584.44 |
| 118 | 2 | 0515 | .00 | 4.14 | 9.73 | 584.44 |
| 119 | 2 | 0530 | .00 | 4.09 | 9.65 | 584.43 |
| 120 | 2 | 0545 | .00 | 4.04 | 9.56 | 584.42 |
| 121 | 2 | 0600 | .00 | 4.00 | 9.48 | 584.42 |
| 122 | 2 | 0615 | .00 | 3.95 | 9.40 | 584.41 |
| 123 | 2 | 0630 | .00 | 3.91 | 9.32 | 584.41 |
| 124 | 2 | 0645 | .00 | 3.86 | 9.24 | 584.40 |
| 125 | 2 | 0700 | .00 | 3.82 | 9.16 | 584.39 |
| 126 | 2 | 0715 | .00 | 3.78 | 9.08 | 584.39 |
| 127 | 2 | 0730 | .00 | 3.74 | 9.00 | 584.38 |
| 128 | 2 | 0745 | .00 | 3.69 | 8.93 | 584.38 |
| 129 | 2 | 0800 | .00 | 3.65 | 8.85 | 584.37 |
| 130 | 2 | 0815 | .00 | 3.61 | 8.77 | 584.36 |
| 131 | 2 | 0830 | .00 | 3.57 | 8.70 | 584.36 |
| 132 | 2 | 0845 | .00 | 3.53 | 8.63 | 584.35 |
| 133 | 2 | 0900 | .00 | 3.49 | 8.55 | 584.35 |
| 134 | 2 | 0915 | .00 | 3.45 | 8.48 | 584.34 |
| 135 | 2 | 0930 | .00 | 3.41 | 8.41 | 584.34 |
| 136 | 2 | 0945 | .00 | 3.38 | 8.34 | 584.33 |
| 137 | 2 | 1000 | .00 | 3.34 | 8.27 | 584.33 |
| 138 | 2 | 1015 | .00 | 3.30 | 8.20 | 584.32 |
| 139 | 2 | 1030 | .00 | 3.26 | 8.14 | 584.32 |
| 140 | 2 | 1045 | .00 | 3.23 | 8.07 | 584.31 |
| 141 | 2 | 1100 | .00 | 3.19 | 8.00 | 584.31 |
| 142 | 2 | 1115 | .00 | 3.15 | 7.94 | 584.30 |
| 143 | 2 | 1130 | .00 | 3.12 | 7.87 | 584.30 |
| 144 | 2 | 1145 | .00 | 3.08 | 7.81 | 584.29 |
| 145 | 2 | 1200 | .00 | 3.05 | 7.74 | 584.29 |
| 146 | 2 | 1215 | .00 | 3.02 | 7.68 | 584.28 |
| 147 | 2 | 1230 | .00 | 2.98 | 7.62 | 584.28 |
| 148 | 2 | 1245 | .00 | 2.95 | 7.56 | 584.27 |
| 149 | 2 | 1300 | .00 | 2.92 | 7.50 | 584.27 |
| 150 | 2 | 1315 | .00 | 2.88 | 7.44 | 584.27 |

| 1TABLE 1 (CONT.) | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|
| | PLAN | 1 | 1 | 1 | 1 |
| | RATIO | .50 | .50 | .50 | .50 |

| PER | DAY MON | HRMN | | | | |
|---|---|---|---|---|---|---|
| 151 | 2 | 1330 | .00 | 2.85 | 7.38 | 584.26 |
| 152 | 2 | 1345 | .00 | 2.82 | 7.32 | 584.26 |
| 153 | 2 | 1400 | .00 | 2.79 | 7.26 | 584.25 |
| 154 | 2 | 1415 | .00 | 2.76 | 7.21 | 584.25 |
| 155 | 2 | 1430 | .00 | 2.72 | 7.15 | 584.24 |
| 156 | 2 | 1445 | .00 | 2.69 | 7.09 | 584.24 |
| 157 | 2 | 1500 | .00 | 2.66 | 7.04 | 584.24 |
| 158 | 2 | 1515 | .00 | 2.63 | 6.98 | 584.23 |
| 159 | 2 | 1530 | .00 | 2.60 | 6.93 | 584.23 |
| 160 | 2 | 1545 | .00 | 2.58 | 6.88 | 584.22 |
| 161 | 2 | 1600 | .00 | 2.55 | 6.82 | 584.22 |
| 162 | 2 | 1615 | .00 | 2.52 | 6.77 | 584.22 |
| 163 | 2 | 1630 | .00 | 2.49 | 6.72 | 584.21 |
| 164 | 2 | 1645 | .00 | 2.46 | 6.67 | 584.21 |
| 165 | 2 | 1700 | .00 | 2.43 | 6.62 | 584.20 |
| 166 | 2 | 1715 | .00 | 2.41 | 6.57 | 584.20 |
| 167 | 2 | 1730 | .00 | 2.38 | 6.52 | 584.20 |
| 168 | 2 | 1745 | .00 | 2.35 | 6.47 | 584.19 |
| 169 | 2 | 1800 | .00 | 2.33 | 6.42 | 584.19 |
| 170 | 2 | 1815 | .00 | 2.30 | 6.37 | 584.19 |
| 171 | 2 | 1830 | .00 | 2.27 | 6.32 | 584.18 |
| 172 | 2 | 1845 | .00 | 2.25 | 6.28 | 584.18 |
| 173 | 2 | 1900 | .00 | 2.22 | 6.23 | 584.18 |
| 174 | 2 | 1915 | .00 | 2.20 | 6.19 | 584.17 |
| 175 | 2 | 1930 | .00 | 2.17 | 6.14 | 584.17 |
| 176 | 2 | 1945 | .00 | 2.15 | 6.10 | 584.17 |
| 177 | 2 | 2000 | .00 | 2.13 | 6.05 | 584.16 |
| 178 | 2 | 2015 | .00 | 2.10 | 6.01 | 584.16 |
| 179 | 2 | 2030 | .00 | 2.08 | 5.97 | 584.16 |
| 180 | 2 | 2045 | .00 | 2.05 | 5.92 | 584.15 |
| 181 | 2 | 2100 | .00 | 2.03 | 5.88 | 584.15 |
| 182 | 2 | 2115 | .00 | 2.01 | 5.84 | 584.15 |
| 183 | 2 | 2130 | .00 | 1.99 | 5.80 | 584.14 |
| 184 | 2 | 2145 | .00 | 1.96 | 5.76 | 584.14 |
| 185 | 2 | 2200 | .00 | 1.94 | 5.72 | 584.14 |
| 186 | 2 | 2215 | .00 | 1.92 | 5.68 | 584.13 |
| 187 | 2 | 2230 | .00 | 1.90 | 5.64 | 584.13 |
| 188 | 2 | 2245 | .00 | 1.88 | 5.60 | 584.13 |
| 189 | 2 | 2300 | .00 | 1.86 | 5.56 | 584.13 |
| 190 | 2 | 2315 | .00 | 1.84 | 5.52 | 584.12 |
| 191 | 2 | 2330 | .00 | 1.82 | 5.48 | 584.12 |
| 192 | 2 | 2345 | .00 | 1.79 | 5.45 | 584.12 |
| 193 | 3 | 0000 | .00 | 1.77 | 5.41 | 584.11 |
| 194 | 3 | 0015 | .00 | 1.75 | 5.37 | 584.11 |
| 195 | 3 | 0030 | .00 | 1.74 | 5.34 | 584.11 |
| 196 | 3 | 0045 | .00 | 1.72 | 5.30 | 584.11 |
| 197 | 3 | 0100 | .00 | 1.70 | 5.27 | 584.10 |
| 198 | 3 | 0115 | .00 | 1.68 | 5.23 | 584.10 |
| 199 | 3 | 0130 | .00 | 1.66 | 5.20 | 584.10 |
| 200 | 3 | 0145 | .00 | 1.64 | 5.16 | 584.10 |

| 1TABLE 1 (CONT.) | | | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|---|---|
| | | | PLAN | 1 | 1 | 1 | 1 |
| | | | RATIO | .50 | .50 | .50 | .50 |
| PER | DAY | MON | HRMN | | | | |
| 201 | 3 | | 0200 | .00 | 1.62 | 5.13 | 584.09 |
| 202 | 3 | | 0215 | .00 | 1.60 | 5.10 | 584.09 |
| 203 | 3 | | 0230 | .00 | 1.59 | 5.06 | 584.09 |
| 204 | 3 | | 0245 | .00 | 1.57 | 5.03 | 584.09 |
| 205 | 3 | | 0300 | .00 | 1.55 | 5.00 | 584.08 |
| 206 | 3 | | 0315 | .00 | 1.53 | 4.97 | 584.08 |
| 207 | 3 | | 0330 | .00 | 1.52 | 4.93 | 584.08 |
| 208 | 3 | | 0345 | .00 | 1.50 | 4.90 | 584.08 |
| 209 | 3 | | 0400 | .00 | 1.48 | 4.87 | 584.08 |
| 210 | 3 | | 0415 | .00 | 1.46 | 4.84 | 584.07 |
| 211 | 3 | | 0430 | .00 | 1.45 | 4.81 | 584.07 |
| 212 | 3 | | 0445 | .00 | 1.43 | 4.78 | 584.07 |
| 213 | 3 | | 0500 | .00 | 1.42 | 4.75 | 584.07 |
| 214 | 3 | | 0515 | .00 | 1.40 | 4.72 | 584.06 |
| 215 | 3 | | 0530 | .00 | 1.38 | 4.69 | 584.06 |
| 216 | 3 | | 0545 | .00 | 1.37 | 4.67 | 584.06 |
| 217 | 3 | | 0600 | .00 | 1.35 | 4.64 | 584.06 |
| 218 | 3 | | 0615 | .00 | 1.34 | 4.61 | 584.06 |
| 219 | 3 | | 0630 | .00 | 1.32 | 4.58 | 584.05 |
| 220 | 3 | | 0645 | .00 | 1.31 | 4.56 | 584.05 |
| 221 | 3 | | 0700 | .00 | 1.29 | 4.53 | 584.05 |
| 222 | 3 | | 0715 | .00 | 1.28 | 4.50 | 584.05 |
| 223 | 3 | | 0730 | .00 | 1.27 | 4.48 | 584.05 |
| 224 | 3 | | 0745 | .00 | 1.25 | 4.45 | 584.04 |
| 225 | 3 | | 0800 | .00 | 1.24 | 4.42 | 584.04 |
| 226 | 3 | | 0815 | .00 | 1.22 | 4.40 | 584.04 |
| 227 | 3 | | 0830 | .00 | 1.21 | 4.37 | 584.04 |
| 228 | 3 | | 0845 | .00 | 1.20 | 4.35 | 584.04 |
| 229 | 3 | | 0900 | .00 | 1.18 | 4.32 | 584.03 |
| 230 | 3 | | 0915 | .00 | 1.17 | 4.30 | 584.03 |
| 231 | 3 | | 0930 | .00 | 1.16 | 4.28 | 584.03 |
| 232 | 3 | | 0945 | .00 | 1.14 | 4.25 | 584.03 |
| 233 | 3 | | 1000 | .00 | 1.13 | 4.23 | 584.03 |
| 234 | 3 | | 1015 | .00 | 1.12 | 4.21 | 584.03 |
| 235 | 3 | | 1030 | .00 | 1.10 | 4.18 | 584.02 |
| 236 | 3 | | 1045 | .00 | 1.09 | 4.16 | 584.02 |
| 237 | 3 | | 1100 | .00 | 1.08 | 4.14 | 584.02 |
| 238 | 3 | | 1115 | .00 | 1.07 | 4.12 | 584.02 |
| 239 | 3 | | 1130 | .00 | 1.06 | 4.09 | 584.02 |
| 240 | 3 | | 1145 | .00 | 1.04 | 4.07 | 584.02 |
| 241 | 3 | | 1200 | .00 | 1.03 | 4.05 | 584.01 |
| 242 | 3 | | 1215 | .00 | 1.02 | 4.03 | 584.01 |
| 243 | 3 | | 1230 | .00 | 1.01 | 4.01 | 584.01 |
| 244 | 3 | | 1245 | .00 | 1.00 | 3.99 | 584.01 |
| 245 | 3 | | 1300 | .00 | .99 | 3.97 | 584.01 |
| 246 | 3 | | 1315 | .00 | .98 | 3.95 | 584.01 |
| 247 | 3 | | 1330 | .00 | .97 | 3.93 | 584.00 |
| 248 | 3 | | 1345 | .00 | .95 | 3.91 | 584.00 |
| 249 | 3 | | 1400 | .00 | .94 | 3.89 | 584.00 |
| 250 | 3 | | 1415 | .00 | .93 | 3.87 | 584.00 |

| 1TABLE 1 (CONT.) | STATION | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE |
|---|---|---|---|---|---|
| | PLAN | 1 | 1 | 1 | 1 |
| | RATIO | .50 | .50 | .50 | .50 |

| PER | DAY MON | HRMN | BASIN FLOW | IMP FLOW | IMP STORAGE | IMP STAGE | |
|---|---|---|---|---|---|---|---|
| 251 | 3 | 1430 | .00 | .93 | 3.85 | 584.00 | |
| 252 | 3 | 1445 | .00 | .92 | 3.83 | 584.00 | |
| 253 | 3 | 1500 | .00 | .92 | 3.81 | 584.00 | |
| 254 | 3 | 1515 | .00 | .91 | 3.79 | 583.99 | |
| 255 | 3 | 1530 | .00 | .91 | 3.77 | 583.99 | |
| 256 | 3 | 1545 | .00 | .90 | 3.75 | 583.99 | |
| 257 | 3 | 1600 | .00 | .90 | 3.74 | 583.99 | |
| 258 | 3 | 1615 | .00 | .89 | 3.72 | 583.99 | |
| 259 | 3 | 1630 | .00 | .89 | 3.70 | 583.99 | |
| 260 | 3 | 1645 | .00 | .89 | 3.68 | 583.99 | |
| 261 | 3 | 1700 | .00 | .88 | 3.66 | 583.98 | |
| 262 | 3 | 1715 | .00 | .88 | 3.64 | 583.98 | |
| 263 | 3 | 1730 | .00 | .87 | 3.63 | 583.98 | |
| 264 | 3 | 1745 | .00 | .87 | 3.61 | 583.98 | |
| 265 | 3 | 1800 | .00 | .86 | 3.59 | 583.98 | |
| 266 | 3 | 1815 | .00 | .86 | 3.57 | 583.98 | |
| 267 | 3 | 1830 | .00 | .86 | 3.55 | 583.98 | |
| 268 | 3 | 1845 | .00 | .85 | 3.54 | 583.97 | |
| 269 | 3 | 1900 | .00 | .85 | 3.52 | 583.97 | |
| 270 | 3 | 1915 | .00 | .84 | 3.50 | 583.97 | |
| 271 | 3 | 1930 | .00 | .84 | 3.48 | 583.97 | |
| 272 | 3 | 1945 | .00 | .83 | 3.47 | 583.97 | |
| 273 | 3 | 2000 | .00 | .83 | 3.45 | 583.97 | |
| 274 | 3 | 2015 | .00 | .83 | 3.43 | 583.97 | |
| 275 | 3 | 2030 | .00 | .82 | 3.42 | 583.97 | |
| 276 | 3 | 2045 | .00 | .82 | 3.40 | 583.96 | |
| 277 | 3 | 2100 | .00 | .81 | 3.38 | 583.96 | |
| 278 | 3 | 2115 | .00 | .81 | 3.36 | 583.96 | |
| 279 | 3 | 2130 | .00 | .81 | 3.35 | 583.96 | |
| 280 | 3 | 2145 | .00 | .80 | 3.33 | 583.96 | |
| 281 | 3 | 2200 | .00 | .80 | 3.31 | 583.96 | |
| 282 | 3 | 2215 | .00 | .79 | 3.30 | 583.96 | |
| 283 | 3 | 2230 | .00 | .79 | 3.28 | 583.95 | |
| 284 | 3 | 2245 | .00 | .79 | 3.27 | 583.95 | |
| 285 | 3 | 2300 | .00 | .78 | 3.25 | 583.95 | |
| 286 | 3 | 2315 | .00 | .78 | 3.23 | 583.95 | |
| 287 | 3 | 2330 | .00 | .77 | 3.22 | 583.95 | |
| 288 | 3 | 2345 | .00 | .77 | 3.20 | 583.95 | |
| 289 | 4 | 0000 | .00 | .77 | 3.19 | 583.95 | |
| 290 | 4 | 0015 | .00 | .76 | 3.17 | 583.95 | |
| 291 | 4 | 0030 | .00 | .76 | 3.15 | 583.95 | |
| 292 | 4 | 0045 | .00 | .76 | 3.14 | 583.94 | |
| 293 | 4 | 0100 | .00 | .75 | 3.12 | 583.94 | |
| 294 | 4 | 0115 | .00 | .75 | 3.11 | 583.94 | |
| 295 | 4 | 0130 | .00 | .74 | 3.09 | 583.94 | |
| 296 | 4 | 0145 | .00 | .74 | 3.08 | 583.94 | |
| 297 | 4 | 0200 | .00 | .74 | 3.06 | 583.94 | |
| 298 | 4 | 0215 | .00 | .73 | 3.05 | 583.94 | |
| 299 | 4 | 0230 | .00 | .73 | 3.03 | 583.94 | |
| 300 | 4 | 0245 | .00 | .73 | **3.02** | **583.93** | ← **Stage/Storage 68.75 Hours after maximum stage/storage** |
| | | MAX | 224.68 | 13.51 | 24.05 | 585.47 | |
| | | MIN | .00 | .00 | .00 | 583.70 | |
| | | AVE | 4.41 | 3.92 | 9.04 | 584.38 | |

*** NORMAL END OF HEC-1 ***

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1***************************************                                                                   ***************************************
 *                                      *                                                                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                                   *   U.S. ARMY CORPS OF ENGINEERS      *
 *           SEPTEMBER 1990             *                                                                   *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.0               *                                                                   *        609 SECOND STREET            *
 *                                      *                                                                   *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/10/2015  TIME  12:41:06 *                                                                  *         (916) 756-1104              *
 *                                      *                                                                   *                                     *
 ***************************************                                                                   ***************************************



                                                    X     X  XXXXXXX   XXXXX          X
                                                    X     X  X        X     X        XX
                                                    X     X  X        X               X
                                                    XXXXXXX  XXXX     X       XXXXX   X
                                                    X     X  X        X               X
                                                    X     X  X        X     X         X
                                                    X     X  XXXXXXX   XXXXX         XXX



            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

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          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
             1          ID  *****************************************************************************
             2          ID  *                                                                           *
             3          ID  *      AEP Amos Plant Bottom Ash Complex     File: PMPB1DD.inp              *
             4          ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                       *
             5          ID  *      1/2 6 Hour PMP Storm Drawdown   36" Pipe Invert Elev 583.2'           *
             6          ID  *      GA Project No. 15055009.01                                           *
             7          ID  *                                                                           *
             8          ID  *      Analyses by: Geo/Environmental Associates                            *
             9          ID  *                   Knoxville, TN                                           *
            10          ID  *                   October 2015                                            *
            11          ID  *                                                                           *
            12          ID  *****************************************************************************
            13          IT      15       0       0      50
            14          IO       3
            15          VS     IMP     IMP     IMP
            16          VV    2.11    6.11    7.11

            17          KK     IMP
            18          KM   continue drawdown 68.75 hours after peak
            19          RS       1    ELEV  583.93
            20          SA    6.01    6.25   17.65   19.97   22.28
            21          SQ       0    4.00   13.48   26.16   38.09
            22          SE   583.2     584     585     586     587
            23          ZZ
```

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1***************************************                                               ***************************************
 *                                     *                                               *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                             *    U.S. ARMY CORPS OF ENGINEERS     *
 *            SEPTEMBER 1990           *                                               *    HYDROLOGIC ENGINEERING CENTER    *
 *             VERSION 4.0             *                                               *          609 SECOND STREET          *
 *                                     *                                               *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE  12/10/2015  TIME  12:41:06 *                                             *           (916) 756-1104            *
 *                                     *                                               *                                     *
 ***************************************                                               ***************************************



                          *****************************************************************************
                          *                                                                           *
                          *      AEP Amos Plant Bottom Ash Complex     File: PMPB1DD.inp              *
                          *      Flood Routing for Ash Pond 1A and Reclaim Pond                       *
                          *      1/2 6 Hour PMP Storm Drawdown   36" Pipe Invert Elev 583.2'           *
                          *      GA Project No. 15055009.01                                           *
                          *                                                                           *
                          *      Analyses by: Geo/Environmental Associates                            *
                          *                   Knoxville, TN                                           *
                          *                   October 2015                                            *
                          *                                                                           *
                          *****************************************************************************

   14 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           3  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN          15  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ          50  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1215  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .25 HOURS
                         TOTAL TIME BASE   12.25 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

                  USER-DEFINED OUTPUT SPECIFICATIONS

          TABLE 1
      VS       STATION       IMP       IMP       IMP
      VV VARIABLE CODE      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00       .00



 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


             **************
             *            *
   17 KK     *      IMP   *
             *            *
             **************
                             continue drawdown 68.75 hours after peak

                HYDROGRAPH ROUTING DATA

   19 RS          STORAGE ROUTING
                        NSTPS           1  NUMBER OF SUBREACHES
                         ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC      583.93  INITIAL CONDITION
                            X         .00 WORKING R AND D COEFFICIENT

   20 SA                   AREA         6.0       6.3      17.6      20.0      22.3
```

```
 21 SQ         DISCHARGE         0.        4.       13.       26.       38.

 22 SE         ELEVATION     583.20    584.00    585.00    586.00    587.00

                                                                    ***

                                                     COMPUTED STORAGE-ELEVATION DATA

                 STORAGE        .00      4.90     16.37     35.17     56.28
               ELEVATION     583.20    584.00    585.00    586.00    587.00

      ***             ***             ***             ***             ***

                              HYDROGRAPH AT STATION      IMP

  PEAK FLOW     TIME                              MAXIMUM AVERAGE FLOW
                                          6-HR       24-HR       72-HR     12.25-HR
+   (CFS)       (HR)
                               (CFS)
+       4.       .25                        3.          2.          2.            2.
                            (INCHES)      .000        .000        .000          .000
                             (AC-FT)        1.          3.          3.            3.

 PEAK STORAGE   TIME                             MAXIMUM AVERAGE STORAGE
                                          6-HR       24-HR       72-HR     12.25-HR
+  (AC-FT)      (HR)
       4.        .25                        4.          3.          3.            3.

  PEAK STAGE    TIME                              MAXIMUM AVERAGE STAGE
                                          6-HR       24-HR       72-HR     12.25-HR
+   (FEET)      (HR)
    583.93       .00                    583.80      583.70      583.70        583.70

                            CUMULATIVE AREA =      .00 SQ MI
```

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

| | OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR | 24-HOUR | 72-HOUR | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---|---|---|---|---|---|---|---|---|---|---|
| | ROUTED TO | | | | | | | | | |
| + | | IMP | 4. | .25 | 3. | 2. | 2. | .00 | | |
| + | | | | | | | | | 583.93 | .00 |

| 1TABLE 1 | | | STATION | IMP FLOW | IMP STORAGE | IMP STAGE | |
|---|---|---|---|---|---|---|---|
| PER | DAY | MON | HRMN | | | | |
| 1 | 1 | | 0000 | 3.65 | 4.47 | 583.93 | |
| 2 | 1 | | 0015 | 3.58 | 4.39 | 583.92 | |
| 3 | 1 | | 0030 | 3.52 | 4.32 | 583.90 | |
| 4 | 1 | | 0045 | 3.46 | 4.25 | 583.89 | |
| 5 | 1 | | 0100 | 3.41 | 4.18 | 583.88 | |
| 6 | 1 | | 0115 | 3.35 | 4.11 | 583.87 | |
| 7 | 1 | | 0130 | 3.29 | 4.04 | 583.86 | |
| 8 | 1 | | 0145 | 3.24 | 3.97 | 583.85 | |
| 9 | 1 | | 0200 | 3.18 | 3.90 | 583.84 | |
| 10 | 1 | | 0215 | 3.13 | 3.84 | 583.83 | |
| 11 | 1 | | 0230 | 3.08 | 3.77 | 583.82 | |
| 12 | 1 | | 0245 | 3.03 | 3.71 | 583.81 | |
| 13 | 1 | | 0300 | 2.98 | 3.65 | 583.80 | |
| 14 | 1 | | 0315 | 2.93 | 3.59 | 583.79 | |
| 15 | 1 | | 0330 | 2.88 | 3.53 | 583.78 | |
| 16 | 1 | | 0345 | 2.83 | 3.47 | 583.77 | |
| 17 | 1 | | 0400 | 2.78 | 3.41 | 583.76 | |
| 18 | 1 | | 0415 | 2.74 | 3.35 | 583.75 | |
| 19 | 1 | | 0430 | 2.69 | 3.30 | 583.74 | |
| 20 | 1 | | 0445 | 2.65 | 3.24 | 583.73 | |
| 21 | 1 | | 0500 | 2.60 | 3.19 | 583.72 | |
| 22 | 1 | | 0515 | 2.56 | 3.14 | 583.71 | |
| 23 | 1 | | 0530 | 2.51 | 3.08 | 583.70 | |
| 24 | 1 | | 0545 | 2.47 | 3.03 | 583.69 | |
| 25 | 1 | | 0600 | 2.43 | 2.98 | 583.69 | |
| 26 | 1 | | 0615 | 2.39 | 2.93 | 583.68 | |
| 27 | 1 | | 0630 | 2.35 | 2.88 | 583.67 | |
| 28 | 1 | | 0645 | 2.31 | 2.83 | 583.66 | |
| 29 | 1 | | 0700 | 2.27 | 2.79 | 583.65 | |
| 30 | 1 | | 0715 | 2.23 | 2.74 | 583.65 | |
| 31 | 1 | | 0730 | 2.20 | 2.69 | 583.64 | |
| 32 | 1 | | 0745 | 2.16 | 2.65 | 583.63 | |
| 33 | 1 | | 0800 | 2.12 | 2.60 | 583.62 | |
| 34 | 1 | | 0815 | 2.09 | 2.56 | 583.62 | |
| 35 | 1 | | 0830 | 2.05 | 2.52 | 583.61 | |
| 36 | 1 | | 0845 | 2.02 | 2.48 | 583.60 | |
| 37 | 1 | | 0900 | 1.99 | 2.43 | 583.60 | |
| 38 | 1 | | **0915** | **1.95** | **2.39** | **583.59** | **← Time to decant 90% maximum storage = 78.0 hours (3.25 days)** |
| 39 | 1 | | 0930 | 1.92 | 2.35 | 583.58 | |
| 40 | 1 | | 0945 | 1.89 | 2.31 | 583.58 | |
| 41 | 1 | | 1000 | 1.86 | 2.28 | 583.57 | |
| 42 | 1 | | 1015 | 1.83 | 2.24 | 583.57 | |
| 43 | 1 | | 1030 | 1.80 | 2.20 | 583.56 | |
| 44 | 1 | | 1045 | 1.77 | 2.16 | 583.55 | |
| 45 | 1 | | 1100 | 1.74 | 2.13 | 583.55 | |
| 46 | 1 | | 1115 | 1.71 | 2.09 | 583.54 | |
| 47 | 1 | | 1130 | 1.68 | 2.06 | 583.54 | |
| 48 | 1 | | 1145 | 1.65 | 2.02 | 583.53 | |
| 49 | 1 | | 1200 | 1.62 | 1.99 | 583.52 | |
| 50 | 1 | | 1215 | 1.60 | 1.96 | 583.52 | |
| | | | MAX | 3.65 | 4.47 | 583.93 | |
| | | | MIN | 1.60 | 1.96 | 583.52 | |
| | | | AVE | 2.48 | 3.04 | 583.70 | |

*** NORMAL END OF HEC-1 ***