REHABILITATION ASSESSMENT REPORT

New Creek Watershed Site 1

Mineral County, West Virginia

Project Sponsors: **Potomac Valley Conservation District**
City of Keyser, WV
West Virginia State Conservation Committee

National Inventory of Dams (NID) ID: WV 05701
Total Failure Index: 200
Population at Risk: 465
Total Risk Index: 3720

Hazard Classification: High

March 2011

Gannett Fleming
Harrisburg, PA

NRCS
Morgantown, WV

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WEST VIRGINIA STATE CONSERVATION COMMITTEE

March 2011

Prepared for

WEST VIRGINIA NRCS
MORGANTOWN, WEST VIRGINIA

Prepared by

GANNETT FLEMING, INC.
HARRISBURG PENNSYLVANIA

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1. Introduction and Purpose

The purpose of this report is to provide the West Virginia Natural Resources Conservation Service (NRCS) an assessment of New Creek Site 1, as authorized by contract dated May 24, 2010 for 41 Dam Assessments for various watersheds in West Virginia (Award No. AG-3D47-D-10-0008). The report provides a description of the dam, an assessment of the current conditions and status of operation and maintenance, and the scope of potential rehabilitation alternatives. In addition to assessing the overall integrity of the structure, available design information was reviewed to determine whether the structure meets current NRCS design criteria. This information is provided to assist the NRCS and local sponsor(s) in determining future actions concerning potential rehabilitation of the dam to extend the service life of the dam and meet current safety criteria.

The Watershed Protection and Flood Protection Act (Section 14 of PL-83-566, as amended) authorizes funding and technical assistance to rehabilitate aging flood control dams originally built with assistance of the USDA Watershed Programs. Sponsors of these dams may apply for assistance to extend the project service life and ensure that the facility meets applicable safety and performance standards. If the project is eligible for rehabilitation assistance, the NRCS may provide funding for 65 percent of the total rehabilitation project costs; the project sponsors are responsible for the remaining 35 percent. Technical assistance by NRCS for planning and design of the rehabilitation project is provided at no cost to project sponsors.

2. Project Setting and History

The original New Creek – White's Run Subwatersheds Work Plan Agreement was signed on March 11, 1957. The New Creek Subwatershed of the Potomac River Watershed was planned and constructed in accordance with provisions of PL-534, approved December 22, 1944. The project Work Plan was supplemented four times; Supplemental Work Plan Agreement No. 1 signed in December 1959, Supplemental Work Plan Agreement No. 2 signed in January 1961, Supplemental Work Plan Agreement No. 3 signed in October 1961, and Supplemental Work Plan Agreement No. 4 signed in August 1991. The Potomac Valley Conservation District, the West Virginia State Conservation Committee, and the City of Keyser, WV are the sponsors of the project.

The purpose of the plan for New Creek Subwatershed was to outline land treatment and structural measures necessary to achieve the maximum practical erosion control and alleviate flood damage. Installation of planned structural measures were to assist in providing floodwater protection to dwellings, roads, fields, crops, and businesses, and to permit more intensive land use by reducing damage to land in the flood regions and also make uplands more attractive and productive. A total of 9 floodwater retarding dams were constructed on tributaries within the New Creek Watershed.

New Creek Site 1 is located on an unnamed tributary of New Creek in Mineral County approximately 1 mile from the center of Keyser, WV. The location of New Creek Site 1 is shown on the Project Map for the New Creek Watershed Presented on Exhibit 1. An aerial photo and USGS quadrangle of New Creek Site 1 are presented on Figures 1 and 2, respectively.

Engineering design data and other reference data were collected and reviewed. The following is a list of data sources reviewed for this assessment report.

1. Original Work Plan and Subsequent Supplements (12/1956, 12/1959, 05/1961, 10/1961, 05/1991)
2. As-Built Drawings (1957)
3. Design Report Sections (Geology, Structural Design, and Hydraulic Design) (1956)
4. Inspection Records (1984, 2008, 2009, 2010)
5. O&M Agreement and Amendments (01/1959, 02/1960, 01/1964, 12/2002)
6. Failure and Risk Index Spreadsheet (2011)
7. New Creek Sub-watershed Map (2010)
8. Emergency Action Plan (12/2007)

New Creek Site 1 is a single purpose flood control dam designed by the SCS (now NRCS), Morgantown, West Virginia. The dam and its appurtenances consist of a 945-foot long, zoned earthfill embankment with a maximum height of 41.7 feet above the invert of the principal spillway. The dam has two spillways; a two-stage principal spillway and an open channel vegetated auxiliary spillway. The auxiliary spillway crest is approximately 6.1 feet below the top of the dam. Both spillways are uncontrolled. All inflow is discharged through the principal spillway until the pool level reaches the level of the auxiliary spillway crest. A drawdown gate was provided to lower or drain the reservoir. The principal spillway conduit consists of a 24-inch diameter reinforced concrete, steel cylinder type pre-stressed pressure pipe. The principal spillway conduit was constructed with a concrete cradle with reinforced concrete anti-seep collars.

A summary of specific design data is presented in Table 1. Selected as-built drawings are presented in Appendix A.

3. Site Inspection Summary and Operation and Maintenance

William Franz, P.E., P.G.; Gregory Richards, E.I.T.; and Joe Bell, E.I.T. of Gannett Fleming, Inc. conducted a site inspection of New Creek Site 1 on September 2, 2010. The WV-ENG-105, Formal Dam Inspection Checklist was used to record findings and is presented in Appendix B. General photographs of the dam site (Photos 1-6) and photographs of deficiencies (Photos 7-16) noted during the site inspection are also presented in Appendix B. Additional photos taken during the field review are furnished in the Supporting Data Folder on a CD. Several ongoing maintenance items as well as recommendations for additional investigations are noted below.

The grass cover on the upstream and downstream slope of the dam embankment appears to be adequate. There are, however, several large animal burrows located on both the upstream and the downstream slope of the dam embankment.

A residential water line has been installed through the auxiliary spillway. The backfill has since settled leaving a vegetated depression that extends through the channel of the spillway. Additionally, a small garden plot and fence was observed within the spillway channel. Many residential homes have been constructed immediately downstream of the auxiliary spillway and

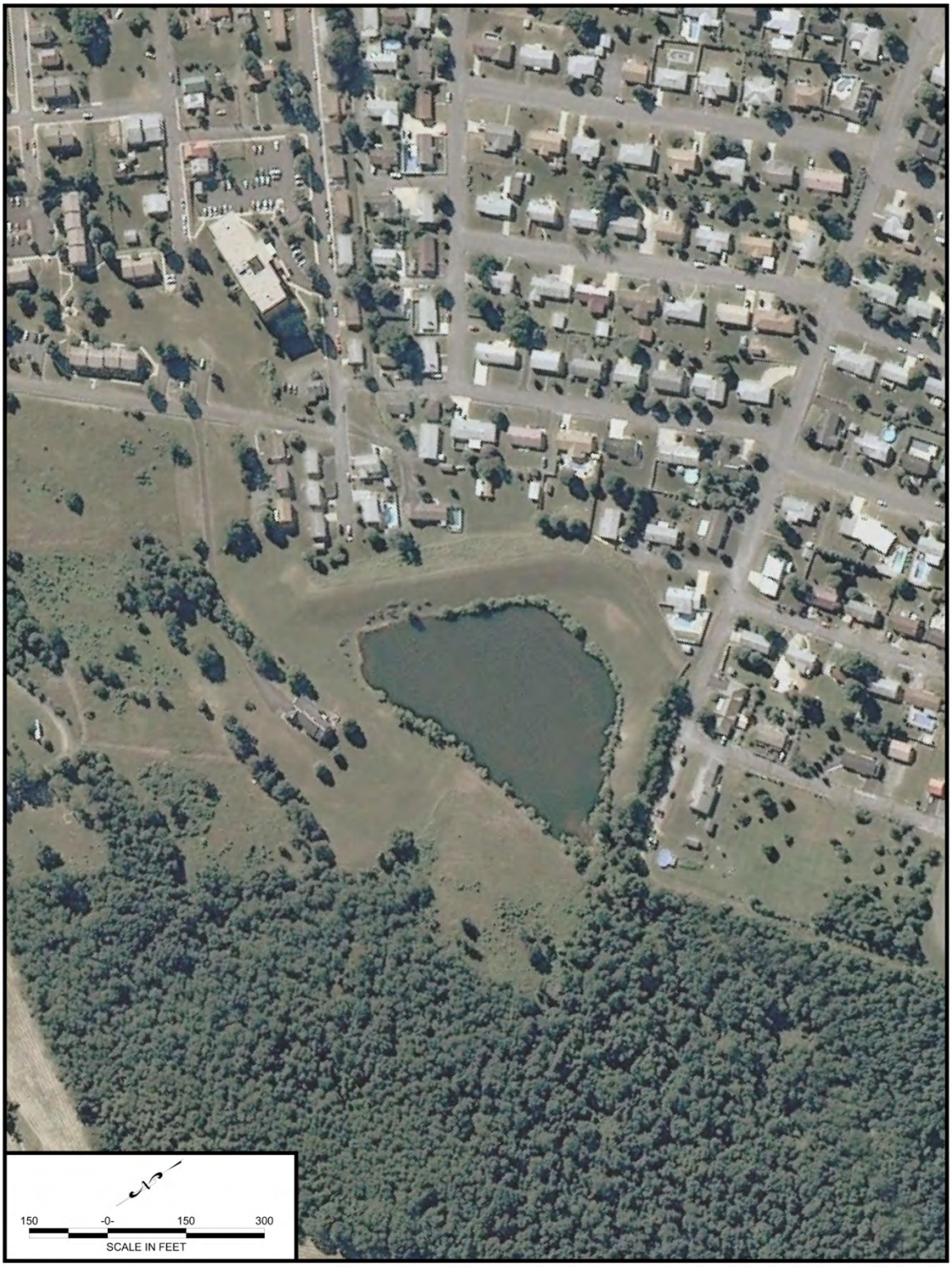


Figure 1. Aerial Photo of New Creek Site 1

Figure 2. USGS Quadrangle of New Creek Site 1

Table 1
As-Built Design Data for New Creek Site 1

Description	Value
General Data	
Year Designed	1956
Year Constructed	1957
Purpose	Flood Control
Original Hazard Classification	High (Class C)
Current Hazard Classification	High (Class C)
Design Life	50 years (2007)
Design Drainage Area	226 Acres (0.35 Mi^2)
Dam Height (Along Centerline)	35 Feet
Maximum Dam Height	41.7 Feet
Embankment Length	945 Feet
Embankment Top Width	14 Feet
Embankment Upstream Slope	3H:1V
Embankment Downstream Slope	2H:1V
Critical Elevations (MSL)	
Top of Dam	926.4 Feet
Auxiliary Spillway Crest	920.3 Feet
PSW Weir	916.9 Feet
Normal Pool (50-Year Submerged Sediment)	906.3 Feet
PSW Conduit Outfall Invert	884.7 Feet
PSW Outlet Channel Invert	883.7 Feet
Storage Capacities	
Sediment Storage (50-Year Submerged & Aerated Sediment)	11 Acre-Feet
Normal Pool (50-Year Submerged Sediment)	9 Acre-Feet
Auxiliary Spillway Crest	72.4 Acre-Feet
Top of Dam	117.4 Acre-Feet
Pool Surface Areas	
Normal Pool	2.1 Acres
Auxiliary Spillway Crest	6.35 Acres
Other Features	
Principal Spillway Orifice Size	12 Inch Dia.
Principal Spillway Conduit Diameter	24 Inches
Principal Spillway Conduit Length	161.13 Feet
Principal Spillway Weir Crest Length	6-Feet (Total)
Auxiliary Spillway Width	80 Feet

would experience flooding should it activate. There is also a home located on the left side of the auxiliary spillway that may be partially in the flood pool.

The bottom of the low inlet trash rack has corroded away and needs to be replaced. Otherwise, the concrete principal spillway riser structure appears to be in good condition and operating as designed. No external evidence of cracking or deterioration was observed.

Significant modifications have been made to the principal spillway outlet and plunge pool as noted in SCS Trip Report dated March 5, 1984. The plunge pool has been completely backfilled and the principal spillway conduit extended to allow the construction of several structures immediately adjacent to the outlet. The conduit extension is significantly misaligned and damaged. A very large tree is also growing near the principal spillway conduit outlet and toe of the dam. No flow was entering the principal spillway intake at the time of inspection; however, a West Virginia Dam Safety Inspection Record dated November 12, 2009 indicated that principal spillway flows are passing thru a gap in the fifth joint from the outlet and draining to some unknown point downstream.

The outlet channel consists of a small, concrete-lined channel that is obstructed by vegetation and an undersized culvert just downstream of the outlet. No energy dissipation structure is in place. CMP drains shown on the as-built drawings have been buried. Their location and possible connection to more recent PVC drains near the conduit outlet is unknown. No signs of embankment instability or seepage were observed.

Items inaccessible for inspection include the submerged exterior of the riser structure, interior of the riser structure, sluice gate, interior of the principal spillway conduit and the interior of the CMP drain pipes.

In addition to the site inspection, video inspection of the principal spillway conduit as provided by the NRCS was reviewed. The ROVVER inspection of the principal spillway conduit was performed on September 17, 2002 and revealed joint separation and visible scouring of conduit bed material 18 feet from the conduit outlet as well as notable fractures and deterioration of the concrete lining up to 31 feet from the conduit outlet.

Items of deferred maintenance include filling animal burrows, removal of obstructions in the auxiliary spillway, filling and reseeding the depression in the auxiliary spillway, removal of vegetation in the downstream discharge channel, and repairing the corroded lower trash rack. In addition to these maintenance concerns, it is recommended that action be taken to rehabilitate the principal spillway outlet structure. This would include rehabilitation of the conduit, plunge pool or other method of energy dissipation, embankment drains, and the downstream discharge channel.

The potential for flooding at events less than the Probable Maximum Flood should also be considered due to the development that has taken place immediately downstream of the dam. The Emergency Action Plan (EAP) should also be reviewed and updated accordingly since there are houses located just downstream of the auxiliary spillway. Current EAP guidelines call for evacuation of downstream persons only if the dam is in danger of failure; however, significant auxiliary spillway flows could endanger houses and potentially human life.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Continued care and inspection are necessary to detect unsafe conditions.

4. Hydrologic and Hydraulic Analyses

Hydraulic analyses were conducted to determine whether the dam meets NRCS and WVDEP current criteria. NRCS design precipitation and other hydrologic parameters have become more stringent since the dam was designed in the 1950s. As part of this assessment, updated hydrologic and hydraulic analyses using the NRCS SITES model were performed to determine the required auxiliary spillway crest and top of dam elevations. Structure geometry and reservoir storage inputs as well as watershed hydrologic characteristics for the model were obtained from as-built drawings and other design documents provided by the West Virginia NRCS. The SITES analyses involved evaluation of the top of dam elevation for both the short duration (6-hour) storm and the long duration (24-hour) storm in accordance with procedures outlined in the latest version (July 2005) of TR-60. The elevation of the auxiliary spillway crest was also evaluated for the 100-year event. The SITES output for as-built, Class C (*high hazard*) criteria for the 6-hour and 24-hour duration storms and the auxiliary spillway crest elevation are presented in Appendix C. A side-by-side comparison of key SITES model input and output for the different scenarios analyzed is presented in Table 2.

Table 2
Side-By-Side Comparison of Key SITES Model Input and Output

Parameter	Original Class C 1956 Design	100-Year ASW Crest	6-hr Class C Top of Dam	24-hr Class C Top of Dam
Key Input Data				
Watershed Area	226 Acres	226 Acres	226 Acres	226 Acres
Weighted Curve Number	73.0	73.0	73.0	73.0
Time of Concentration, T_c	0.31 Hours	0.31 Hours	0.31 Hours	0.31 Hours
100-Year Rainfall (P-100)	- Inches	5.82 Inches	3.77 Inches	5.82 Inches
Freeboard Rainfall (P-FB)	27.3 Inches	-	27.3 Inches	34.8 Inches
Key Output Data				
ASW Crest Elevation	920.3 Feet	**918.37 Feet**	920.30 Feet	920.30 Feet
Top of Dam Elevation	926.4 Feet	-	926.34 Feet	923.62 Feet
Freeboard	-	-	**0.06 Feet**	**2.78 Feet**

The following can be concluded based on the analysis results summarized in Table 2:

1. The Auxiliary Spillway crest is 1.93 feet higher than required using the 100-year flood activation criteria.
2. For a Class C (*high hazard*) structure, the dam would not be overtopped and would have 0.06 feet of freeboard to pass the 6-hr Freeboard Hydrograph.

5. Spillway Integrity Analyses

Preliminary auxiliary spillway integrity analyses were also performed as part of this assessment using the SITES program. Very little subsurface information is available from which to develop a representative geologic profile of the most erodible section through the auxiliary spillway. The assumed geologic profile of the auxiliary spillway was developed using as-built drawings, geology and soils design reports, and supplemental reports from the United States Geological Survey and the West Virginia Geological and Economic Survey.

The geology of the auxiliary spillway for the SITES integrity analysis was assumed to consist of shale from the crest of the spillway down to approximately elevation 908 feet. An additional layer of shale is located beneath the first and extends down to the valley floor. The assumed material properties for the preliminary assessment of the spillway integrity are presented in Table 3. A schematic profile of the auxiliary spillway obtained from the SITES output is presented on Figure 3.

The SITES auxiliary spillway analysis shows that the auxiliary spillway will experience significant damage of the spillway during passage of the 24-hour FBH. Damage includes a headcut over 10 feet deep propagating up to the level control section of the spillway. For the 6-hour storm, the analysis shows damage of the auxiliary spillway to a lesser degree than the 24-hour storm.

Photo 8 in Appendix B shows a small depression that runs through the control section of the auxiliary spillway. This feature creates a preferential flow path and that can accelerate the erosion of the spillway. Photos 14 and 15 show other features observed during the site visit including several structures immediately downstream of the spillway and a small garden plot in the spillway that can also accelerate erosion of the spillway. These features have not been incorporated in the SITES auxiliary spillway analysis but should be considered in evaluating the overall integrity of the spillway. The SITES output for both the 6-hour and 24-hour storms for as-built, Class C criteria are presented in Appendix C. The electronic input files for the SITES model are furnished in the Supporting Data Folder on a CD.

Table 3
Assumed Parameters for Auxiliary Spillway Integrity Analysis

Material Description	Assumed ASW Material Erosion Parameters				
	Dry Density (lbs/ft^3)	Headcut Index (K_h)	Percent Clay	Plasticity Index	D_{75} / Rep. Dia.(in)
Soil/Ground	100	0.17	12	4	0.002
Shale 1	110	2	0	0	0.5
Shale 2	120	8	0	0	6

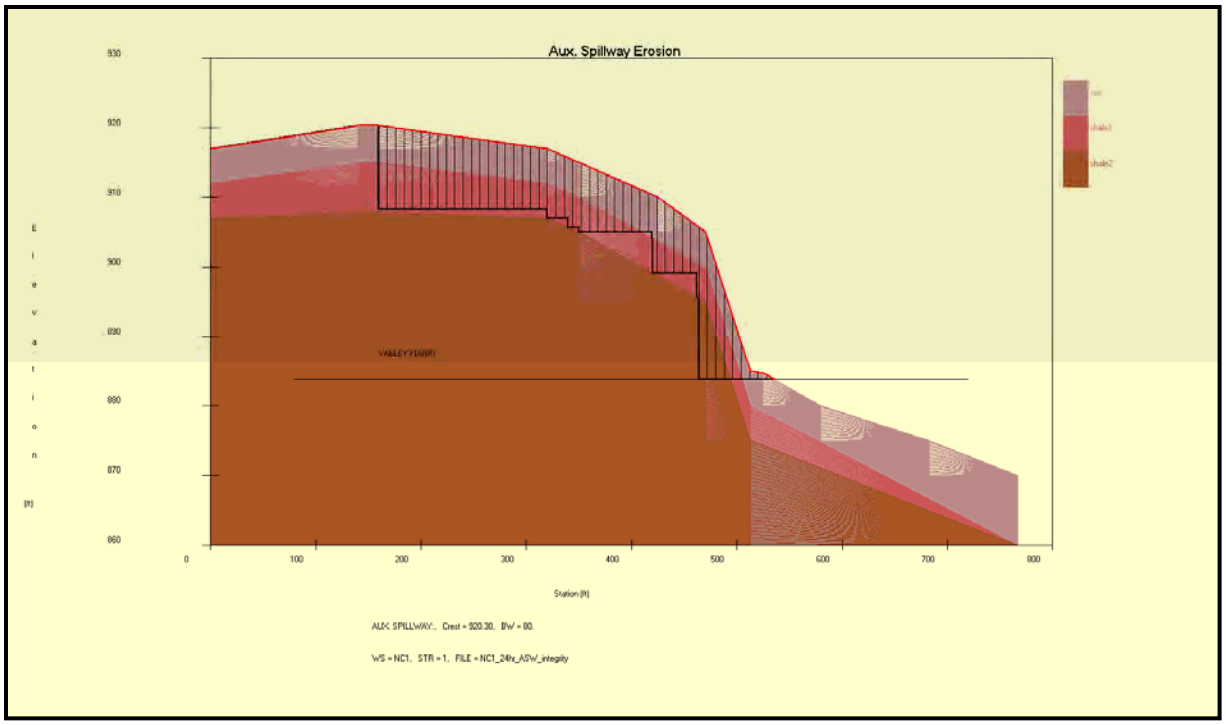


Figure 3. Plot of Auxiliary Spillway Profile and Extent of Erosion from Integrity Analysis for 24-hour Class C Freeboard Hydrograph (PMF) Obtained from SITES Model Output

6. Breach Inundation Mapping and Hazard Classification Summary

A dam breach hydraulic analysis was performed using the U.S. Army Corps of Engineers' HEC-RAS computer model in order to determine the downstream inundation limits of the flood wave created by a sudden breach of the dam. A field assessment of downstream structures located within the path of the flood wave was also made to verify the current hazard classification. The hazard classification evaluation consisted of evaluating the downstream area within the breach inundation zone. The dam was then classified according to West Virginia State Dam Safety definitions and NRCS definitions in NEM, Part 520, Subpart C – Dams.

The inflow hydrograph, reservoir stage-storage relationship, and other inputs used to describe the dam in the HEC-RAS model were obtained from the 6-hour FBH SITES output and as-built drawings. The dam breach parameters, including the time to breach, breach bottom width and side slopes were determined by trial and error until the peak breach discharge criteria specified in TR-60 was satisfied. The minimum and maximum peak breach discharges using TR-60 criteria were computed to be 35,375 cfs and 63,847 cfs, respectively. Assuming a complete breach of the dam occurs within 3 minutes, a peak breach discharge of approximately 36,000 cfs was computed using the HEC-RAS model. The height of the breach flood wave at the dam site, from the top of the dam to the valley floor would be approximately 47 feet.

The HEC-RAS dam breach analysis and downstream unsteady flow modeling of the flood wave was performed using a three (3) meter Digital Elevation Model (DEM) and SAMB Orthophotos to obtain the cross sections and Manning's "n" values necessary for modeling the

channel and floodplain. The HEC-RAS model of the downstream area at the confluence of New Creek Site 1's unnamed tributary with New Creek was treated as a junction so that the flood wave could be modeled as propagating both upstream and downstream of the junction. The additional storage attenuation of the flood wave within the reach immediately upstream of the junction can be an important feature of the hydraulic analysis. Without this feature, the downstream inundation limits can be overestimated.

The extent of the breach analysis was greater than that shown on the existing inundation map included in the Emergency Evacuation Plan for this structure. The breach analysis was based upon the FBH storm for a Class C dam with assumed failure occurring at the top of dam elevation. The FBH storm was only assumed to occur in the watershed upstream of the dam with normal base flow of approximately 200 cfs occurring downstream of the dam. Flood elevations were tracked downstream until they came largely within the stream bank or when the flow rate was less than 10 percent of the peak breach flow rate at the dam.

For New Creek Site 1, the inundation mapping was extended to the city of Keyser, approximately 1.4 miles downstream of the dam, until the flood wave was largely within the banks of New Creek. According to the HEC-RAS dam breach model, the peak flow rate of the breach flow or flood wave at Keyser is approximately 6,000 cfs or 17 percent of the peak breach flow at the dam. The resulting inundation limits in the vicinity of Keyser were compared with the inundation limits shown on the existing detailed FEMA Flood Insurance maps for the same area for the 100-year and 500-year flood events. At Keyser, the peak 100-year and 500-year FEMA flood flows were estimated to be 10,610 cfs and 15,710 cfs, respectively. The two sources of mapping appear to be in very close agreement. The peak FEMA 100-year flood elevation near the center of Keyser was reported to be 811 feet. The peak dam breach flood elevation at the same location was computed to be 808.5 feet. A side by side comparison of the dam breach inundation mapping and the FEMA Flood Insurance mapping at Keyser is presented in Figure 4.

Homes, businesses, road crossings, bridges, farms and commercial buildings, utilities and other structures located within the dam breach inundation limits were identified and photographed. All photographs were tagged electronically with their date, time, longitude and latitude using GPS. This information was used to create a GIS database to help quantify the flood impacts and persons at risk.

The limits of the maximum pool elevation and the downstream inundation were plotted in AutoCAD on both an orthophoto base map and a USGS Quadrangle base map, and are presented on Exhibits 2 and 3, respectively. The locations of all cross sections used in the HEC-RAS model are also shown Exhibits 2 and 3. All associated HEC-RAS, AutoCAD, and other supporting computer files are furnished in the Supporting Data Folder on a CD. A GIS database containing the downstream inundation limits and the photographs of all inundated features within the downstream inundation limits is also provided on a CD.

According to West Virginia State Dam Safety definitions and NRCS definitions in NEM, Part 520, Subpart C – Dams, *high hazard* dams (Class 1 or Class C) are those dams located where failure may cause loss of life or serious damage to homes, commercial or industrial buildings, main highways or railroads, or important public utilities. This classification must be

used if failure may result in loss of human life. Existing and future downstream development including controls for future development must be considered when classifying the dam.

New Creek Site 1 was designed in 1956 as a *high hazard* (Class C) structure. Based on the inundation mapping presented on Exhibits 2 and 3, and the downstream reconnaissance of the area within the inundation zone, this classification is found to be appropriate. Sudden failure of New Creek Site 1 during the FBH event impacts considerable downstream dwellings, road

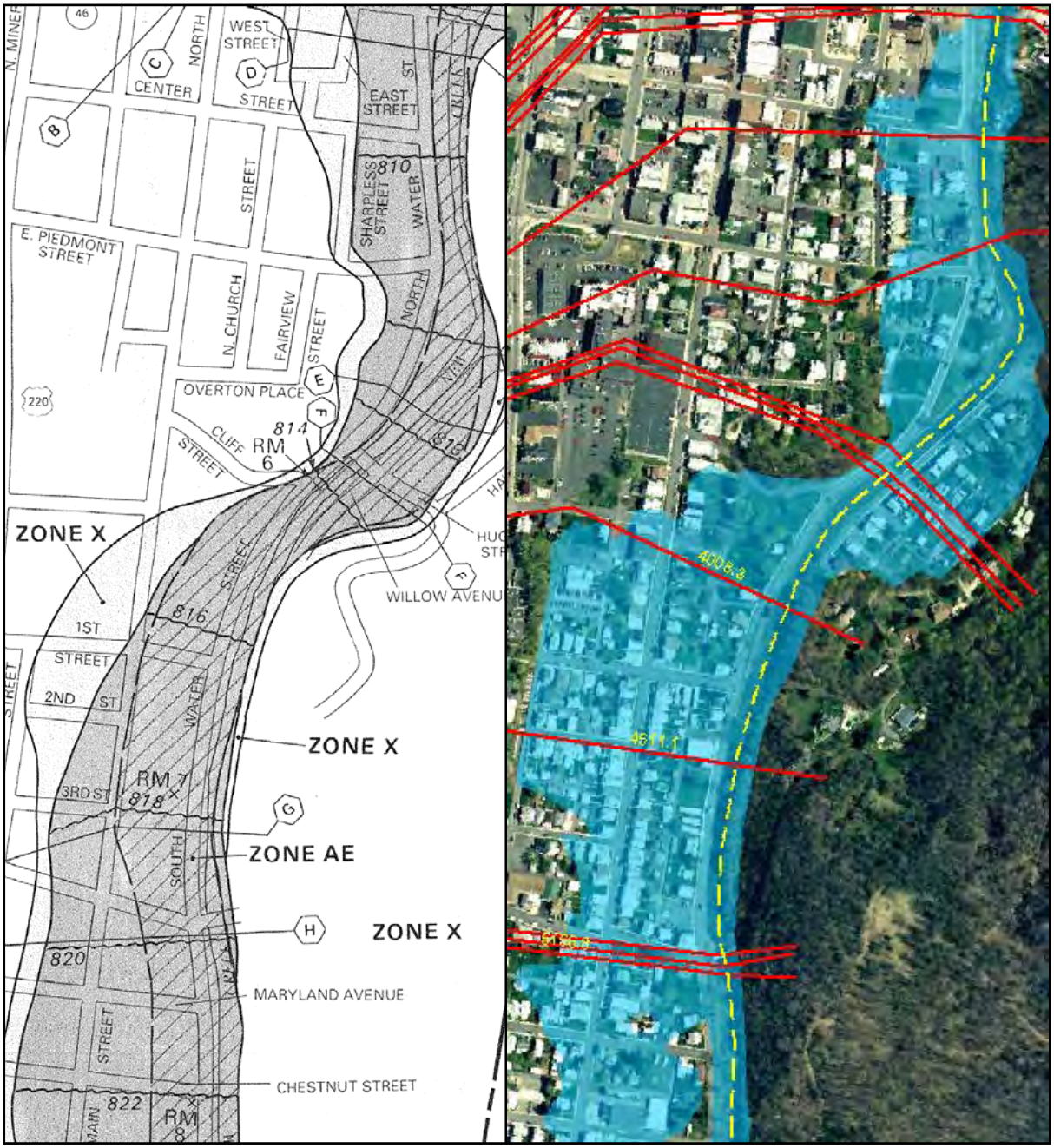


Figure 4. Side by Side Comparison of Floodplain Boundaries from the 1991 FEMA Flood Insurance Study (left) and the 2011 Gannett Fleming Dam Breach Study (right) at Keyser, WV.

crossings/bridges, commercial buildings and other structures, and meets both the loss of life and property damage criteria for a high hazard dam.

Eight dwellings were identified within the downstream inundation zone that are less than 200 feet from the toe of the dam. Many other dwellings in the City of Keyser would clearly be impacted by a flood wave.

A total of approximately 186 dwellings were judged to experience flooding of the adjacent ground by a depth of more than 3 feet based on the aforementioned dam failure hydraulic analysis. The corresponding persons at risk (PAR) assuming an average of 2.5 persons per dwelling is 465 persons.

According to the HEC-RAS model results, it will take less than 15 minutes for a flood wave created by a sudden failure of New Creek Site 1 to reach its peak flood level at Keyser. There is, therefore, a limited amount of warning time available which significantly decreases the probability of survival for persons at risk that are located in the downstream reaches of the inundation area.

7. Review of Available Geotechnical Information

Available geotechnical information was reviewed with respect to items that are considered in the "*Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet*". This information included the Geology Report (1956), as built plan sheets (1957), Phase I Inspection Report prepared by Berger Associates for the Huntington District of the U.S. Army Corps of Engineers (1981), a trip report prepared by the SCS (03/1984), and a dam inspection report prepared by the WVDEP (11/2009).

The 1950's time period for design and construction predates the full development of several current NRCS design criteria. Two important design criteria include drain/filter compatibility and seepage control for principal spillway conduits. The manuals that define these two design methodologies, Gradation Design of Sand and Gravel Filters and Filter Diaphragms, were first published in 1994 and 2007, respectively. The compatibility of adjacent embankment zones is another design criteria that has developed since the 1960's and has become an essential step in the design process for earthen dams.

As discussed in Section 3, significant modifications have been made to the principal spillway conduit of New Creek Site 1. The conduit has been extended and additional fill added to the embankment and downstream toe area to cover the pipe and backfill the former plunge pool. The joint between the original pipe and the extension is open. As observed during the WV DEP November 2009 inspection, the joint spacing was large enough to capture all of the flow from the riser. No exit point for the flow could be determined. Also, the single outlet pipe for the internal embankment drain appears to have been buried in conjunction with the additional fill placement.

The existing embankment drain consists of a single coarse aggregate material. No gradation limits are specified. The as built drawings state a requirement for pit run sand and gravel or a 2:1 mixture of concrete sand and coarse aggregate. The use of drain materials

without specified gradation limits for drains is problematic with respect to compatibility with adjacent embankment and foundation soils.

The drain configuration within the embankment has very few similarities to currently designed filter diaphragms. While its horizontal dimension, which essentially extends from abutment to abutment, does exceed current criteria, the lack of any piping alongside the principal spillway conduit is a significant omission from current design.

Slope stability analyses performed as part of the original design were not available. A stability analysis, however, was performed in conjunction with the Phase I inspection. Since no site specific shear strength parameters were available, the analysis was an iterative solution that solved for a factor of safety of 1.5 while varying soil strengths. The predicted shear strengths were judged to be within the expected range for site soils; therefore, the stability was considered to be adequate.

The significant seepage control deficiencies, an open joint in the principal spillway conduit, sand and gravel drain material, the lack of a filter diaphragm, and a buried outlet pipe, require a thorough seepage assessment of the embankment. As recommended by WV DEP, this assessment should include televising the entire length of the conduit, and observing the conduit after each storm event that fills the pipe by about one quarter of its cross section. This seepage assessment should include a subsurface investigation to determine the geotechnical characteristics of the foundation and embankment. The dam has no instrumentation to monitor phreatic levels, seepage discharge or surface movement.

Review comments related to the geotechnical factors in the "*Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet*" are presented in Appendix D. Also included in the appendix is a copy of the spreadsheet as completed by the WV NRCS.

8. Failure and Risk Indexes

The structure's risk of failure and the consequences of failure were evaluated by the WV NRCS by completing the "Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet" (Exhibit 508.1 of the NRCS-National Watershed Manual) to determine whether the dam qualifies for rehabilitation as per Section 508 Subpart E of the National Watershed Manual. Based on the completed spreadsheet, the total failure index computed by the NRCS for New Creek Site 1 is 200, with a total risk index of 3,720. A copy of the spreadsheet completed by the WV NRCS is included in Appendix D.

9. Discussion of Potential Rehabilitation Alternatives

New Creek Site 1 meets current Class C (*high hazard*) design criteria relating to overtopping of the dam and activation of the auxiliary spillway. However, it is recommended that action be taken to rehabilitate the principal spillway outlet structure due to unauthorized alterations made prior to 1984. This would include rehabilitation of the conduit, plunge pool or other method of energy dissipation, embankment drains, and the downstream discharge channel.

It appears that the auxiliary spillway would experience a significant but acceptable amount of damage during passage of the Freeboard Hydrograph as determined by the preliminary SITES integrity analysis. However, it is noted that the spillway integrity analysis was performed using limited information about the subsurface properties of the spillway. Some design features within the embankment, particularly drain/filter compatibility, seepage control, and compatibility between adjacent embankment zones as discussed in Section 7 of this report, do not meet current NRCS design criteria. Full evaluation for compliance to current criteria cannot be confirmed without a subsurface investigation and subsequent analyses and are not included herein as deficiencies requiring rehabilitation.

10. Cost Estimates for Rehabilitation Alternatives

Based on preliminary information, planning level cost estimates were prepared for the two alternatives listed in Table 4. Decommissioning or breaching the dam was included as an alternative. Due to the many factors related to the rehabilitation of the principal spillway outlet structure, the cost of this alternative has been approximated and is listed as a range. Factors impacting this cost include the possibility of land acquisition, the unknown condition of the buried conduit and drains, and the length of downstream channel to be rehabilitated. The cost estimate for breaching the dam is based on construction prices from similar projects.

In addition to the costs noted in Table 4, subsequent investigation of the condition of the embankment and auxiliary spillway profile may reveal additional deficiencies. Such deficiencies could increase rehabilitation costs substantially.

Table 4
Planning-Level Cost Estimates for Modifications to Bring New Creek Site 1 into Compliance with NRCS Class C Design Criteria*

Alternative	Alternative Description	Estimated Total Project Cost
1	Rehabilitate Principal Spillway Outlet Conduit, Energy Dissipation Structure, Embankment Drains, and the Discharge Channel	$1,500,000 - $2,000,000
2	Decommission/Breach Dam	$600,000

* *Some design features within the embankment may not meet current NRCS design criteria. Compliance of these features cannot be confirmed without further analysis and are not included herein as deficiencies requiring rehabilitation.*

11. Conclusions and Recommendations

11.1 Operations and Maintenance. Several maintenance deficiencies exist at New Creek Site 1 that need to be addressed. These include filling animal burrows, removal of obstructions in the auxiliary spillway, filling and reseeding the depression in the auxiliary spillway, removal of vegetation in the downstream discharge channel, and repairing the corroded lower trash rack.

11.2 Additional Studies. Subsurface investigations to more accurately quantify conditions within the embankment, foundation, and auxiliary spillway are recommended. This information is important to confirm that the embankment meets current design criteria and to more accurately evaluate the integrity of the auxiliary spillway. Embankment slope stability should be evaluated based on the results of the subsurface investigations. Items not readily accessible for inspection such as the inside of the principal spillway conduit, riser structure, and embankment drains, and the submerged exterior of the riser and sluice gate should also be assessed.

As recommended by WV DEP, a thorough seepage assessment of the embankment should be performed and include televising the entire length of the conduit, and observing the conduit after each storm event that fills the pipe by about one quarter of its cross section. This seepage assessment should include a subsurface investigation to determine the geotechnical characteristics of the foundation and embankment.

In addition to subsurface investigations, the potential for flooding at events less than the Probable Maximum Flood should be considered due to the development that has taken place immediately downstream of the dam. The Emergency Action Plan (EAP) should also be reviewed and updated accordingly since there are houses located just downstream of the auxiliary spillway. Current EAP guidelines call for evacuation of downstream persons only if the dam is in danger of failure; however, significant auxiliary spillway flows could endanger houses and potentially human life.

11.3 Hazard Classification. Based on the inundation mapping prepared as part of this study and the downstream reconnaissance of the area within the inundation zone, the classification of New Creek Site 1 as a high hazard structure is found to be appropriate. Sudden failure of New Creek Site 1 during the FBH event impacts considerable downstream dwellings, road crossings/bridges, commercial buildings and other structures, and meets both the loss of life and property damage criteria for a high hazard dam.

11.4 Design Deficiencies. New Creek Site 1 meets current Class C (*high hazard*) design criteria relating to overtopping of the dam and activation of the auxiliary spillway. However, it is recommended that action be taken to rehabilitate the principal spillway outlet structure due to unauthorized alterations made prior to 1984. Other deficiencies may exist related to geotechnical issues with the embankment or features that were not inspected.

11.5 Failure and Risk Indexes and Priority Ranking of Rehabilitation Project. The total failure index for New Creek Site 1 as indicated in the spreadsheet prepared by the WV NRCS is 200, with a total risk index of 3,720.

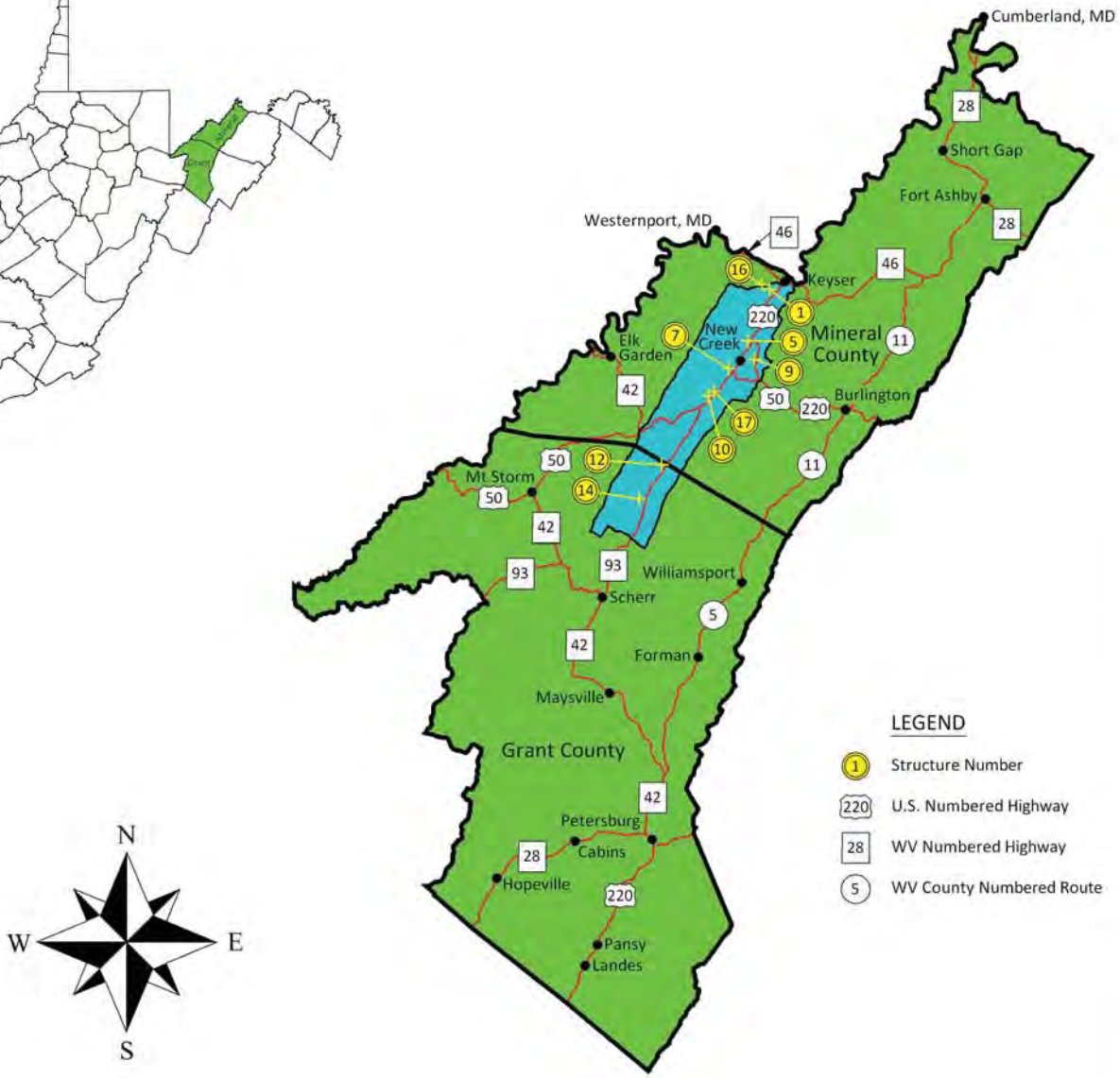
11.6 Rehabilitation Project. Significant modifications to the principal spillway outlet of New Creek Site 1 are needed to bring the dam into compliance with current NRCS high hazard dam design criteria, for the known deficiencies. This would include rehabilitation of the conduit, plunge pool or other method of energy dissipation, embankment drains, and the downstream discharge channel. A planning level total project cost to make structural modifications to the dam to meet current NRCS design criteria is estimated to be between $1,500,000 and $2,000,000. This estimate assumes that major expenditures to address potential embankment and auxiliary spillway integrity deficiencies are not required, as discussed in Section 9 and Section 11.2.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

JUNE 2010

NEW CREEK WATERSHED

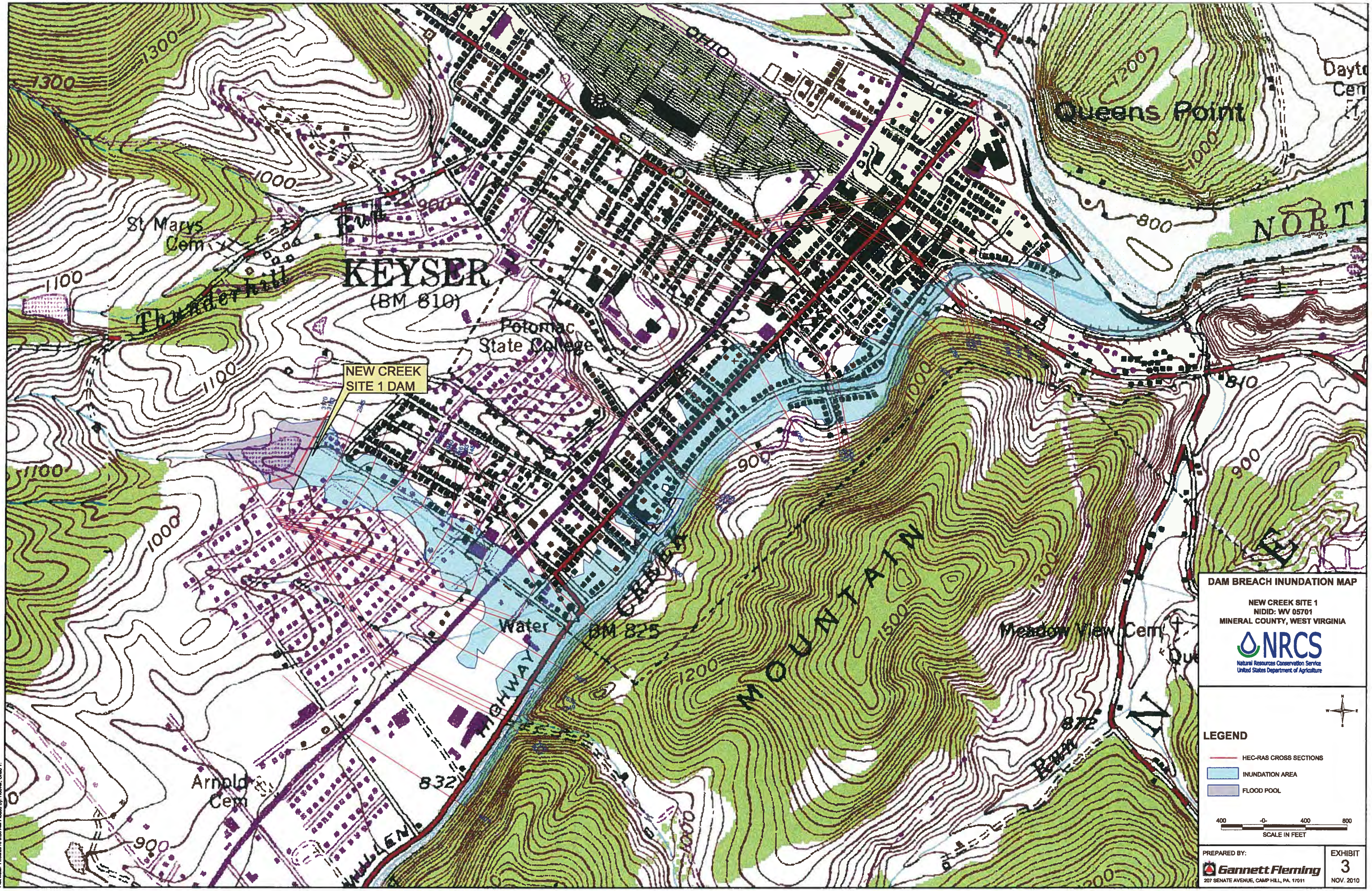
MINERAL AND GRANT COUNTY, WEST VIRGINIA



WBD-WV HUC-12 020700020401

EXHIBIT 1


NEW CREEK
SITE 1 DAM
DAM BREACH INUNDATION MAP
NEW CREEK SITE 1
NIDID: WV 05701
MINERAL COUNTY, WEST VIRGINIA
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
N
W
E
S
LEGEND
HEC-RAS CROSS SECTIONS
INUNDATION AREA
FLOOD POOL
400
-0-
400
800
SCALE IN FEET
PREPARED BY:
Gannett Fleming
207 SENATE AVENUE, CAMP HILL, PA. 17011
EXHIBIT
2
NOV. 2010


Queens Point
NORTH
KEYSER
(BM 810)
St Marys Cem
Thunderhill Run
Potomac State College
NEW CREEK
SITE 1 DAM
Water
BM 825
HIGHWAY
CREEK
MOUNTAIN
Meadow View Cem
Arnold Cem
832
872
DAM BREACH INUNDATION MAP
NEW CREEK SITE 1
NIDID: WV 05701
MINERAL COUNTY, WEST VIRGINIA
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
LEGEND
HEC-RAS CROSS SECTIONS
INUNDATION AREA
FLOOD POOL
400 -0- 400 800
SCALE IN FEET
PREPARED BY:
Gannett Fleming
207 SENATE AVENUE, CAMP HILL, PA. 17011
EXHIBIT
3
NOV. 2010

Appendix A
Selected As-Built Drawings

"As Built"

POTOMAC RIVER FLOOD PREVENTION PROJECT
NEW CREEK SITE NE-P #1
KEYSER, WEST VIRGINIA

DRAINAGE AREA	226.	ACRES
FLOODWATER DETENTION CAPACITY	90.2	AC. FT.
SEDIMENT STORAGE	11.0	AC. FT.
SEDIMENT POOL AREA	2.1	ACRES
HEIGHT OF DAM	35.	FEET
PRINCIPAL SPILLWAY DIAMETER	24.	INCHES

BUILT BY THE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

COOPERATING WITH

POTOMAC VALLEY
SOIL CONSERVATION DISTRICT

INDEX

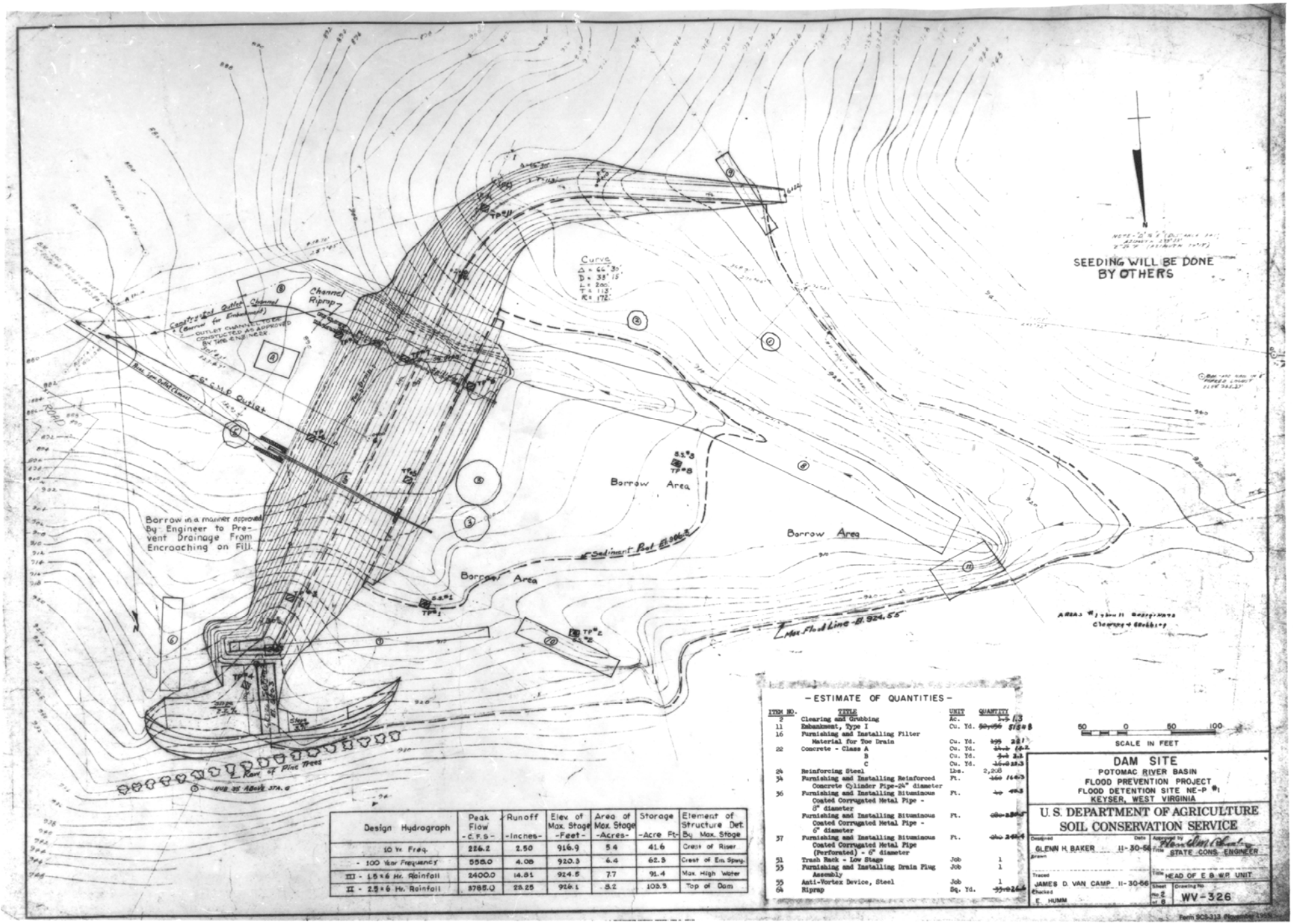
"AS BUILT"

"AS BUILT"

POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed GLENN H. BAKER	Date 11-30-56	Approved by Title STATE CONS. ENGINEER
Drawn		Title HEAD OF E & WP UNIT
Traced		Sheet No. 1 of 8 — Drawing No. WV-326
Checked		



Design Hydrograph	Peak Flow -C.F.S-	Runoff -Inches-	Elev. of Max. Stage -Feet-	Area of Max. Stage -Acres-	Storage -Acre Ft-	Element of Structure Det. By Max. Stage
10 Yr. Freq.	226.2	2.50	916.9	5.4	41.6	Crest of Riser
- 100 Year Frequency	555.0	4.08	920.3	6.4	62.3	Crest of Em. Spwy.
III - 1.5 x 6 Hr. Rainfall	2400.0	14.81	924.5	7.7	91.4	Max. High Water
II - 2.5 x 6 Hr. Rainfall	3785.0	23.25	926.1	8.2	103.3	Top of Dam

-ESTIMATE OF QUANTITIES-

ITEM NO.	TITLE	UNIT	QUANTITY
2	Clearing and Grubbing	Ac.	1.3
11	Embankment, Type I	Cu. Yd.	51,208
16	Furnishing and Installing Filter Material for Toe Drain	Cu. Yd.	221
22	Concrete - Class A	Cu. Yd.	16.2
	B	Cu. Yd.	2.3
	C	Cu. Yd.	23.3
24	Reinforcing Steel	Lbs.	2,208
34	Furnishing and Installing Reinforced Concrete Cylinder Pipe-24" diameter	Ft.	140
36	Furnishing and Installing Bituminous Coated Corrugated Metal Pipe - 8" diameter	Ft.	40
	Furnishing and Installing Bituminous Coated Corrugated Metal Pipe - 6" diameter	Ft.	280
37	Furnishing and Installing Bituminous Coated Corrugated Metal Pipe (Perforated) - 6" diameter	Ft.	240
51	Trash Rack - Low Stage	Job	1
53	Furnishing and Installing Drain Flag Assembly	Job	1
55	Anti-Vortex Device, Steel	Job	1
64	Riprap	Sq. Yd.	226

50 0 50 100

SCALE IN FEET

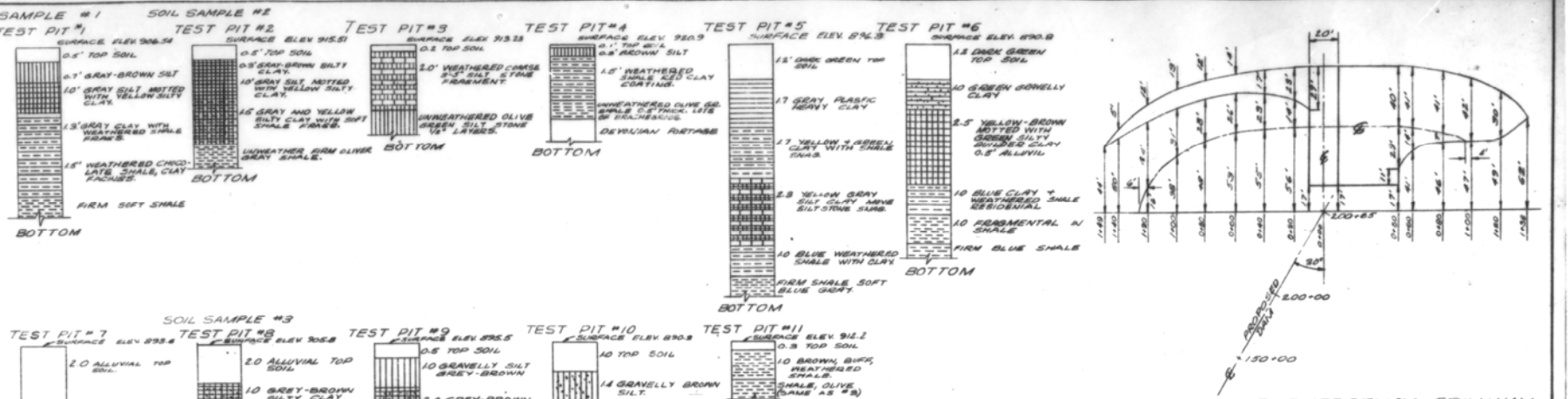
DAM SITE

POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

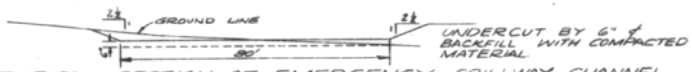
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed GLENN H. BAKER	Date 11-30-56	Approved by [signature] Title STATE CONS. ENGINEER	
Drawn		Title HEAD OF E & W.P. UNIT	
Traced JAMES D. VAN CAMP	11-30-56	Sheet No. 2 of 8	Drawing No. WV-326
Checked E. HUMM			

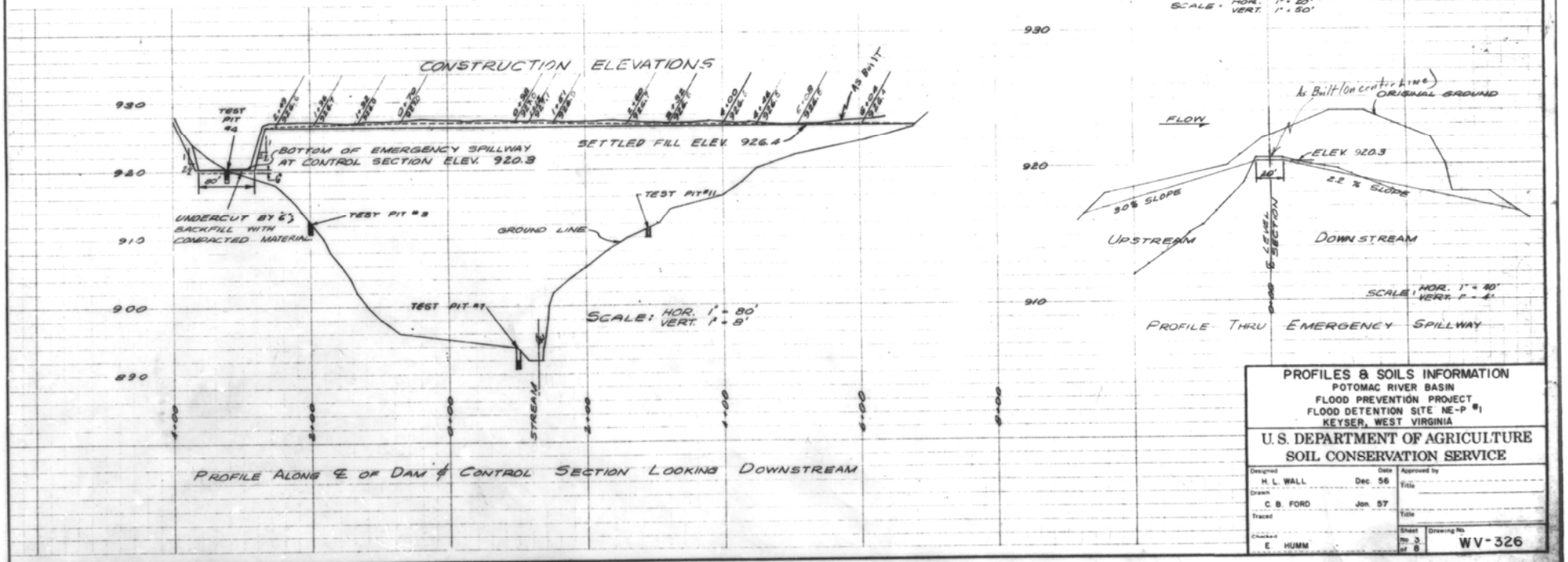
Form SCS-313 (November 1955)



LOCATION OF EMERGENCY SPILLWAY
SCALE: 1" = 40'



TYPICAL SECTION OF EMERGENCY SPILLWAY CHANNEL
SCALE: HOR. 1" = 20'
VERT. 1" = 50'



PROFILE ALONG ℄ OF DAM & CONTROL SECTION LOOKING DOWNSTREAM

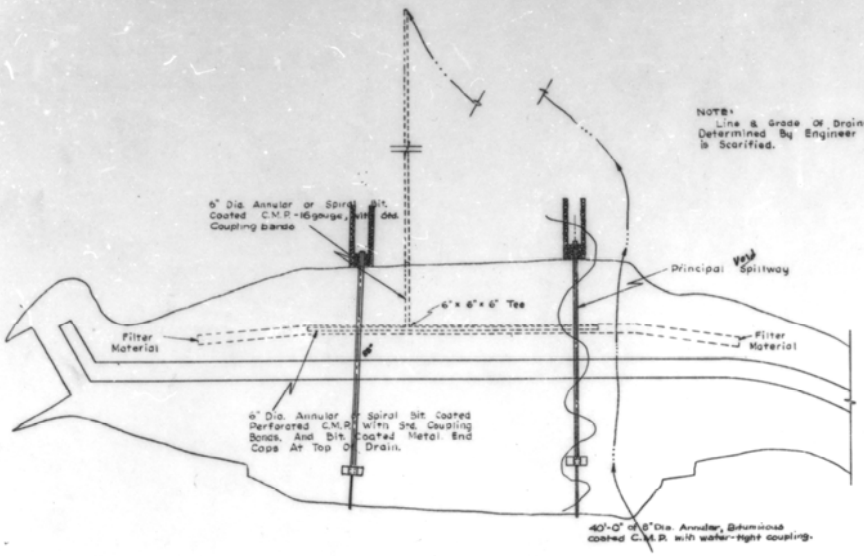
PROFILE THRU EMERGENCY SPILLWAY

PROFILES & SOILS INFORMATION
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

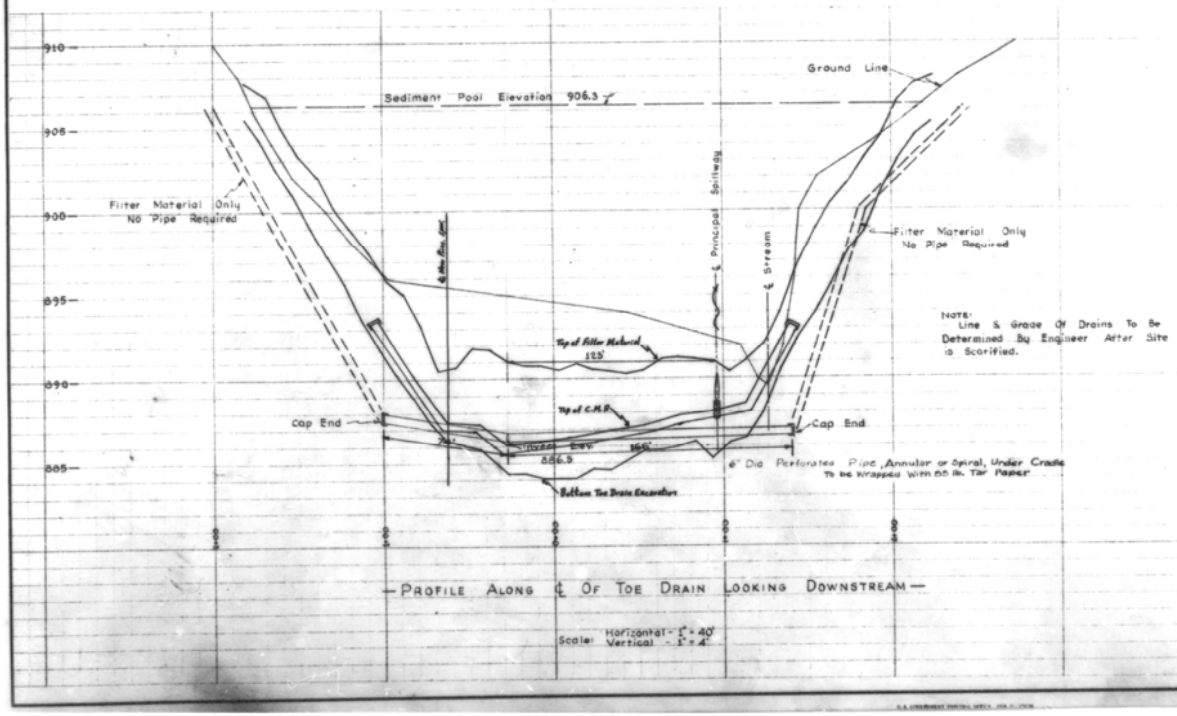
Designed	Date	Approved by
H. L. WALL	Dec. 56	Title
Drawn		
C. B. FORD	Jan. 57	Title
Traced		
Checked	Sheet No. 3 of 8	Drawing No.
E. HUMM		WV-326

Form SCS-317 (November 1955)



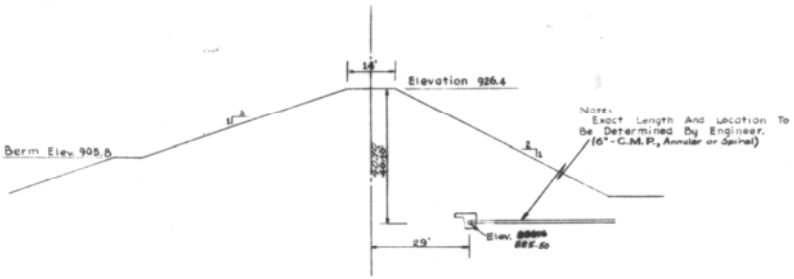
— Plan View Of Toe Drain —

Scale: 1" = 50'



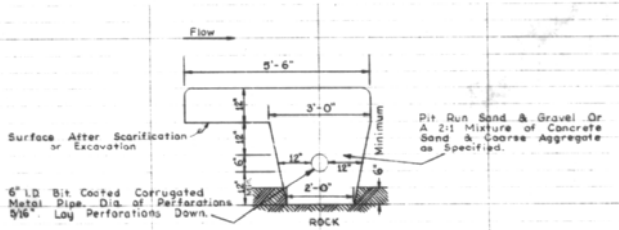
— Profile Along ℄ Of Toe Drain Looking Downstream —

Scale: Horizontal - 1" = 40'
Vertical - 1" = 4'



— Section Thru Fill Showing Toe Drain —

Scale: 1" = 20'



— Typical Section Thru Toe Drain —

NOTE:
Where Only Filter Material is Used Section is the Same as Above, Except Pipe is Omitted.

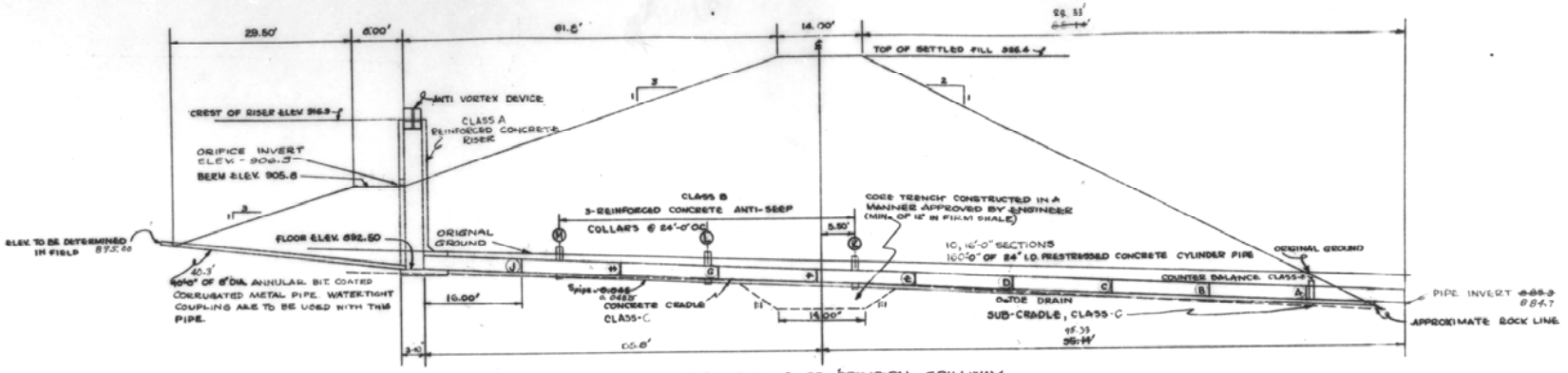
Scale 1" = 2'

TOE DRAIN DETAILS

POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H. L. WALL	Date DEC 56	Approved by Title	
Drawn B. J. GERMANA	DEC 56	Title	
Traced			
Checked E. HUMM		Sheet No. 4 of 8	Drawing No. WV-326



SECTION THRU ℄ OF PRINCIPAL SPILLWAY

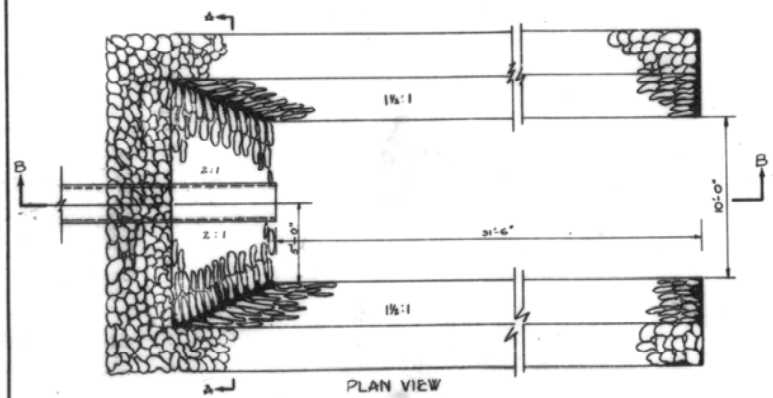
10 0 10 20

POINT	DISTANCE FROM DISCHARGE END OF BARREL IN FEET	ELEVATION OF INVERT	BASE OF DESIGN CRADLE	ELEVATION OF INVERT	BASE OF DESIGN CRADLE
A	16.0	886.08	885.38	885.48	884.77
B	32.0	886.74	886.05	886.26	885.55
C	48.0	887.46	886.77	887.04	886.33
D	64.0	888.18	887.49	887.82	887.11
E	80.0	888.9	888.21	888.60	887.89
F	96.0	889.62	888.93	889.38	888.67
G	112.0	890.7	890.01	890.16	889.46
H	128.0	891.66	890.97	890.94	890.23
J	144.0	891.78	891.09	891.72	891.01
K	159.64	889.38	888.64	889.04	888.35
L	173.64	890.40	889.71	890.24	889.53
M	187.64	891.49	890.80	891.41	890.70

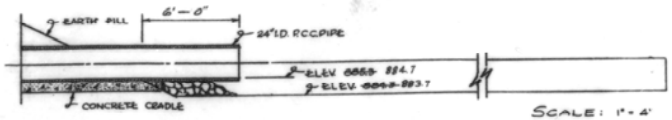
NOTE: ABOVE DIMENSIONS OF LENGTH OF PIPE ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE CREEP

SEE SHEET 6 OF 8 FOR DETAIL OF PIPE CONNECTION TO RISER

NOTE: FOR DETAILS OF ANTI-VORTEX DEVICE SEE SHEET 8 OF 8
FOR DETAILS OF RISER SEE SHEET 6 OF 8



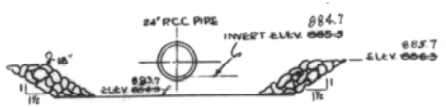
PLAN VIEW



SCALE: 1"=4'

SECTION B-B ON CENTERLINE

RIP-RAP AT OUTLET



SECTION A-A

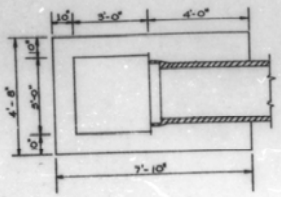
RIP-RAP SIDES TO LEVEL OF SURROUNDING FUTURE GROUND ELEVATION OR TO DEPTH DETERMINED BY ENGINEER

SECTION THRU PRINCIPAL SPILLWAY
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

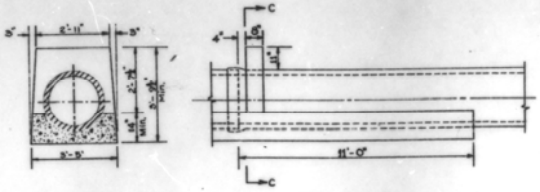
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
H L WALL	DEC 56	Title
Drawn		
G J MERCER	DEC 56	Title
Traced		
Checked	Sheet No. 5 of 8	Drawing No. WV-326
E HUMM		

Form SCS-313 (November

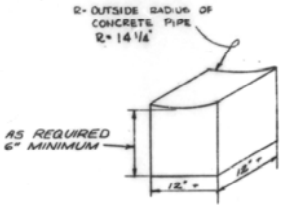


SECTION A-A

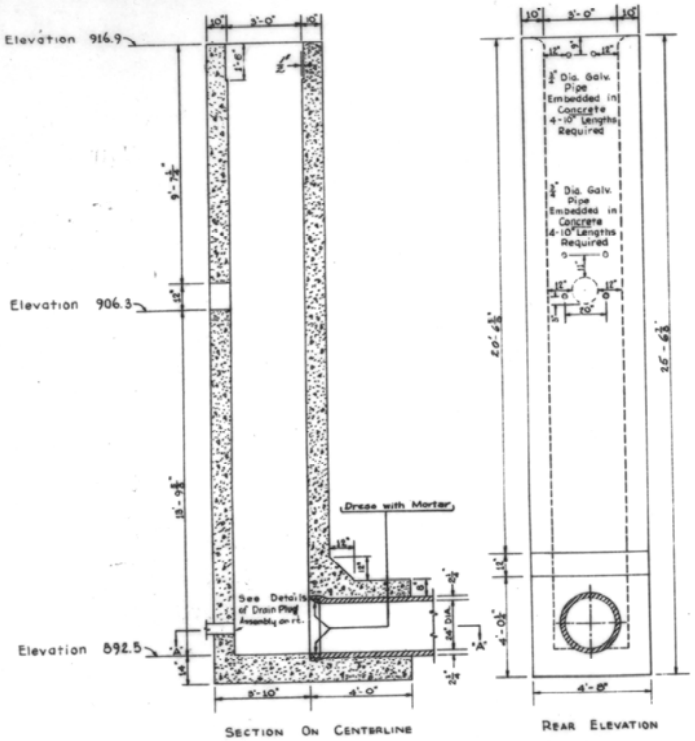


SECTION C-C SIDE ELEVATION

DETAILS OF REINFORCED CONCRETE COUNTER BALANCE
CLASS - "B" CONCRETE

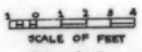


SUPPORT BLOCK

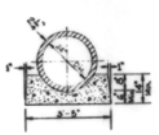


SECTION ON CENTERLINE REAR ELEVATION

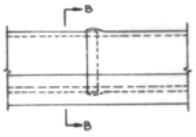
— DETAILS OF REINFORCED CONCRETE RISER —
CLASS - "A" CONCRETE



SCALE OF FEET
3/8" = 1'-0"

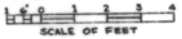


SECTION B-B

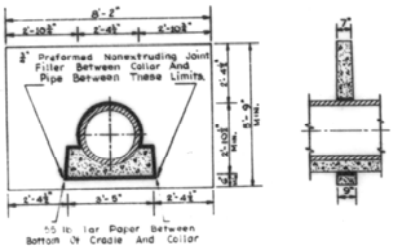


SIDE ELEVATION

—DETAILS OF CONCRETE CRADLE—
CLASS - "C" CONCRETE

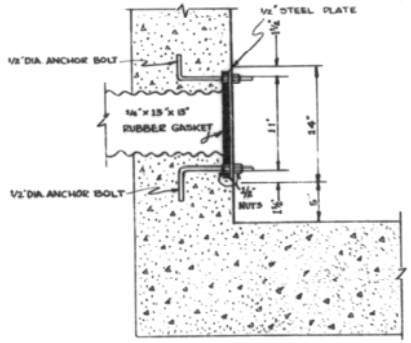


SCALE OF FEET
1" = 1'-0"



— DETAILS OF REINFORCED CONCRETE —
ANTI-SEEP COLLAR
CLASS - "B" CONCRETE

NOTE: FOR DETAILS OF STEEL PLATE AND ANCHOR BOLTS, SEE SHEET 8 OF 8



DETAILS OF DRAIN PLUG ASSEMBLY

SCALE OF FEET
1 1/2" = 1'-0"

NOTE:
For Steel Details Of Riser And Anti-Seep Collar See Sheet 7

For Details Of Trash Racks See Sheet 6

Locate Drain Pipe To Avoid Bending Or Cutting Reinforcing Steel.

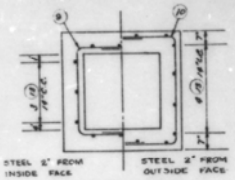
For Details Of Anti-Vortex Device See Sheet 6

STRUCTURAL DIMENSIONS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

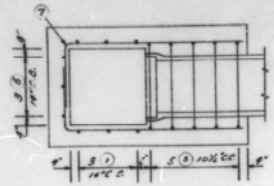
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H.L. WALL	Date JAN57	Approved by	
Drawn B. GERMANA	JAN57	Title	
Traced		Title	
Checked E. HUMM		Sheet No. 6	Drawing No. WV-326
		Sheets No. 8	

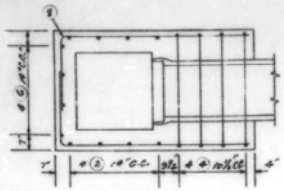
Form SCS-313 (November 1955)



SECTION A-A

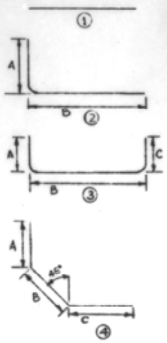


SECTION B-B



SECTION C-C

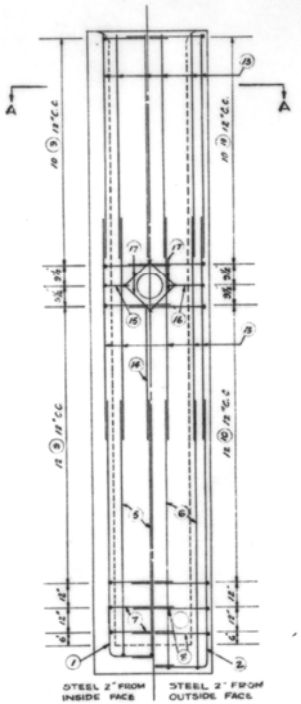
BAR TYPES



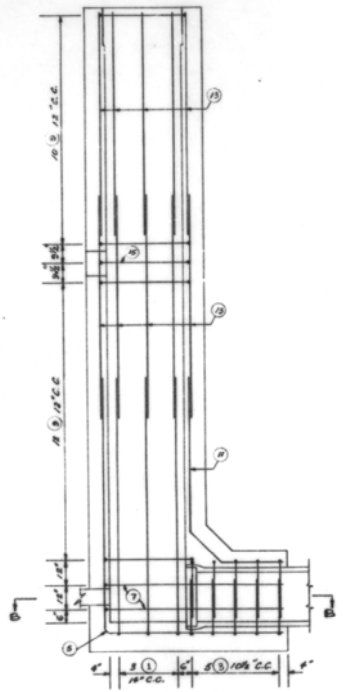
STEEL SCHEDULE

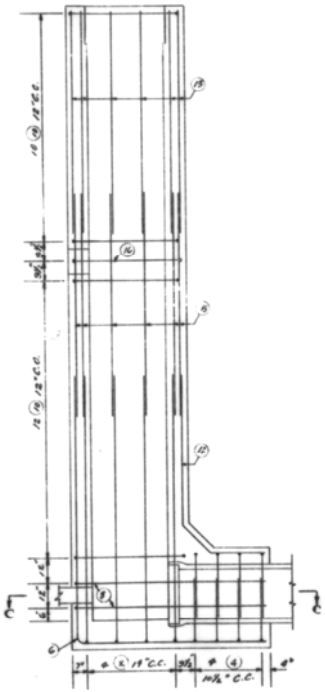
MARK	LOCATION	QUAN.	SIZE	LENGTH	TYPE	A	B	C	TOTAL
1	RISER	6	5	12-9	2	10-3	2-6	—	76-6
2	"	8	5	13-9	2	10-9	3-0	—	110-0
3	RISER EXTENS.	10	5	8-0	3	2-3	3-6	2-3	80-0
4	RISER EXTENS	3	5	9-3	3	2-6	4-3	2-6	28-0
5	RISER	3	5	17-3	2	10-3	7-0	—	51-9
6	"	4	5	18-3	2	10-9	7-6	—	73-0
7	"	4	5	9-6	2	7-0	2-6	—	38-0
8	"	4	5	10-6	2	7-6	3-0	—	42-0
9	"	44	5	8-6	3	2-6	3-6	2-6	374-0
10	"	44	5	10-3	3	2-0	4-3	3-0	451-0
11	"	3	5	10-6	4	6-3	1-9	2-6	31-6
12	"	4	5	9-8	4	6-0	1-6	2-8	39-0
13	"	58	5	8-9	1	—	—	—	471-6
14	"	2	5	5-3	1	—	—	—	10-6
15	"	2	5	7-0	3	1-0	3-6	2-6	18-0
16	"	2	5	8-9	3	1-6	4-2	3-0	17-6
17	"	2	5	6-6	1	—	—	—	13-0
18	COLLAR (3)	12	4	8'3	1	—	—	—	99-6
19	"	30	4	2-0	1	—	—	—	60-0
20	"	7	4	7-9	1	—	—	—	54-9
21	COUNTERBALANCE	1	4	9-3	3	2-3	2-9	3-3	9-3

No. 4 Bars 235'-6"
No. 5 Bars 1967'-3"
No.4 BARS 156.0 Lbs.
No.5 BARS 2051.8 Lbs.

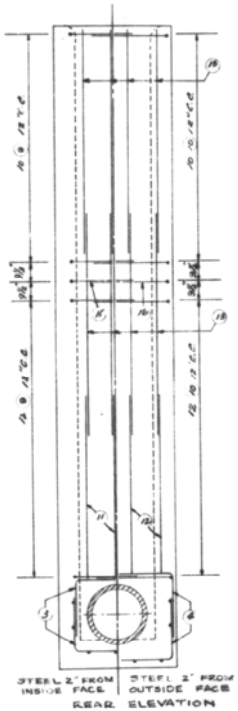


FRONT ELEVATION



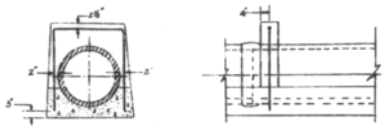


SECTION ON CENTERLINE

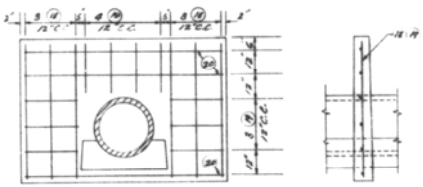


REAR ELEVATION

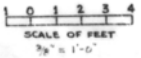
Steel Details Of Reinforced Concrete Riser
Class "A" Concrete



Steel Details of Reinforced Concrete Counter Balance
Class "B" Concrete



Steel Details Of Reinforced Concrete
Anti-Seep Collar
Class "B"



SCALE OF FEET
3/8" = 1'-0"

PLACE 8" DRAIN PIPE TO AVOID PASSING OF REINFORCING STEEL

2" OF CLEAR CONCRETE COVER IN SIDES OF RISER.

3" OF CLEAR CONCRETE COVER IN BASE OF RISER. (CONCRETE THAT IS POURED AGAINST EARTH.)

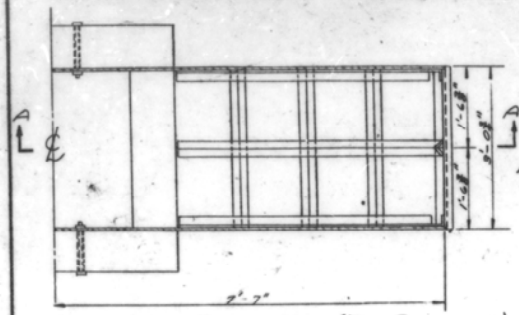
ALL STEEL IN RISER NO. 5 - 13" OVERLAP

REINFORCING STEEL DETAILS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #1
KEYSER, WEST VIRGINIA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H.L. WALL	Date DEC 56	Approved by Title	
Drawn B.J. GERMANA	Date DEC 56	Title	
Traced			
Checked E. HUMM		Sheet No 7 of 8	Drawing No WV-326

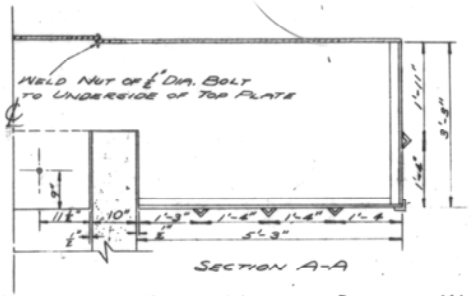
Form SCS-313 (November 1955)



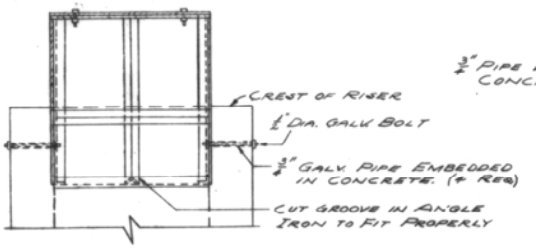
ONE-HALF PLAN VIEW (TOP REMOVED)

BOLTS REQUIRED		
ITEM	QUAN.	SIZE
LOW STAGE INLET TRASH RCK.	4	⅝"×12"
ANTI-VORTEX DEVICE	1	⅝"×12"
ANTI-VORTEX DEVICE CAP PL.	4	⅝"×1½"

NOTE: ALL ANGLE IRON 2½"×2½"×¼"
ALL NUTS & BOLTS TO BE GALVANIZED
ALL POINTS OF CONTACT OF ANGLE IRON TO ANGLE IRON TO BE FILLET WELDED
EST. QUAN. OF ANGLE IRON REQ FOR ANTI-VORTEX DEVICE; 81.6 LINEAR FT.
TRASH RACK & COVER PLATE FOR DRAIN TO BE GALVANIZED OR PAINTED AS SPECIFIED AFTER FABRICATION.
TOP PLATE IS WELDED TO SIDE PLATES, & ANGLE IRONS ARE WELDED TO SIDE PLATES.



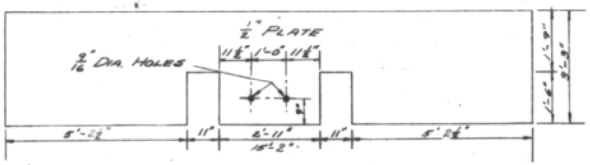
SECTION A-A



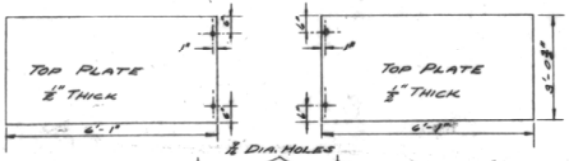
END VIEW

DETAILS OF ANTI-VORTEX DEVICE WITH TRASH RACK (1 REQ.)

SCALE OF FEET

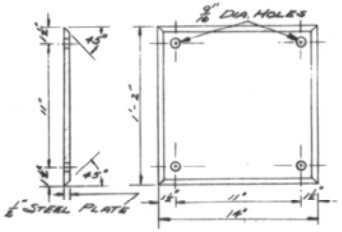


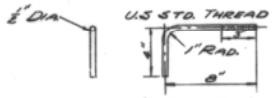
SIDE PLATE FOR ANTI-VORTEX DEVICE
(2 SIDE PLATES REQ.)



TOP PLATE & CAP FOR ANTI-VORTEX DEVICE

SCALE OF FEET

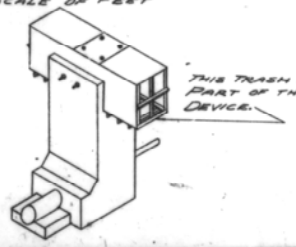




(4 EACH REQ)

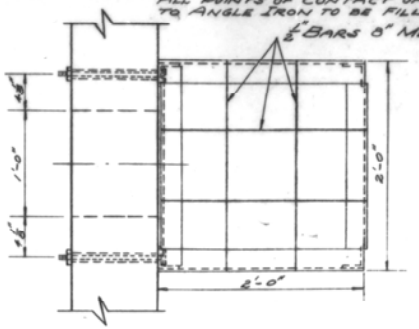
DETAILS OF COVER PLATE & ANCHOR BOLT FOR DRAIN

SCALE OF FEET

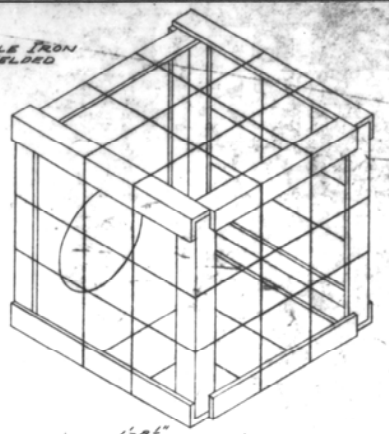


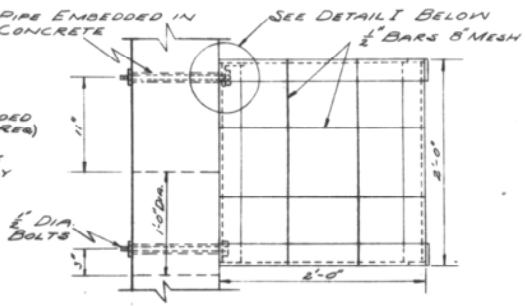
THIS TRASH RACK IS A PART OF THE ANTI-VORTEX DEVICE.

LOW STAGE TRASH RACK
NOTE: ALL ANGLE IRON 2½"×2½"×¼"
ALL POINTS OF CONTACT OF ANGLE IRON TO ANGLE IRON TO BE FILLET WELDED

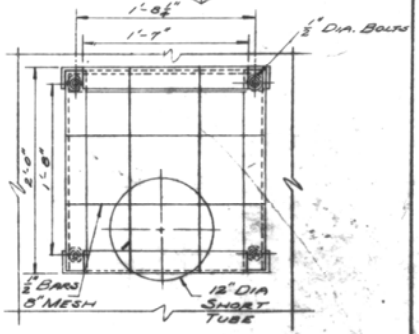


TOP VIEW





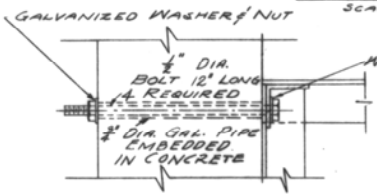
SIDE VIEW

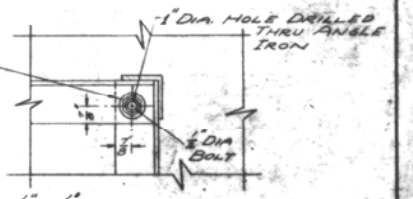


FRONT VIEW

LOW STAGE INLET TRASH RACK (1 REQUIRED)

SCALE OF FEET





ALL ANGLE IRON 2½" × 2½" × ¼"

DETAIL I

LOW STAGE TRASH RACK
ESTIMATE OF QUANTITIES
2½"×2½"×¼" ANGLE IRONS — 22.5 LIN.FT.
½" DIA. BARS — 40.0 LIN.FT.
½" DIA. BOLTS — 4 EACH
¾" DIA PIPE, 10" LONG — 4 EACH

TRASH RACK & MISC. DETAILS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P
KEYSER, WEST VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H. L. WALL	Date DEC 55	Approved by	
Drawn		Title	
Traced		Title	
Checked C. HUSH		Sheet No. 8 of 8	Drawing No. WV-326

NRCS

APPENDIX B

Appendix B
Site Inspection Checklist and Photos

U.S. DEPARTMENT OF AGRICULTURE Natural Resources Conservation Service	**FORMAL DAM INSPECTION CHECKLIST**	WV-ENG-105 3/09

WATERSHED New Creek
COUNTY Mineral
OWNER
ADDRESS

SITE NUMBER 1
NID # 05701 **HAZARD CLASS** C
PURPOSE OF DAM Flood Control
INSPECTION DATE 9/2/2010
WEATHER Sunny, 95° F

ITEM	Y	N	N/A	REMARKS
1. General Conditions				
a. Alterations to dam?	X			Principal spillway conduit has been extended and outlet channel altered.
b. Grass cover adequate?	X			
c. Settlements, misalignments or cracks?		X		
d. Vehicle ruts or animal trails?		X		
e. Fencing adequate?			X	
f. Recent high water marks?		X		elevation
g. Development in flood pool?	X			
h. Development in downstream floodplain?	X			
i. Development in upstream watershed?	X			
2. Upstream Slope				
a. Erosion?		X		
b. Trees?		X		
c. Rodent holes?	X			
d. Cracks, settlements or bulges?		X		
e. Adequate and sound riprap?	X			
3. Downstream Slope				
a. Erosion?		X		
b. Trees?	X			Large trees growing near the principal spillway conduit outlet and toe of dam.
c. Rodent holes?	X			
d. Cracks, settlements, & bulges?		X		
e. Drains or wells flowing?		X		estimated gpm
f. Seepage or boils?		X		estimated gpm
4. Intake Structure concrete X metal				water surface elevation
a. Spalling, cracking, & scaling?				None observed. Interior not accessed.
b. Exposed reinforcement?				None observed. Interior not accessed.
c. Corrosion present?				None observed on visible portion.
d. Manhole cover?	X			
e. Leakage?				estimated gpm None observed. Interior not accessed.
f. Trash rack adequate?		X		Lower trash rack is corroded and needs to be replaced.
g. Inlet obstructed?		X		
h. Drawdown operative? closed___ open___				Not accessed. Unknown.
i. Ladder intact?			X	
j. Pedestal securely fastened?				Not accessed. Unknown.
k. Floodgates operational?				Not accessed. Unknown.
l. Stem bent?				Visible portion not bent.
m. Stem guides operational?				Not accessed. Unknown.
n. Stem handwheel present?			X	
o. Do metal parts require painting?		X		
5. Abutment Contacts				
a. Erosion, cracks, or slides?		X		
b. Seepage?		X		
c. Gutters intact?	X			
6. Auxiliary Spillway				
a. Obstructions?	X			Small garden plot for adjacent residential home. Several homes and buildings located immediately downstream of spillway.
b. Erosion?		X		
c. Rodent holes?		X		
d. Low areas?	X			Depression due to installation of water line and settlement of backfill runs though the entire auxiliary spillway channel.
e. Slips?		X		

ITEM	Y	N	N/A	REMARKS
7. Conduit & Outlet concrete X metal				tailwater elevation/flow
a. Spalling, cracking, & scaling?	X			Significant damage to concrete observed at conduit outlet.
b. Exposed reinforcement?				None observed. See Note 1.
c. Joints displaced or offset?	X			Observed from outlet.
d. Joint material lost?	X			Observed from outlet.
e. Leakage?				None observed. See Note 1.
f. Earth erosion?				None observed. See Note 1.
g. Conduit misaligned?	X			Observed from outlet.
h. Outlet channel obstructed?	X			Vegetation and undersized culvert obstructing downstream discharge channel.
8. Stilling Basin Plunge Pool				Plunge pool has been filled in and replaced with concrete-lined discharge channel. No energy dissipation structure is in place.
a. Spalling, cracking, & scaling?			X	
b. Exposed reinforcement?			X	
c. Joints displaced or offset?			X	
d. Joint material lost?			X	
e. Joints leak?			X	
f. Rock adequate?				
g. Dissipater deteriorating?			X	
h. Dissipater clean of debris?			X	
i. Toe drains visible?				Original CMP drains were buried in alterations of conduit and plunge pool. There are several PVC
j. Toe drains flowing?				pipes which drain into the discharge channel possibly from the dam embankment and the adjacent
k. Toe drain animal guards in place?				structures. None of these drains were flowing. None of them had animal guards.
9. Reservoir				
a. Buildings in floodpool?	X			Home on left side of auxiliary spillway appears to be on the fringe of the flood pool.
b. Slides or erosion on banks?		X		
c. Debris?		X		
d. Unsecured boats/docks?		X		
e. Sediment deposits?		X		
10. Instruments				
a. Structure instrumented?		X		
b. Monitoring performed?			X	
11. Development				
a. New development upstream of dam?		X		
b. New development downstream of dam?	X			Since dam was constructed.
c. EAP plan and mapping adequate?				To be determined by others.
12. Hazard Classification Correct?	X			

REMARKS:

- Residential development is encroaching on the dam, resulting in modifications to the auxiliary spillway and outlet of the principal spillway conduit and plunge pool. The plunge pool has been backfilled and the conduit extended. The extension of the conduit has been significantly misaligned and damaged. Previous inspections state that flow from the principal spillway conduit is bypassing the extension through a joint gap and draining to an unknown downstream point. It is suspected that the CMP drains have been buried.
- Depression runs though the entire auxiliary spillway channel. This despression was created by the settlement of backfill from the installation of a residential water line.
- Large trees were observed near the principal spillway conduit outlet and toe of dam.
- Lower trash rack is corroded and needs to be replaced.
- Vegetation and undersized culvert are obstructing the discharge channel at the principal spillway outlet.
- Several houses would be at risk of flooding should the auxiliary spillway activate or the principal spillway experience full pipe flow.

Note 1: The conduit and outlet were inspected from the downstream end. A comprehensive inspection of the conduit has not been performed as part of this inspection.

ENGINEER William Franz DATE 11/19/10

PROFESSIONAL ENGINEER SEAL

SIGNATURE _____ Engineer

GENERAL

1. General overview of dam from left side of auxiliary spillway.

2. Principal spillway riser structure.

GENERAL

3. Upstream embankment slope.

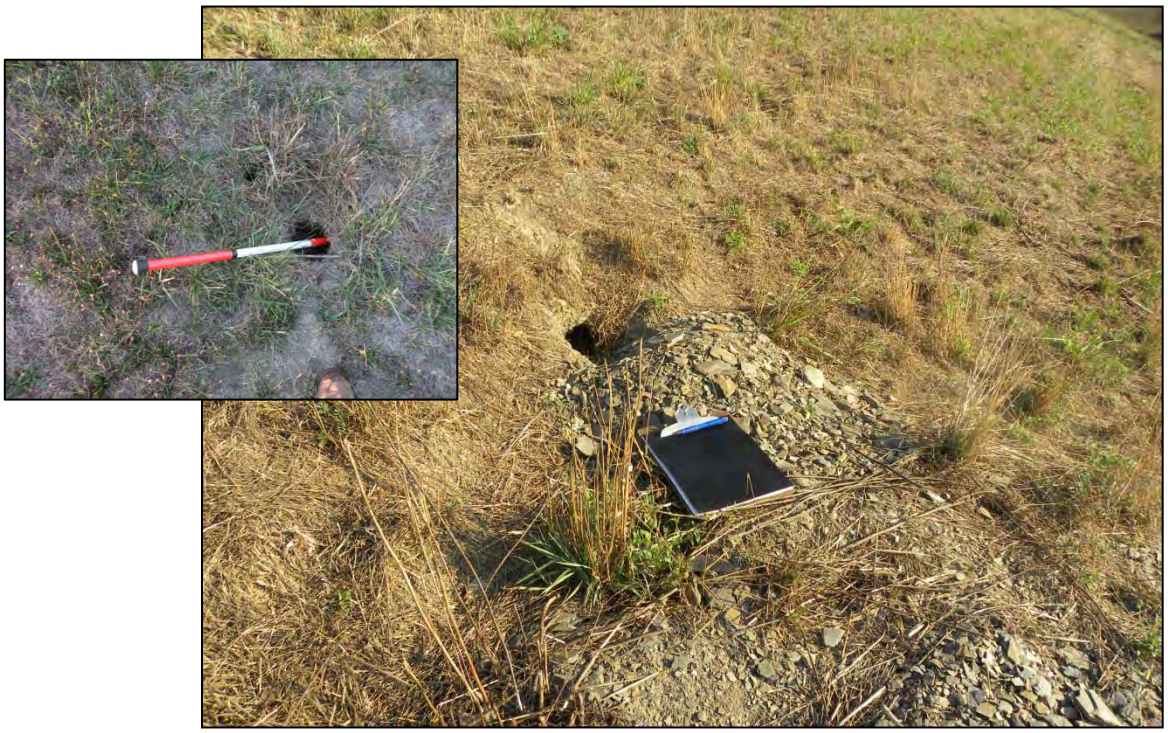
4. Downstream embankment slope.

GENERAL

5. Outlet conduit and discharge channel.

6. Inside of outlet conduit.

OBSERVED DEFICIENCIES



7. Animal burrows on both upstream and downstream slopes of the embankment.

8. Depression through auxiliary spillway due to installation of residential water line and settlement of backfill.

OBSERVED DEFICIENCIES

9. Principal spillway conduit outlet and discharge channel are encroached upon by large trees and residential structures.

10. Principal spillway conduit has been extended and plunge pool replaced with discharge channel. The extension of the conduit is misaligned and significantly damaged near the outlet.

OBSERVED DEFICIENCIES

11. Joint separation and movement is evident at the outlet of the principal spillway conduit extension. Previous inspections have noted significant joint leakage.

12. Vegetation and undersized culvert are obstructing the outlet channel of the principal spillway conduit.

OBSERVED DEFICIENCIES

13. Bottom of lower trash rack has completely corroded away

14. Small garden within the auxiliary spillway.

OBSERVED DEFICIENCIES

15. Residential homes and other structures located immediately downstream of the auxiliary spillway.

16. Residential homes and other structures encroaching on the toe of the dam.

NRCS

Appendix C
SITES Output

NRCS

SITES Output

New Creek Site 1 – ASW Crest Criteria

```
1*************************************************************************
 SITES XEQ 02/10/2011   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
      VER 2005.1.04              (USER MANUAL - DATED DECEMBER 2005)
      TIME 13:55:28

 ************************* 80-80 LIST OF INPUT DATA **************************

 SITES     01/01/2005NC1       New Creek Site 1              0.353125  A1
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 1
                     892.2                                   0
                     894                                     0.01
                     896                                     0.256
                     898                                     0.955
                     900                                     2.159
                     902                                     3.96
                     904                                     6.524
                     906                                     9.995
                     908                                     14.895
                     910                                     21.247
                     912                                     28.776
                     914                                     37.562
                     916                                     47.502
                     918                                     58.475
                     920                                     70.429
                     922                                     83.628
                     924                                     98.061
                     926                                     113.694
                     931                                     160
                     936                                     210
 ENDTABLE
 WSDATA    2C 1   AC 73        226       0.31                6.2
 BASEFLOW            0.95
 PDIRECT             5.82      8.49
 POOLDATA  ELEV                906.3     906.3                       TC
 PSINLET   ELEV      0.75      6         916.9     .89       .89
 PSDATA    1         160.33    24                  0.013     885.7
 GRAPHICS  I
 GO,DESIGN LN
 SAVMOV    2    101  1                   1
 ENDJOB

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

 ***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                  ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                  WSID= NC1
 VER 2005.1.04                                                    SUBW= 1
 TIME 13:55:28           SITE = 1               PASS=    1     PART=   1


 ***************************    BASIC DATA    ********************************
 HUMID- SUBHUMID CLIMATE AREA                     DESIGN CLASS  C

 STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

 STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
 NRCS DESIGN STORM RAINFALL DISTRIBUTION  (CHAPTER 21, NEH4 & TR-60).

 PRECIP. - P-PS,1-DAY    P-PS,10-DAY       Q-SD           Q-FB
               5.82          8.49          0.00           0.00

 WSDATA -       CN          DA-SM          TC/L            -/H           QRF
```

```
             73.00          0.35          0.31          0.00          6.20

SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
             0.00        906.30        906.30          0.00           NO

          BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
             0.95          0.00          0.00         DESIGN

PSDATA -  NO. COND        COND L         DIA/W           -/H
             1.00        160.33         24.00          0.00

             PS N            KE        WEIR L        TW EL
            0.013          0.75          6.00        885.70

           2ND STG         ORF H         ORF L      START AUX.
           916.90          0.89          0.89          0.00

ASCRESTS -   AUX.1         AUX.2         AUX.3         AUX.4         AUX.5
             0.00          0.00          0.00          0.00          0.00

AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                0          0.00          0.00             0

AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
             0.000          0.00         0.000          0.000           NO

BTM WIDTH -    BW1           BW2           BW3           BW4           BW5
             0.00          0.00          0.00          0.00          0.00


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                     SUBW= 1
 TIME 13:55:28            SITE = 1               PASS=    1     PART=   2


 CREST PS        906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 SED ACCUM       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 BASEFLOW        906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 2ND STAGE       916.90 FT      52.4 ACFT      0.00 AC      12.1 CFS

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS


 NRCS-PSH  RAINFALL   1-DAY =   5.82 IN    10-DAY =   8.49 IN    DA =   0.35 SM
           RUNOFF     1-DAY =   2.94 IN    10-DAY =   3.24 IN

      CLIMATIC INDEX = 1.00    CN 10-DAY = 56.    CN 1-DAY =  73.
      QRF  =      2.19 CFS      907.60 FEET,    GIVEN VALUE.

      PEAK =       586.3 CFS, AT  120.0 HRS.


 ROUTED RESULT - HYD TYPE      EMAX         VOL-MAX        AMAX         QMAX
                 NRCS-PSH    918.37 FT      60.7 ACFT      0.00 AC     46.2 CFS

      PS STORAGE      50.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 DRAWDOWN (DDT) TEST        909.20 FT      18.7 ACFT      5.12 CFS
      CONTROL IS 0.150 DETENTION STORAGE

      TIME TO DDT TEST DISCHARGE IS   2.73 DAYS - DRAWDOWN CONTINUING.

      DRAWDOWN TIME =  6.29 DAYS, TO     2.2 CFS    (LIMIT = 10.00 DAYS)


 ****************************************************************************
```

```
 RATING TABLE DEVELOPED, SITE = 1    :
  WITH PS DEVELOPED BY PROGRAM AND NO AUX. DATA GIVEN.


 RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                          FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   924.75     81.43     81.43      0.00    103.94      0.00
 12   930.38     87.09     87.09      0.00    154.22      0.00
 13   936.00     92.41     92.41      0.00    210.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                      SUBW= 1
 TIME 13:55:28            SITE = 1                PASS=    1     PART=   3


 AUX. CREST      918.37 FT      60.7 ACFT      0.00 AC      46.2 CFS

      PS STORAGE     50.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV      907.62 FT      14.0 ACFT      0.00 AC       2.5 CFS

 ELEVATION OF LOW POINT IS ZERO.  NO CRITERIA CHECK MADE FOR
 STRUCTURE CLASSIFICATION.

 ***** MESSAGE - NO INPUT DATA GIVEN FOR AUXILIARY SPILLWAY CREST AND/OR
                 BOTTOM WIDTH.   NO AUXILIARY SPILLWAY ROUTINGS PERFORMED.
 ------------------------------------------------------------------------------

 Inflow Hyd 1 PSH-Peak =         46.23 CFS  at  120.60 hrs.,  Location Point
HYDOUT   1     1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 NC1           New Creek Site 1

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       1 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

 ******************************************************************************
```

```
 SITES.....COMPUTATIONS COMPLETE


1                              SUMMARY TABLE  1          SITES VERSION 2005.1.04
                              ----------------               DATED 01/01/2005


 WATERSHED ID                        RUN DATE                            RUN TIME
 ------------                        --------                            --------
 NC1                               02/10/2011                            13:55:28

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       1        1         0.35     73.   0.31      0.35    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.    MAX.    EMB.  INTEGR.*  EXIT*    TYPE
  NO.  WIDTH    ELEV    WIDTH   HP     ELEV    VOL.   DIST.     VEL.     HYD
      (IN/FT)  (FT)     (FT)  (FT)    (FT)    (CY)   (FT)   (FT/SEC)
 ----  -----  -------  ------  ----  -------  -------  -----  ------  ---------



 SITES.......SUMMARY TABLE 1 COMPLETED.


                    NRCS  SITES    VERSION 2005.1.04 ,01/01/2005
                             NC1      FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_ASW_Crest.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_ASW_Crest.OUT
         DATED 02/10/2011 13:55:28

                         GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_ASW_Crest.DRG DATED 02/10/2011
13:55:28

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_ASW_Crest.DHY DATED 02/10/2011
13:55:28

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_ASW_Crest.DEM DATED 02/10/2011
13:55:28
```

NRCS

SITES Output

New Creek Site 1 – Top of Dam (6-hr)

```
1*******************************************************************************
 SITES XEQ 02/10/2011   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
      VER 2005.1.04              (USER MANUAL - DATED DECEMBER 2005)
      TIME 13:52:14

 ************************* 80-80 LIST OF INPUT DATA **************************

 SITES     01/01/2005NC1       New Creek Site 1              0.353125  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 1
                     892.2                                   0
                     894                                     0.01
                     896                                     0.256
                     898                                     0.955
                     900                                     2.159
                     902                                     3.96
                     904                                     6.524
                     906                                     9.995
                     908                                     14.895
                     910                                     21.247
                     912                                     28.776
                     914                                     37.562
                     916                                     47.502
                     918                                     58.475
                     920                                     70.429
                     922                                     83.628
                     924                                     98.061
                     926                                     113.694
                     931                                     160
                     936                                     210
 ENDTABLE
 WSDATA    2C 1   AC 73        226       0.31
 BASEFLOW             0.95
 PDIRECT                                 9.90      27.30
 POOLDATA  ELEV       906.3     906.3     906.3     892       883.7     TC
 PSINLET   ELEV       0.75      6         916.9     .89       .89
 PSDATA    1          160.33    24                  0.013     885.7
 ASSPRFL   41
           0          916       20        916.91    133       920.3
           153        920.3     330       916.406   340       916
 ENDTABLE
 ASSURFACE 41         330       0.1
           0          20        0.035     0.5       1         1
           20         133       0.035     0.5       1         1
           133        153       0.035     0.5       1         1
           153        330       0.035     0.5       1         1
           330        340       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                             2.5                           2
 BTMWIDTH  FEET       80
 GRAPHICS  I
 GO,DESIGN HL                     6                           906.3
 SAVMOV    2    101  1                   1
 ENDJOB

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

 ***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                   ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

 ***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO   920.30
                 FROM THE ASSPRFL RECORDS.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                   WSID= NC1
```

```
VER 2005.1.04                                                    SUBW= 1
TIME 13:52:14            SITE = 1                PASS=    1     PART=   1


***************************    BASIC DATA    *********************************
HUMID- SUBHUMID CLIMATE AREA                     DESIGN CLASS  C

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION  (CHAPTER 21, NEH4 & TR-60).

PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD           P-FB
              0.00          0.00          9.90          27.30

WSDATA -       CN          DA-SM          TC/L           -/H           QRF
             73.00          0.35          0.31          0.00          0.00

SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
            906.30        906.30        906.30         883.70           NO

          BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
              0.95          0.00          0.00         DESIGN

PSDATA -  NO. COND        COND L         DIA/W           -/H
              1.00        160.33         24.00          0.00

             PS N            KE         WEIR L         TW EL
            0.013          0.75          6.00         885.70

           2ND STG         ORF H          ORF L      START AUX.
            916.90          0.89          0.89         906.30

ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
            920.30          0.00          0.00          0.00          0.00

AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
               41          0.00        153.00               0

AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
             0.035          2.50         0.035           0.022            NO

BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
  ft         80.00          0.00          0.00           0.00          0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                    SUBW= 1
 TIME 13:52:14            SITE = 1                PASS=    1     PART=   2


 PERM POOL       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 CREST PS        906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 SED ACCUM       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 BASEFLOW        906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 2ND STAGE       916.90 FT      52.4 ACFT      0.00 AC      12.1 CFS

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS


 ******************************************************************************
 RATING TABLE DEVELOPED, SITE = 1    :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.
```

```
 RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                             FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   924.75     81.43     81.43      0.00    103.94      0.00
 12   930.38     87.09     87.09      0.00    154.22      0.00
 13   936.00     92.41     92.41      0.00    210.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                      SUBW= 1
 TIME 13:52:14            SITE = 1                PASS=    1     PART=   3


 AUX. CREST      920.30 FT      72.4 ACFT      0.00 AC      76.4 CFS

      PS STORAGE     61.7 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 EFFECTIVE HEIGHT(H)= 28.3 FEET,  PRODUCT=    2049. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=   6.00 HR    P=  9.90 IN     Q=  6.53 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    123.1 ACFT

      PEAK =      1194.9 CFS, AT    2.6 HRS.

 NRCS-FBH      D=   6.00 HR    P= 27.30 IN     Q= 23.31 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    439.3 ACFT

      PEAK =      4188.0 CFS, AT    2.5 HRS.


 ******************************************************************************
 RATING TABLE DEVELOPED, SITE = 1    :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.


 RATING TABLE NUMBER  2
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                             FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   919.52     75.78     75.78      0.00     67.56      0.00
```

```
 12   919.91     76.21     76.21      0.00     69.89      0.00
 13   920.30     76.65     76.65      0.00     72.41      0.00
 14   921.08    200.72     77.51    123.21     77.59      0.00
 15   921.87    466.42     78.37    388.06     82.77      0.00
 16   923.28   1230.47     79.88   1150.59     92.89      0.00
 17   925.01   2532.02     81.70   2450.32    105.96      0.00
 18   928.15   6036.60     84.90   5951.70    133.61      0.00
 19   932.08  11891.31     88.73  11802.58    170.75      0.00
 20   936.00  19592.89     92.41  19500.48    210.00      0.00
 ************************************************************************

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH  FROM     TO   SLOPE  RETARDANCE  VEGETAL  MAINT. ROOTING  REACH
       STA     STA           CURVE      COVER    CODE   DEPTH  LOCATION
       (ft)    (ft)   (%)    INDEX@     FACTOR          (ft)     *
-----  ----    ----  ------ ----------  -------  -----  ------- --------
  1      0.     20.   -4.5     0.035       **       **     **    INLET
  2     20.    133.   -3.0     0.035       **       **     **    INLET
  3    133.    153.    0.0     0.035       **       **     **    CREST
  4    153.    330.    2.2     0.035     0.50       1     1.0    EXIT !
  5    330.    340.    4.1     0.035     0.50       1     1.0    exit

 @ The program interprets retardance curve index entries of less than 1 as
   Manning's n values.
 * Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and
     rooting depth for inlet and crest reaches in computations.
 ! Reach   4 used in computing exit channel velocities.
 ************************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-SDH          80.0    921.33      79.2       0.0      1.03       6.8

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =      77.8     206.0     283.8

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.59      4.31     0.022     0.029

          AUXILIARY SPILLWAY DURATION FLOW =        3.7 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   4.3 FT/SEC
                                           EXIT SLOPE  = 0.022 FT/FT
                                           FLOW DEPTH  =   0.6 FT
         ********************************************************************

         EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
         (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
           Aux. Spillway Discharge =     206. cfs;   Bottom Width =    80. ft

                                                                 TOTAL  EFFECTIVE
           REACH   FROM    TO    SLOPE  MANNING`S  VELOCITY  STRESS  STRESS
            NO.    STA     STA     %        n        ft/s    lb/ft^2 lb/ft^2
             4     153.    330.   2.20   0.035       4.34      0.80   0.100
         ********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH          80.0    926.34     116.8       0.0      6.04      44.4

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       83.     3828.     3911.

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
```

```
           SPILLWAY ---     3.97     10.73     0.012     0.016

           AUXILIARY SPILLWAY DURATION FLOW =        4.8 HOURS
                              ATTACK, OE/B =        4.3 ACFT/FT

           EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  13.1 FT/SEC
                                            EXIT SLOPE  = 0.022 FT/FT
                                            FLOW DEPTH  =   3.3 FT

 Inflow Hyd 1 SDH-Peak =        283.76 CFS  at    3.56 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       3911.04 CFS  at    2.65 hrs.,  Location Point
HYDOUT   1     1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 NC1           New Creek Site 1

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       2 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

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



 SITES.....COMPUTATIONS COMPLETE


1                              SUMMARY TABLE  1          SITES VERSION 2005.1.04
                              ----------------               DATED 01/01/2005


 WATERSHED ID                        RUN DATE                          RUN TIME
 ------------                        --------                          --------
 NC1                                02/10/2011                         13:52:14

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
        ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       1        1         0.35     73.   0.31      0.35    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.    MAX.    EMB.  INTEGR.*  EXIT*    TYPE
  NO.  WIDTH    ELEV    WIDTH   HP     ELEV    VOL.   DIST.     VEL.     HYD
      (IN/FT)   (FT)     (FT)  (FT)    (FT)    (CY)   (FT)   (FT/SEC)
 ----  -----  -------  ------  ----  -------  -------  -----  ------  ---------
    1   24.0    920.3    80.0   6.0    926.3       0.     0.    13.1  NRCS-FBH


 *  INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED
    HYDROGRAPH SHOWN UNDER TYPE HYD.



 SITES.......SUMMARY TABLE 1 COMPLETED.


                    NRCS  SITES    VERSION 2005.1.04 ,01/01/2005
                             NC1      FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_TOD_Crest.D2C
```

```
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_TOD_Crest.OUT
         DATED 02/10/2011 13:52:14

                        GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_TOD_Crest.DRG DATED 02/10/2011
13:52:14

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_TOD_Crest.DHY DATED 02/10/2011
13:52:14

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_TOD_Crest.DEM DATED 02/10/2011
13:52:14
```

NRCS

SITES Output

New Creek Site 1 – Top of Dam (24-hr)

```
1*******************************************************************************
 SITES XEQ 02/10/2011   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
      VER 2005.1.04              (USER MANUAL - DATED DECEMBER 2005)
      TIME 13:54:40

 ************************* 80-80 LIST OF INPUT DATA **************************

 SITES     01/01/2005NC1       New Creek Site 1              0.353125  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 1
                     892.2                                   0
                     894                                     0.01
                     896                                     0.256
                     898                                     0.955
                     900                                     2.159
                     902                                     3.96
                     904                                     6.524
                     906                                     9.995
                     908                                     14.895
                     910                                     21.247
                     912                                     28.776
                     914                                     37.562
                     916                                     47.502
                     918                                     58.475
                     920                                     70.429
                     922                                     83.628
                     924                                     98.061
                     926                                     113.694
                     931                                     160
                     936                                     210
 ENDTABLE
 WSDATA    2C 1   AC 73        226       0.31
 BASEFLOW             0.95
 RAINTABLE 1          24
                     0         0.008     0.0162    0.0246    0.0333
                     0.0425    0.0524    0.063     0.0743    0.0863
                     0.099     0.1124    0.1265    0.142     0.1595
                     0.18      0.205     0.255     0.345     0.437
                     0.53      0.603     0.633     0.66      0.684
                     0.705     0.724     0.742     0.759     0.775
                     0.79      0.8043    0.818     0.8312    0.8439
                     0.8561    0.8678    0.879     0.8898    0.9002
                     0.9103    0.9201    0.9297    0.9391    0.9483
                     0.9573    0.9661    0.9747    0.9832    0.9916
                     1
 ENDTABLE
 PDIRECT                                13.35     34.80
 POOLDATA  ELEV       906.3     906.3     906.3     892       883.7     TC
 PSINLET   ELEV       0.75      6         916.9     .89       .89
 PSDATA    1          160.33    24                  0.013     885.7
 ASSPRFL   41
           0          916       20        916.91    133       920.3
           153        920.3     330       916.406   340       916
 ENDTABLE
 ASSURFACE 41         330       0.1
           0          20        0.035     0.5       1         1
           20         133       0.035     0.5       1         1
           133        153       0.035     0.5       1         1
           153        330       0.035     0.5       1         1
           330        340       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                               2.5                           2
 BTMWIDTH  FEET       80
 GRAPHICS  I
 GO,DESIGN HL         1         24                            906.3
 SAVMOV    2    101   1                   1
```

```
 ENDJOB

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

 ***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                  ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

 ***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO   920.30
                FROM THE ASSPRFL RECORDS.


1SITES ---------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                    WSID= NC1
 VER 2005.1.04                                                       SUBW= 1
 TIME 13:54:40            SITE = 1                 PASS=    1     PART=   1


 ****************************    BASIC DATA    ********************************
 HUMID- SUBHUMID CLIMATE AREA                      DESIGN CLASS  C

 STORM DISTRIBUTION AUX. -

 PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD           P-FB
               0.00          0.00         13.35          34.80

 WSDATA -       CN          DA-SM          TC/L            -/H           QRF
              73.00           0.35          0.31           0.00          0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
             906.30        906.30        906.30         883.70           NO

           BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
               0.95          0.00          0.00         DESIGN

 PSDATA -  NO. COND        COND L         DIA/W           -/H
               1.00        160.33         24.00          0.00

              PS N            KE         WEIR L         TW EL
             0.013          0.75          6.00         885.70

            2ND STG         ORF H          ORF L      START AUX.
             916.90          0.89          0.89         906.30

 ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
             920.30          0.00          0.00           0.00          0.00

 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                 41          0.00        153.00               0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035           0.022           NO

 BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
   ft         80.00          0.00          0.00           0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ---------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                    WSID= NC1
 VER 2005.1.04                                                       SUBW= 1
 TIME 13:54:40            SITE = 1                 PASS=    1     PART=   2


 PERM POOL       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 CREST PS        906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 SED ACCUM       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS
```

```
BASEFLOW        906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

2ND STAGE       916.90 FT      52.4 ACFT      0.00 AC      12.1 CFS

START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS


*******************************************************************************
RATING TABLE DEVELOPED, SITE = 1    :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.


RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                          FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   924.75     81.43     81.43      0.00    103.94      0.00
 12   930.38     87.09     87.09      0.00    154.22      0.00
 13   936.00     92.41     92.41      0.00    210.00      0.00


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                     SUBW= 1
 TIME 13:54:40            SITE = 1                PASS=    1     PART=   3


 AUX. CREST      920.30 FT      72.4 ACFT      0.00 AC      76.4 CFS

      PS STORAGE     61.7 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 EFFECTIVE HEIGHT(H)= 28.3 FEET,  PRODUCT=    2049. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=  24.00 HR    P= 13.35 IN     Q=  9.75 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    184.2 ACFT

      PEAK =       498.6 CFS, AT    9.7 HRS.

 NRCS-FBH      D=  24.00 HR    P= 34.80 IN     Q= 30.72 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    579.3 ACFT

      PEAK =      1481.6 CFS, AT    9.6 HRS.


*******************************************************************************
RATING TABLE DEVELOPED, SITE = 1    :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.


RATING TABLE NUMBER  2
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
```

```
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                             FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   919.52     75.78     75.78      0.00     67.56      0.00
 12   919.91     76.21     76.21      0.00     69.89      0.00
 13   920.30     76.65     76.65      0.00     72.41      0.00
 14   921.08    200.72     77.51    123.21     77.59      0.00
 15   921.87    466.42     78.37    388.06     82.77      0.00
 16   923.28   1230.47     79.88   1150.59     92.89      0.00
 17   925.01   2532.02     81.70   2450.32    105.96      0.00
 18   928.15   6036.60     84.90   5951.70    133.61      0.00
 19   932.08  11891.31     88.73  11802.58    170.75      0.00
 20   936.00  19592.89     92.41  19500.48    210.00      0.00
 ************************************************************************

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH  FROM     TO   SLOPE  RETARDANCE  VEGETAL  MAINT. ROOTING  REACH
       STA     STA           CURVE      COVER    CODE   DEPTH  LOCATION
       (ft)    (ft)   (%)    INDEX@     FACTOR          (ft)     *
-----  ----    ----  ------ ----------  -------  -----  ------- --------
  1      0.     20.   -4.5     0.035       **       **     **    INLET
  2     20.    133.   -3.0     0.035       **       **     **    INLET
  3    133.    153.    0.0     0.035       **       **     **    CREST
  4    153.    330.    2.2     0.035     0.50       1     1.0    EXIT !
  5    330.    340.    4.1     0.035     0.50       1     1.0    exit

 @ The program interprets retardance curve index entries of less than 1 as
   Manning's n values.
 * Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and
     rooting depth for inlet and crest reaches in computations.
 ! Reach   4 used in computing exit channel velocities.
 ************************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-SDH          80.0    921.60      81.0       0.0      1.30       8.6

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =      78.1     297.6     375.7

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.75      4.85     0.020     0.027

          AUXILIARY SPILLWAY DURATION FLOW =        7.0 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   5.0 FT/SEC
                                           EXIT SLOPE  = 0.022 FT/FT
                                           FLOW DEPTH  =   0.7 FT
         ********************************************************************

         EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
         (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
           Aux. Spillway Discharge =     298. cfs;   Bottom Width =    80. ft

                                                                 TOTAL  EFFECTIVE
           REACH   FROM    TO    SLOPE  MANNING`S  VELOCITY  STRESS  STRESS
            NO.    STA     STA     %        n        ft/s    lb/ft^2 lb/ft^2
             4     153.    330.   2.20   0.035       5.00      1.00   0.124
```

```
         ****************************************************************

 ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
 RESULTS          FT        FT        ACFT      AC         FT       ACFT
 NRCS-FBH          80.0    923.62      95.3       0.0      3.32      22.9

           PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
           DISCHARGE  =       80.     1396.     1476.

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
           AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
           SPILLWAY ---     2.07      7.92     0.014     0.019

           AUXILIARY SPILLWAY DURATION FLOW =       16.9 HOURS
                             ATTACK, OE/B =        5.0 ACFT/FT

           EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   9.0 FT/SEC
                                            EXIT SLOPE  = 0.022 FT/FT
                                            FLOW DEPTH  =   1.8 FT

 Inflow Hyd 1 SDH-Peak =        375.68 CFS  at   10.24 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       1475.76 CFS  at    9.71 hrs.,  Location Point
HYDOUT   1     1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 NC1           New Creek Site 1

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       2 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

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



 SITES.....COMPUTATIONS COMPLETE


1                             SUMMARY TABLE  1          SITES VERSION 2005.1.04
                             ----------------               DATED 01/01/2005


 WATERSHED ID                        RUN DATE                          RUN TIME
 ------------                        --------                          --------
 NC1                               02/10/2011                          13:54:40

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID     ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       1        1         0.35     73.   0.31      0.35    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.    MAX.    EMB.  INTEGR.*  EXIT*    TYPE
  NO.  WIDTH    ELEV    WIDTH   HP     ELEV    VOL.   DIST.     VEL.     HYD
      (IN/FT)   (FT)     (FT)  (FT)    (FT)    (CY)   (FT)   (FT/SEC)
 ----  -----  -------  ------  ----  -------  -------  -----  ------  ---------
    1   24.0    920.3    80.0   3.3    923.6        0.     0.     9.0  NRCS-FBH


 *  INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED
    HYDROGRAPH SHOWN UNDER TYPE HYD.
```

```
 SITES.......SUMMARY TABLE 1 COMPLETED.


                    NRCS  SITES    VERSION 2005.1.04 ,01/01/2005
                             NC1      FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_TOD_Crest.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_TOD_Crest.OUT
         DATED 02/10/2011 13:54:40

                         GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_TOD_Crest.DRG DATED 02/10/2011
13:54:40

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_TOD_Crest.DHY DATED 02/10/2011
13:54:40

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_TOD_Crest.DEM DATED 02/10/2011
13:54:40
```

NRCS

SITES Output

New Creek Site 1 – ASW Integrity (6-hr)

```
1*****************************************************************************
 SITES XEQ 02/10/2011   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
      VER 2005.1.04              (USER MANUAL - DATED DECEMBER 2005)
      TIME 13:51:17

 ************************* 80-80 LIST OF INPUT DATA **************************

 SITES     01/01/2005NC1       New Creek Site 1              0.353125  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 1
                     892.2                                  0
                     894                                    0.01
                     896                                    0.256
                     898                                    0.955
                     900                                    2.159
                     902                                    3.96
                     904                                    6.524
                     906                                    9.995
                     908                                    14.895
                     910                                    21.247
                     912                                    28.776
                     914                                    37.562
                     916                                    47.502
                     918                                    58.475
                     920                                    70.429
                     922                                    83.628
                     924                                    98.061
                     926                                    113.694
                     931                                    160
                     936                                    210
 ENDTABLE
 WSDATA    2C 1   AC 73        226       0.31
 BASEFLOW             0.95
 PDIRECT                                 9.90      27.30
 POOLDATA  ELEV       906.3     906.3     906.3     892       883.7     TC
 PSINLET   ELEV       0.75      6         916.9     .89       .89
 PSDATA    1          160.33    24                  0.013     885.7
 ASSURFACE 41         330       0.1
           0          20        0.035     0.5       1         1
           20         133       0.035     0.5       1         1
           133        153       0.035     0.5       1         1
           153        330       0.035     0.5       1         1
           330        340       0.035     0.5       1         1
           340        767       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                              2.5                           1
 BTMWIDTH  FEET       80
 ASMATERIAL
           1          4         0.002     12        100       0.17
           2          0         0.5       0         110       2
           3          0         6         0         120       8
 ENDTABLE
 ASCOORD    1         Soil      Y
           0          917       139.3     920.3     159.3     920.3
           320        917       350       915       425       910
           470.30     905       513.1     885       524.9     884.7
           579.9      880       682.7     875       767       870.00
 ENDTABLE
 ASCOORD    2         Shale1
           0          912       139.3     915       159.3     915
           320        912       350       910       470       900
           513        880       767       860
 ENDTABLE
 ASCOORD    3         Shale2
           0          907       139.3     908       159.3     908
           320        907       350       905       470       895
```

```
          513       875       767       860
 ENDTABLE
 GRAPHICS  I
 GO,DESIGN L                   6                            906.3
 SAVMOV    2    101  1                  1
 ENDJOB

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

 ***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                  ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

 ***** MESSAGE - DEFAULT TOPSOIL FILL MATERIAL PARAMETERS USED.

 ***** WARNING - HEADCUT ERODIBILITY INDEX OF      2.0 (MATERIAL  2)
                 APPEARS INCONSISTENT WITH DENSITY OF  110.0.

 ***** WARNING - HEADCUT ERODIBILITY INDEX OF      8.0 (MATERIAL  3)
                 APPEARS INCONSISTENT WITH DENSITY OF  120.0.

 ***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO   920.30
                 FROM THE ASCOORD RECORDS.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                      SUBW= 1
 TIME 13:51:17            SITE = 1                PASS=    1     PART=   1


 **********************    MATERIAL PROPERTIES    ****************************
                            DRY                    PERCENT       DETACH.      REP.
      MATERIAL       PI    DENSITY        Kh        CLAY         RATE      DIAMETER
                           lbs/CuFt                              (Ft/H)/(lb/SqFt)  inches
     Soil            4.      100.      0.17        12.0          --        0.00200
     Shale1          0.      110.      2.00         0.0          --        0.50000
     Shale2          0.      120.      8.00         0.0          --        6.00000
     TS_FILL         0.      100.      0.05         0.0          --        0.05000
     GEN_FILL        4.      100.      0.17        12.0          --        0.00200

 ****************************    BASIC DATA    *********************************
 HUMID- SUBHUMID CLIMATE AREA                    DESIGN CLASS  C

 STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
 NRCS DESIGN STORM RAINFALL DISTRIBUTION  (CHAPTER 21, NEH4 & TR-60).

 PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD          P-FB
               0.00          0.00          9.90         27.30

 WSDATA -       CN          DA-SM          TC/L           -/H          QRF
              73.00          0.35          0.31          0.00         0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
             906.30        906.30        906.30         883.70           NO

           BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
               0.95          0.00          0.00         DESIGN

 PSDATA -  NO. COND        COND L         DIA/W           -/H
               1.00        160.33         24.00          0.00

              PS N           KE         WEIR L         TW EL
             0.013         0.75          6.00         885.70

            2ND STG         ORF H          ORF L      START AUX.
             916.90         0.89          0.89         906.30

 ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
             920.30         0.00          0.00          0.00          0.00
```

```
 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                 41          0.00        159.30              0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035           0.021           YES

 BTM WIDTH -     BW1           BW2           BW3           BW4           BW5
   ft          80.00          0.00          0.00          0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                      SUBW= 1
 TIME 13:51:17            SITE = 1                PASS=    1     PART=   2


 PERM POOL       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 CREST PS        906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 SED ACCUM       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 BASEFLOW        906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 2ND STAGE       916.90 FT      52.4 ACFT      0.00 AC      12.1 CFS

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS


 ********************************************************************************
 RATING TABLE DEVELOPED, SITE = 1    :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.


 RATING TABLE NUMBER  1
        ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
        FEET       CFS       CFS       CFS      AC-FT     ACRE
   1   906.30      0.00      0.00      0.00     10.73      0.00
   2   906.47      0.20      0.20      0.00     11.15      0.00
   3   906.65      0.56      0.56      0.00     11.58      0.00
                                            TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
   4   906.82      1.03      1.03      0.00     12.00      0.00
   5   910.18      7.06      7.06      0.00     21.92      0.00
   6   913.54      9.94      9.94      0.00     35.54      0.00
   7   916.90     12.15     12.15      0.00     52.44      0.00
   8   917.64     24.49     24.49      0.00     56.52      0.00
   9   918.39     46.69     46.69      0.00     60.78      0.00
                                            FULL CONDUIT FLOW, ELEV =  919.13 FT
  10   919.13     75.30     75.30      0.00     65.22      0.00
  11   924.75     81.43     81.43      0.00    103.94      0.00
  12   930.38     87.09     87.09      0.00    154.22      0.00
  13   936.00     92.41     92.41      0.00    210.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                      SUBW= 1
 TIME 13:51:17            SITE = 1                PASS=    1     PART=   3


 AUX. CREST      920.30 FT      72.4 ACFT      0.00 AC      76.4 CFS

      PS STORAGE     61.7 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS
```

```
EFFECTIVE HEIGHT(H)= 28.3 FEET,  PRODUCT=    2049. (H * STORAGE AT CREST AUX.).

INPUT DESIGN CLASS = C

NRCS-SDH      D=   6.00 HR    P=  9.90 IN     Q=  6.53 IN      DA=   0.35 SM
             TC=   0.31 HR   CN=  73.00     VOL=    123.1 ACFT

     PEAK =      1194.9 CFS, AT    2.6 HRS.

NRCS-FBH      D=   6.00 HR    P= 27.30 IN     Q= 23.31 IN      DA=   0.35 SM
             TC=   0.31 HR   CN=  73.00     VOL=    439.3 ACFT

     PEAK =      4188.0 CFS, AT    2.5 HRS.


*******************************************************************************
RATING TABLE DEVELOPED, SITE = 1    :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.


RATING TABLE NUMBER  2
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                             FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   919.52     75.78     75.78      0.00     67.56      0.00
 12   919.91     76.21     76.21      0.00     69.89      0.00
 13   920.30     76.65     76.65      0.00     72.41      0.00
 14   921.08    197.87     77.51    120.36     77.59      0.00
 15   921.87    464.10     78.37    385.74     82.77      0.00
 16   923.28   1211.64     79.88   1131.76     92.89      0.00
 17   925.01   2504.62     81.70   2422.92    105.96      0.00
 18   928.15   5982.54     84.90   5897.65    133.61      0.00
 19   932.08  11823.88     88.73  11735.14    170.75      0.00
 20   936.00  19489.77     92.41  19397.36    210.00      0.00
 *******************************************************************************

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH  FROM     TO    SLOPE  RETARDANCE  VEGETAL  MAINT. ROOTING  REACH
       STA     STA            CURVE      COVER    CODE   DEPTH  LOCATION
       (ft)    (ft)   (%)     INDEX@     FACTOR     +    (ft)     *
-----  ----    ----  ------ ----------  -------  -----  ------- --------
  1      0.     20.   -2.4     0.035       **       **     **    INLET
  2     20.    133.   -2.4     0.035       **       **     **    INLET
  3    133.    139.   -2.4     0.035       **       **     **    INLET
  4    139.    153.    0.0     0.035       **       **     **    CREST
  5    153.    159.    0.0     0.035       **       **     **    CREST
  6    159.    320.    2.1     0.035     0.50       1     1.0    EXIT !
  7    320.    330.    6.7     0.035     0.50       1     1.0    EXIT
  8    330.    340.    6.7     0.035     0.50       1     1.0    exit
  9    340.    350.    6.7     0.035     0.50       1     1.0    exit
 10    350.    425.    6.7     0.035     0.50       1     1.0    exit
 11    425.    470.   11.0     0.035     0.50       1     1.0    exit
 12    470.    513.   46.7     0.035     0.50       1     1.0    exit
 13    513.    525.    2.5     0.035     0.50       1     1.0    exit
 14    525.    537.    8.5     0.035     0.50       1     1.0    exit

 @ The program interprets retardance curve index entries of less than 1 as
```

```
   Manning's n values.
 + The minimum maintenance code value of 2 is used in INTEGRITY computations
     (the program changes values of 1 to 2 during computation).
 * Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and
     rooting depth for inlet and crest reaches in computations.
 ! Reach   6 used in computing exit channel velocities.
 ************************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-SDH          80.0    921.34      79.3       0.0      1.04       6.8

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =      77.8     205.7     283.5

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.59      4.31     0.022     0.029

          AUXILIARY SPILLWAY DURATION FLOW =        3.7 HOURS

          EXIT CHANNEL FLOW SUBCRITICAL: MAX VELOCITY=   4.2 FT/SEC
                                         EXIT SLOPE  = 0.021 FT/FT
                                         FLOW DEPTH  =   0.6 FT
        ********************************************************************

        EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
        (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
          Aux. Spillway Discharge =     206. cfs;   Bottom Width =    80. ft

                                                                 TOTAL  EFFECTIVE
          REACH   FROM    TO    SLOPE  MANNING`S  VELOCITY  STRESS  STRESS
           NO.    STA     STA     %        n        ft/s    lb/ft^2 lb/ft^2
            6     159.    320.   2.05   0.035       4.24      0.76   0.095
            7     320.    330.   6.67   0.035       6.07      1.74   0.216   max.
        ********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH          80.0    926.37     117.1       0.0      6.07      44.7

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       83.     3825.     3908.

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     3.97     10.72     0.012     0.016

          INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
           (The auxiliary spillway began flow at time =    2.2 hours
            and peaked at time =    2.7 hours.)


            REACH   5: FROM STATION    159. TO    320. ON    2.1% SLOPE.
               Surface unfailed: Stressed to  85% of allowable.


            REACH   6: FROM STATION    320. TO    340. ON    6.7% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =    3.7 hours.


            REACH   7: FROM STATION    340. TO    350. ON    6.7% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =    3.7 hours.
```

```
   REACH   8: FROM STATION    350. TO    425. ON    6.7% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    3.7 hours.


   REACH   9: FROM STATION    425. TO    470. ON   11.0% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.5 hours.


   REACH  10: FROM STATION    470. TO    513. ON   46.7% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.3 hours.


   REACH  11: FROM STATION    513. TO    525. ON    2.5% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.3 hours.


   REACH  12: FROM STATION    525. TO    537. ON    8.5% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    3.4 hours.


  INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

    The most upstream headcut began at station    320.
    and progressed upstream to station    320.
    The final height of the headcut was   10.0 ft.

    The headcut having the maximum final overfall height began
    at station    425. and progressed upstream to station   418.
    The final height of the headcut was   26.4 ft.

                    DURATION    ATTACK   DIST. FROM MOST U/S
                      FLOW       OE/B    HEADCUT TO U/S EDGE
  AUXILIARY          HRS      ACFT/FT     AUX. CREST, FT
  SPILLWAY ---       4.8         4.3           181.

  EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  12.8 FT/SEC
                                   EXIT SLOPE  = 0.021 FT/FT
                                   FLOW DEPTH  =   3.4 FT

 Inflow Hyd 1 SDH-Peak =        283.49 CFS  at    3.56 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       3907.63 CFS  at    2.65 hrs.,  Location Point
HYDOUT   1     1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 NC1           New Creek Site 1

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.

       2 HYDROGRAPHS ROUTED AT LOWEST SITE.

       0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

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



 SITES.....COMPUTATIONS COMPLETE
```

1 SUMMARY TABLE 1 SITES VERSION 2005.1.04
DATED 01/01/2005

WATERSHED ID	RUN DATE	RUN TIME
NC1	02/10/2011	13:51:17

>>> SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS <<<
1	1	0.35	73.	0.31	0.35	TR60	C

PASS NO.	DIA./ WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
1	24.0	920.3	80.0	6.1	926.4	0.	181.	12.8	NRCS-FBH

* INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED HYDROGRAPH SHOWN UNDER TYPE HYD.

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.04 ,01/01/2005
NC1 FILES

INPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.OUT
DATED 02/10/2011 13:51:17

GRAPHICS FILES GENERATED

OPTION "L" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.DRG DATED 02/10/2011 13:51:17

OPTION "P" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.DHY DATED 02/10/2011 13:51:17

OPTION "E" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.DEM DATED 02/10/2011 13:51:17

AUX.GRAPHICS = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_6hr_ASW_Integrity.DG* DATED 02/10/2011 13:51:17

NRCS

SITES Output

New Creek Site 1 – ASW Integrity (24-hr)

```
1*******************************************************************************
 SITES XEQ 02/10/2011   WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
      VER 2005.1.04              (USER MANUAL - DATED DECEMBER 2005)
      TIME 13:53:00

 ************************* 80-80 LIST OF INPUT DATA **************************

 SITES     01/01/2005NC1       New Creek Site 1              0.353125  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 1
                     892.2                                   0
                     894                                     0.01
                     896                                     0.256
                     898                                     0.955
                     900                                     2.159
                     902                                     3.96
                     904                                     6.524
                     906                                     9.995
                     908                                     14.895
                     910                                     21.247
                     912                                     28.776
                     914                                     37.562
                     916                                     47.502
                     918                                     58.475
                     920                                     70.429
                     922                                     83.628
                     924                                     98.061
                     926                                     113.694
                     931                                     160
                     936                                     210
 ENDTABLE
 WSDATA    2C 1   AC 73        226       0.31
 BASEFLOW             0.95
 RAINTABLE 1          24
                     0         0.008     0.0162    0.0246    0.0333
                     0.0425    0.0524    0.063     0.0743    0.0863
                     0.099     0.1124    0.1265    0.142     0.1595
                     0.18      0.205     0.255     0.345     0.437
                     0.53      0.603     0.633     0.66      0.684
                     0.705     0.724     0.742     0.759     0.775
                     0.79      0.8043    0.818     0.8312    0.8439
                     0.8561    0.8678    0.879     0.8898    0.9002
                     0.9103    0.9201    0.9297    0.9391    0.9483
                     0.9573    0.9661    0.9747    0.9832    0.9916
                     1
 ENDTABLE
 PDIRECT                                 13.35     34.80
 POOLDATA  ELEV       906.3     906.3     906.3     892       883.7     TC
 PSINLET   ELEV       0.75      6         916.9     .89       .89
 PSDATA    1          160.33    24                  0.013     885.7
 ASSURFACE 41         330       0.1
           0          20        0.035     0.5       1         1
           20         133       0.035     0.5       1         1
           133        153       0.035     0.5       1         1
           153        330       0.035     0.5       1         1
           330        340       0.035     0.5       1         1
           340        767       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                              2.5                           1
 BTMWIDTH  FEET       80
 ASMATERIAL
           1          4         0.002     12        100       0.17
           2          0         0.5       0         110       2
           3          0         6         0         120       8
 ENDTABLE
 ASCOORD    1         Soil      Y
```

```
          0         917       139.3     920.3     159.3     920.3
          320       917       350       915       425       910
          470.30    905       513.1     885       524.9     884.7
          579.9     880       682.7     875       767       870.00
ENDTABLE
ASCOORD    2        Shale1
          0         912       139.3     915       159.3     915
          320       912       350       910       470       900
          513       880       767       860
ENDTABLE
ASCOORD    3        Shale2
          0         907       139.3     908       159.3     908
          320       907       350       905       470       895
          513       875       767       860
ENDTABLE
GRAPHICS  I
GO,DESIGN L         1         24                            906.3
SAVMOV    2    101  1                   1
ENDJOB

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

***** MESSAGE - DRAINAGE AREA FROM WSDATA CONTROL BEING CONVERTED FROM
                 ACRES TO SQUARE MILES FOR COMPUTATION PURPOSES.

***** MESSAGE - DEFAULT TOPSOIL FILL MATERIAL PARAMETERS USED.

***** WARNING - HEADCUT ERODIBILITY INDEX OF      2.0 (MATERIAL  2)
               APPEARS INCONSISTENT WITH DENSITY OF  110.0.

***** WARNING - HEADCUT ERODIBILITY INDEX OF      8.0 (MATERIAL  3)
               APPEARS INCONSISTENT WITH DENSITY OF  120.0.

***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO   920.30
               FROM THE ASCOORD RECORDS.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                  WSID= NC1
 VER 2005.1.04                                                    SUBW= 1
 TIME 13:53:00           SITE = 1                PASS=    1     PART=   1


**********************    MATERIAL PROPERTIES    ***************************
                          DRY                   PERCENT       DETACH.      REP.
     MATERIAL       PI   DENSITY        Kh       CLAY         RATE      DIAMETER
                        lbs/CuFt                            (Ft/H)/(lb/SqFt)  inches
    Soil            4.      100.      0.17       12.0          --        0.00200
    Shale1          0.      110.      2.00        0.0          --        0.50000
    Shale2          0.      120.      8.00        0.0          --        6.00000
    TS_FILL         0.      100.      0.05        0.0          --        0.05000
    GEN_FILL        4.      100.      0.17       12.0          --        0.00200

***************************    BASIC DATA    ********************************
HUMID- SUBHUMID CLIMATE AREA                    DESIGN CLASS  C

STORM DISTRIBUTION AUX. -

PRECIP. - Q-PS,1-DAY    Q-PS,10-DAY       P-SD          P-FB
              0.00          0.00         13.35         34.80

WSDATA -       CN          DA-SM          TC/L           -/H          QRF
             73.00          0.35          0.31          0.00         0.00

SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL        378?
            906.30        906.30        906.30         883.70           NO

          BASEFLOW      INITIAL EL     EXTRA VOL      SITE TYPE
              0.95          0.00          0.00         DESIGN
```

```
 PSDATA -  NO. COND        COND L         DIA/W           -/H
               1.00       160.33         24.00          0.00

              PS N           KE         WEIR L        TW EL
             0.013         0.75          6.00        885.70

           2ND STG        ORF H          ORF L     START AUX.
            916.90         0.89          0.89        906.30

 ASCRESTS -   AUX.1        AUX.2         AUX.3          AUX.4          AUX.5
             920.30         0.00          0.00           0.00          0.00

 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00        159.30              0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035           0.021           YES

 BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
   ft         80.00          0.00          0.00           0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 1                   WSID= NC1
 VER 2005.1.04                                                     SUBW= 1
 TIME 13:53:00           SITE = 1                PASS=    1     PART=   2


 PERM POOL       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 CREST PS        906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 SED ACCUM       906.30 FT      10.7 ACFT      0.00 AC       0.0 CFS

 BASEFLOW        906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 2ND STAGE       916.90 FT      52.4 ACFT      0.00 AC      12.1 CFS

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS


 ***************************************************************************
 RATING TABLE DEVELOPED, SITE = 1    :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.


 RATING TABLE NUMBER  1
       ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
       FEET       CFS       CFS       CFS      AC-FT     ACRE
  1   906.30      0.00      0.00      0.00     10.73      0.00
  2   906.47      0.20      0.20      0.00     11.15      0.00
  3   906.65      0.56      0.56      0.00     11.58      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
  4   906.82      1.03      1.03      0.00     12.00      0.00
  5   910.18      7.06      7.06      0.00     21.92      0.00
  6   913.54      9.94      9.94      0.00     35.54      0.00
  7   916.90     12.15     12.15      0.00     52.44      0.00
  8   917.64     24.49     24.49      0.00     56.52      0.00
  9   918.39     46.69     46.69      0.00     60.78      0.00
                                          FULL CONDUIT FLOW, ELEV =  919.13 FT
 10   919.13     75.30     75.30      0.00     65.22      0.00
 11   924.75     81.43     81.43      0.00    103.94      0.00
 12   930.38     87.09     87.09      0.00    154.22      0.00
 13   936.00     92.41     92.41      0.00    210.00      0.00
```

```
1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011                New Creek Site 1                    WSID= NC1
 VER 2005.1.04                                                       SUBW= 1
 TIME 13:53:00            SITE = 1                 PASS=    1     PART=   3


 AUX. CREST      920.30 FT      72.4 ACFT      0.00 AC      76.4 CFS

      PS STORAGE     61.7 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV      906.54 FT      11.3 ACFT      0.00 AC       0.3 CFS

 EFFECTIVE HEIGHT(H)= 28.3 FEET,  PRODUCT=    2049. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=  24.00 HR    P= 13.35 IN     Q=  9.75 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    184.2 ACFT

      PEAK =       498.6 CFS, AT    9.7 HRS.

 NRCS-FBH      D=  24.00 HR    P= 34.80 IN     Q= 30.72 IN      DA=   0.35 SM
              TC=   0.31 HR   CN=  73.00     VOL=    579.3 ACFT

      PEAK =      1481.6 CFS, AT    9.6 HRS.


 ***************************************************************************
 RATING TABLE DEVELOPED, SITE = 1    :
  BY PROGRAM FOR PS AND AUX. SPILLWAYS
  AUX. RATING USED WSPVRT METHOD.


 RATING TABLE NUMBER  2
        ELEV.    Q-TOTAL    Q-PS     Q-AUX.    VOLUME     AREA
        FEET       CFS       CFS       CFS      AC-FT     ACRE
   1   906.30      0.00      0.00      0.00     10.73      0.00
   2   906.47      0.20      0.20      0.00     11.15      0.00
   3   906.65      0.56      0.56      0.00     11.58      0.00
                                              TRANSITION TO ORIFICE FLOW, ELEV =  906.82 FT
   4   906.82      1.03      1.03      0.00     12.00      0.00
   5   910.18      7.06      7.06      0.00     21.92      0.00
   6   913.54      9.94      9.94      0.00     35.54      0.00
   7   916.90     12.15     12.15      0.00     52.44      0.00
   8   917.64     24.49     24.49      0.00     56.52      0.00
   9   918.39     46.69     46.69      0.00     60.78      0.00
                                              FULL CONDUIT FLOW, ELEV =  919.13 FT
  10   919.13     75.30     75.30      0.00     65.22      0.00
  11   919.52     75.78     75.78      0.00     67.56      0.00
  12   919.91     76.21     76.21      0.00     69.89      0.00
  13   920.30     76.65     76.65      0.00     72.41      0.00
  14   921.08    197.87     77.51    120.36     77.59      0.00
  15   921.87    464.10     78.37    385.74     82.77      0.00
  16   923.28   1211.64     79.88   1131.76     92.89      0.00
  17   925.01   2504.62     81.70   2422.92    105.96      0.00
  18   928.15   5982.54     84.90   5897.65    133.61      0.00
  19   932.08  11823.88     88.73  11735.14    170.75      0.00
  20   936.00  19489.77     92.41  19397.36    210.00      0.00
  ***************************************************************************

 SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

 REACH  FROM     TO    SLOPE  RETARDANCE  VEGETAL  MAINT. ROOTING  REACH
        STA     STA            CURVE      COVER    CODE   DEPTH  LOCATION
        (ft)    (ft)   (%)     INDEX@     FACTOR     +    (ft)     *
 -----  ----    ----  ------ ----------  -------  -----  ------- --------
   1      0.     20.   -2.4     0.035       **       **     **    INLET
   2     20.    133.   -2.4     0.035       **       **     **    INLET
   3    133.    139.   -2.4     0.035       **       **     **    INLET
   4    139.    153.    0.0     0.035       **       **     **    CREST
```

```
  5    153.    159.    0.0     0.035       **       **     **    CREST
  6    159.    320.    2.1     0.035     0.50       1     1.0    EXIT !
  7    320.    330.    6.7     0.035     0.50       1     1.0    EXIT
  8    330.    340.    6.7     0.035     0.50       1     1.0    exit
  9    340.    350.    6.7     0.035     0.50       1     1.0    exit
 10    350.    425.    6.7     0.035     0.50       1     1.0    exit
 11    425.    470.   11.0     0.035     0.50       1     1.0    exit
 12    470.    513.   46.7     0.035     0.50       1     1.0    exit
 13    513.    525.    2.5     0.035     0.50       1     1.0    exit
 14    525.    537.    8.5     0.035     0.50       1     1.0    exit

 @ The program interprets retardance curve index entries of less than 1 as
   Manning's n values.
 + The minimum maintenance code value of 2 is used in INTEGRITY computations
     (the program changes values of 1 to 2 during computation).
 * Upper case indicates a reach of constructed spillway channel.
** The program does not use vegetal cover factor, maintenance code, and
     rooting depth for inlet and crest reaches in computations.
 ! Reach   6 used in computing exit channel velocities.
 ************************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-SDH          80.0    921.61      81.0       0.0      1.31       8.6

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =      78.1     297.4     375.5

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.75      4.85     0.020     0.027

          AUXILIARY SPILLWAY DURATION FLOW =        7.0 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   4.9 FT/SEC
                                           EXIT SLOPE  = 0.021 FT/FT
                                           FLOW DEPTH  =   0.7 FT
        ********************************************************************

        EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
        (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
          Aux. Spillway Discharge =     297. cfs;   Bottom Width =    80. ft

                                                                 TOTAL  EFFECTIVE
          REACH   FROM    TO    SLOPE  MANNING`S  VELOCITY  STRESS  STRESS
           NO.    STA     STA     %        n        ft/s    lb/ft^2 lb/ft^2
            6     159.    320.   2.05   0.035       4.90      0.95   0.118
            7     320.    330.   6.67   0.035       7.01      2.17   0.270   max.
        ********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH          80.0    923.65      95.6       0.0      3.35      23.1

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       80.     1395.     1476.

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     2.07      7.92     0.014     0.019

          INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
           (The auxiliary spillway began flow at time =    7.6 hours
            and peaked at time =    9.7 hours.)


            REACH   5: FROM STATION    159. TO    320. ON    2.1% SLOPE.
               Vegetal cover failed and concentrated flow developed
```

```
   at time =   14.8 hours.


 REACH   6: FROM STATION    320. TO    340. ON    6.7% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    9.9 hours.


 REACH   7: FROM STATION    340. TO    350. ON    6.7% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    9.9 hours.


 REACH   8: FROM STATION    350. TO    425. ON    6.7% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    9.9 hours.


 REACH   9: FROM STATION    425. TO    470. ON   11.0% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    9.4 hours.


 REACH  10: FROM STATION    470. TO    513. ON   46.7% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    8.3 hours.


 REACH  11: FROM STATION    513. TO    525. ON    2.5% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    8.3 hours.


 REACH  12: FROM STATION    525. TO    537. ON    8.5% SLOPE.
   Vegetal cover failed and concentrated flow developed
   at time =    9.6 hours.


INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

  The most upstream headcut began at station    159.
  and progressed upstream to station    159.
  The final height of the headcut was   12.1 ft.

  The headcut having the maximum final overfall height began
  at station    470. and progressed upstream to station   464.
  The final height of the headcut was   22.0 ft.

                DURATION    ATTACK   DIST. FROM MOST U/S
                  FLOW       OE/B    HEADCUT TO U/S EDGE
AUXILIARY          HRS     ACFT/FT     AUX. CREST, FT
SPILLWAY ---      16.9        5.0            20.

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   8.8 FT/SEC
                                 EXIT SLOPE  = 0.021 FT/FT
                                 FLOW DEPTH  =   1.9 FT

 Inflow Hyd 1 SDH-Peak =        375.48 CFS  at   10.24 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       1475.70 CFS  at    9.71 hrs.,  Location Point
HYDOUT   1     1

1SITES....JOB NO.  1 COMPLETE.
 ------------------------------------------------------------------------------

 NC1           New Creek Site 1

       0 SUBWATERSHED(S) ANALYZED.

       1 STRUCTURE(S) ANALYZED.
```

```
      2 HYDROGRAPHS ROUTED AT LOWEST SITE.

      0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

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



 SITES.....COMPUTATIONS COMPLETE


1                              SUMMARY TABLE  1          SITES VERSION 2005.1.04
                              ----------------               DATED 01/01/2005


 WATERSHED ID                         RUN DATE                            RUN TIME
 ------------                         --------                            --------
 NC1                                 02/10/2011                           13:53:00

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
        ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       1        1         0.35     73.   0.31      0.35    TR60     C

 PASS  DIA./  AUX.CREST  BTM.  MAX.    MAX.    EMB.  INTEGR.*  EXIT*    TYPE
  NO.  WIDTH    ELEV    WIDTH   HP     ELEV    VOL.   DIST.     VEL.     HYD
      (IN/FT)   (FT)     (FT)  (FT)    (FT)    (CY)   (FT)   (FT/SEC)
 ----  -----  -------  ------  ----  -------  -------  -----  ------  ---------
    1   24.0    920.3    80.0   3.3    923.7       0.    20.     8.8  NRCS-FBH


 *  INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED
    HYDROGRAPH SHOWN UNDER TYPE HYD.



 SITES.......SUMMARY TABLE 1 COMPLETED.


                    NRCS  SITES    VERSION 2005.1.04 ,01/01/2005
                             NC1      FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.OUT
         DATED 02/10/2011 13:53:00

                         GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.DRG DATED
02/10/2011 13:53:00

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.DHY DATED
02/10/2011 13:53:00

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.DEM DATED
02/10/2011 13:53:00

AUX.GRAPHICS = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 1\NC1 SITES Model\NC1\NC1_24hr_ASW_integrity.DG* DATED
02/10/2011 13:53:00
```

NRCS

Appendix D
Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet

EVALUATION OF POTENTIAL REHABILITATION PROJECTS								
STATE	WV	**DAM**	New Creek Site 1	**BY**	TAR	**DATE**	01/20/11	
	YEAR BUILT	1957	**DESIGN HAZARD CLASS**	C	**DRAINAGE AREA**		0.35	mi2
	WORK PLAN DATE	1956	**CURRENT HAZARD CLASS**	C	**DAM HEIGHT**		41.7	ft
sht 1 of 5	**CONSEQUENCES OF DAM FAILURE**						ver 100101	

POTENTIAL DAM FAILURE:				
Total Failure Index			200	A
POTENTIAL LOSS OF LIFE:				
Maximum Population-at-Risk [PAR]		(number)	465	B
Total Risk Index			3720	C
POTENTIAL LOSS OF PROPERTY:				
Identify major community affected by breach and rate impact as High (H), Medium (M), Low (L) or None(blank)				
Community Keyser		(H,M,L,-)	H	D
Number of homes, businesses, major buildings		(number)	186	E
POTENTIAL LIFELINE DISRUPTION:				
Water supply, identify community disrupted by dam failure, and estimate number/amount				
Municipal sole source	Users	(number)		F
Supplemental source	Users	(number)		G
Irrigation water	Storage	(Ac-Ft)		H
POTENTIAL INFRASTRUCTURE DISRUPTION:				
Transportation system crossings, identify major crossing rendered unusable by dam failure, and estimate number				
Major/Interstate U.S. Route 220	Roads	(number)	1	I
Secondary/County W.V. Route 46, County Route 220/5	Roads	(number)	2	J
POTENTIAL ADVERSE IMPACTS ON THE ENVIRONMENT:				
Describe impacts and rate each as High (H), Medium (M), Low (L), or None (blank)				
Threatened & endangered species		(H,M,L,-)	L	K
Sensitive riparian areas		(H,M,L,-)	L	L
Contaminated reservoir sediment		(H,M,L,-)	L	M
Wetland and wildlife habitat		(H,M,L,-)	L	N
Other		(H,M,L,-)		O
POTENTIAL ADVERSE SOCIAL IMPACTS:				
Describe impacts and rate each as High (H), Medium (M), Low (L) or None(blank)				
Known cultural resources		(H,M,L,-)	L	P
Historic preservation issues		(H,M,L,-)		Q
Socially disadvantaged community		(H,M,L,-)	M	R
POTENTIAL ADVERSE ECONOMIC IMPACTS:				
Average annual benefits attributed to this dam, updated workplan value		($)	11,548	S
Changes in benefits since workplan; Increase(I), No change(NC), Decrease(D)		(I,NC,D)	I	T
Low income families impacted		(number)	208	U
INPUT BY STATE DAM SAFETY AGENCY:				
State dam safety order issued for repair, modification, removal issued, Yes(Y), No(N)		(Y,N)		V
State Dam Safety Agency Priority, High(H), Medium(M), Low(L), None(blank)		(H,M,L,-)		W
OTHER CONSIDERATIONS:				
Identify any other considerations and rate as High(H), Medium(M), Low(L) or None(blank)				
		(H,M,L,-)		X
		(H,M,L,-)		Y

EVALUATION OF POTENTIAL REHABILITATION PROJECTS							
STATE	WV	**DAM**	New Creek Site 1	**BY**	TAR	**DATE**	01/20/11
sht 2 of 5	**FAILURE & RISK INDEXES**						ver 102201

Adopted from Bureau of Reclamation "Risk Based Profile System"

see: http://www.usbr.gov/dsis/risk/rbpsdocumentation.pdf

LIFE LOSS:

Population-at-Risk [PAR], see NRCS dams inventory definition (number of people)

Estimate PAR for static loading failure, typically assume water at top of dam	465	A
Estimate PAR for hydrologic loading failure, typically assume water at top of dam	465	B
Estimate PAR for seismic loading failure, typically assume water at ES crest (sunny day failure)	465	C

Fatality Rates [FR] from dam breach

Adopted from BuRec "A Procedure for Estimating Loss of Life Caused by Dam Failure" DSO-99-06

see: http://www.usbr.gov/research/dam_safety/documents/dso-99-06.pdf

Flood Severity/Lethality [DV] is the average depth [D] times velocity [V] across flood plain (ft2/sec)

DV= (breach discharge - bank full discharge) / breach floodplain width

Warning Time [T] between failure warning and flood wave at population (minutes)

Flood Severity Understanding [U] of the warning issuer of the likely flooding magnitude

scenario	breach discharge (cfs)	bankfull discharge (cfs)	breach width (ft)	DV (ft2/sec)	warning time (minutes)	under-standing (N/A or Vague)
Static	47556	85	544	87	2	Vague
Hydrologic	63847	85	575	111	1	Vague
Seismic	47556	85	544	87	2	Vague

For	DV>50	T=0	U=N/A (no warning)	FR=0.15
For	DV>50	T<60	U=vague	FR=0.04
For	DV>50	T>60	U=vague	FR=0.03
For	DV<50	T=0	U=N/A (no warning)	FR=0.01
For	DV<50	T<60	U=vague	FR=0.007
For	DV<50	T>60	U=vague	FR=0.0003

Estimate FR for static loading failure scenario	0.04	D
Estimate FR for hydrologic loading failure scenario	0.04	E
Estimate FR for seismic loading failure scenario	0.04	F

Scenario	Load Factor	Response Factor	Failure Index	Fatality Rate	PAR	Risk Index
Static	1	93	93	0.04	465	1730
Hydrologic	*	*	107	0.04	465	1990
Seismic	0.00	#DIV/0!	0	0.04	465	0
		TOTAL=	200		TOTAL=	3720

EVALUATION OF POTENTIAL REHABILITATION PROJECTS								
STATE	WV	**DAM**	New Creek Site 1	**BY**	TAR	**DATE**	01/20/11	
sht 3 of 5	**STATIC FAILURE INDEX**						ver 100101	
PRINCIPAL SPILLWAY SYSTEM (60 points max):					(total points)	20		A
Downstream filter or filter zone around conduit (yes=0 or no=10)							0	B
Conduit trench deep (>2d) and narrow (<3d) and steep sideslope (<2:1) (no=0 or yes=10)							0	C
Principal spillway system (inlet, pipe, or outlet) in deteriorated condition (no=0 or yes=10)							0	D
Conduit has seepage cutoff collars or other compaction adverse features (no=0 or yes=10)							10	E
Conduit contains open joints, open cracks, steady seepage (no=0 or yes=10)							10	F
Conduit founded on competent bedrock (yes=0 or no=10)							0	G
Reservoir control gate located at outlet of conduit (no=0 or yes=10)							0	H
RESERVOIR FILLING HISTORY (75 points max):					(total points)	25		I
Reservoir has filled to x% of effective height (earth spillway crest minus original streambed)							85	J
(<50%=75 or 51-75%=50 or 76-90%=25 or 91-95%=10 or 96-100%=5 or >100%=0)							25	K
SEEPAGE AND DEFORMATION (85 points max):					(total points)	12		L
Seepage carrying fines, or seepage increases with reservoir elevation increases, or sinkholes/jugholes exist in embankment (no=0 or yes=80)							0	M
Large amounts of seepage (no=0 or yes=6)							0	N
Visible and significant slope movement or sloughing (no=0 or yes=6)							0	O
Longitudinal or transverse embankment cracking greater than one foot in depth (no=0 or yes=6)							0	P
Sinkholes/depressions within two times effective height of the dam, either face (no=0 or yes=6)							6	Q
Poor top of dam condition, eroded, trees, rodent holes, settlement (no=0 or yes=6)							6	R
Abnormally wet areas at downstream toe/groin of embankment (no=0 or yes=6)							0	S
Inadequate slope protection against erosion by rainfall or waves (no=0 or yes=6)							0	T
FOUNDATION GEOLOGY (41 points max):					(total points)	30		U
Highly fractures rock under core (no=0 or treated=3 or untreated=30)							30	V
Karst terrain and soluble rock (gypsum or limestone) (no=0 or treated=3 or untreated=30)							0	W
Collapsible soils (no=0 or treated=3 or untreated=30)							0	X
Significant stress relief fractures in abutments (no=0 or treated=3 or untreated=30)							0	Y
History of underground mining under embankment area (no=0 or treated=3 or untreated=30)							0	Z
Coarse grained and highly permeable soils (no=0 or yes=3)							0	AA
Presence of weak layers/conditions diminishing embankment stability (no=0 or yes=3)							0	AB
Erodible soils (sandy/silty materials) or weakly cemented rock (no=0 or yes=3)							0	AC
Reservoir area prone to landslides that could cause overtopping (no=0 or yes=3)							0	AD
EMBANKMENT DESIGN AND CONSTRUCTION (24 points max):					(total points)			AE
Filters for core or foundation or incompatibility between zones (no=3 or yes=0)							0	AF
Embankment or foundation drainage system (yes=0 or no=4)							0	AG
Erodible core material (sands, silts, dispersive clays) (no=0 or yes=4)							0	AH
Incomplete or no foundation cutoff of shallow permeable layers (no=0 or yes=4)							0	AI
Poorly placed earthfill, inadequate density (no=0 or yes=4)							0	AJ
Gate features to drain reservoir (yes=0 or no=4)							0	AK
EMBANKMENT MONITORING (15 points max):					(total points)	6		AL
Instruments (except surficial survey points) installed at dam (yes=0 or no=3)							3	AM
Installed instruments routinely read and evaluated (yes=0 or no=3)							3	AN
Visual inspection of dam by engineer less often than yearly (no=0 or yes=3)							0	AO
Good physical/visual access to downstream groin/toe for inspection (yes=0 or no=3)							0	AP
STATIC FAILURE INDEX: A+I+L+U+AE+AL							93	AQ

EVALUATION OF POTENTIAL REHABILITATION PROJECTS							
STATE	WV	**DAM**	New Creek Site 1	**BY**	TAR	**DATE**	01/20/11
sht 4 of 5	**HYDROLOGIC FAILURE INDEX**						ver 100101

HYDROLOGIC LOADING:					
Total Spillway Capacity (PS&ES) for 6hr storm [Pfb], Work Plan Tbl 3 (rainfall inches)				9.88	A
Obtained from Work Plan Tbl 3, or dams inventory data, or computer routings					
100 year, 6hr rainfall [P100] (inches)				3.76	B
Probable Maximum Precipitation [PMP] (inches)				27.3	C
if Pfb <= P100	=	3.76	enter 40		
if Pfb = P100+0.2(PMP-P100)	=	8.468	enter 25		
if Pfb = P100+0.4(PMP-P100)	=	13.18	enter 15		
if Pfb = P100+0.6(PMP-P100)	=	17.88	enter 7		
if Pfb = P100+0.8(PMP-P100)	=	22.59	enter 3		
if Pfb >= PMP	=	27.3	enter 1		
Enter interpolated value				22	D
HYDROLOGIC UNCERTAINTY:					
Drainage Area [DA] (square miles)				0.35	E
DA<10 enter 1.5 ; 10<DA<20 enter 1.4 ; 20<DA<50 enter 1.3 ; DA=>50 enter 1.2				1.5	F
PIPE SPILLWAY PLUGGING:					
Pipe Diameter [D] (inches)				24	G
D<12 enter 1.1; 12<=D<24 enter 1.0; 24<=D enter 0.9				0.9	H
Riser & trash rack type:					
Non-standardized inlet enter 1.1, Open Top riser enter 1.0; Covered or Baffle Top enter 0.9				1	I
EARTH SPILLWAY FLOW:					
Earth spillway flow depth [Des] from top of dam to spillway crest (feet)(10' max)				6.1	J
DAM EROSION RESISTANCE:					
Non-plastic (PI<10) fill enter 2.0 ; Plastic core enter 1.7 ; Overtopping armoring enter 0.8				2	K
Vegetal Cover Factor [Cf], see SITES or AH667				0.7	L
http://www.pswcrl.ars.usda.gov/ah667/ah667.htm					
Cf <0.4 enter 1.1; Cf < 0.7 enter 1.0; Cf<1.0 enter 0.9; larger Cf enter 0.8				0.9	M
EARTH SPILLWAY EROSION RESISTANCE:					
Low, can be excavated with hand tools, enter 2.0					
PI>10 and SPT blows<8, PI<10 and SPT blows>8, Kh<0.10, seismic velocity<2000fps					
Moderate, can be excavated with construction equipment, easy ripping, enter 1.2					
PI>10 and SPT blows>8, PI<10 and SPT blows>30, Kh<10, seismic velocity<7000fps					
High, very hard ripping, requires drilling and blasting, enter 0.2					
moderately hard rock, Kh>10, seismic velocity>7000fps				1.2	N
Vegetal Cover Factor [Cf], see SITES or AH667				0.7	O
Cf <0.4 enter 1.1; Cf < 0.7 enter 1.0; Cf<1.0 enter 0.9; larger Cf enter 0.8				0.9	P
HYDROLOGIC FAILURE INDEX:					
dam overtopping breach: (2)(D)(F)(H)(I)(K)(M)				107	Q
earth spillway breach: (D+5J)(F)(H)(I)(N)(P)				77	R
larger of (2)(D)(F)(H)(I)(K)(M) or (D+5J)(F)(H)(I)(N)(P) but less than 300				107	S

EVALUATION OF POTENTIAL REHABILITATION PROJECTS							
STATE	WV	**DAM**	New Creek Site 1	**BY**	TAR	**DATE**	01/20/11
sht 5 of 5	**SEISMIC FAILURE INDEX**						ver 102201

SEISMIC LOADING:		
Latitude (degrees.decimal)	39.435	A
Longitude (degrees.decimal)	-78.99	B
See "http://eqint.cr.usgs.gov/eq/html/lookup.shtml"		
PGA [peak ground acceleration] for 2% chance in 50 years, see NEHRP maps (%g)	5.446	C
if PGA is less than 10% g, enter 0		
if PGA is between 10% g and 19% g, enter 0.15		
if PGA is between 20% g and 39% g, enter 0.30		
if PGA is between 40% g and 59% g, enter 0.65		
if PGA is greater than 60% g, enter 1.0	0	D
FOUNDATION LIQUEFACTION:		
Select only one of the following foundation conditions which best represents the site		
Loose alluvium, lacustrine, loess materials (no=0 or yes=10)	0	E
Bedrock, glacial till, highly clayey materials (no=0 or yes=5)	5	F
EMBANKMENT FREEBOARD FOR FOUNDATION LIQUEFACTION:		
Dam height for seismic event is the height from top of dam to downstream channel bottom (ft)	41.7	G
Freeboard for seismic event is the depth from top of dam to assumed pool surface (ft)	6.1	H
Freeboard percent of dam height (%)	15	I
if Freeboard is less than 25% of dam height, enter 10		
if Freeboard is 25% to 50% of dam height, enter 5		
if Freeboard is more than 50% of dam height, enter 1	10	J
EMBANKMENT FREEBOARD FOR EMBANKMENT CRACKING:		
Freeboard is less than or equal to 15 feet (no=0 or yes=1)	1	K
EMBANKMENT CRACKING:		
Embankment contains self-healing filter zones (no=4 or yes=0)	4	L
SEISMIC FAILURE INDEX:		
(D) ((E)(J) + (F)(K+1)(L+1)) but less than 100	0	M

Angela D. Greene

Digitally signed by Angela D. Greene, PE
Date: 2011.03.21 10:02:59 -04'00'

State Conservation Engineer's Signature

concurring with technical content of sheets 2 thru 5

Review Comments Related to Geotechnical Factors in the "*Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet*"

Failure Index	Line	Comment
Static	B	As-builts show only the horizontal filter diaphragm criteria is met.
Static	C	As-builts do not show PSW excavation slopes. Test pits show shallow top of rock.
Static	E	As-builts show 3 anti-seep collars constructed along the PSW.
Static	G	As-builts show conduit founded on soil.
Static	M, N	No excessive seepage observed.
Static	O,P,Q	No sloughs, cracks or sinkholes/depressions observed.
Static	R	Top of dam in good condition, but rodent holes are common.
Static	S	No wet areas observed on downstream slope.
Static	T	No wave erosion observed on upstream slope.
Static	V	As-builts show cutoff trench excavated to top of rock. No grouting completed.
Static	W	No karst geology or soluble rock mapped on West Virginia Geologic Survey publications.
Static	X	No collapsible soils identified in the design reports.
Static	Y	No stress relief fractures identified in the design reports.
Static	Z	No underground mining under embankment described in the design reports.
Static	AA	Test pit logs shown on as-builts describe significant clay in foundation soils. No Soils Report included.
Static	AB	No weak layers/conditions identified in the design report.
Static	AC	No erodible soils or weakly cemented rock identified in the design report.
Static	AD	Susceptibility of reservoir area to landslides that could overtop dam was not assessed in the design files.
Static	AF	As-builts do not detail zoning. Calculations for the compatibility of zones were not included in the design files.
Static	AG	As-builts show a seepage drain system, but outlet of drain pipe has become buried since original construction.
Static	AH	No erodible core materials identified in the design report.
Static	AI	As-builts show cutoff trench excavated to top of rock.
Static	AJ	No construction quality control embankment fill test results provided.
Static	AM	Dam does not have any instrumentation.
Hydrologic	N	Average shale SITES parameters used.
Seismic	E,F	Liquefaction was not evaluated in the design documents reviewed.
Seismic	L	As-builts show a filter zone.