REHABILITATION ASSESSMENT REPORT

New Creek Watershed Site 17

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 05706
Total Failure Index: 273
Population at Risk: 1143
Total Risk Index: 12482

Hazard Classification: High

March 2011

Gannett Fleming
Harrisburg, PA

NRCS
Morgantown, WV

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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 17, 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 17 is located on Ash Spring Run in Mineral County approximately 7 miles south of Keyser, WV. The location of New Creek Site 17 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 17 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 (1960)
3. Design Report Sections (Geology, 1959) (Soil Mechanics, Hydraulic Design, 1960)
4. Inspection Records (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 17 is a single purpose flood control dam designed by the SCS (now NRCS), Morgantown, West Virginia. The dam and its appurtenances consist of a 1,735-foot long, zoned earthfill embankment with a maximum height of 68.3 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 7.2 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 conforming to AWWA-C301 standards. 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 12 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. With the exception of several ongoing maintenance items noted below, the dam was found to be in good condition.

The grass cover on the upstream and downstream slope of the dam embankment has not been mowed for several years as evidenced by brush and small trees on both the upstream and downstream slopes. The downstream slope was constructed with a steep 2:1 slope and armored in some areas with large cobbles. Due to the inability to mow the areas covered in cobbles, vegetation has become very dense in these areas. Additionally, the slope in these areas seems very irregular which suggests there has been some creep of the downstream slope. Large trees were also observed to be encroaching on the abutment contacts of the dam.

Figure 1. Aerial Photo of New Creek Site 17

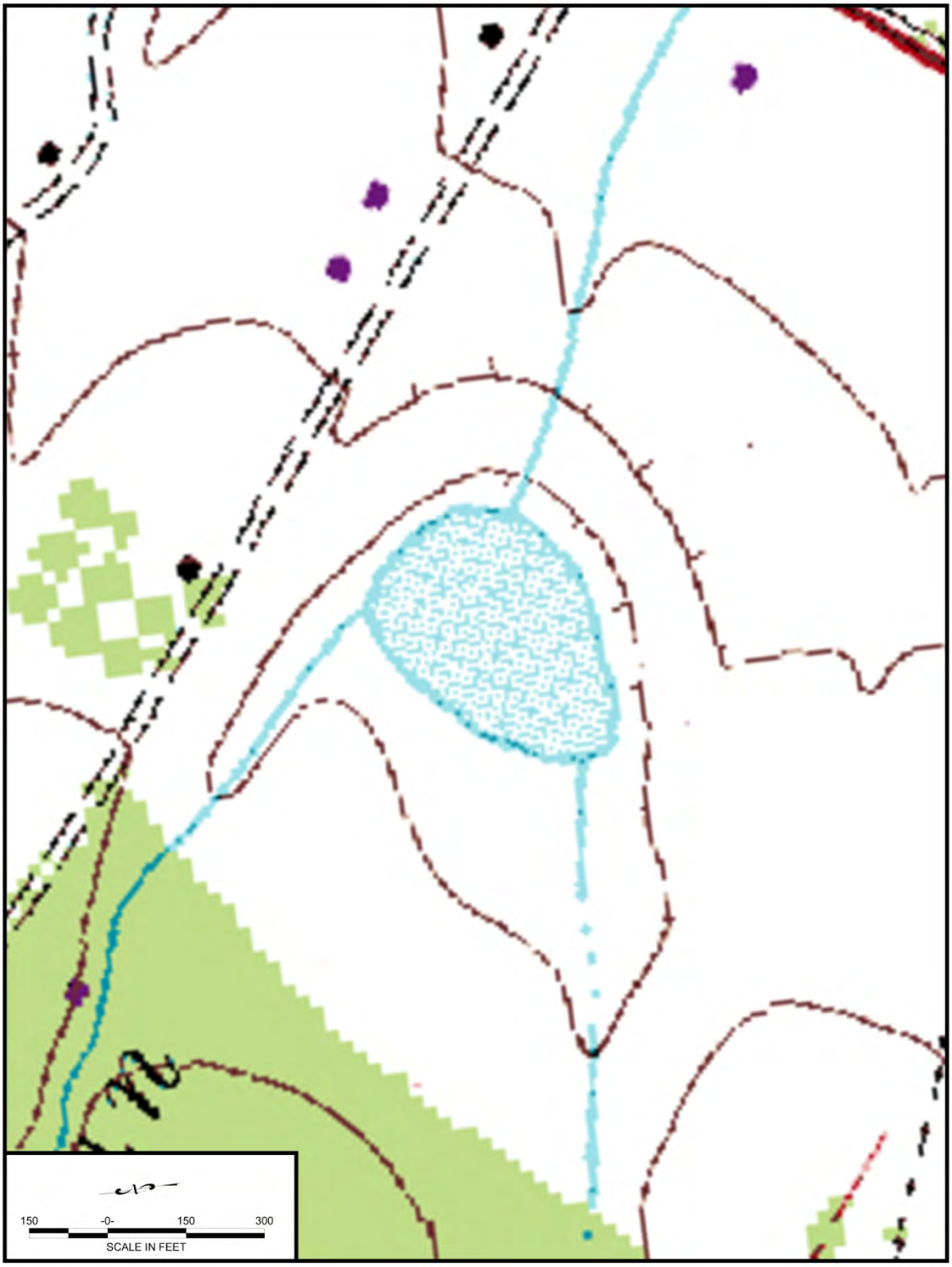


Figure 2. USGS Quadrangle of New Creek Site 17

Table 1
As-Built Design Data for New Creek Site 17

Description	Value
General Data	
Year Designed	1959
Year Constructed	1960
Purpose	Flood Control
Original Hazard Classification	High (Class C)
Current Hazard Classification	High (Class C)
Design Life	50 years (2010)
Design Drainage Area	1,086 Acres (1.7 Mi^2)
Dam Height (Along Centerline)	57.3 Feet
Maximum Dam Height	68.3 Feet
Embankment Length	1,735 Feet
Embankment Top Width	19 Feet
Embankment Upstream Slope	3H:1V
Embankment Downstream Slope	2H:1V
Critical Elevations (MSL)	
Top of Dam	1143.3 Feet
Auxiliary Spillway Crest	1136.1 Feet
PSW Weir	1128.4 Feet
Normal Pool (50-Year Submerged Sediment)	1104.12 Feet
PSW Conduit Outfall Invert	1075.01 Feet
PSW Outlet Channel Invert	1074.0 Feet
Storage Capacities	
Sediment Storage (50-Year Submerged & Aerated Sediment)	35 Acre-Feet
Normal Pool (50-Year Submerged Sediment)	25.5 Acre-Feet
Auxiliary Spillway Crest	384.5 Acre-Feet
Top of Dam	557.7 Acre-Feet
Pool Surface Areas	
Normal Pool	3.81 Acres
Auxiliary Spillway Crest	20.87 Acres
Other Features	
Principal Spillway Orifice Size	16 Inch Dia.
Principal Spillway Conduit Diameter	24 Inches
Principal Spillway Conduit Length	280.33 Feet
Principal Spillway Weir Crest Length	12-Feet (Total)
Auxiliary Spillway Width	200 Feet

Bare earth tire ruts were observed on the crest of the dam as well as on the auxiliary spillway training dike and the left side of the downstream slope. An animal burrow was observed near the toe of the downstream embankment. A small, wooden fence runs through the channel of the auxiliary spillway.

The principal spillway conduit outlet shows signs of significant deterioration including a fracture about 4 feet long. The outlet and plunge pool are surrounded and obstructed by thick, woody vegetation. A seep was observed beneath the cradle of the principal spillway outlet conduit. The seep was visibly flowing. No drains were observed at the site.

The concrete principal spillway riser structure appears to be in good condition and operating as designed. No external evidence of cracking or deterioration of the concrete was observed. The lower level trash rack and drawdown handwheel show signs of corrosion and need to be painted. There is also some minor debris on the lower inlet trash rack as well as a large tree branch lodged in the principal spillway riser structure.

Items inaccessible for inspection include the buried exterior section of the riser structure, control valve, interior of the riser structure, submerged portions of the pond drain intake, and the interior of the principal spillway conduit.

In addition to the site inspection, a 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 18, 2002 and revealed visible evidence of wear of the concrete lining throughout the length of the conduit. The inspection also showed some joint separation.

Items of deferred maintenance include removal of woody vegetation from the embankment and auxiliary spillway, filling groundhog holes, filling and seeding bare earth tire ruts, removal of small fence in the auxiliary spillway, repairing the concrete lining of the principal spillway outlet conduit, clearing vegetation and trees away from the plunge pool area, painting the lower trash rack and drawdown handwheel, and clearing debris from the riser structure. Gates should also be replaced in order to reduce motorized traffic across the dam crest. In addition to these maintenance items, the seep below the principal spillway should be monitored. Also, long-term maintenance issues as well as possible stability concerns for the downstream slope of the embankment should be investigated and addressed.

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 1959 Design	100-Year ASW Crest	6-hr Class C Top of Dam	24-hr Class C Top of Dam
Key Input Data				
Watershed Area	1,086 Acres	1,086 Acres	1,086 Acres	1,086 Acres
Weighted Curve Number	72.0	72.0	72.0	72.0
Time of Concentration, T_c	0.78 Hours	0.78 Hours	0.78 Hours	0.78 Hours
100-Year Rainfall (P-100)	- Inches	5.82 Inches	3.8 Inches	5.82 Inches
Freeboard Rainfall (P-FB)	26.33 Inches	-	27.3 Inches	34.8 Inches
Key Output Data				
ASW Crest Elevation	1136.1 Feet	**1130.06 Feet**	1136.10 Feet	1136.10 Feet
Top of Dam Elevation	1143.3 Feet	-	1143.91 Feet	1141.15 Feet
Freeboard	-	-	**-0.61 Feet**	**2.15 Feet**

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

1. The Auxiliary Spillway crest is 6.04 feet higher than required using the 100-year flood activation criteria.
2. For a Class C (*high hazard*) structure, the dam would be overtopped and would need to be raised 0.61 feet to pass the 6-hr Freeboard Hydrograph without overtopping.

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 soil from the crest of the spillway down to elevation 1125 feet. Shale is located below the soil 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.

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	125	0.37	28	12	0.004
Shale	110	2	0	0	0.5

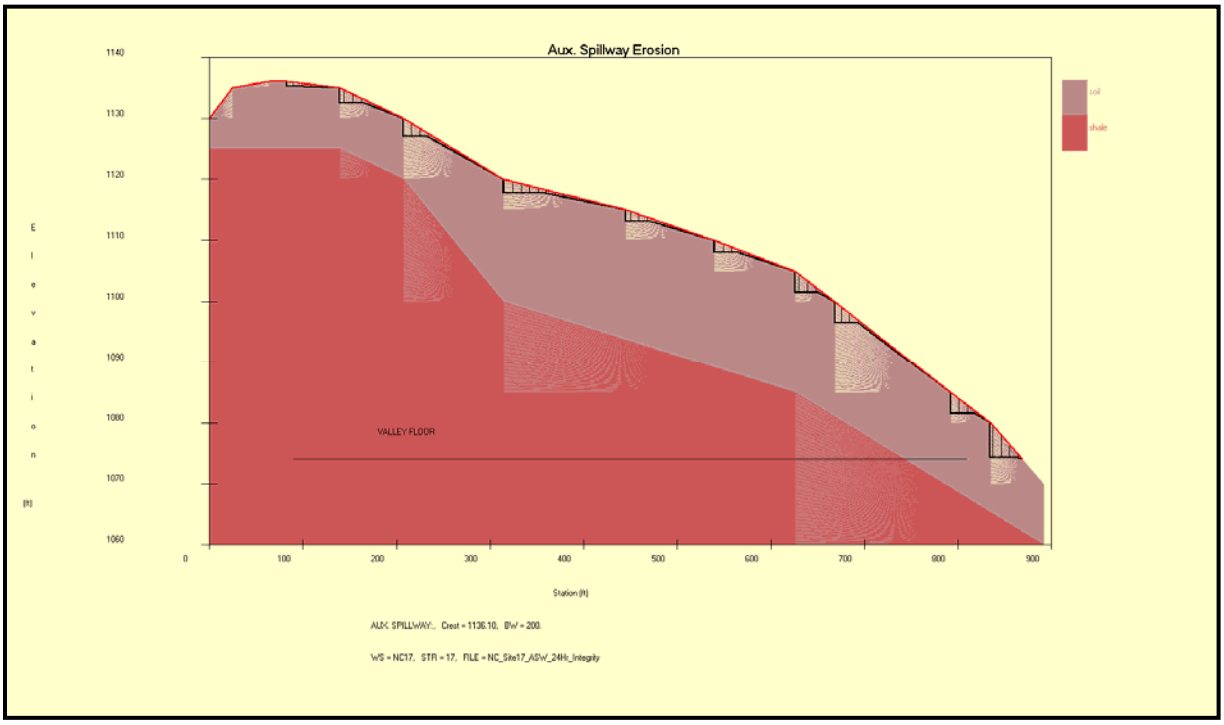


Figure 3. Plot of Auxiliary Spillway Profile and Extent of Erosion from Integrity Analysis for 24-hour Class C Freeboard Hydrograph (PMF) Obtained from SITES Model Output

The SITES auxiliary spillway analysis shows only minor damage for both the 6-hour and 24-hour duration storm events. Photos 9 and 16 show features including trees and a small, wooden fence observed in the auxiliary spillway during the site visit that can 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.

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 87,332 cfs and 123,323 cfs, respectively. Assuming a complete breach of the dam occurs within 4.8 minutes, a peak breach discharge of approximately 113,000 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 66 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 flood plain. The HEC-RAS model of the downstream area at the confluence of Ash Spring Run 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 300 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 17, the inundation mapping was extended to the city of Keyser, approximately 6.5 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 14,800 cfs or 13 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 peak FEMA 100- and 500-year flood elevation near the center of Keyser were reported to be 809.5 feet and 813 feet . The peak dam breach flood elevation at the same location was computed to be 807.5 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 human 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 the loss of human life. Existing and future downstream development including controls for future development must be considered when classifying the dam.

New Creek Site 17 was designed in 1959 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 17 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.

Two dwellings were identified within the downstream inundation zone that are less than 500 feet from the toe of the dam. Many other dwellings, including the City of Keyser, approximately 6.5 miles downstream, would clearly be impacted by a flood wave that overflowed the channel banks.

A total of approximately 457 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 1143 persons.

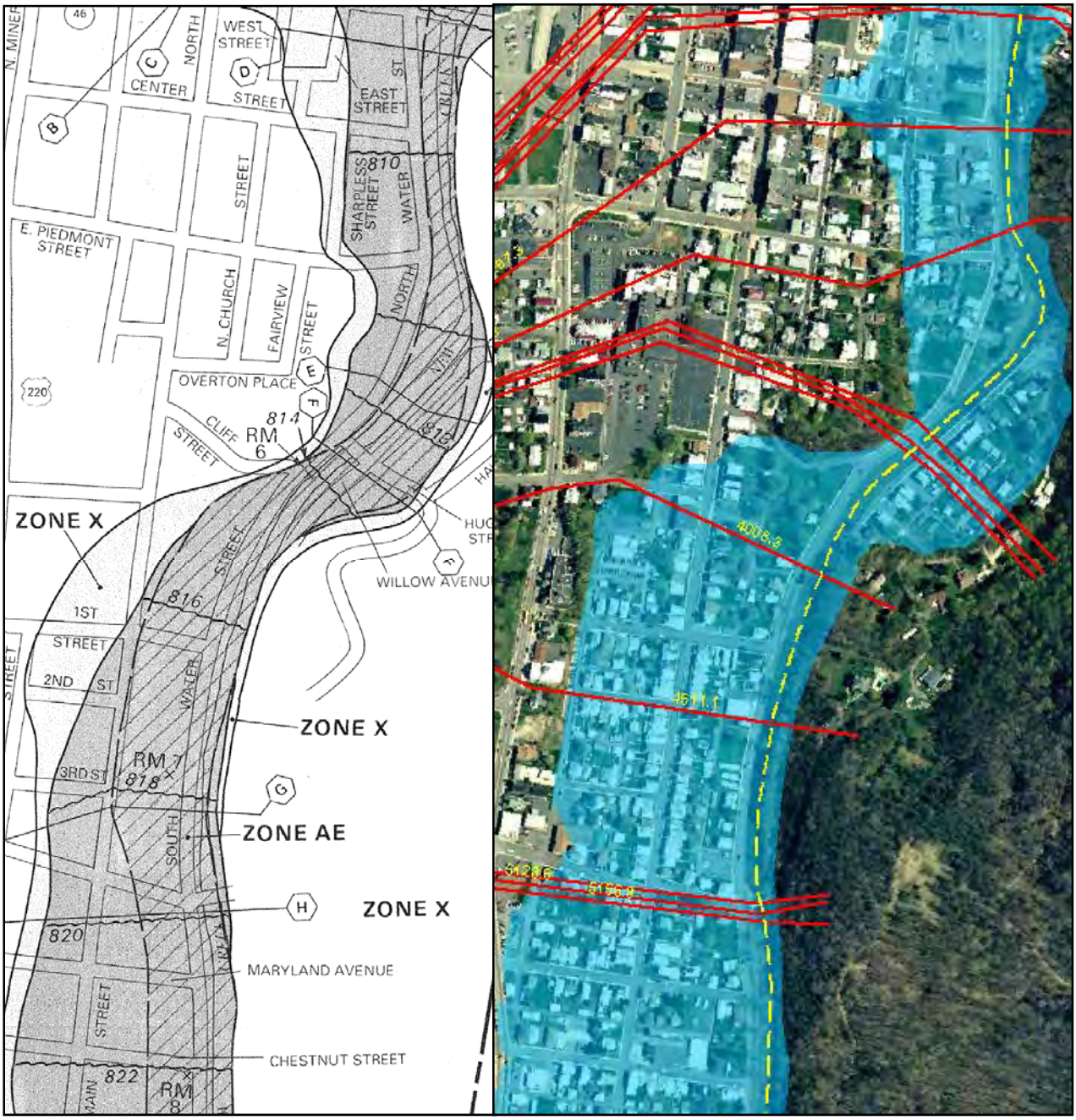


Figure 4. Side by Side Comparison of Floodplain Boundaries from the 1991 FEMA Flood Insurance Study (left) and the 2011 Gannett Fleming Dam Breach Study (right) at Keyser, West Virginia.

It should be noted that according to the HEC-RAS model results, it will take about 2 hours for a flood wave created by a sudden failure of New Creek Site 17 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 and Soils Reports (1959, 1960), as-built plans (1960), and Phase I Inspection Report prepared by Berger Associates for the Huntington District of the U.S. Army Corps of Engineers (1981).

The 1960'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.

The embankment relies entirely on the downstream rock fill toe to filter, collect, and convey seepage. The rock fill material was obtained from removing rock larger than 6 inches from the embankment fill. The as-built plans show no internal drain. An internal drain is typically built on the embankment/foundation contact about midway between the crest and downstream toe. The lack of an internal drain, which can serve the additional role of a filter diaphragm along the principal spillway conduit, is a very significant omission from the design.

Another design issue that can only be evaluated with an additional subsurface investigation is the compatibility of the clayey central core to the downstream shale shell, the compatibility of the shale shell to the rock fill toe, and the rock fill toe to the foundation soils. Transition zones which are required by current design criteria were not constructed at the contacts between zones.

Slope stability analyses performed as part of the original design were not available. However, a downstream slope stability analysis was performed in conjunction with the Phase I inspection. Shear strengths were taken from the original Soils Report and the phreatic surface was represented by a straight line between the sediment pool and the downstream toe. As discussed in Section 3, the steep 2H:1V downstream rock fill slope is very irregular. At a minimum this would imply that significant creep movement has occurred. The extreme vegetation covering the slope limited observation to fully evaluate the extent of movement.

The seepage control deficiencies and the possibility of inadequate slope stability require a thorough geotechnical assessment. The 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 17 is 273, with a total risk index of 12,482. A copy of the spreadsheet completed by the WV NRCS is included in Appendix D.

9. Discussion of Potential Rehabilitation Alternatives

In order to satisfy Class C (*high hazard*) design criteria, the only current deficiency identified in the preliminary SITES analysis is the overtopping of the dam. The preliminary SITES integrity analysis determined that the auxiliary spillway would experience an acceptable amount of damage during passage of the Freeboard Hydrograph. Therefore, armoring of the spillway will not be required.

It is noted that the dam assessment and spillway integrity analysis were performed using limited information about the subsurface properties of the dam embankment and auxiliary spillway profile. 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.

Modifications modeled with the SITES program include lowering the auxiliary spillway, widening the auxiliary spillway, and armoring the embankment so that it could be overtopped without eroding. Table 4 provides a summary of the results of SITES runs where the elevation and width of the auxiliary spillway were varied and the dam was armored so that it could be overtopped.

10. Cost Estimates for Rehabilitation Alternatives

Based on preliminary information, planning level cost estimates were prepared for the four alternatives listed in Table 4 and are presented in Table 5. Decommissioning or breaching the dam was included as an alternative in Table 5. The estimates assume that the auxiliary spillway will not need to be armored to prevent spillway breaching and that major expenditures to address potential embankment deficiencies are not required. Cost estimates are based on approximate quantities and construction prices from similar projects.

Combinations and permutations of the alternatives presented in Table 4, and other alternatives can be explored and refined during subsequent planning phases for this project to

Table 4
Potential Modifications to Bring New Creek Site 17
Into Compliance with NRCS Class C Structure Design Criteria

Alternative	Alternative Description	Lower ASW Crest Elevation (Feet)	ASW Width (Feet)	Amount Dam would Need to be Raised (Feet)	Overtopping Depth (Feet)
1	Raise Dam	0	200	**0.61**	0
2	Lower ASW Crest(1)	**0.64**	200	0	0
3	Widen ASW Crest	0	**235**	0	0
4	Armor Embankment	0	200	0	**0.48**

(1) Would result in loss of some flood control benefits. However, the ASW would still meet the 100-year flood activation criteria according to current design standards if lowered by 0.64 feet.

Table 5
Planning-Level Cost Estimates for Modifications to Bring
New Creek Site 17 into Compliance with NRCS Class C Design Criteria*

Alternative	Alternative Description	Estimated Total Project Cost
1	Raise Dam(1)	$2,600,000
2	Lower ASW Crest(2)	$150,000
3	Widen ASW	$300,000
4	Armor Embankment	$8,600,000
5	Decommission/Breach Dam	$1,500,000

* *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.*

(1) This cost represents a standard approach to raising a dam and includes the installation of a filter, drains, and fill across the entire downstream slope. Because the dam needs to be raised by only 0.61-foot, less costly alternatives such as regrading or narrowing the crest, steepening the slopes, or the installation of a parapet wall should be investigated.

(2) Would result in loss of some flood control benefits. However, the ASW would still meet the 100-year flood activation criteria according to current design standards if lowered by 0.64-foot.

obtain the most cost effective solution. For example, a combination of widening the auxiliary spillway and raising the dam to achieve a balance of materials can be evaluated. As an option to Alternative 2 (lower ASW crest), if it is desired that the current flood storage capacity of the existing dam and reservoir be maintained, fuse plugs or fuse gates could be incorporated into the lowered auxiliary spillway crest design. The fuse plugs or fuse gates could be divided into multiple individual bays such that they would be activated or eroded sequentially and only as needed.

11. Conclusions and Recommendations

11.1 Operations and Maintenance. New Creek Site 17 was observed to be in good condition with several maintenance deficiencies that need to be addressed. These include removal of woody vegetation from the embankment and auxiliary spillway, filling groundhog holes, filling and seeding bare earth tire ruts, removal of small fence in the auxiliary spillway, repairing the concrete lining of the principal spillway outlet conduit, clearing vegetation and trees away from the plunge pool area, painting the lower trash rack and drawdown handwheel, and clearing debris from the riser structure. Gates should also be replaced in order to control unauthorized motorized traffic across the dam crest. In addition to these maintenance items, the seep below the principal spillway should be monitored. Also, long-term maintenance issues as well as possible stability concerns for the downstream slope of the embankment should be investigated and addressed.

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. The combination of the lack of an embankment drain and an irregular 2H:1V downstream slope provides a strong incentive to complete a subsurface investigation to evaluate stability. The extreme vegetation on the downstream slope will probably require an initial clearing and grubbing effort. Items not readily accessible for inspection such as the inside of the principal spillway conduit and riser structure, and the buried exterior of the riser and drain control valve should also be assessed.

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 17 as a high hazard structure is found to be appropriate. Sudden failure of New Creek Site 17 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 17 not meet current NRCS design criteria for a Class C (*high hazard*) structure. The only identified design deficiency is the overtopping of the dam during passage of the FBH. 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 17 as indicated in the spreadsheet prepared by the WV NRCS is 273, with a total risk index of 12,482.

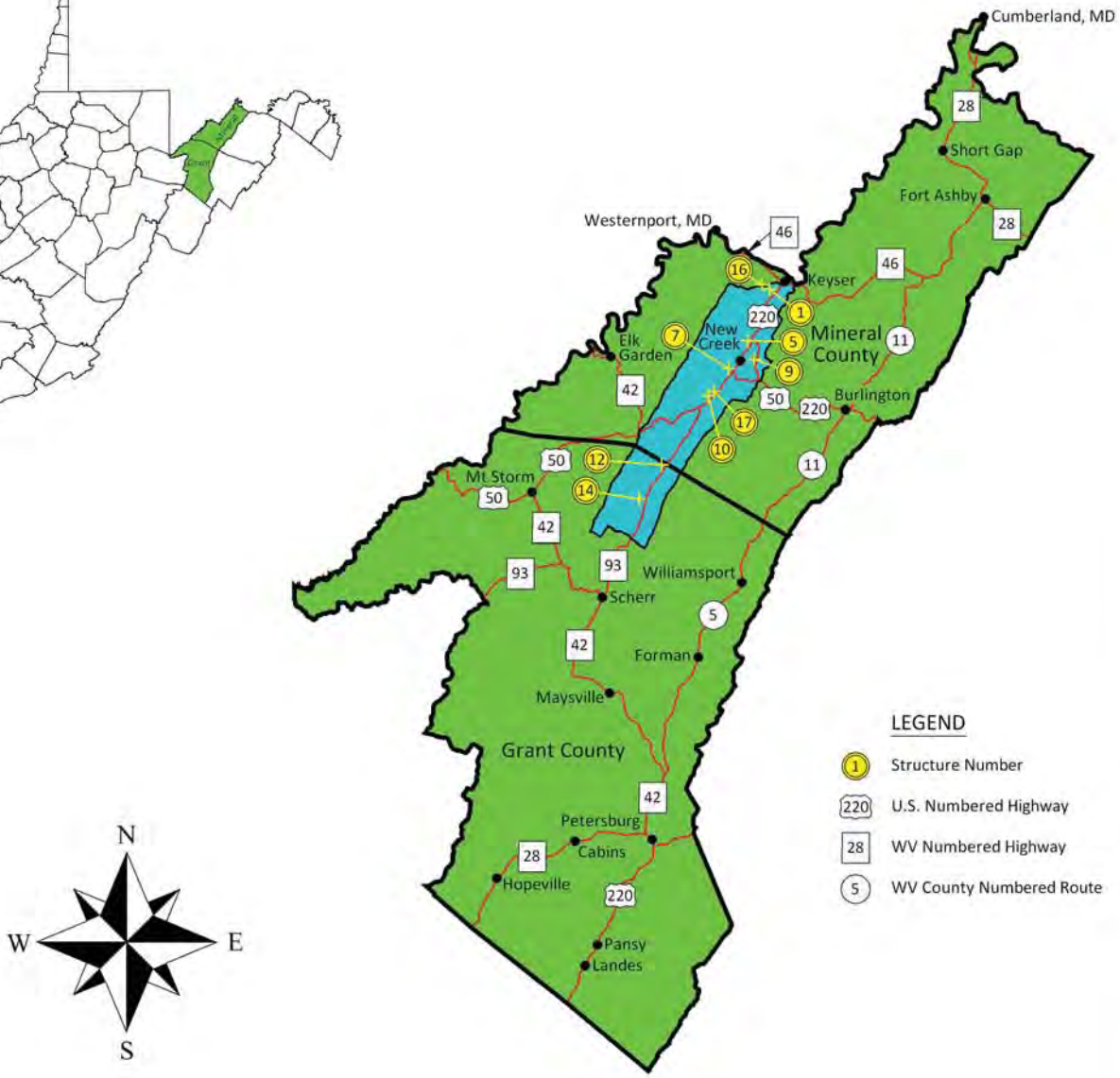
11.6 Rehabilitation Project. Major modifications to New Creek Site 17 are needed to bring the dam into compliance with current NRCS high hazard dam design criteria, for the known deficiencies. Of the alternatives listed in Table 5, a combination of lowering or widening the auxiliary spillway, and raising the dam appear to offer the best value. A planning level total project cost to make structural modifications to the dam to meet current NRCS design criteria without compromising current flood control benefits is estimated at $300,000. This estimate assumes that the auxiliary spillway will not need to be armored to prevent spillway breaching and that major expenditures to address potential embankment 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

KEYSER

NEW CREEK SITE 17 DAM

NEW CREEK

CLAYSVILLE

DAM BREACH INUNDATION MAP

NEW CREEK SITE 17
NIDID: WV 05706
MINERAL COUNTY, WEST VIRGINIA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

LEGEND

- HEC-RAS CROSS SECTIONS
- INUNDATION AREA
- FLOOD POOL

1500 -0- 1500 3000
SCALE IN FEET

PREPARED BY:
Gannett Fleming
207 SENATE AVENUE, CAMP HILL, PA. 17011

EXHIBIT 2
NOV. 2010

W:\426\Active Jobs\52999 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\11 - CADD\New Creek Site 17\New Creek Site 17 Inundation Map.dwg
Plot Date: 1/5/2011 2:30 PM | Plotted By: Miller, Brian S.

NEW CREEK SITE 17 DAM

NEW CREEK

CLAYSVILLE

KEYSER

DAM BREACH INUNDATION MAP

NEW CREEK SITE 17
NIDID: WV 05706
MINERAL COUNTY, WEST VIRGINIA

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

LEGEND

- HEC-RAS CROSS SECTIONS
- INUNDATION AREA
- FLOOD POOL

1500 -0- 1500 3000
SCALE IN FEET

PREPARED BY:
Gannett Fleming
207 SENATE AVENUE, CAMP HILL, PA. 17011

EXHIBIT
3
NOV. 2010

W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\1 - CAD\New Creek Site 17\New Creek Site 17 Inundation Map.dwg
Plot Date: 1/2/2011 2:26 PM Plotted By: Miller, Brian S.

Appendix A
Selected As-Built Drawings

"AS BUILT"

POTOMAC RIVER FLOOD PREVENTION PROJECT
NEW CREEK SITE NE-P # 17
KEYSER, WEST VIRGINIA

DRAINAGE AREA	1086.0 ACRES
FLOODWATER DETENTION CAPACITY	~~348.~~ 358 AC. FT.
SEDIMENT STORAGE	24.5 AC. FT.
SEDIMENT POOL AREA	~~3.5~~ 3.8 ACRES
HEIGHT OF DAM	57.3 FEET
PRINCIPAL SPILLWAY DIAMETER	24.0 INCHES

BUILT BY THE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

COOPERATING WITH

POTOMAC VALLEY
SOIL CONSERVATION DISTRICT

INDEX

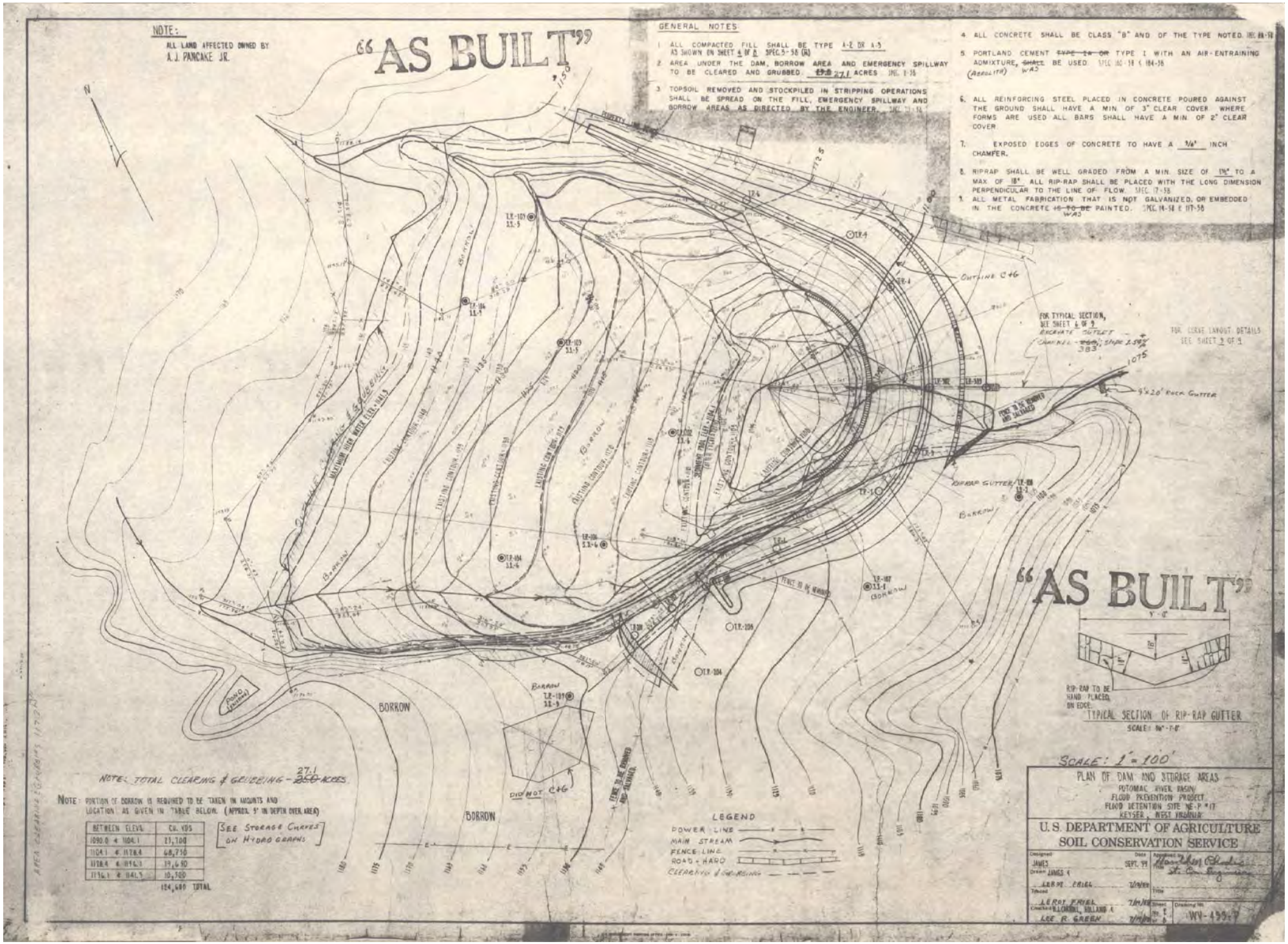
"AS BUILT"

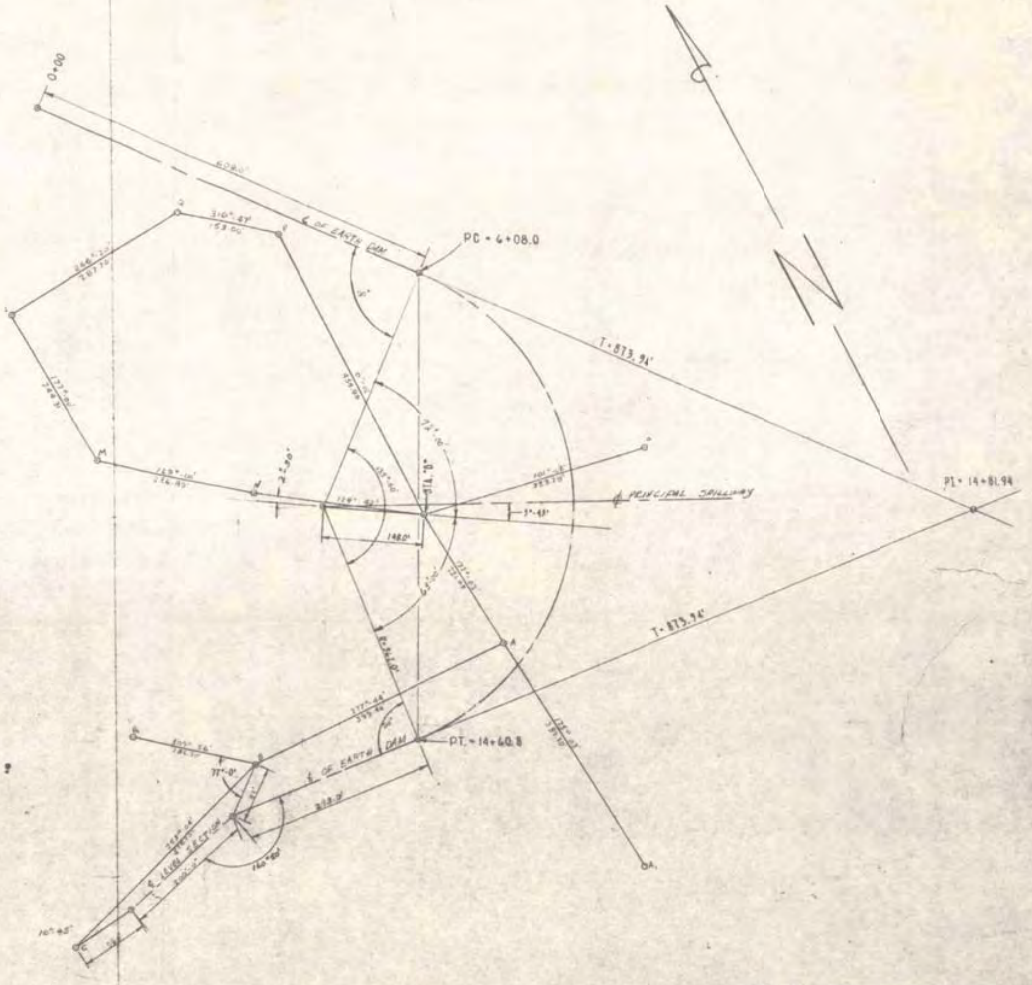
COVER SHEET
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P # 17
KEYSER, WEST VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H. DURLOFSKY - B. ELLIS	Date DEC. '59	Approved by Glenn W. Smith, HEAD OF E. & W.P. UNIT
Drawn M. NIKOLICH	JAN '60	Harold M. Rhodes, Title STATE CONSERVATION ENG.
Traced		Sheet No. 1 of 8
Checked W.J. CARROLL	FEB '60	Drawing No. WV-433-P

Form SCS-313 (November 1955)


"AS BUILT"
NOTE:
ALL LAND AFFECTED OWNED BY
A. J. PANCAKE JR.
GENERAL NOTES
1. ALL COMPACTED FILL SHALL BE TYPE A-2 OR A-5 AS SHOWN ON SHEET 6 OF 9 SPEC. 5-58 (M)
2. AREA UNDER THE DAM, BORROW AREA AND EMERGENCY SPILLWAY TO BE CLEARED AND GRUBBED 27.1 ACRES SPEC. 1-58
3. TOPSOIL REMOVED AND STOCKPILED IN STRIPPING OPERATIONS SHALL BE SPREAD ON THE FILL, EMERGENCY SPILLWAY AND BORROW AREAS AS DIRECTED BY THE ENGINEER. SPEC. 10-58
4. ALL CONCRETE SHALL BE CLASS "B" AND OF THE TYPE NOTED. SPEC. 18-58
5. PORTLAND CEMENT TYPE II OR TYPE I WITH AN AIR-ENTRAINING ADMIXTURE, SHALL BE USED. SPEC. SPEC. 18 & 184-58 (AEROLITH) WAS
6. ALL REINFORCING STEEL PLACED IN CONCRETE POURED AGAINST THE GROUND SHALL HAVE A MIN. OF 3" CLEAR COVER WHERE FORMS ARE USED ALL BARS SHALL HAVE A MIN. OF 2" CLEAR COVER
7. EXPOSED EDGES OF CONCRETE TO HAVE A 3/4" INCH CHAMFER.
8. RIPRAP SHALL BE WELL GRADED FROM A MIN. SIZE OF 1½" TO A MAX. OF 18" ALL RIP-RAP SHALL BE PLACED WITH THE LONG DIMENSION PERPENDICULAR TO THE LINE OF FLOW. SPEC. 17-58
9. ALL METAL FABRICATION THAT IS NOT GALVANIZED, OR EMBEDDED IN THE CONCRETE IS TO BE PAINTED. SPEC. 19-58 & 177-58 WAS
OUTLINE C+G
FOR TYPICAL SECTION, SEE SHEET 6 OF 9
FOR CURVE LAYOUT DETAILS SEE SHEET 7 OF 9
EMERGENCY SPILLWAY CREST ELEV. 1135.0
MAXIMUM HIGH WATER ELEV. 1141.5
FENCE TO BE REMOVED AND RELOCATED
9'x20' ROCK GUTTER
RIPRAP GUTTER
BORROW
DO NOT C+G
POND (existing)
LEGEND
POWER LINE
MAIN STREAM
FENCE LINE
ROAD - HARD
CLEARING & GRUBBING
"AS BUILT"
RIP-RAP TO BE HAND PLACED ON EDGE
TYPICAL SECTION OF RIP-RAP GUTTER
SCALE: 1/2"=1'-0"
NOTE: TOTAL CLEARING & GRUBBING - 27.1 ACRES
NOTE: PORTION OF BORROW IS REQUIRED TO BE TAKEN IN AMOUNTS AND LOCATION AS GIVEN IN TABLE BELOW. (APPROX. 5' IN DEPTH OVER AREA)
SEE STORAGE CHARTS ON HYDRO GRAPHS
BETWEEN ELEVS. | CU. YDS
1090.0 & 1104.1 | 27,700
1104.1 & 1118.4 | 68,750
1118.4 & 1129.3 | 39,690
1129.3 & 1141.5 | 10,380
124,480 TOTAL
SCALE: 1" = 100'
PLAN OF DAM AND STORAGE AREAS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-P #17
KEYSER, WEST VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed JAMES Date SEPT. 59
Drawn JAMES K
Traced LEROY FRIEL 7/24/59
Checked LEROY FRIEL 7/24/59
Approved by Hawthorn Rhodes
Title State Conservationist
Sheet No. 5
Drawing No. WV-439-7
W.CORDELL HOLLAND & LEE R. GREEN 7/24/59



GURVE DATA

R = 362'	M = 223.47
Δ = 135°-00'	E = 381.91
L = 852.80'	PC = 4+08.0
LC = 668.90'	PI = 14+81.94
T = 873.94'	PT = 14+60.80

	STATIONS ON CURVE	DEFLECTION	CHORD DISTANCE
PC	4+08	0°-0'-0"	0.00
	5+08	7°-56'-30"	99.68
	8+08	15°-49'-40"	99.68
	9+08	23°-44'-10"	99.68
	10+08	31°-39'-24"	99.68
℄ OF PRINCIPAL SPILLWAY	10+34.43	35°-30'-21"	99.60
	11+08	39°-34'-14"	99.68
	12+08	47°-29'-04"	99.68
	13+08	55°-23'-54"	99.68
	14+08	63°-18'-44"	99.68
PT	14+60.80	67°-30'-0"	52.90

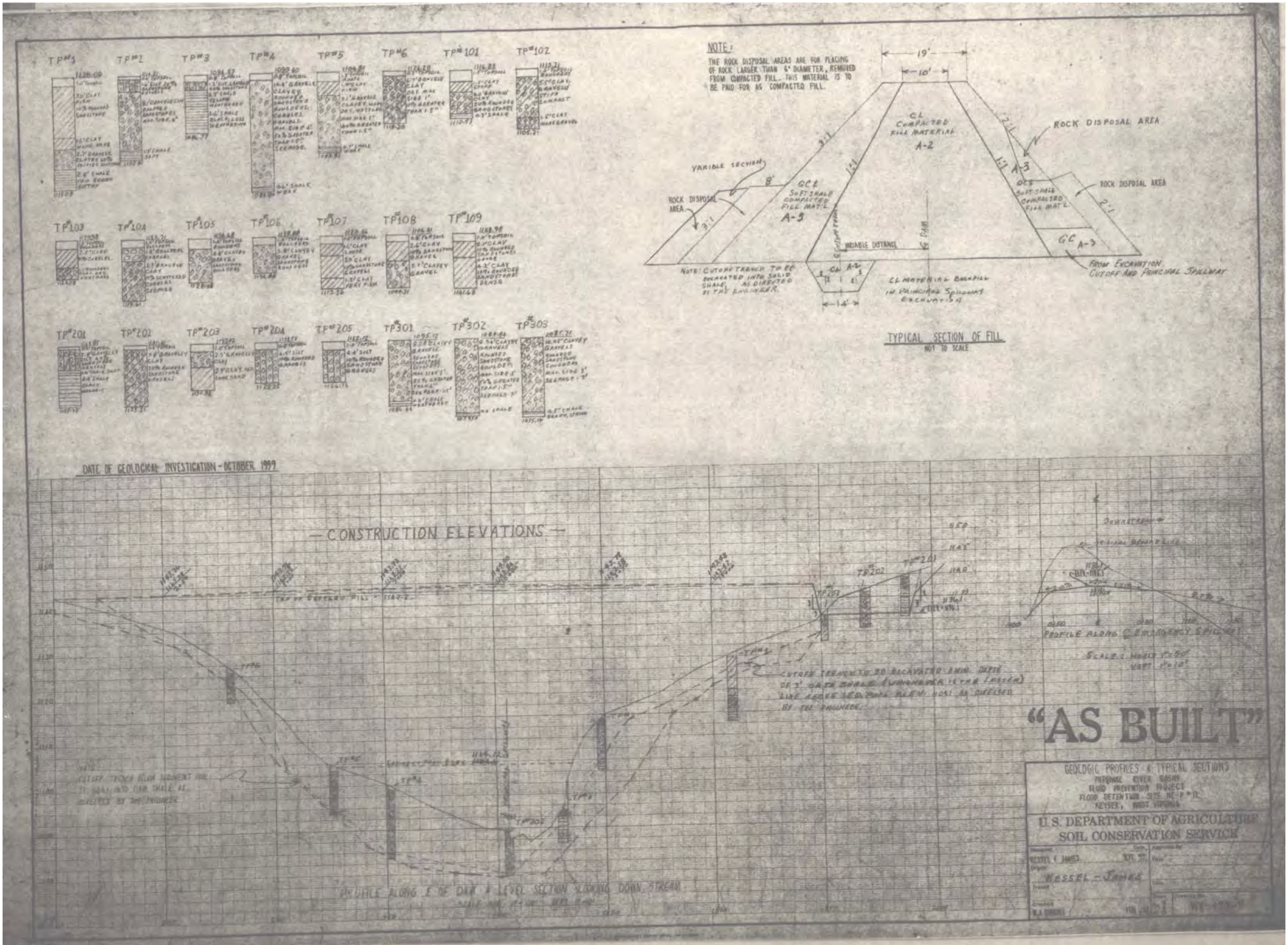
"AS BUILT"

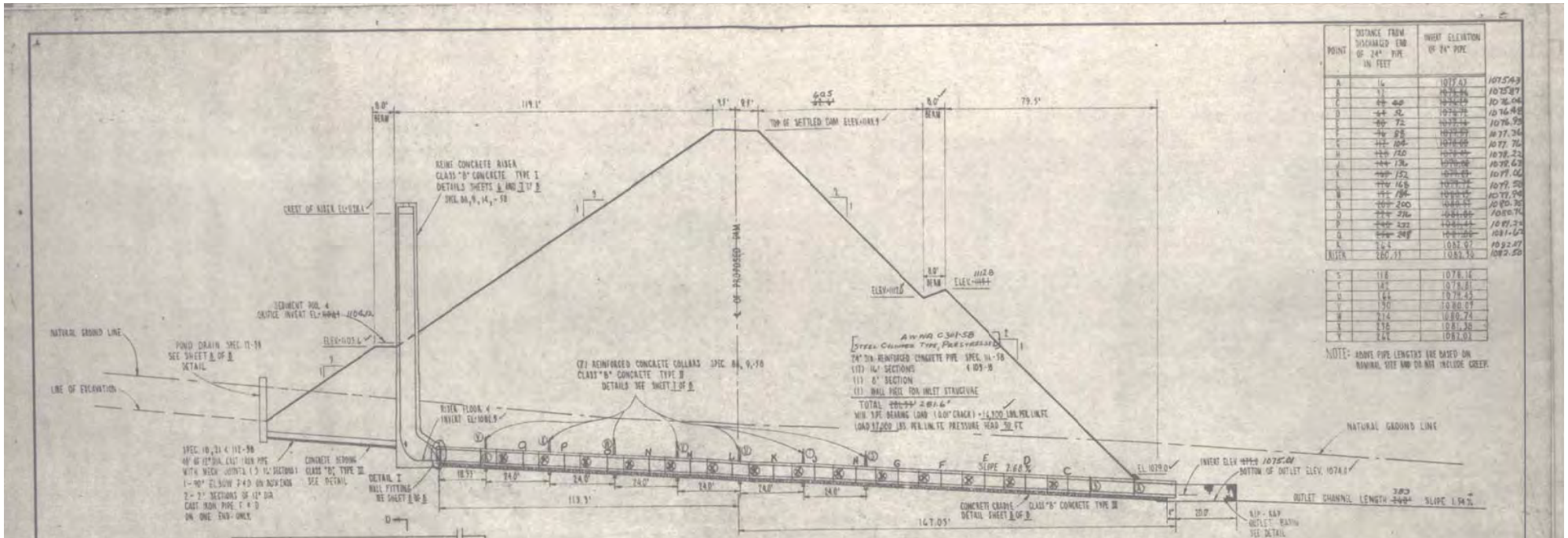
℄ LAYOUT SKETCH
NEW CREEK WATERSHED, FLOOD PREVENTION PROJECT
DETENTION RESERVOIR SITE #17
KEYSER, WEST VIRGINIA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	JAMES K. STEFFEY	Date	SEPT. '99
Drawn	STEFFEY		9/99
Traced			
Checked	W. ZEARFOSS		FEB. '00
	James S.		2/24/00

Approved by
Title
Title
Sheet No. 2 of 8
Drawing No. WV-433-P

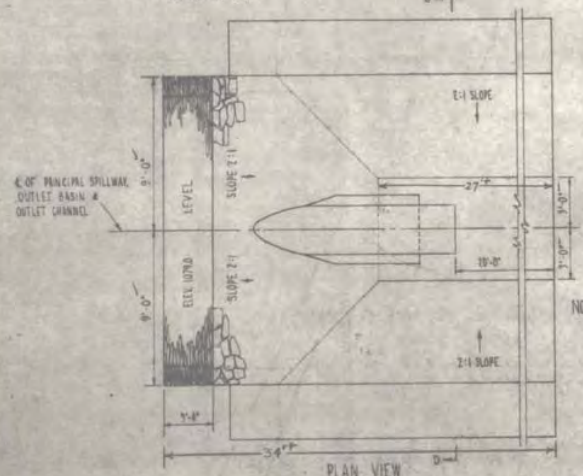

TP#1
TP#2
TP#3
TP#4
TP#5
TP#6
TP#101
TP#102
TP#103
TP#104
TP#105
TP#106
TP#107
TP#108
TP#109
TP#201
TP#202
TP#203
TP#204
TP#205
TP#301
TP#302
TP#303
NOTE:
THE ROCK DISPOSAL AREAS ARE FOR PLACING OF ROCK LARGER THAN 6" DIAMETER, REMOVED FROM COMPACTED FILL. THIS MATERIAL IS TO BE PAID FOR AS COMPACTED FILL.
19'
10'
CL
COMPACTED
FILL MATERIAL
A-2
ROCK DISPOSAL AREA
VARIABLE SECTION
8'
GC
SOFT SHALE
COMPACTED
FILL MAT'L
A-3
ROCK DISPOSAL AREA
3:1
2:1
VARIABLE DISTANCE
NOTE: CUTOFF TRENCH TO BE EXCAVATED INTO SOLID SHALE, AS DIRECTED BY THE ENGINEER.
14'
CL MATERIAL BACKFILL IN PRINCIPAL SPILLWAY EXCAVATION
GC A-3
FROM EXCAVATION
CUTOFF AND PRINCIPAL SPILLWAY
TYPICAL SECTION OF FILL
NOT TO SCALE
DATE OF GEOLOGICAL INVESTIGATION - OCTOBER 1949
— CONSTRUCTION ELEVATIONS —
PROFILE ALONG ℄ OF DAM & LEVEL SECTION LOOKING DOWN STREAM
PROFILE ALONG ℄ EMERGENCY SPILLWAY
DOWNSTREAM
"AS BUILT"
GEOLOGIC PROFILES & TYPICAL SECTIONS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NC-P #11
KEYSER, WEST VIRGINIA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KESSEL - JAMES



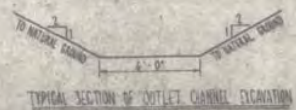
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY NOT TO SCALE

POINT	DISTANCE FROM DISCHARGE END OF 24" PIPE IN FEET	INVERT ELEVATION OF 24" PIPE	
A	14	1077.63	1075.63
B	17	1076.96	1075.87
C	44 40	1076.29	1076.04
D	44 52	1076.78	1076.48
E	44 72	1077.14	1076.93
F	44 88	1077.57	1077.34
G	144 104	1078.00	1077.76
H	144 120	1078.43	1078.23
I	144 136	1078.86	1078.63
J	144 152	1079.29	1079.02
K	144 168	1079.72	1079.50
L	144 184	1080.15	1079.94
M	144 200	1080.58	1080.38
N	144 216	1081.01	1080.82
O	144 232	1081.44	1081.24
P	144 248	1081.87	1081.67
Q	144 264	1082.30	1082.09
R	264	1082.97	1082.47
RISER	280.33	1083.39	1082.50
S	118	1078.16	
T	142	1078.81	
U	164	1079.45	
V	190	1080.09	
W	214	1080.74	
X	236	1081.38	
Y	264	1082.03	

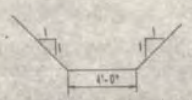
NOTE: ABOVE PIPE LENGTHS ARE BASED ON NOMINAL SIZE AND DO NOT INCLUDE CREEP.



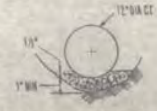
NOTE: HAND PLACED RIPRAP SHALL BE WELL GRADED FROM A MINIMUM SIZE OF 1/2" TO A MAXIMUM SIZE OF 18" WITH THE LONG DIMENSION PLACED PERPENDICULAR TO THE LINE OF FLOW. APPROX. 39 SQ. YDS.



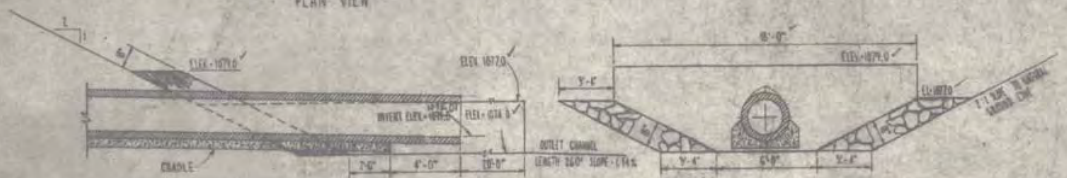
TYPICAL SECTION OF OUTLET CHANNEL EXCAVATION
SPEC. 4-58 R



TYPICAL SECTION OF POND DRAIN EXCAVATION
SPEC. 4-58 R



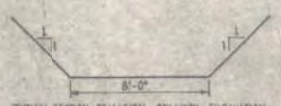
TYP. SECTION OF CONCRETE BEDDING FOR POND DRAIN PIPE
SPEC. 84-58



SECTION ALONG ℄

SECTION D-D

DETAIL OF OUTLET BASIN SCALE IN = 4'-0" SPEC. 17-58



TYPICAL SECTION PRINCIPAL SPILLWAY EXCAVATION
SPEC. 4-58 R

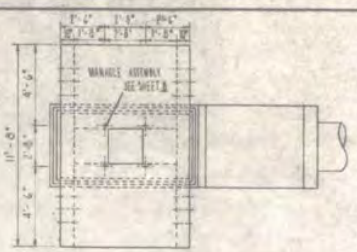
"AS BUILT"

PROFILE ALONG PRINCIPAL SPILLWAY
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NE-7-W-17
KEYSER, WEST VIRGINIA

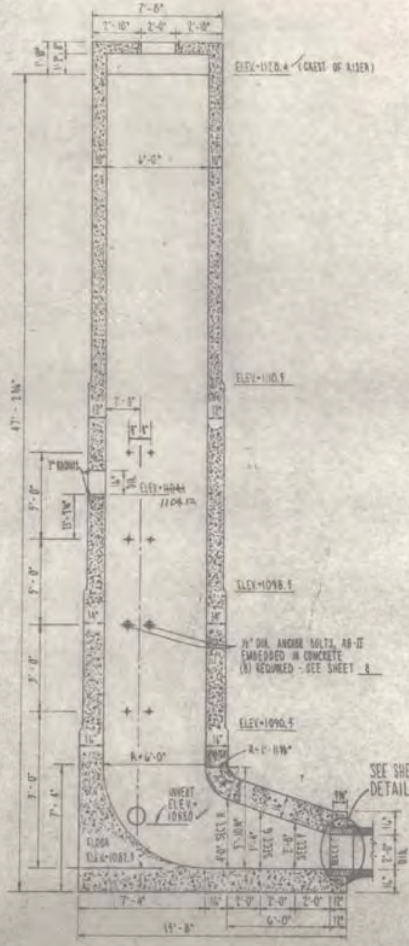
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	H. DUBLOFSKY, C. ELIAS	Date DEC. '59	Approved by
Drawn	W. T. BROWNING, JR.	JAN. '60	Title
Traced			Title
Checked	W. J. CARROLL	FEB. '60	Sheet No. 3 of 8 — Drawing No. WV-499-P

Form SCS-313 (November 1958)



TOP VIEW



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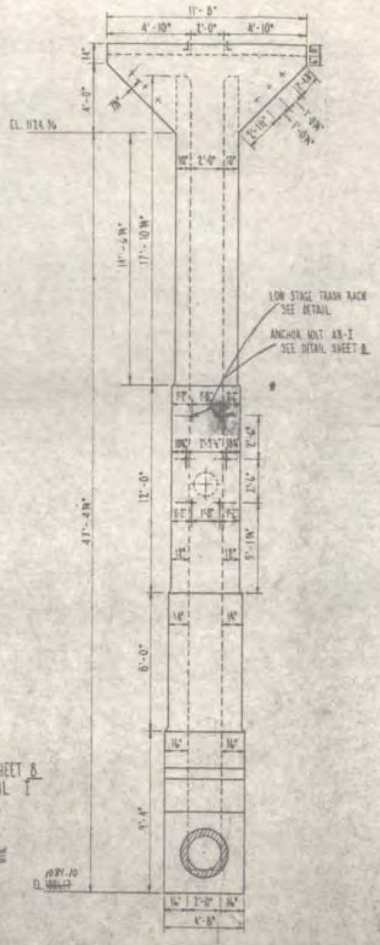
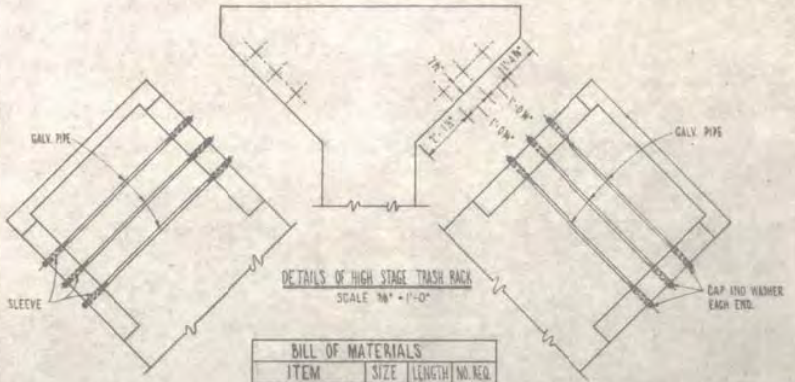


REAR ELEVATION

DETAILS OF REINFORCED CONCRETE RISER & ANTI-VORTEX DEVICE

SCALE ¾" = 1'-0" (SPEC. 14, 9, 14, 16, - 14)



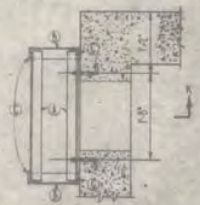
DETAILS OF HIGH STAGE TRASH RACK

SCALE ¾" = 1'-0"

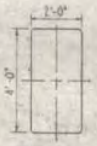
BILL OF MATERIALS			
ITEM	SIZE	LENGTH	NO. REQ.
GALV. PIPE - STD. STR. - THREADED	3" DIA.	8'-0"	4
GALV. PIPE - STD. STR.	3" DIA.	0'-10"	12
GALV. CAPS	3" DIA.		12
GALV. WASHERS	2¾" DIA.		12

BILL OF MATERIALS			
ITEM	SIZE	LENGTH	NO. REQ.
A - ANGLE IRON	2½" x 2½" x ¼"	1'-6"	4
B - ANGLE IRON	2½" x 2½" x ¼"	1'-0"	4
C - ANGLE IRON	2½" x 1½" x ¼"	5'-5½"	4
ANCHOR BOLTS W/ NUTS & WASHERS	¾" DIA.	0'-8"	6
ALONG BARS - PLAIN	NO. 4	5'-3"	1
ALONG BARS - PLAIN	NO. 4	1'-6"	4
ALONG BARS - PLAIN	NO. 4	1'-0"	10

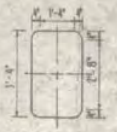
*SEE DETAIL OF BARS.
WELD ALL POINTS OF CONTACT BETWEEN ANGLE IRON



SECTION L-L



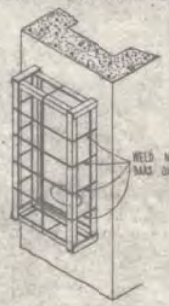
SECTION-H



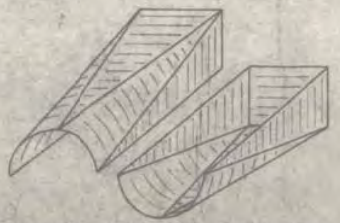
SECTION-G

SECTION-F

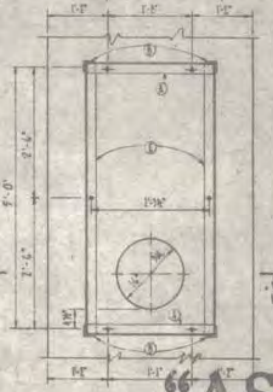
SECTION-E



ISOMETRIC VIEW



ISOMETRIC VIEW OF INSIDE OF RISER STUB



SECTION J-J

"AS BUILT"

DETAILS OF LOW STAGE TRASH RACK

SCALE ¾" = 1'-0" (SPEC 14-16)

STRUCTURAL DIMENSIONS & TRASH RACK DETAILS
POTOMAC RIVER BASIN
FLOOD PREVENTION PROJECT
FLOOD DETENTION SITE NF-2 P17
KEYSER, WEST VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	V. DURLOFSKY - G. ELIAS	Date DEC. '59	Approved by
Drawn	R.T. BROWNING, JR.	JAN '60	Title
Traced			Date
Checked	W. J. CARROLL	FEB. '60	Sheet No. 4 of 8 sheets; Drawing No. WV-499-P

Form SCS-513, (November 1959)

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 17
NID # 05706 **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		
b. Grass cover adequate?		X		Bare earth tire ruts on crest, upstream and downstream slopes need to be mowed
c. Settlements, misalignments or cracks?	X			Downstream slope
d. Vehicle ruts or animal trails?	X			Bare earth tire ruts along crest of dam, down auxiliary spillway training dike, and on left, downstream face
e. Fencing adequate?		X		Gates missing
f. Recent high water marks?		X		elevation
g. Development in flood pool?		X		
h. Development in downstream floodplain?	X			Houses and farms
i. Development in upstream watershed?	X			Recent subdivision just upstream of dam (1990's)
2. Upstream Slope				
a. Erosion?		X		
b. Trees?	X			Woody vegetation
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			Woody vegetation
c. Rodent holes?	X			Near toe of embankment and principal spillway conduit outlet
d. Cracks, settlements, & bulges?	X			Areas of large cobbles appear to be irregular possibly due to creep
e. Drains or wells flowing?			X	estimated gpm No drains visible
f. Seepage or boils?	X			estimated gpm Seep around cradle beneath principal spillway conduit visibly flowing
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?	X			Low level trash rack and drawdown handwheel need to be painted
d. Manhole cover?	X			
e. Leakage?				estimated gpm None observed. Interior not accessed.
f. Trash rack adequate?	X			
g. Inlet obstructed?	X			Minor debris surrounding lower inlet. Large branch lodged in riser structure.
h. Drawdown operative? closed ___ open X				Not accessed. Unknown.
i. Ladder intact?			X	
j. Pedestal securely fastened?				Not accessed. Unknown.
k. Floodgates operational?				Not accessed. Unknown.
l. Stem bent?		X		Visible portion not bent.
m. Stem guides operational?				Not accessed. Unknown.
n. Stem handwheel present?	X			
o. Do metal parts require painting?	X			Low level trash rack and drawdown handwheel
5. Abutment Contacts				
a. Erosion, cracks, or slides?		X		
b. Seepage?		X		
c. Gutters intact?	X			Trees encroaching on all gutters.
6. Auxiliary Spillway				
a. Obstructions?	X			Small, wooden fence in auxiliary spillway channel.
b. Erosion?		X		
c. Rodent holes?		X		
d. Low areas?		X		
e. Slips?		X		

ITEM	Y	N	N/A	REMARKS
7. Conduit & Outlet concrete X metal				tailwater elevation/flow
a. Spalling, cracking, & scaling?	X			~4-foot-long fracture observed on the principal spillway conduit outlet.
b. Exposed reinforcement?				None observed. See Note 1.
c. Joints displaced or offset?				None observed. See Note 1.
d. Joint material lost?				None observed. See Note 1.
e. Leakage?				None observed. See Note 1.
f. Earth erosion?				None observed. See Note 1.
g. Conduit misaligned?				Not observed. See Note 1.
h. Outlet channel obstructed?	X			Thick vegetation around conduit outlet and plunge pool.
8. Stilling Basin Plunge Pool X				
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?	X			
g. Dissipater deteriorating?			X	
h. Dissipater clean of debris?			X	
i. Toe drains visible?			X	No drains visible
j. Toe drains flowing?			X	
k. Toe drain animal guards in place?			X	
9. Reservoir				
a. Buildings in floodpool?		X		
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:

- Upstream and downstream slopes are covered with patches of thick woody vegetation and need to be mowed.
- Bare earth tire ruts along crest of dam, on left side of upstream slope, and on auxiliary spillway training dike.
- Gates are needed to impede ATV traffic on crest and face of dam.
- Animal burrow observed near toe of dam.
- The areas of large cobbles on the downstream face appear to be very irregular possibly to due creep of the steep slope. They are also thickly overgrown with vegetation due to the inability to mow.
- Seep beneath cradle at the principal spillway conduit outlet is visibly flowing.
- Low level trash rack and drawdown handwheel need to be painted.
- Small, wooden fence could obstruct flow in auxiliary spillway channel.
- Thick vegetation surrounding plunge pool and principal spillway outlet conduit.
- Significant fracture and deterioration of concrete lining of principal spillway conduit outlet observed.

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 William Franz
Engineer

GENERAL

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

2. Principal spillway riser structure.

GENERAL

3. Upstream embankment slope.

4. Downstream embankment slope.

GENERAL

5. Outlet conduit.

6. Plunge pool.

OBSERVED DEFICIENCIES

7. Bare earth tire ruts on dam crest, left side of upstream slope, and auxiliary spillway training dike.

8. Animal burrow near toe of downstream embankment.

OBSERVED DEFICIENCIES

9. Woody vegetation on upstream slope of dam embankment and auxiliary spillway entrance slope.

10. Woody vegetation on downstream embankment, especially in areas of large cobbles. Cobbled slope appears irregular due to overgrowth and possibly creep.

OBSERVED DEFICIENCIES

11. Plunge pool and outlet conduit are overgrown with vegetation.

12. Seep around cradle beneath principal spillway conduit visibly flowing.

OBSERVED DEFICIENCIES

13. Significant fracture (~4 feet long) of principal spillway conduit outlet.

14. Minor debris obstructing lower inlet of principal spillway. Large tree branch lodged in principal spillway riser structure.

OBSERVED DEFICIENCIES

15. Lower trash rack and drawdown gate stem and handwheel show signs of corrosion and need to be painted.

16. Small, wooden fence in auxiliary spillway channel.

NRCS

Appendix C
SITES Output

NRCS

SITES Output

New Creek Site 17 – 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 16:24:07

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

 SITES     01/01/2005NC17      New Creek Site 17             1.696875  A1
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 17
                     1090                                    0
                     1095                                    3.4
                     1100                                    12.4
                     1105                                    28.25
                     1110                                    53.1
                     1115                                    88.55
                     1120                                    136
                     1125                                    195.65
                     1130                                    269.5
                     1135                                    360.35
                     1140                                    470.1
                     1145                                    602.85
                     1160                                    1100
 ENDTABLE
 WSDATA    2C 17  AC 72        1086      0.78                6.2
 BASEFLOW            0.95
 PDIRECT             5.82      8.45
 POOLDATA  ELEV                1104.12   1104.12                       TC
 PSINLET   ELEV      0.75      12        1128.4    1.18      1.18
 PSDATA    1         280.33    24                  0.013     1076.01
 GRAPHICS  I
 GO,DESIGN LN
 SAVMOV    2    101  1                   17
 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 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:24:07           SITE = 17               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          8.45          0.00          0.00

 WSDATA -       CN          DA-SM          TC/L           -/H          QRF
             72.00           1.70          0.78          0.00         6.20

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
              0.00       1104.12       1104.12           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       280.33         24.00          0.00

             PS N           KE         WEIR L         TW EL
            0.013         0.75         12.00       1076.01

          2ND STG        ORF H          ORF L      START AUX.
          1128.40         1.18          1.18           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 17                   WSID= NC17
 VER 2005.1.04                                                      SUBW= 17
 TIME 16:24:07           SITE = 17               PASS=    1     PART=   2


 CREST PS       1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 SED ACCUM      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 BASEFLOW       1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 2ND STAGE      1128.40 FT     245.9 ACFT      0.00 AC      32.6 CFS

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS


 NRCS-PSH  RAINFALL   1-DAY =   5.82 IN    10-DAY =   8.45 IN    DA =   1.70 SM
           RUNOFF     1-DAY =   2.85 IN    10-DAY =   2.98 IN

      CLIMATIC INDEX = 1.00    CN 10-DAY = 54.    CN 1-DAY =  72.
      QRF  =     10.52 CFS     1109.36 FEET,    GIVEN VALUE.

      PEAK =      2665.3 CFS, AT  120.1 HRS.


 ROUTED RESULT - HYD TYPE      EMAX         VOL-MAX        AMAX         QMAX
                 NRCS-PSH   1130.06 FT     270.6 ACFT      0.00 AC     80.9 CFS

      PS STORAGE     245.1 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 DRAWDOWN (DDT) TEST       1111.51 FT      63.8 ACFT     15.77 CFS
      CONTROL IS 0.150 DETENTION STORAGE

      TIME TO DDT TEST DISCHARGE IS   6.66 DAYS - DRAWDOWN CONTINUING.

      TIME LIMIT =  10.00 DAYS;  FLOW WAS    12.31 CFS,  ELEV =  1109.59 FT


 ****************************************************************************
 RATING TABLE DEVELOPED, SITE = 17   :
  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  1104.12      0.00      0.00      0.00     25.46      0.00
   2  1104.35      0.40      0.40      0.00     26.19      0.00
   3  1104.58      1.13      1.13      0.00     26.91      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
   4  1104.81      2.08      2.08      0.00     27.64      0.00
   5  1112.67     18.91     18.91      0.00     72.04      0.00
   6  1120.54     26.65     26.65      0.00    142.39      0.00
   7  1128.40     32.61     32.61      0.00    245.87      0.00
   8  1128.79     41.96     41.96      0.00    251.64      0.00
   9  1129.18     58.83     58.83      0.00    257.41      0.00
                                          FULL CONDUIT FLOW, ELEV = 1129.57 FT
  10  1129.57     80.60     80.60      0.00    263.18      0.00
  11  1139.71     87.95     87.95      0.00    463.84      0.00
  12  1149.86     94.70     94.70      0.00    763.84      0.00
  13  1160.00    100.99    100.99      0.00   1100.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                      SUBW= 17
 TIME 16:24:07            SITE = 17               PASS=    1     PART=   3


 AUX. CREST     1130.06 FT     270.6 ACFT      0.00 AC      80.9 CFS

      PS STORAGE    245.1 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     1109.59 FT      51.0 ACFT      0.00 AC      12.3 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 =         80.87 CFS  at  121.52 hrs.,  Location Point
HYDOUT   1     17

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

 NC17          New Creek Site 17

       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
 ------------                        --------                             --------
 NC17                               02/10/2011                            16:24:07

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       17       17        1.70     72.   0.78      1.70    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
                             NC17     FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_ASW_Crest.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_ASW_Crest.OUT
         DATED 02/10/2011 16:24:07

                         GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_ASW_Crest.DRG
DATED 02/10/2011 16:24:07

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_ASW_Crest.DHY
DATED 02/10/2011 16:24:07

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_ASW_Crest.DEM
DATED 02/10/2011 16:24:07
```

NRCS

SITES Output

New Creek Site 17 – 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 16:24:39

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

 SITES     01/01/2005NC17      New Creek Site 17             1.696875  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 17
                     1090                                    0
                     1095                                    3.4
                     1100                                    12.4
                     1105                                    28.25
                     1110                                    53.1
                     1115                                    88.55
                     1120                                    136
                     1125                                    195.65
                     1130                                    269.5
                     1135                                    360.35
                     1140                                    470.1
                     1145                                    602.85
                     1160                                    1100
 ENDTABLE
 WSDATA    2C 17  AC 72        1086      0.78
 BASEFLOW            0.95
 PDIRECT                                 9.90      27.30
 POOLDATA  ELEV       1104.12   1104.12   1104.12   1086      1074      TC
 PSINLET   ELEV       0.75      12        1128.4    1.18      1.18
 PSDATA    1          280.33    24                  0.013     1076.01
 ASSPRFL   41
           -81        1123.5    -56       1135.18   -10       1136.1
           10         1136.1    69        1134.92   181       1125.176
 ENDTABLE
 ASSURFACE 41         69        0.1
           -81        -56       0.02      0.5       1         1
           -56        -10       0.035     0.5       1         1
           -10        10        0.035     0.5       1         1
           10         69        0.035     0.5       1         1
           69         181       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                              2.5                           2
 BTMWIDTH  FEET       200
 GRAPHICS  I
 GO,DESIGN HL                     6                             1104.12
 SAVMOV    2    101  1                   17
 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  1136.10
                 FROM THE ASSPRFL RECORDS.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                      SUBW= 17
 TIME 16:24:39            SITE = 17               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
              72.00           1.70          0.78          0.00         0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
            1104.12       1104.12       1104.12        1074.00           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         280.33         24.00          0.00

              PS N            KE         WEIR L        TW EL
             0.013          0.75         12.00        1076.01

            2ND STG         ORF H          ORF L      START AUX.
            1128.40          1.18          1.18        1104.12

 ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
            1136.10          0.00          0.00           0.00          0.00

 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00         10.00              0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035          0.020            NO

 BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
   ft        200.00          0.00          0.00           0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:24:39           SITE = 17               PASS=    1     PART=   2


 PERM POOL      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 CREST PS       1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 SED ACCUM      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 BASEFLOW       1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 2ND STAGE      1128.40 FT     245.9 ACFT      0.00 AC      32.6 CFS

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS


 ***************************************************************************
 RATING TABLE DEVELOPED, SITE = 17   :
  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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
```

```
                                                TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                                FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1139.71     87.95     87.95      0.00    463.84      0.00
 12  1149.86     94.70     94.70      0.00    763.84      0.00
 13  1160.00    100.99    100.99      0.00   1100.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                      SUBW= 17
 TIME 16:24:39            SITE = 17               PASS=    1     PART=   3


 AUX. CREST     1136.10 FT     384.5 ACFT      0.00 AC      85.0 CFS

      PS STORAGE    359.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 EFFECTIVE HEIGHT(H)= 50.1 FEET,  PRODUCT=   19263. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=   6.00 HR    P=  9.90 IN     Q=  6.40 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=    579.8 ACFT

      PEAK =      4092.3 CFS, AT    2.8 HRS.

 NRCS-FBH      D=   6.00 HR    P= 27.30 IN     Q= 23.13 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=   2094.4 ACFT

      PEAK =     15062.4 CFS, AT    2.8 HRS.


 ********************************************************************************
 RATING TABLE DEVELOPED, SITE = 17   :
  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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
                                                TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                                FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1131.75     82.27     82.27      0.00    301.26      0.00
 12  1133.92     83.86     83.86      0.00    340.80      0.00
 13  1136.10     85.42     85.42      0.00    384.50      0.00
 14  1137.29    709.57     86.27    623.30    410.72      0.00
 15  1138.49   2019.83     87.11   1932.73    436.96      0.00
 16  1140.64   5679.57     88.59   5590.98    487.12      0.00
 17  1143.27  11787.01     90.38  11696.64    556.92      0.00
 18  1148.05  27540.17     93.53  27446.64    703.94      0.00
```

```
 19  1154.03  52839.61     97.33  52742.27    901.97      0.00
 20  1160.00  85026.20    100.99  84925.21   1100.00      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    -81.    -56.  -46.7     0.020       **       **     **    INLET
  2    -56.    -10.   -2.0     0.035       **       **     **    INLET
  3    -10.     10.    0.0     0.035       **       **     **    CREST
  4     10.     69.    2.0     0.035     0.50       1     1.0    EXIT !
  5     69.    181.    8.7     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         200.0   1137.60     417.5       0.0      1.50      33.0

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       86.      960.     1047.

                       CRITICAL  CRITICAL   CRITICAL  25% OF Q
                         DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.89      5.33     0.019     0.025

          AUXILIARY SPILLWAY DURATION FLOW =        4.1 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   5.4 FT/SEC
                                           EXIT SLOPE  = 0.020 FT/FT
                                           FLOW DEPTH  =   0.9 FT
         ********************************************************************

         EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
         (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
           Aux. Spillway Discharge =     960. cfs;   Bottom Width =   200. 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      10.     69.   2.00   0.035       5.44      1.09   0.136
         ********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH         200.0   1143.91     574.0       0.0      7.81     189.5

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       91.    13527.    13618.

                       CRITICAL  CRITICAL   CRITICAL  25% OF Q
                         DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     5.11     12.45     0.011     0.014

          AUXILIARY SPILLWAY DURATION FLOW =        5.7 HOURS
                             ATTACK, OE/B =        8.5 ACFT/FT

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  15.2 FT/SEC
                                           EXIT SLOPE  = 0.020 FT/FT
```

```
                                          FLOW DEPTH  =   4.2 FT

 Inflow Hyd 1 SDH-Peak =       1046.66 CFS  at    4.58 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =      13617.71 CFS  at    2.96 hrs.,  Location Point
HYDOUT   1     17

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

 NC17          New Creek Site 17

       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
 ------------                       --------                          --------
 NC17                              02/10/2011                         16:24:39

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
        ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       17       17        1.70     72.   0.78      1.70    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   1136.1   200.0   7.8   1143.9       0.     0.    15.1  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
                             NC17     FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_TOD_Crest.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_TOD_Crest.OUT
         DATED 02/10/2011 16:24:39
```

GRAPHICS FILES GENERATED

OPTION "L" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_TOD_Crest.DRG
DATED 02/10/2011 16:24:39

OPTION "P" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_TOD_Crest.DHY
DATED 02/10/2011 16:24:39

OPTION "E" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_Estimating_TOD_Crest.DEM
DATED 02/10/2011 16:24:39

NRCS

SITES Output

New Creek Site 17 – 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 16:25:30

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

 SITES     01/01/2005NC17      New Creek Site 17             1.696875  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 17
                     1090                                    0
                     1095                                    3.4
                     1100                                    12.4
                     1105                                    28.25
                     1110                                    53.1
                     1115                                    88.55
                     1120                                    136
                     1125                                    195.65
                     1130                                    269.5
                     1135                                    360.35
                     1140                                    470.1
                     1145                                    602.85
                     1160                                    1100
 ENDTABLE
 WSDATA    2C 17  AC 72        1086      0.78
 BASEFLOW             0.95
 RAINTABLE 17         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                                 13.40     34.80
 POOLDATA  ELEV       1104.12   1104.12   1104.12   1086      1074      TC
 PSINLET   ELEV       0.75      12        1128.40   1.18      1.18
 PSDATA    1          280.33    24                  0.013     1076.01
 ASSPRFL   41
           -81        1123.5    -56       1135.18   -10       1136.1
           10         1136.1    69        1134.92   181       1125.176
 ENDTABLE
 ASSURFACE 41         69        0.1
           -81        -56       0.02      0.5       1         1
           -56        -10       0.035     0.5       1         1
           -10        10        0.035     0.5       1         1
           10         69        0.035     0.5       1         1
           69         181       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                              2.5                           2
 BTMWIDTH  FEET       200
 GRAPHICS  I
 GO,DESIGN HL         17        24                            1104.12
 SAVMOV    2    101   1                   17
 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  1136.10
               FROM THE ASSPRFL RECORDS.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:25:30           SITE = 17               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         13.40          34.80

 WSDATA -       CN          DA-SM          TC/L            -/H           QRF
              72.00          1.70          0.78           0.00          0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
            1104.12       1104.12       1104.12        1074.00           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        280.33         24.00          0.00

              PS N            KE         WEIR L         TW EL
             0.013          0.75         12.00        1076.01

            2ND STG         ORF H          ORF L      START AUX.
            1128.40          1.18          1.18        1104.12

 ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
            1136.10          0.00          0.00           0.00          0.00

 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00         10.00              0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035           0.020           NO

 BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
   ft        200.00          0.00          0.00           0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:25:30           SITE = 17               PASS=    1     PART=   2


 PERM POOL      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 CREST PS       1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 SED ACCUM      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 BASEFLOW       1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 2ND STAGE      1128.40 FT     245.9 ACFT      0.00 AC      32.6 CFS

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS
```

```
*******************************************************************************
RATING TABLE DEVELOPED, SITE = 17   :
 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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                          FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1139.71     87.95     87.95      0.00    463.84      0.00
 12  1149.86     94.70     94.70      0.00    763.84      0.00
 13  1160.00    100.99    100.99      0.00   1100.00      0.00


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 17                  WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:25:30            SITE = 17               PASS=    1     PART=   3


 AUX. CREST     1136.10 FT     384.5 ACFT      0.00 AC      85.0 CFS

      PS STORAGE    359.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 EFFECTIVE HEIGHT(H)= 50.1 FEET,  PRODUCT=   19263. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=  24.00 HR    P= 13.40 IN     Q=  9.65 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=    876.4 ACFT

      PEAK =      2270.5 CFS, AT    9.8 HRS.

 NRCS-FBH      D=  24.00 HR    P= 34.80 IN     Q= 30.53 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=   2766.5 ACFT

      PEAK =      6917.3 CFS, AT    9.7 HRS.


*******************************************************************************
RATING TABLE DEVELOPED, SITE = 17   :
 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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
                                          TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
```

```
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                          FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1131.75     82.27     82.27      0.00    301.26      0.00
 12  1133.92     83.86     83.86      0.00    340.80      0.00
 13  1136.10     85.42     85.42      0.00    384.50      0.00
 14  1137.29    709.57     86.27    623.30    410.72      0.00
 15  1138.49   2019.83     87.11   1932.73    436.96      0.00
 16  1140.64   5679.57     88.59   5590.98    487.12      0.00
 17  1143.27  11787.01     90.38  11696.64    556.92      0.00
 18  1148.05  27540.17     93.53  27446.64    703.94      0.00
 19  1154.03  52839.61     97.33  52742.27    901.97      0.00
 20  1160.00  85026.20    100.99  84925.21   1100.00      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    -81.    -56.  -46.7     0.020       **       **     **    INLET
  2    -56.    -10.   -2.0     0.035       **       **     **    INLET
  3    -10.     10.    0.0     0.035       **       **     **    CREST
  4     10.     69.    2.0     0.035     0.50       1     1.0    EXIT !
  5     69.    181.    8.7     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         200.0   1137.66     418.6       0.0      1.56      34.2

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       87.     1019.     1105.

                       CRITICAL  CRITICAL   CRITICAL  25% OF Q
                         DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---     0.93      5.43     0.018     0.025

          AUXILIARY SPILLWAY DURATION FLOW =       14.9 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   5.6 FT/SEC
                                           EXIT SLOPE  = 0.020 FT/FT
                                           FLOW DEPTH  =   0.9 FT
         ********************************************************************

         EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
         (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
           Aux. Spillway Discharge =    1019. cfs;   Bottom Width =   200. 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      10.     69.   2.00   0.035       5.57      1.13   0.140
         ********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH         200.0   1141.15     500.7       0.0      5.05     116.2

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
```

```
           DISCHARGE  =       89.     6780.     6869.

                        CRITICAL  CRITICAL   CRITICAL  25% OF Q
                          DEPTH   VELOCITY   SLOPE-Sc     Sc
           AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
           SPILLWAY ---     3.25     10.03     0.012     0.017

           AUXILIARY SPILLWAY DURATION FLOW =       17.6 HOURS
                              ATTACK, OE/B =       11.3 ACFT/FT

           EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  11.7 FT/SEC
                                            EXIT SLOPE  = 0.020 FT/FT
                                            FLOW DEPTH  =   2.8 FT

 Inflow Hyd 1 SDH-Peak =       1105.37 CFS  at   10.83 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       6868.85 CFS  at    9.84 hrs.,  Location Point
HYDOUT   1     17

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

 NC17          New Creek Site 17

       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
 ------------                        --------                          --------
 NC17                               02/10/2011                         16:25:30

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       17       17        1.70     72.   0.78      1.70    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   1136.1   200.0   5.1   1141.2       0.     0.    11.7  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
                             NC17     FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES
Model\NC17\NC_Site17_Estimating_TOD_Crest_24Hr.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES
Model\NC17\NC_Site17_Estimating_TOD_Crest_24Hr.OUT
         DATED 02/10/2011 16:25:30

                         GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES
Model\NC17\NC_Site17_Estimating_TOD_Crest_24Hr.DRG DATED 02/10/2011 16:25:30

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES
Model\NC17\NC_Site17_Estimating_TOD_Crest_24Hr.DHY DATED 02/10/2011 16:25:30

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES
Model\NC17\NC_Site17_Estimating_TOD_Crest_24Hr.DEM DATED 02/10/2011 16:25:30
```

NRCS

SITES Output

New Creek Site 17 – 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 16:22:53

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

 SITES     01/01/2005NC17      New Creek Site 17             1.696875  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 17
                     1090                                    0
                     1095                                    3.4
                     1100                                    12.4
                     1105                                    28.25
                     1110                                    53.1
                     1115                                    88.55
                     1120                                    136
                     1125                                    195.65
                     1130                                    269.5
                     1135                                    360.35
                     1140                                    470.1
                     1145                                    602.85
                     1160                                    1100
 ENDTABLE
 WSDATA    2C 17  AC 72        1086      0.78
 BASEFLOW             0.95
 PDIRECT                                 9.90      27.30
 POOLDATA  ELEV       1104.12   1104.12   1104.12   1086      1074      TC
 PSINLET   ELEV       0.75      12        1128.4    1.18      1.18
 PSDATA    1          280.33    24                  0.013     1076.01
 ASSURFACE 41         139       0.1
           0          25        0.02      0.5       1         1
           25         139       0.035     0.5       1         1
           139        891       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                             2.5                           1
 BTMWIDTH  FEET       200
 ASMATERIAL
           1          12        0.004     28        125       0.37
           2          0         0.5       0         110       2
 ENDTABLE
 ASCOORD    1         Soil      Y
           0          1130      25        1135      63        1136.1
           83         1136.1    139       1135      207       1130
           314.00     1120      444.60    1115      539.00    1110
           626.00     1105      668.00    1100      792.00    1085
           835.00     1080      891.00    1070
 ENDTABLE
 ASCOORD    2         Shale
           0          1125      139       1125      207       1120
           314        1100      626       1085      891       1060
 ENDTABLE
 GRAPHICS  I
 GO,DESIGN L                    6                               1104.12
 SAVMOV    2    101  1                   17
 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.
```

```
***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO  1136.10
               FROM THE ASCOORD RECORDS.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:22:53           SITE = 17               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           12.      125.      0.37        28.0          --        0.00400
     Shale           0.      110.      2.00         0.0          --        0.50000
     TS_FILL         0.      100.      0.05         0.0          --        0.05000
     GEN_FILL       12.      125.      0.37        28.0          --        0.00400

 ***************************    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
              72.00          1.70          0.78          0.00          0.00

 SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
            1104.12       1104.12       1104.12        1074.00           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        280.33         24.00          0.00

              PS N            KE         WEIR L         TW EL
             0.013          0.75         12.00        1076.01

            2ND STG         ORF H          ORF L      START AUX.
            1128.40          1.18          1.18        1104.12

 ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
            1136.10          0.00          0.00           0.00          0.00

 AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
                41          0.00         83.00              0

 AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
              0.035          2.50         0.035          0.020           YES

 BTM WIDTH -     BW1           BW2           BW3           BW4           BW5
   ft         200.00          0.00          0.00          0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                     SUBW= 17
 TIME 16:22:53           SITE = 17               PASS=    1     PART=   2


 PERM POOL      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS
```

```
CREST PS       1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

SED ACCUM      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

BASEFLOW       1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

2ND STAGE      1128.40 FT     245.9 ACFT      0.00 AC      32.6 CFS

START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS


*************************************************************************
RATING TABLE DEVELOPED, SITE = 17   :
 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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
                                            TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                            FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1139.71     87.95     87.95      0.00    463.84      0.00
 12  1149.86     94.70     94.70      0.00    763.84      0.00
 13  1160.00    100.99    100.99      0.00   1100.00      0.00


1SITES -------------------------------------------------------------------------
 XEQ 02/10/2011               New Creek Site 17                   WSID= NC17
 VER 2005.1.04                                                      SUBW= 17
 TIME 16:22:53            SITE = 17               PASS=    1     PART=   3


 AUX. CREST     1136.10 FT     384.5 ACFT      0.00 AC      85.0 CFS

      PS STORAGE    359.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 EFFECTIVE HEIGHT(H)= 50.1 FEET,  PRODUCT=   19263. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=   6.00 HR    P=  9.90 IN     Q=  6.40 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=    579.8 ACFT

      PEAK =      4092.3 CFS, AT    2.8 HRS.

 NRCS-FBH      D=   6.00 HR    P= 27.30 IN     Q= 23.13 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=   2094.4 ACFT

      PEAK =     15062.4 CFS, AT    2.8 HRS.


*************************************************************************
RATING TABLE DEVELOPED, SITE = 17   :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.
```

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE	
1	1104.12	0.00	0.00	0.00	25.46	0.00	
2	1104.35	0.40	0.40	0.00	26.19	0.00	
3	1104.58	1.13	1.13	0.00	26.91	0.00	
					TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT		
4	1104.81	2.08	2.08	0.00	27.64	0.00	
5	1112.67	18.91	18.91	0.00	72.04	0.00	
6	1120.54	26.65	26.65	0.00	142.39	0.00	
7	1128.40	32.61	32.61	0.00	245.87	0.00	
8	1128.79	41.96	41.96	0.00	251.64	0.00	
9	1129.18	58.83	58.83	0.00	257.41	0.00	
					FULL CONDUIT FLOW, ELEV = 1129.57 FT		
10	1129.57	80.60	80.60	0.00	263.18	0.00	
11	1131.75	82.27	82.27	0.00	301.26	0.00	
12	1133.92	83.86	83.86	0.00	340.80	0.00	
13	1136.10	85.42	85.42	0.00	384.50	0.00	
14	1137.29	724.25	86.27	637.98	410.72	0.00	
15	1138.49	2055.79	87.11	1968.69	436.96	0.00	
16	1140.64	5747.69	88.59	5659.10	487.12	0.00	
17	1143.27	11884.28	90.38	11793.90	556.92	0.00	
18	1148.05	27678.50	93.53	27584.97	703.94	0.00	
19	1154.03	53064.41	97.33	52967.07	901.97	0.00	
20	1160.00	85264.31	100.99	85163.32	1100.00	0.00	

****

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE +	ROOTING DEPTH (ft)	REACH LOCATION *
1	0.	25.	-20.0	0.020	**	**	**	INLET
2	25.	63.	-2.9	0.035	**	**	**	INLET
3	63.	83.	0.0	0.035	**	**	**	CREST
4	83.	139.	2.0	0.035	0.50	1	1.0	EXIT !
5	139.	207.	7.4	0.035	0.50	1	1.0	exit
6	207.	314.	9.3	0.035	0.50	1	1.0	exit
7	314.	445.	3.8	0.035	0.50	1	1.0	exit
8	445.	539.	5.3	0.035	0.50	1	1.0	exit
9	539.	626.	5.7	0.035	0.50	1	1.0	exit
10	626.	668.	11.9	0.035	0.50	1	1.0	exit
11	668.	792.	12.1	0.035	0.50	1	1.0	exit
12	792.	835.	11.6	0.035	0.50	1	1.0	exit
13	835.	869.	17.9	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 4 used in computing exit channel velocities.

****

ROUTED RESULTS	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
NRCS-SDH	200.0	1137.59	417.1	0.0	1.49	32.6

	Q-PS	Q-AUX.	Q-TOT.
PEAK - CFS DISCHARGE =	86.	963.	1049.

AUXILIARY SPILLWAY ---	CRITICAL DEPTH FT	CRITICAL VELOCITY FT/SEC	CRITICAL SLOPE-Sc FT/FT	25% OF Q Sc FT/FT
	0.89	5.33	0.019	0.025

```
 AUXILIARY SPILLWAY DURATION FLOW =        4.0 HOURS

 EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   5.4 FT/SEC
                                  EXIT SLOPE  = 0.020 FT/FT
                                  FLOW DEPTH  =   0.9 FT
*********************************************************************

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
  Aux. Spillway Discharge =     963. cfs;   Bottom Width =   200. 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      83.    139.   1.96   0.035       5.42      1.08   0.134
*********************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH        200.0   1143.88     573.1       0.0      7.78     188.6

 PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
 DISCHARGE  =       91.    13533.    13623.

                CRITICAL  CRITICAL   CRITICAL  25% OF Q
                  DEPTH   VELOCITY   SLOPE-Sc     Sc
 AUXILIARY         FT      FT/SEC     FT/FT     FT/FT
 SPILLWAY ---     5.11     12.45     0.011     0.014

 INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
  (The auxiliary spillway began flow at time =    2.5 hours
   and peaked at time =    3.0 hours.)


   REACH   4: FROM STATION     83. TO    139. ON    2.0% SLOPE.
      Surface unfailed: Stressed to  71% of allowable.


   REACH   5: FROM STATION    139. TO    207. ON    7.4% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.9 hours.


   REACH   6: FROM STATION    207. TO    314. ON    9.3% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.8 hours.


   REACH   7: FROM STATION    314. TO    445. ON    3.8% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.8 hours.


   REACH   8: FROM STATION    445. TO    539. ON    5.3% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    5.1 hours.


   REACH   9: FROM STATION    539. TO    626. ON    5.7% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    4.9 hours.


   REACH  10: FROM STATION    626. TO    668. ON   11.9% SLOPE.
      Vegetal cover failed and concentrated flow developed
      at time =    2.7 hours.


   REACH  11: FROM STATION    668. TO    792. ON   12.1% SLOPE.
      Vegetal cover failed and concentrated flow developed
```

```
                at time =    2.7 hours.


              REACH  12: FROM STATION    792. TO    835. ON   11.6% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =    2.7 hours.


              REACH  13: FROM STATION    835. TO    869. ON   17.9% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =    2.7 hours.


           INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

              The most upstream headcut began at station    139.
              and progressed upstream to station    139.
              The final height of the headcut was    2.2 ft.

              The headcut having the maximum final overfall height began
              at station    835. and progressed upstream to station   834.
              The final height of the headcut was    3.9 ft.

                            DURATION    ATTACK   DIST. FROM MOST U/S
                              FLOW       OE/B    HEADCUT TO U/S EDGE
           AUXILIARY           HRS     ACFT/FT     AUX. CREST, FT
           SPILLWAY ---        5.7        8.5            76.

           EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  15.1 FT/SEC
                                            EXIT SLOPE  = 0.020 FT/FT
                                            FLOW DEPTH  =   4.3 FT

 Inflow Hyd 1 SDH-Peak =       1049.20 CFS  at    4.58 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =      13623.41 CFS  at    2.96 hrs.,  Location Point
HYDOUT   1     17

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

 NC17          New Creek Site 17

       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
 ------------                       --------                          --------
 NC17                             02/10/2011                          16:22:53

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
         ID     ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       17       17        1.70     72.   0.78      1.70    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	1136.1	200.0	7.8	1143.9	0.	76.	15.1	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
NC17 FILES

INPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.OUT
DATED 02/10/2011 16:22:53

GRAPHICS FILES GENERATED

OPTION "L" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.DRG DATED 02/10/2011 16:22:53

OPTION "P" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.DHY DATED 02/10/2011 16:22:53

OPTION "E" = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.DEM DATED 02/10/2011 16:22:53

AUX.GRAPHICS = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_6Hr_Integrity.DG* DATED 02/10/2011 16:22:53

NRCS

SITES Output

New Creek Site 17 – 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 16:23:22

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

 SITES     01/01/2005NC17      New Creek Site 17             1.696875  C2
 SAVMOV    0    101
 SAVMOV    101  1                                                      1
 STRUCTURE 17
                     1090                                    0
                     1095                                    3.4
                     1100                                    12.4
                     1105                                    28.25
                     1110                                    53.1
                     1115                                    88.55
                     1120                                    136
                     1125                                    195.65
                     1130                                    269.5
                     1135                                    360.35
                     1140                                    470.1
                     1145                                    602.85
                     1160                                    1100
 ENDTABLE
 WSDATA    2C 17  AC 72        1086      0.78
 BASEFLOW             0.95
 RAINTABLE 17         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                                 13.40     34.80
 POOLDATA  ELEV       1104.12   1104.12   1104.12   1086      1074      TC
 PSINLET   ELEV       0.75      12        1128.40   1.18      1.18
 PSDATA    1          280.33    24                  0.013     1076.01
 ASSURFACE 41         139       0.1
           0          25        0.02      0.5       1         1
           25         139       0.035     0.5       1         1
           139        891       0.035     0.5       1         1
 ENDTABLE
 ASDATA    41                             2.5                           1
 BTMWIDTH  FEET       200
 ASMATERIAL
           1          12        0.004     28        125       0.37
           2          0         0.5       0         110       2
 ENDTABLE
 ASCOORD    1         Soil      Y
           0          1130      25        1135      63        1136.1
           83         1136.1    139       1135      207       1130
           314.00     1120      444.60    1115      539.00    1110
           626.00     1105      668.00    1100      792.00    1085
           835.00     1080      891.00    1070
 ENDTABLE
 ASCOORD    2         Shale
           0          1125      139       1125      207       1120
           314        1100      626       1085      891       1060
 ENDTABLE
 GRAPHICS  I
```

```
GO,DESIGN L         17        24                            1104.12
SAVMOV    2    101  1                   17
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.

***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO  1136.10
               FROM THE ASCOORD RECORDS.


1SITES ----------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                  WSID= NC17
 VER 2005.1.04                                                    SUBW= 17
 TIME 16:23:22           SITE = 17               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           12.      125.      0.37         28.0          --         0.00400
    Shale           0.      110.      2.00          0.0          --         0.50000
    TS_FILL         0.      100.      0.05          0.0          --         0.05000
    GEN_FILL       12.      125.      0.37         28.0          --         0.00400

***************************    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         13.40         34.80

WSDATA -       CN          DA-SM          TC/L           -/H          QRF
             72.00          1.70          0.78          0.00         0.00

SITEDATA- PERM POOL     CREST PS        FP SED        VALLEY FL         378?
           1104.12       1104.12       1104.12        1074.00           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        280.33         24.00          0.00

             PS N            KE         WEIR L         TW EL
            0.013          0.75         12.00        1076.01

          2ND STG         ORF H          ORF L      START AUX.
          1128.40          1.18          1.18        1104.12

ASCRESTS -   AUX.1         AUX.2         AUX.3          AUX.4          AUX.5
           1136.10          0.00          0.00           0.00          0.00

AUX.DATA -  REF.NO.    RETARD. Ci   TIE STATION    INLET LENGTH
               41          0.00         83.00              0

AUX.DATA - INLET N     SIDE SLOPE       EXIT N      EXIT SLOPE     ACTUAL AUX?
             0.035          2.50         0.035          0.020           YES

BTM WIDTH -    BW1           BW2           BW3            BW4           BW5
```

```
  ft        200.00          0.00          0.00          0.00          0.00

 AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                  WSID= NC17
 VER 2005.1.04                                                    SUBW= 17
 TIME 16:23:22            SITE = 17               PASS=    1     PART=   2


 PERM POOL      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 CREST PS       1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 SED ACCUM      1104.12 FT      25.5 ACFT      0.00 AC       0.0 CFS

 BASEFLOW       1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 2ND STAGE      1128.40 FT     245.9 ACFT      0.00 AC      32.6 CFS

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS


 ********************************************************************************
 RATING TABLE DEVELOPED, SITE = 17   :
  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  1104.12      0.00      0.00      0.00      25.46      0.00
   2  1104.35      0.40      0.40      0.00      26.19      0.00
   3  1104.58      1.13      1.13      0.00      26.91      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
   4  1104.81      2.08      2.08      0.00      27.64      0.00
   5  1112.67     18.91     18.91      0.00      72.04      0.00
   6  1120.54     26.65     26.65      0.00     142.39      0.00
   7  1128.40     32.61     32.61      0.00     245.87      0.00
   8  1128.79     41.96     41.96      0.00     251.64      0.00
   9  1129.18     58.83     58.83      0.00     257.41      0.00
                                             FULL CONDUIT FLOW, ELEV = 1129.57 FT
  10  1129.57     80.60     80.60      0.00     263.18      0.00
  11  1139.71     87.95     87.95      0.00     463.84      0.00
  12  1149.86     94.70     94.70      0.00     763.84      0.00
  13  1160.00    100.99    100.99      0.00    1100.00      0.00


1SITES ------------------------------------------------------------------------
 XEQ 02/10/2011              New Creek Site 17                  WSID= NC17
 VER 2005.1.04                                                    SUBW= 17
 TIME 16:23:22            SITE = 17               PASS=    1     PART=   3


 AUX. CREST     1136.10 FT     384.5 ACFT      0.00 AC      85.0 CFS

      PS STORAGE    359.0 ACFT,  BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

 START ELEV     1104.69 FT      27.3 ACFT      0.00 AC       1.6 CFS

 EFFECTIVE HEIGHT(H)= 50.1 FEET,  PRODUCT=   19263. (H * STORAGE AT CREST AUX.).

 INPUT DESIGN CLASS = C

 NRCS-SDH      D=  24.00 HR    P= 13.40 IN     Q=  9.65 IN      DA=   1.70 SM
              TC=   0.78 HR   CN=  72.00     VOL=    876.4 ACFT

      PEAK =      2270.5 CFS, AT    9.8 HRS.
```

```
NRCS-FBH      D=  24.00 HR    P= 34.80 IN     Q= 30.53 IN      DA=   1.70 SM
             TC=   0.78 HR   CN=  72.00     VOL=   2766.5 ACFT

     PEAK =      6917.3 CFS, AT    9.7 HRS.


*************************************************************************
RATING TABLE DEVELOPED, SITE = 17   :
 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  1104.12      0.00      0.00      0.00     25.46      0.00
  2  1104.35      0.40      0.40      0.00     26.19      0.00
  3  1104.58      1.13      1.13      0.00     26.91      0.00
                                             TRANSITION TO ORIFICE FLOW, ELEV = 1104.81 FT
  4  1104.81      2.08      2.08      0.00     27.64      0.00
  5  1112.67     18.91     18.91      0.00     72.04      0.00
  6  1120.54     26.65     26.65      0.00    142.39      0.00
  7  1128.40     32.61     32.61      0.00    245.87      0.00
  8  1128.79     41.96     41.96      0.00    251.64      0.00
  9  1129.18     58.83     58.83      0.00    257.41      0.00
                                             FULL CONDUIT FLOW, ELEV = 1129.57 FT
 10  1129.57     80.60     80.60      0.00    263.18      0.00
 11  1131.75     82.27     82.27      0.00    301.26      0.00
 12  1133.92     83.86     83.86      0.00    340.80      0.00
 13  1136.10     85.42     85.42      0.00    384.50      0.00
 14  1137.29    724.25     86.27    637.98    410.72      0.00
 15  1138.49   2055.79     87.11   1968.69    436.96      0.00
 16  1140.64   5747.69     88.59   5659.10    487.12      0.00
 17  1143.27  11884.28     90.38  11793.90    556.92      0.00
 18  1148.05  27678.50     93.53  27584.97    703.94      0.00
 19  1154.03  53064.41     97.33  52967.07    901.97      0.00
 20  1160.00  85264.31    100.99  85163.32   1100.00      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.     25.  -20.0     0.020       **       **     **    INLET
  2     25.     63.   -2.9     0.035       **       **     **    INLET
  3     63.     83.    0.0     0.035       **       **     **    CREST
  4     83.    139.    2.0     0.035     0.50       1     1.0    EXIT !
  5    139.    207.    7.4     0.035     0.50       1     1.0    exit
  6    207.    314.    9.3     0.035     0.50       1     1.0    exit
  7    314.    445.    3.8     0.035     0.50       1     1.0    exit
  8    445.    539.    5.3     0.035     0.50       1     1.0    exit
  9    539.    626.    5.7     0.035     0.50       1     1.0    exit
 10    626.    668.   11.9     0.035     0.50       1     1.0    exit
 11    668.    792.   12.1     0.035     0.50       1     1.0    exit
 12    792.    835.   11.6     0.035     0.50       1     1.0    exit
 13    835.    869.   17.9     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   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        200.0   1137.64     418.3       0.0      1.54      33.8

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       87.     1024.     1111.

                       CRITICAL  CRITICAL   CRITICAL  25% OF Q
                         DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---    0.93      5.44     0.018     0.025

          AUXILIARY SPILLWAY DURATION FLOW =       14.9 HOURS

          EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=   5.5 FT/SEC
                                           EXIT SLOPE  = 0.020 FT/FT
                                           FLOW DEPTH  =   0.9 FT
        ****************************************************************

        EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
        (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)
          Aux. Spillway Discharge =    1024. cfs;   Bottom Width =   200. 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      83.    139.   1.96   0.035       5.55      1.12   0.139
        ****************************************************************

ROUTED       BTM WIDTH  MAX ELEV   VOL-MAX  AREA-MAX   AUX.-HP   VOL-AUX.
RESULTS          FT        FT        ACFT      AC         FT       ACFT
NRCS-FBH        200.0   1141.12     499.9       0.0      5.02     115.4

          PEAK - CFS        Q-PS     Q-AUX.    Q-TOT.
          DISCHARGE  =       89.     6780.     6869.

                       CRITICAL  CRITICAL   CRITICAL  25% OF Q
                         DEPTH   VELOCITY   SLOPE-Sc     Sc
          AUXILIARY        FT      FT/SEC     FT/FT     FT/FT
          SPILLWAY ---    3.25     10.03     0.012     0.017

          INTEGRITY ANALYSIS - REACH SURFACE PERFORMANCE SUMMARY
           (The auxiliary spillway began flow at time =    8.2 hours
            and peaked at time =    9.8 hours.)


            REACH   4: FROM STATION     83. TO    139. ON    2.0% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =   18.0 hours.


            REACH   5: FROM STATION    139. TO    207. ON    7.4% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =   10.6 hours.


            REACH   6: FROM STATION    207. TO    314. ON    9.3% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =   10.3 hours.


            REACH   7: FROM STATION    314. TO    445. ON    3.8% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =   10.3 hours.


            REACH   8: FROM STATION    445. TO    539. ON    5.3% SLOPE.
               Vegetal cover failed and concentrated flow developed
               at time =   11.4 hours.
```

```
              REACH   9: FROM STATION    539. TO    626. ON    5.7% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =   11.1 hours.


              REACH  10: FROM STATION    626. TO    668. ON   11.9% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =   10.0 hours.


              REACH  11: FROM STATION    668. TO    792. ON   12.1% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =   10.0 hours.


              REACH  12: FROM STATION    792. TO    835. ON   11.6% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =   10.0 hours.


              REACH  13: FROM STATION    835. TO    869. ON   17.9% SLOPE.
                 Vegetal cover failed and concentrated flow developed
                 at time =    8.9 hours.


            INTEGRITY ANALYSIS - HEADCUT EROSION DAMAGE SUMMARY

              The most upstream headcut began at station     83.
              and progressed upstream to station     83.
              The final height of the headcut was    0.8 ft.

              The headcut having the maximum final overfall height began
              at station    835. and progressed upstream to station   834.
              The final height of the headcut was    5.9 ft.

                            DURATION    ATTACK   DIST. FROM MOST U/S
                              FLOW       OE/B    HEADCUT TO U/S EDGE
            AUXILIARY          HRS     ACFT/FT     AUX. CREST, FT
            SPILLWAY ---      17.6       11.3            20.

            EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY=  11.6 FT/SEC
                                             EXIT SLOPE  = 0.020 FT/FT
                                             FLOW DEPTH  =   2.8 FT

 Inflow Hyd 1 SDH-Peak =       1110.59 CFS  at   10.83 hrs.,  Location Point

 Inflow Hyd 1 FBH-Peak =       6869.28 CFS  at    9.84 hrs.,  Location Point
HYDOUT   1     17

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

 NC17          New Creek Site 17

       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
 ------------                         --------                             --------
 NC17                                02/10/2011                            16:23:22

 >>>   SITE   SUBWS   SUBWS DA   CURVE    TC   TOTAL DA   TYPE    STRUC    <<<
        ID      ID     (SQ MI)    NO.    (HRS)  (SQ MI)  DESIGN   CLASS
       -----   ----   --------   -----   ----   -------   -----   -----
       17       17        1.70     72.   0.78      1.70    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   1136.1   200.0   5.0   1141.1       0.    20.    11.6  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
                               NC17     FILES

INPUT  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.D2C
OUTPUT = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.OUT
         DATED 02/10/2011 16:23:22

                          GRAPHICS FILES GENERATED

OPTION "L"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.DRG
DATED 02/10/2011 16:23:22

OPTION "P"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.DHY
DATED 02/10/2011 16:23:22

OPTION "E"  = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.DEM
DATED 02/10/2011 16:23:22

AUX.GRAPHICS = W:\426\Active Jobs\52299 - WV NRCS 2010 Contract\05 Working\41 Dam
Assessments\New Creek Site 17\NC17 SITES Model\NC17\NC_Site17_ASW_24Hr_Integrity.DG*
DATED 02/10/2011 16:23:22
```

NRCS

Appendix D
Evaluation of Potential Rehabilitation Projects-Priority Ranking Spreadsheet

EVALUATION OF POTENTIAL REHABILITATION PROJECTS									
STATE	WV	**DAM**	New Creek Site 17		**BY**	TAR	**DATE**	02/17/11	
	YEAR BUILT	1960	**DESIGN HAZARD CLASS**	C		**DRAINAGE AREA**	1.7	mi2	
	WORK PLAN DATE	1956	**CURRENT HAZARD CLASS**	C		**DAM HEIGHT**	68.29	ft	
sht 1 of 5	**CONSEQUENCES OF DAM FAILURE**						ver 100101		

POTENTIAL DAM FAILURE:				
Total Failure Index			273	A
POTENTIAL LOSS OF LIFE:				
Maximum Population-at-Risk [PAR]		(number)	1143	B
Total Risk Index			12482	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	Claysville	(H,M,L,-)	H	D
Number of homes, businesses, major buildings		(number)	457	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. Routes 50 and 220 Roads	(number)	2	I
Secondary/County	WV Rte 972, Co Rtes 220/3,220/6,220/2,220/5,220/1, Roads	(number)	7	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		($)	56,088	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 17	**BY**	TAR	**DATE**	02/17/11
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	1143	A
Estimate PAR for hydrologic loading failure, typically assume water at top of dam	1143	B
Estimate PAR for seismic loading failure, typically assume water at ES crest (sunny day failure)	1143	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	59590	89	659	90	3	Vague
Hydrologic	100293	89	708	142	2	Vague
Seismic	59590	89	659	90	3	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	116	116	0.04	1143	5304
Hydrologic	*	*	157	0.04	1143	7178
Seismic	0.00	#DIV/0!	0	0.04	1143	0
		TOTAL=	273		TOTAL=	12482

EVALUATION OF POTENTIAL REHABILITATION PROJECTS								
STATE	WV	**DAM**	New Creek Site 17	**BY**	TAR	**DATE**	02/17/11	
sht 3 of 5	**STATIC FAILURE INDEX**						ver 100101	
PRINCIPAL SPILLWAY SYSTEM (60 points max):					(total points)	30		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)							10	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)	50		I
Reservoir has filled to x% of effective height (earth spillway crest minus original streambed)							73	J
(<50%=75 or 51-75%=50 or 76-90%=25 or 91-95%=10 or 96-100%=5 or >100%=0)							50	K
SEEPAGE AND DEFORMATION (85 points max):					(total points)			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)							0	Q
Poor top of dam condition, eroded, trees, rodent holes, settlement (no=0 or yes=6)							0	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							116	AQ

EVALUATION OF POTENTIAL REHABILITATION PROJECTS								
STATE	WV	**DAM**	New Creek Site 17		**BY**	TAR	**DATE**	02/17/11
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)				3.8	B
Probable Maximum Precipitation [PMP] (inches)				27.2	C
if Pfb <= P100	=	3.8	enter 40		
if Pfb = P100+0.2(PMP-P100)	=	8.48	enter 25		
if Pfb = P100+0.4(PMP-P100)	=	13.16	enter 15		
if Pfb = P100+0.6(PMP-P100)	=	17.84	enter 7		
if Pfb = P100+0.8(PMP-P100)	=	22.52	enter 3		
if Pfb >= PMP	=	27.2	enter 1		
Enter interpolated value				22	D
HYDROLOGIC UNCERTAINTY:					
Drainage Area [DA] (square miles)				1.7	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				0.9	I
EARTH SPILLWAY FLOW:					
Earth spillway flow depth [Des] from top of dam to spillway crest (feet)(10' max)				10	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				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)				96	Q
earth spillway breach: (D+5J)(F)(H)(I)(N)(P)				157	R
larger of (2)(D)(F)(H)(I)(K)(M) or (D+5J)(F)(H)(I)(N)(P) but less than 300				157	S

EVALUATION OF POTENTIAL REHABILITATION PROJECTS

STATE	WV	DAM	New Creek Site 17	BY	TAR	DATE	02/17/11
sht 5 of 5			SEISMIC FAILURE INDEX				ver 102201

SEISMIC LOADING:		
Latitude (degrees.decimal)	39.355	A
Longitude (degrees.decimal)	-79.05	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)	5.477	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)	68.29	G
Freeboard for seismic event is the depth from top of dam to assumed pool surface (ft)	13.8	H
Freeboard percent of dam height (%)	20	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 10:07:57 -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 no filter diaphragm criteria is met.
Static	C	As-builts do not show PSW excavation slopes. Thick valley soils.
Static	E	As-builts show 7 anti-seep collars constructed along the PSW.
Static	G	As-builts do not show foundation below PSW conduit.
Static	M, N	No excessive seepage observed. Seepage under PSW conduit at downstream toe.
Static	O,P,Q	Irregular downstream slope observed.
Static	R	Top of dam in fair condition. Downstream slope has excessive vegetation, particularly within rockfill.
Static	S	No wet areas observed on downstream slope.
Static	T	No erosion observed.
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. Kittlelick thrust fault in abutment.
Static	Z	No underground mining under embankment described in the design reports.
Static	AA	As-built profile shows average soil depths are about 20 feet thick. Testing in Soils Report has an average plasticity index of 14, which indicates that the foundation contains sufficient clay to produce a low permeability.
Static	AB	No weak layers/conditions identified in the design reports.
Static	AC	No erodible soils or weakly cemented rock identified in the design reports.
Static	AD	Susceptibility of reservoir area to landslides that could overtop dam was not assessed in the design files.
Static	AF	As-builts show three zones. Calculations for the compatibility of zones were not included in the design files.
Static	AG	As-builts do not show a seepage drain system.
Static	AH	No erodible core materials identified in the design reports.
Static	AI	As-builts show cutoff trench excavated to shale.
Static	AJ	No construction quality control embankment fill test results provided.
Static	AM	Dam does not have any instrumentation.
Hydrologic	N	Minimum shale SITES parameters used.
Seismic	E,F	Liquefaction was not evaluated in the design documents reviewed.
Seismic	L	As-builts show no filter zone.