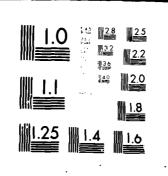
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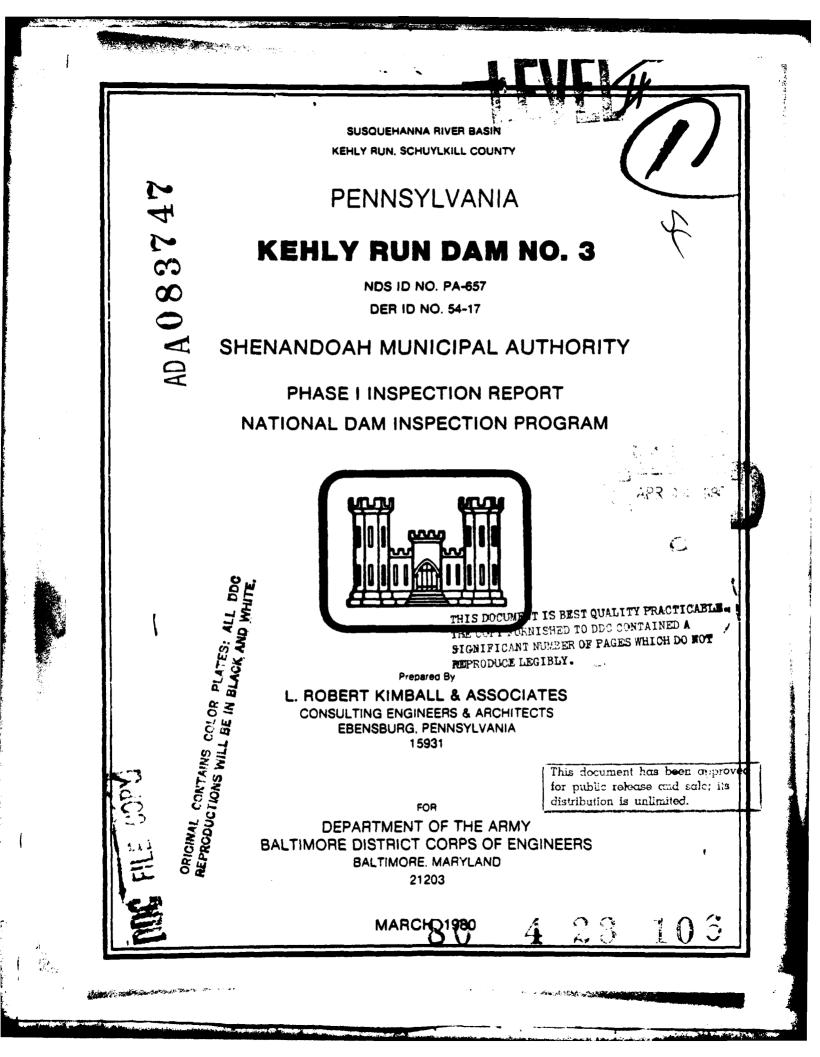
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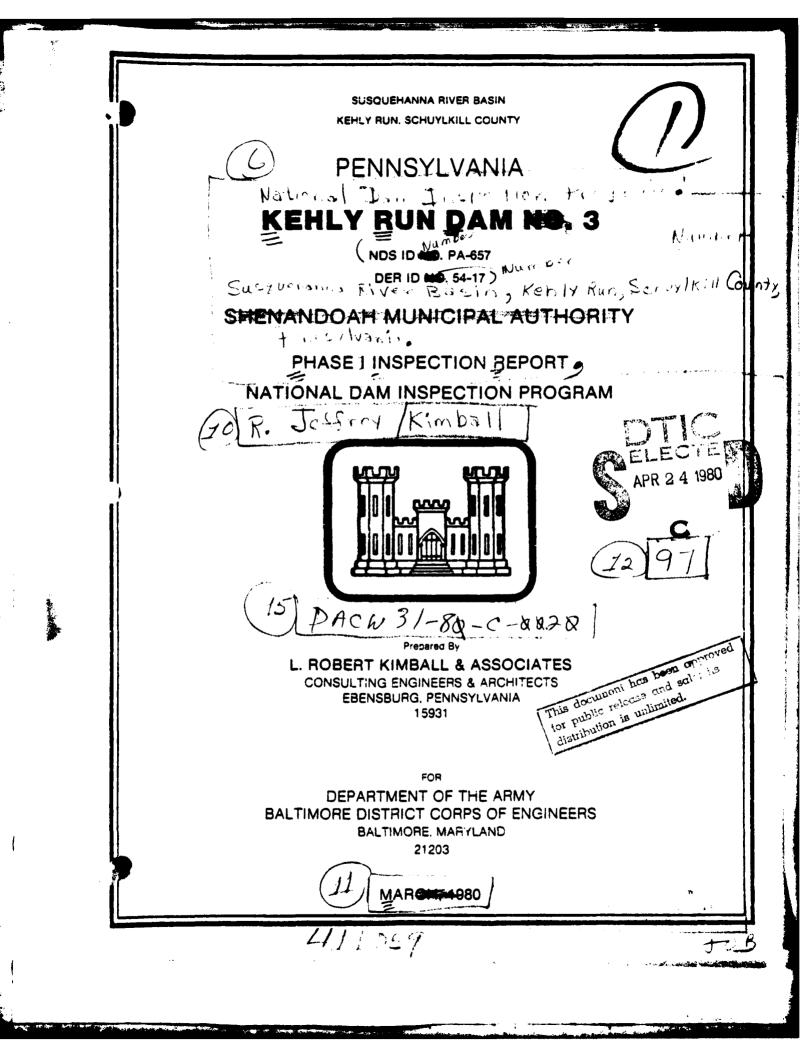
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This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, 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. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is 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. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in detemining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PREFACE

PHASE I REPORT NATIONAL DAM INSPECTION REPORT

NAME OF DAM STATE LOCATED COUNTY LOCATED STREAM DATE OF INSPECTION

Kehly Run Dam No. 3 Pennsylvania Schuylkill Kehly Run November 7 and 16, 1979

ASSESSMENT

The assessment of Kehly Run Dam No. 3 is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance.

Kehly Run Dam No. 3 appears to be in fair condition. Several areas of "possible past instability" are apparent on the downstream slope. In addition, extensive seepage areas have been reported in the past but may be obscurred by the tailwater. Maintenance of the dam and operating facilities is considered poor.

Kehly Run Dam No. 3 is a high hazard-small size dam. The spillway design flood is the PMF (probable maximum flood). The spillway and reservoir are capable of controlling approximately 17% of the PMF without overtopping the embankment. Based on criteria established by the Corps of Engineers the spillway is termed inadequate, but not seriously inadequate.

The following recommendations and remedial measures should be instituted immediately.

1. A detailed hydrologic and hydraulic study should be conducted by a professional engineer knowledgeable in dam design to develop plans to increase spillway capacity. The exit channel and spillway wingwall should be evaluated to determine whether improvements are required. Many of the reservoirs in the Kehly Run system do not control the PMF, thus all spillways in the system should be studied and upgraded because of the severe consequence of failure of reservoirs in series and the location of the Borough of Shenandoah downstream.

2. The trees and large vegetation on embankment slopes and in the spillway should be cleared at the direction of a professional engineer knowledgeable in the design and construction of dams.

3. Some means of positive closure of the drainline should be developed in case of emergencies.

4. Exercise and lubricate all valves on a regular basis.

5. A detailed study should be conducted by a registered professional engineer knowledgeable in earth dams to evaluate the seepage, possible slope instability and source of discharge from the swimming pool on the stability of the structure.

6. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

7. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

8. A subsidence investigation should be conducted by the owner or his engineer to determine the effects of past and present mining beneath the reservoir.



L. ROBERT KIMBALL & ASSOCIATES CONSULTING ENGINEERS AND ARCHITECTS

R Jettra Kebell

March 1980 Date

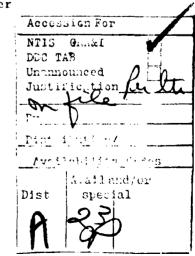
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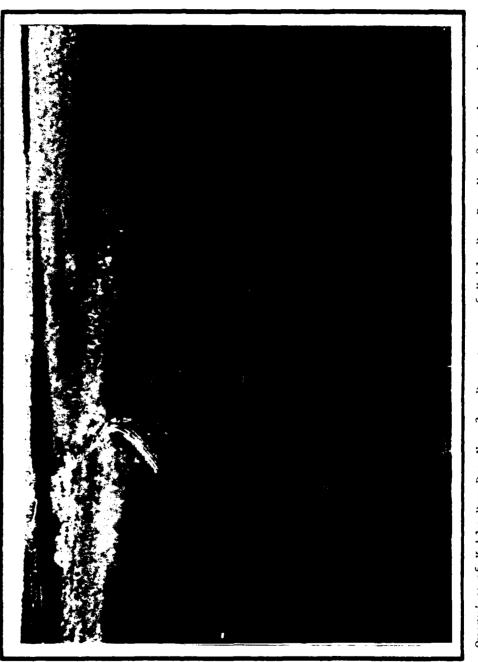
25 Mar 1980 Date IAMES W. PECK

Colonel, Corps of Engineers District Engineer

R. Jeffrey Kimball, P.E.



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Overview of Kehly kun Dam No. 3. Downstream of Kehly kun Dam No. 3 is the swimming pool (formerly Kehly kun Dam No. 2). Note upstream dams (Kehly kun Dam No.'s 4, 5, and 6) in upper left corner.

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PHASE I NATIONAL DAM INSPECTION PROGRAM KEHLY RUN DAM NO. 3 NDI. I.D. NO. PA 657 DER I.D. NO. 54-17

> SECTION 1 PROJECT INFORMATION

1.1 General.

a. <u>Authority</u>. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. <u>Purpose</u>. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Kehly Run Dam No. 3 is an earth and rockfill dam 442 feet long and approximately 33 feet high. The upstream slope is 1H:1V and covered with hand placed riprap. The downstream slope is 1.5H:1V and covered with rock rubble. The reservoir drain consists of a 10" cast iron pipe under the embankment.

The spillway is an open cut channel located on the left abutment. A stone masonry wall forms the junction between the spillway and the embankment. The left abutment hillside forms the left portion of the spillway. The spillway crest has a total length of 35 feet and has an irregular bottom. The spillway discharge channel winds along the left abutment and is confined by a stone rubble dike.

Immediately downtream of Kehly Run Dam No. 3 is a swimming pool which forms tailwater on the dam. This swimming pool is formerly Kehly Run Dam No. 2. Upstream of Kehly Run Dam No. 3 are three reservoirs (Kehly Run Dams No. 4, 5, 6).

b. Location. The dam is located on Kehly Run, one-half mile north of Shenandoah, Schuylkill County, Pennsylvania. Kehly Run Dam No. 3 can be located on the Shenandoah, U.S.G.S. 7.5 minute quadrangle.

c. <u>Size Classification</u>. Kehly Run Dam No. 3 is a small size structure (33 feet high, 40 acre-feet).

d. <u>Hazard Classification</u>. Kehly Run Dam No. 3 is a high hazard dam. Downstream conditions indicate that loss of more than a few lives is probable should the structure fail (See Section 3.1e).

e. <u>Ownership</u>. Kehly Run Dam No. 3 is owned by The Shenandoah Municipal Authority. Correspondence should be addressed to:

Shenandoah Municipal Authority 26 West Lloyd Street Shenandoah, PA 17976 Attention: Charles Dallazia, Manager 717-462-1904

f. <u>Purpose of Dam</u>. Kehly Run Dam No. 3 is used for water supply.

g. Design and Construction History. The dam was built in approximately 1872. No information is available on the design or construction of the original dam. No drawings are available on the dam. The spillway was originally located in the center portion of the embankment but was moved to the left abutment prior to 1920.

h. <u>Normal Operating Procedure</u>. The reservoir is maintained at the spillway crest elevation 1495.0. Excess inflow is discharged over the spillway crest. Water is drawn off Kehly Run Dam No. 3 through the outlet works into the water system. It is believed that the outlet works pipe is used as the reservoir drain.

1.3 Pertinent Data.

a. Drainage Area. 1.01	square	miles
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b. Discharge at Dam Site (cfs).

Maximum known flood at dam site Spillway capacity at top of dam Reservoir drain

c. <u>Elevation (U.S.G.S. Datum) (feet)</u>. - Field survey based on pool elevation 1495 shown on USGS 7.5 minute quadrangle.

Top of dam - low point	1497.6
Top of dam - design height	Unknown
Maximum pool - PMF	1498.9
Full flood control pool	Not applicable
Normal pool	1495.0
Spillway crest	1495.0

Unknown 490

Unknown

	Streambed at centerline of dam Tailwater on day of inspection Toe of dam	1465.2 1464.1 1465.2
d.	Reservoir (feet).	
	Length of maximum pool (PMF) Length of normal pool	600 400
e.	Storage (acre-feet).	
	Normal pool Top of dam	33 40
f.	Reservoir Surface (acres).	
	Top of dam Normal pool Spillway crest	2.7 2.4 2.4
g٠	Dam.	
	Type Length Height Top width Side slopes - upstream - downstream Zoning Impervious core Cutoff	Earth and rockfill 442' 33' 16' 1H: 1V 1.5H: 1V Unknown Unknown Unknown
h.	Reservoir Drain. Type Length Closure Access Regulating facilities	10" CIP Approximately 110' Valve at toe None
i.		Valve at toe
	Spillway. Type Weir Length Crest elevation Upstream channel Downstream channel	Open cut channel 35' 1495' Unrestricted Narrow open channel

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SECTION 2 ENGINEERING DATA

2.1 <u>Design</u>. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed that inspection reports, permits, photographs and correspondence were available for review. No design reports or original design drawings or construction data was available. The data that was available was reviewed for this study.

2.2 Construction. No data is available on construction of the dam.

2.3 Operation. No operating records are maintained.

2.4 Evaluation.

a. <u>Availability</u>. Engineering data were provided by PennDER, Bureau of Dams and Waterway Management and the owner. The manager of the Municipal Authority was interviewed to obtain data on operation and maintenance of the dam. The owner did not provide any information on past deep mining activities in the area of the dam and reservoir.

b. Adequacy. A detailed analysis cannot be made because of the lack of detailed design information or drawings. This Phase I Report is based upon available data, visual inspection, and a hydrologic and hydraulic analysis.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. <u>General</u>. The onsite inspection of Kehly Run Dam No. 3 was conducted by personnel of L. Robert Kimball and Associates on November 7 and 16, 1979. The inspection consisted of:

- 1. Visual inspection of the retaining structure, abutments and toe.
- 2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
- 3. Observations affecting the runoff potential of the drainage basin.
- 4. Evaluation of the downstream area hazard potential.

The dam appears to be in fair condition. From a Ъ. Dam. brief survey conducted during the inspection, it was noted that a low spot was present adjacent to the spillway. The upstream slope was measured to be 1H:1V and covered with hand placed masonry. The downstream slope was measured to be 1.5H:1V and covered with stone rubble. The crest width is 16 feet. The upstream slope was covered with small trees and brush and the downstream slope was covered with larger trees and brush. The downstream slope showed two areas (one located near the center of the embankment, the other located near the left abutment) that have either had new material added or showed signs of possible slope movement. A small amount of seepage was present along the left abutment. This seepage was partially obscurred by the presence of large boulders dumped on this abutment. The swimming pool located at the toe of dam (formerly a dam named Kehly Run Dam No. 2) may have partially obscured this seepage and obscured viewing the toe of dam.

c. <u>Appurtenant Structures</u>. The open cut spillway is located on the left abutment. The junction of the spillway and the embankment is formed by a masonry wall. This masonry wall is in need of repair. The weir has an irregular crest caused by the severe deterioration of the concrete. The weir is 19 feet long at elevation 1495.0. The weir gains an additional 16 feet of width (total 35 feet) by gently sloping upward to meet the natural hillside. The spillway exit channel is narrow and very irregular. The channel follows the left abutment hillside and is formed by a stone rubble dike (See photographs, Appendix C).

The 10" cast iron pipe outlet works was not observed during the inspection. The value to control flow through the outlet works is below the toe of dam. No upstream shutoff is provided.

d. <u>Reservoir Area</u>. The watershed is covered mostly with woodland. The reservoir slopes are moderately steep but are not susceptible to landslides which would affect the storage volume of the reservoir or overtopping of the dam by displacing water.

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e. <u>Downstream Channel</u>. The channel downstream of Kehly Run Dam No. 3 is narrow for approximately 1800 feet until it fans out into the Borough of Shenandoah.

3.2 Evaluation. In general, the embankment and appurtenant structures appear to be in fair condition but poorly maintained.

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SECTION 4 OPERATIONAL PROCEDURES

4.1 <u>Procedures</u>. The reservoir is maintained at the spillway crest elevation 1495.0. The valve in the outlet works remains open so that water enters the water system. The excess inflow discharges over the spillway crest. The valve is reportedly operated on a regular basis.

4.2 <u>Maintenance of the Dam</u>. No planned maintenance schedule exists. Maintenance of the dam is performed by the Municipal Authority staff. Maintenance of the dam is considered poor.

4.3 <u>Maintenance of Operating Facilities</u>. Maintenance of the spillway and outlet works is considered poor. The valve on the outlet works is reportedly operated regularly.

4.4 <u>Warning System in Effect</u>. There is no warning system in effect to warn downstream residents of large spillway discharges or imminent failure of the dam.

4.5 <u>Evaluation</u>. Maintenance of the dam and operating facilities is considered poor. There is no system in effect to warn downstream residents of large spillway discharges or failure of the dam.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. <u>Design Data</u>. No calculations or design data pertaining to hydrology were available.

b. <u>Experience Data</u>. No rainfall, runoff or reservoir level data were available. The spillway has reportedly functioned adequately in the past.

c. <u>Visual Observations</u>. The spillway appeared to be in poor condition. The spillway crest is badly deteriorated, sedimentation and debris has destroyed the original overflow channel. The discharge channel is narrow and flow is partially restricted by occassional large boulders.

A low spot was noted on the dam embankment adjacent to the right spillway wingwall. This area could easily be filled to increase the top of dam elevation.

d. <u>Overtopping Potential</u>. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 <u>Evaluation Assumptions</u>. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. The pool elevation in the reservoir prior to the storm is 1495 feet.

2. For the overtoppping analysis a top of dam elevation of 1497.6 feet (low spot) was assumed for the entire length of the crest of 442 feet. Field survey measurements taken during the inspection indicate that the top of dam varies from 1497.6 feet to 1498.6 feet.

3. For the dam breach analysis it was assumed that dam failure would begin when the water level in the reservoir reached elevation 1497.9 or 0.30 feet over the top of the dam.

4. The flood was routed through all upstream reservoirs.

5.3 <u>Summary of Overtopping Analysis</u>. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	2764 cfs
Spillway capacity	446 cfs

a. <u>Spillway Adequacy Rating</u>. The Spillway Design Flood (SDF) for this dam is the PMF. The SDF is based on the hazard and size classification of the dam. Based on the following definition provided by the Corps of Engineers, the spillway is rated as inadequate as a result of our hydrologic analysis.

Inadequate - All high hazard dams which do not pass the SDF (PMF), but where failure due to overtopping does not significantly increase the hazard potential for loss of life downstream.

The spillway and reservoir are capable of controlling approximately 17% of the PMF without overtopping the dam (based on low spot).

5.4 <u>Summary of Dam Breach Analysis</u>. As the subject dam cannot satisfactorily pass 50% of the PMF (based on our analyses) it was necessary to perform a breach analysis and downstream routing of the flood wave. This analyses determines the degree of increased flooding due to dam failure.

The water level in the reservoir at the time of dam failure was assumed to be at 1497.9 feet (0.30 feet over the top of dam low spot) based on the evaluating engineers judgement. The 30% PMF was routed through the reservoir and downstream.

The flood wave was routed downstream with and without embankment failure conditions considered. The flood was not routed through the swimming pool because of its small size.

Results of the Dam Breach analysis indicate that downstream flooding is not significantly increased. Since flooding downstream is not significantly increased due to dam failure, the spillway is not considered seriously inadequate. Therefore, this spillway is rated as "inadequate".

Note: Future development within the watershed, at the dam, or downstream may change the characeristics and assumptions made for this study and different results are likely. Future development downstream may also greatly increase the potential for loss of life due to failure of the structure.

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SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. <u>Visual Observations</u>. Two locations on the downstream embankment slope showed possible signs of instability. These two areas appear as if some of the rock rubble has recently moved downslope. These areas are not vegetated. These areas are located approximately 160 feet from the right abutment and adjacent to the spillway.

A very small amount of seepage was present approximately 150 feet to the right of the spillway at the toe of dam. It is reported in the correspondence that Kehly Run Dam No. 2 (swimming pool) was constructed to collect seepage. However, because of the swimming pool and the presence of large rock boulders on the left abutment this seepage is obscured. The swimming pool at the toe of dam may be obscuring the presence of a large quantity of seepage. The outflow from the swimming pool is several hundred gallons per minute. Past history indicates a large amount of seepage near the toe of dam.

b. <u>Design and Construction Data</u>. No stability analyses are on record for this dam. No data on the design or construction is available.

c. Operating Records. No operating records are maintained.

d. <u>Post Construction Changes</u>. No post construction changes are known other than reconstruction of the spillway on the left abutment and construction of Kehly Run Dam No. 2, downstream of Kehly Run Dam No. 3.

e. <u>Seismic Stability</u>. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected loading.

SECTION 7 ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. <u>Safety</u>. The dam appears to be in fair condition. There is evidence that slow movement is taking place or has recently taken place on portions of the downstream slope. A small amount of seepage was in evidence during the inspection. In addition, past inspections report a considerable amount of seepage at the toe of dam prior to construction of Kehly Run Dam No. 2. The tailwater may be obscuring a high seepage rate. The visual observations, review of available information, hydrologic and hydraulic calculations and past operations and performance indicate that Kehly Run Dam No. 3's spillway is inadequate but not seriously inadequate. The spillway is capable of controlling 17% of the PMF without overtopping the earth embankment. No adequate stability analysis has been performed for this structure. The long term affect of the seepage is unknown.

b. Adequacy of Information. Detailed analyses of the structure cannot be made because of the lack of any design or construction data. This Phase I Report is based upon visual observations, review of available data, hydrologic and hydraulic calculations and past operations and performance.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. <u>Necessity for Further Investigation</u>. To complete some of the recommendations/remedial measures outlined below, additional investigations are required.

7.2 Recommendations/Remedial Measures.

1. A detailed hydrologic and hydraulic study should be conducted by a professional engineer knowledgeable in dam design to develop plans to increase spillway capacity. The exit channel and spillway wingwall should be evaluated to determine whether improvements are required. Many of the reservoirs in the Kehly Run system do not control the PMF, thus all spillways in the system should be studied and upgraded because of the severe consequence of failure of reservoirs in series and the location of the Borough of Shenandoah downstream.

2. The trees and large vegetation on embankment slopes and in the spillway should be cleared at the direction of a professional engineer knowledgeable in the design and construction of dams.

3. Some means of positive closure of the drainline should be developed in case of emergencies.

4. Exercise and lubricate all valves on a regular basis.

5. A detailed study should be conducted by a registered professional engineer knowledgeable in earth dams to evaluate the seepage, possible slope instability and source of discharge from the swimming pool on the stability of the structure.

6. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

7. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

8. A subsidence investigation should be conducted by the owner or his engineer to determine the effects of past and present mining beneath the reservoir.

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APPENDIX A CHECKLIST, VISUAL INSPECTION, PHASE I

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a 10# PA 657	High	500
STATE <u>Pennsylvania</u> ID# <u>PA 657</u>	HAZARD CATEGORY HISh	TEMPERATURE
COUNTY Schuylk111		Cloudy, warm
COUNTY		<u>16. 197</u> %EATHER
NAME OF DAM Kehly Run Dam No. 3	TYPE OF DAM Earth and rockfill	DATE(s) INSPECTIONNov. 7 and 16, 19
NAME 0	TYPE 0	DATE (8

TAILMATER AT TIME OF INSPECTION 1464.2 M.S.L.

M.S.L.

POOL ELEVATION AT TIME OF INSPECTION 1495.0

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

0.T. McConnell - L. Robert Kimball and Associates

James T. Hockensmith

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- RECORDER

EMBANKMENT

SURFACE CRACKS None noted in embankment. SURFACE CRACKS None noted in embankment. SURVAL HOVENERT OR UNUSUAL HOVENERT OR CRACKING AT OR BETOND THE TOE None noted. SURVENT NO THE TOE None noted. SURVENT AND OF EMANNEEDT AND DEFENSION ANTHENT SLOPES None noted. AUTHENT SLOPES adjacent to pillivay, appears to have had adjacent to pillivay, appears to be good. VERTICAL AND HORIZONTAL HORIZONTAL HORIZONTAL ALIGNMENT OF THE CREST VERTICAL AND HORIZONTAL HORIZONTAL HORIZONTAL VERTICAL AND HORIZONTAL HORIZONTAL VERTICAL AND HORIZONTAL VERTICAL AND HORIZONTAL MAINTENT SLOPES MAINTENT SLOPES	VISU	VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
None noted. None noted. Two areas, 150 feet from right abutment, adjacent to spillway, appear to have had recent slope movement and recently placed material added. AL Horizontal alignment appears to be good. Vertical, low spot on the spillway. None.	SURF	ACE CRACKS		
<pre>ION Two areas, 150 feet from right abutment, adjacent to spillway, appear to have had recent slope movement and recently placed material added. CNTAL Horizontal alignment appears to be good. CREST Vertical, low spot on the spillway. None.</pre>	UNUS CRAC THE	SUAL MOVEMENT OR XING AT OR BEYOND TOE	None noted.	
	SLOU ABUT	JCHING OR EROSION MBANKMENT AND MENT SLOPES	<pre>i, 150 feet from right abutment, to spillway, appear to have had tope movement and recently placed added.</pre>	
	VERT	FICAL AND HORIZONTAL		
	RIPR	LAP FAILURES	None.	

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EMBANKMENT

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VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Small trees and brush on upstream slope. Trees and brush on downstream slope.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLMAY AND DAM	Appears to be good. Masonry wall at embankment -spillway contact in need of repair.	4
ANY NOFICEABLE SEEPAGE	Minor amount of seepage noted at junction of left abutment and toe of dam. However, considerable amount of seepage may be present beneath the tail- water.	erable ail-
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

A-3

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	P OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

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CONCRETE/MASONRY DAMS

	UTSITAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
	STRUCTURAL CRACKING	Not applicable.	
A-5	VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
	SINIOF HITIONOW	Not applicable.	
	CONSTRUCTION JOINTS	Not applicable.	
	STAPP GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS

فتشمه ممكنة ألمنا

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet works unobserved during inspection.	
INTAKE STRUCTURE	Unobserved during inspection.	
OUTLET STRUCTURE	None.	
OUTLET CHANNEL	None.	
EMERGENCY GATE	Valve beyond toe of dam. Not operated during inspection.	

A-6

UNGATED SPILLWAY

	VISILAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	CONCRETE WEIR	Very irregular weir surface. Right wall of spillway shows considerable deterioration.	
	APPROACH CHANNEL	Lake.	
A-7	DISCHARGE CHANNEL	Stone rubble dike forms the discharge channel.	
	BRIDGE AND PIERS	None.	

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A LUUGH EADERLING TON UF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

1.

DOWNSTREAM CHANNEL

X

L	VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
1		Narrow confined channel.	
	CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)		
		Appear to be stable.	
A-9	STOPES		
	APPROXIMATE NO.	Approximately 400 homes - 1600 people.	
	OF HOMES AND POPULATION		

A-9

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RESERVOIR

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VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep but appear to be stable.	
SEDIMENTATION	Does not appear to be excessive because of upstream reservoirs.	
A-		

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INSTRUMENTATION

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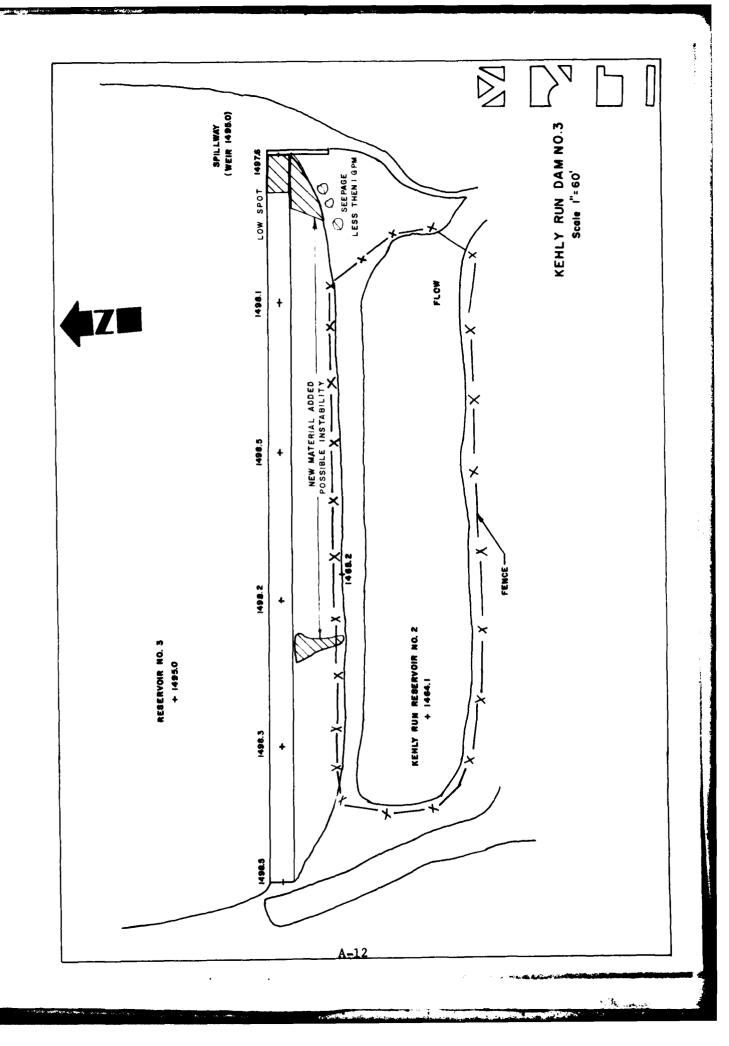
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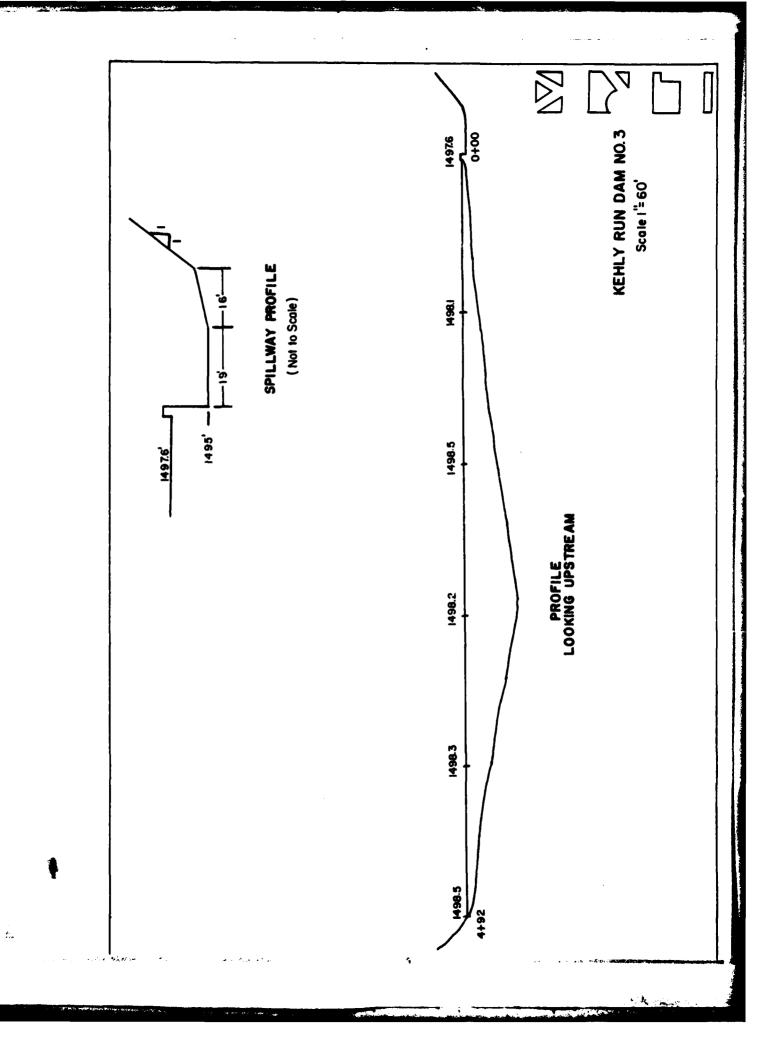
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Land	VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	MONUMENTATION/SURVEYS	None.	
	OBSERVATION WELLS	None.	
A-11	WEIRS	None.	
	PIEZOMETERS	None.	
	OTHER	None.	

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APPENDIX B CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

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CHECK LIST ENGINEERING DATA DESIGN, CONSTRUCTION, UPERATION PHASE I

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NAME OF DAM Kehly Run Dam No. 3

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ID# PA 657

Ľ	ITEM	REMARKS
¥.	AS-BUILT DRAWINGS	None.
8	REGIONAL VICINITY MAP	USGS quadrangle.
8-1	CONSTRUCTION HISTORY	None.
F	TYPICAL SECTIONS OF DAM	None .
5 2	OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	None. None. None. None.

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	ITBN	REMARKS
L	DESIGN REPORTS	None.
	GEOLOGY REPORTS	None.
B-2	DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
	MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Unknown.
	POST-CONSTRUCTION SURVEYS OF DAM	Unknown.
	BORROW SOURCES	Unknown.

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	ITEM	REMARKS
	MONITORING SYSTEMS	None.
	MODIFICATIONS	Unknown.
B-	HIGH POOL RECORDS	None.
3	POST CONSTRUCTION ENCINEERING STUDIES AND REPORTS	None.
	PRIOR ACCIDENTS OR PAILURE OF DAM DESCRIPTION REPORTS	Unknown.
	MAINTENANCE OPERATION RECORDS	None.

Section of the Sectio

L	ITEM	REMARKS
I		None.
	SPILLMAY PLAN	
	SECTIONS	
	DETAILS	
L	OPERATING EQUIPMENT PLANS & DETAILS	None.
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B-4

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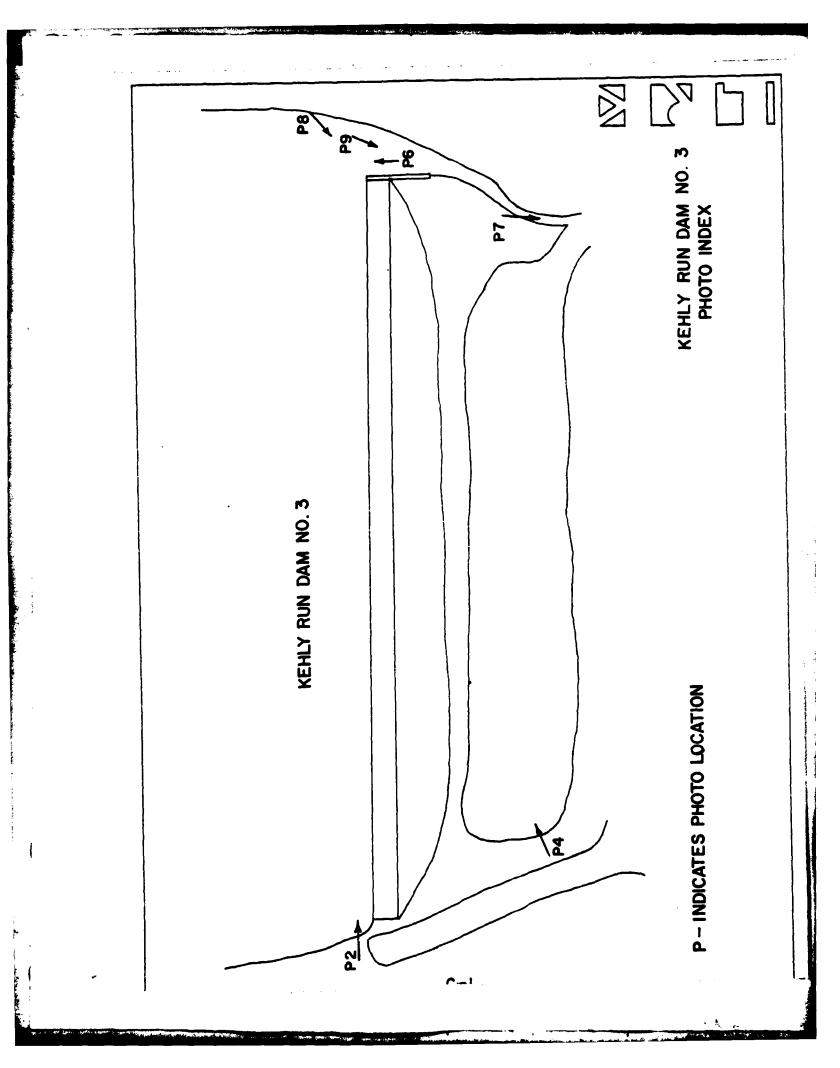
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APPENDIX C PHOTOGRAPHS

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KEHLY RUN DAM NO. 3

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Photograph Descriptions
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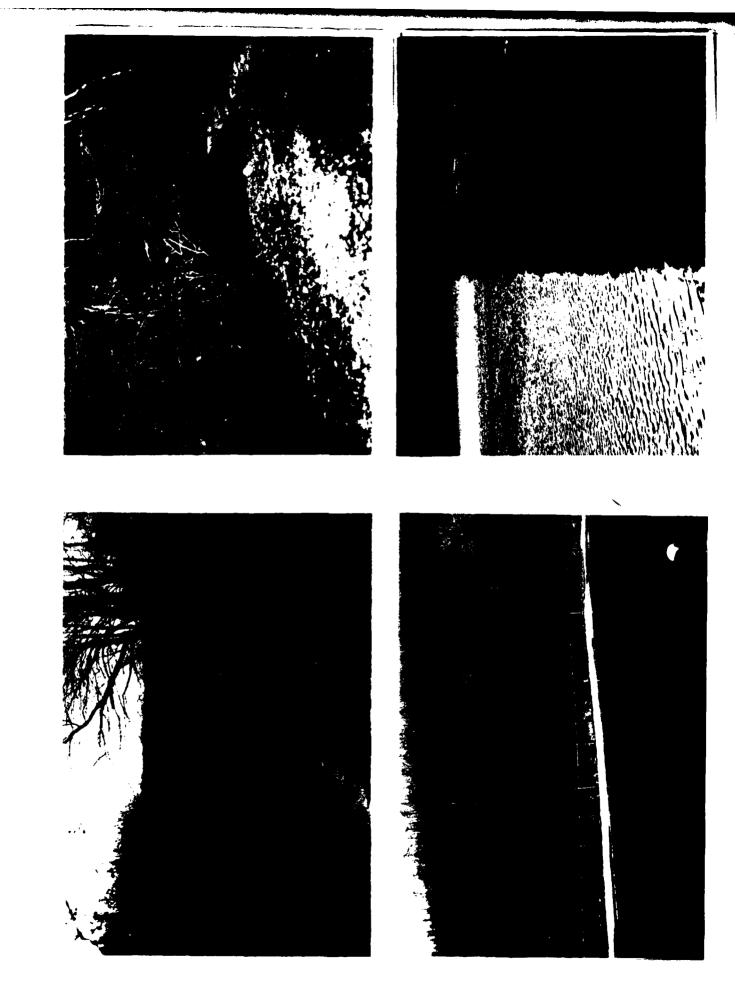
Sheet 1. Front

(1) Upper left - Spillway on Kehly Run Dam No. 4.
(2) Upper right - Upstream slope of Kehly Run Dam No. 3.
(3) Lower left - View of crest of Kehly Run Dam No. 4 (upstream dam). In background is downstream slope of Kehly Run Dam No. 5.
(4) Lower right - Downstream slope of Kehly Run Dam No. 3.

(5) Upper right - Downstream exposure (Shenandoah Borough). Coal refuse embankment in foreground.

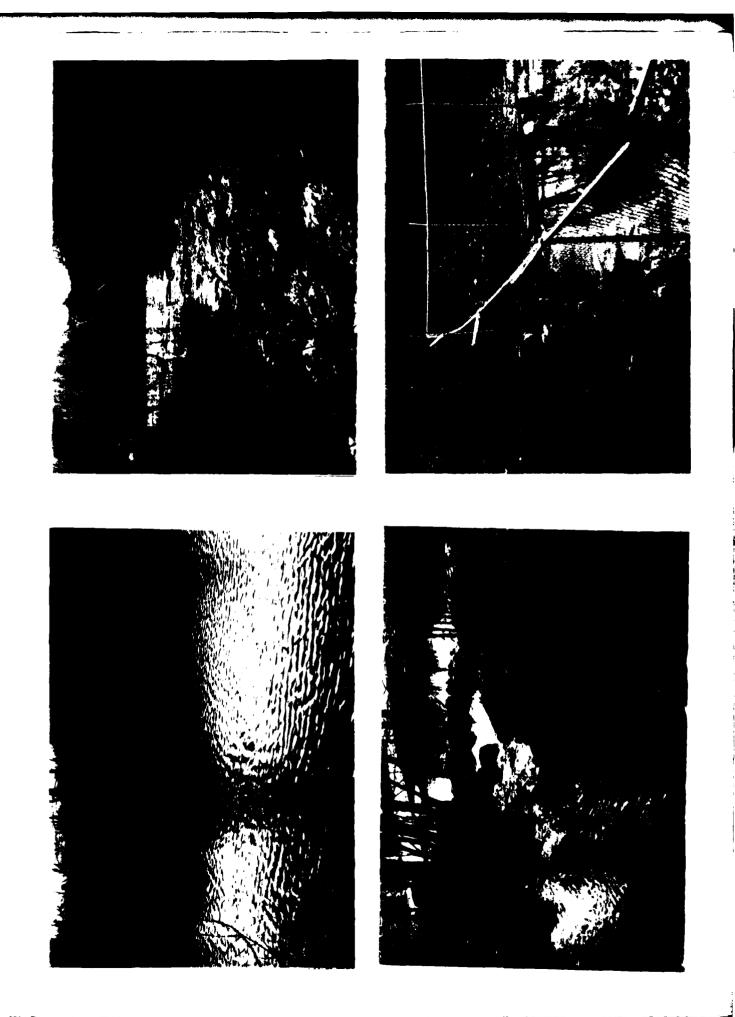
Sheet 2. Front

- (6) Upper left Spillway weir.
- (7) Upper right Spillway discharge channel along swimming pool.
- (8) Lower left Upstream slope and spillway entrance.
- (9) Lower right Spillway discharge channel.





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APPENDIX D HYDROLOGY AND HYDRAULICS

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APPENDIX D HYDROLOGY AND HYDRAULICS

<u>Methodology</u>. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. <u>Precipitation</u>. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topographic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

D-1

3. <u>Routing</u>. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. <u>Dam Overtopping</u>. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where crosssections are input.

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HYDROLOGY AND HYDRAULICS ANALYSIS DATA BASE

NAME OF DAM: Kehly Run Dam No. 3 PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 (1.005) = 22.3" 2 STATION 1 3 Station Description Kehly No. 6 Kehly No. 5 Kehly No. 4 Kehly No. 3 Drainage Area (square miles) 0.29 0.11 0.04 0.57 Cumulative Drainage Area 0.29 0.40 1.01 (square miles) 0.44 Adjustment of PMF for Drainage Area $(%)^{(1)}$ 6 hours 117 117 117 117 12 hours 127 127 127 127 24 hours 136 136 136 136 48 hours 143 143 143 143 72 hours 145 145 145 145 Snyder Hydrograph Parameters Zone (2) Cp (3) 13 13 13 13 0.50 0.50 0.50 0.50 Ct (3) 1.85 1.85 1.85 1.85 0.40 0.20 0.85 L (miles) (4) Lca (miles) (4) 0.40 **0.19** ŏ. 10 $tp = Ct(LxLca)^{0.3}$ hrs. 0.87 0.87 0.56 1.34 Spillway Data Lt. Rt. Crest Length (ft) 9 26 39 10 35 Freeboard (ft) 3.5 3.1 3.0 2.6 Discharge Coefficient 3.1 C'=0.95 C'=0.95 C'=0.95 C'=0.95 Exponent 1.5 N/A N/A N/A N/A (1)Hydrometeorological Report 40 (Figure 1), U.S. Army Corps of Engineers, 1965. (2)Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (Cp and Ct).

(3)Snyder's Coefficients.

(4)L=Length of longest water course from outlet to basin divide.

^Lca=Length of water course from outlet to point opposite the centroid of drainage area.

CHECK LIST HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: ______.D.A. =1.01 mi² Wooded Steep Slopes ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): _____33 ac.ft. ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): _____40 ac.ft. ELEVATION MAXIMUM DESIGN POOL: _____ Unknown ELEVATION TOP DAM: ____1497.6 feet

SPILLWAY CREST:

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- 1495 feet a. Elevation
- b. Type _____ Trapezoidal 35 feet - bottom
- c. Width Channel approximately 200' d. Length ____
- e. Location Spillover Left abutment
- f. Number and Type of Gates None

OUTLET WORKS:

£ ,

a.	Туре	10" CIP
	Location	
c.	Entrance inverts	Unknown
	Exit inverts	Unknown

e. Emergency draindown facilities _____10" CIP___

HYDROMETEOROLOGICAL GAUGES:

- a. Type _ None
- b. Location _____ None c. Records _ None

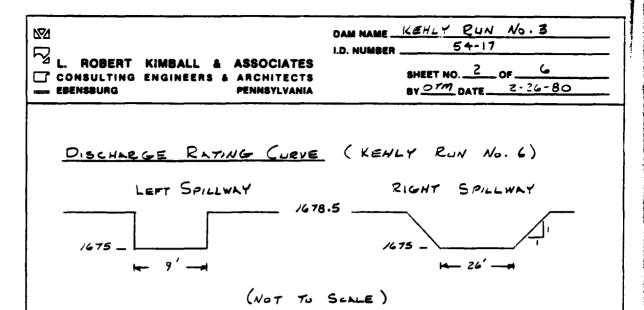
MAXIMUM NON-DAMAGING DISCHARGE : Unknown

D-4

			E <u>KEHLY RUN</u> No. 3 ER 54-17
	KIMBALL & ASSOCIATI	ES	SHEET NO OF
ENSBURG	PENNSYLVAN		BY OTM DATE 1-23-80
As er	COMMENDED BY		OF ENGINEERS,
ح	TRTL = LINCH		
	NSTL : 0.05 /	1/40	
	TRTQ . 1.5 cfs		
	RCSN = 0.05 (PEAK FLOW)
•	TIOR : 2.0	,	
INITIN	LLWAY CEEST E L Storage = Surface Area	33.2 A	c.FT.
AT ELE	V. 1500', AREA V. 1520', AREA		
AT ELE At ELE From (EV. 1520', ARE	a = G.4 A For rese	ERVOIR VOLUME.
AT ELE At Ele From (Floco	EN. 1520', ARE CONIC METHOD , HYDROGRAPH	a = 6.4 A For rese Package	ERVOIR VOLUME . E (HEC-I)
AT ELE At Ele From (Floco	EV. 1520', ARE	a = 6.4 A For rese Package	ERVOIR VOLUME . E (HEC-I)
AT ELE NT ELE From (Flocod DNM S H =	EN. 1520', ARE CONIC METHOD , HYDROGRAPH	a = 6.4 A For rese Package	ERVOIR VOLUME . E (HEC-I)
AT ELE AT ELE From (Flocod Dam S H = =	V. 1520', ARE CONIC METHOD HYDROGRAPH SAFETY VERSI 3 Y /A 3 (33.2) / 2.4 99.6 / 2.4	A = G.4 A FOR RESE PACKAGE ON (USE	ERVOIR VOLUME. E (HEC-I), RS MANUAL).
AT ELE AT ELE From (Flocod Dam S H = = = ELEVAT	V. 1520', ARE CONIC METHOD HYDROGENPH SNFETY VERSIN 3 (33.2)/2.4 99.6/2.4 41.5'	A = G.4 A FOR RESE PACKAGE ON (USE	ERVOIR VOLUME. E (HEC-I), RS MANUAL).
AT ELE AT ELE From (Flocod Dam S H = = = ELEVAT	V. 1520', ARE CONIC METHOD HYDROGRAPH SAFETY VERSI 3 Y /A 3 (33.2) / 2.4 99.6 / 2.4 41.5' TON WHERE AR	A = G.4 A FOR RESE PACKAGE ON (USE	ERVOIR VOLUME. E (HEC-I), RS MANUAL).

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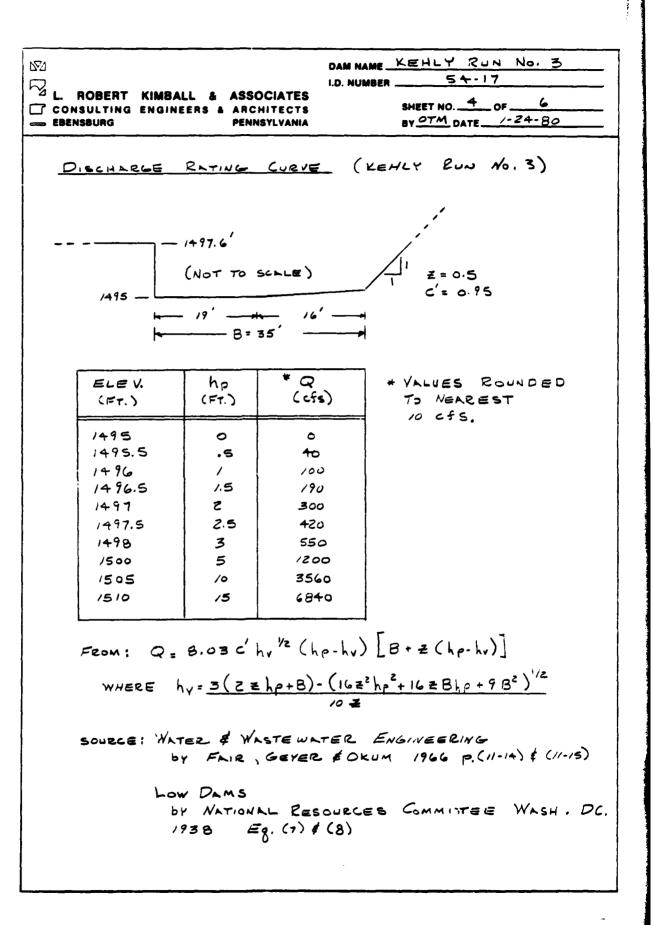
ELEV.	LEFT S	SPILLWAY	RIGH	T SPILLWAY	* Discharge
(FY.)	h. (=)	Qi (cts)	hp (Ft)	Qz (cfs)	Q (cfs)
1675	0	o	0	C	0
1676	/	<i>2</i> 8		78	110
1677	z	79	2	227	310
1678	3	/45	3	4 28	570
1678.5	3.5	183	3.5	545	730
1679	4	223	4	674	900
1680	5	3/2	5	965	0551
1685	10	88 Z	10	3053	3940
1690	15	1621	15	6213	7830
					1

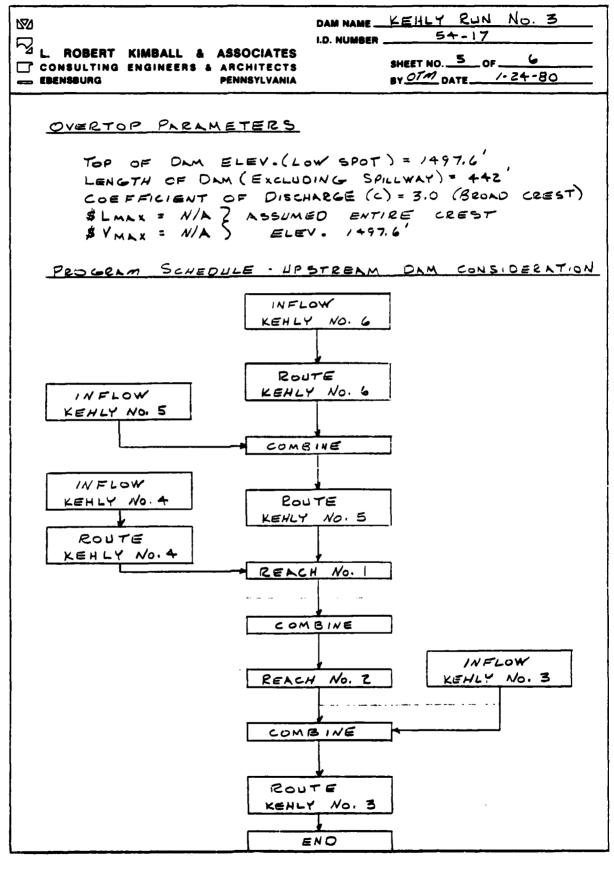
* VALUES ROUNDED TO NEAREST 10 cfs.

	L. ROBERT Consulting Ebensburg	KIMBALL Engineers	& ASSOCIATES & ARCHITECTS PENNSYLVANIA	DAM NAME	KEHLY RUN No. 3 54-17 SHEET NO. <u>3</u> OF <u>6</u> BY <u>OTM</u> DATE <u>2-26-80</u>
	DISCHNEG	E RATIN	Currie	(KEHLY	RUN NO. 5)
	ELE V. (FT.)	hp (Ft)	*Q (cfs)	1663.1_	
	1660	0	0		(NOT TO SCALE)
	1660.5	.5	40	1660	+ + + + + + + + + + + + + + + + +
	1661	1 / 1	051		
	1661.5	1.5	230	* V.L.UI	ES ROUNDED TO
	166 Z	Z	370	NEN	REST 10 CSS.
Ì	1662.5	2.5	530		
	1663	3	720	B=	39'
	1664	4	1180	Z =	4
	1665	5	1740	: 'ک	0.95
	1670	10	6240		

DISCHARGE RATING CURVE (KEHLY RUN No. 4)

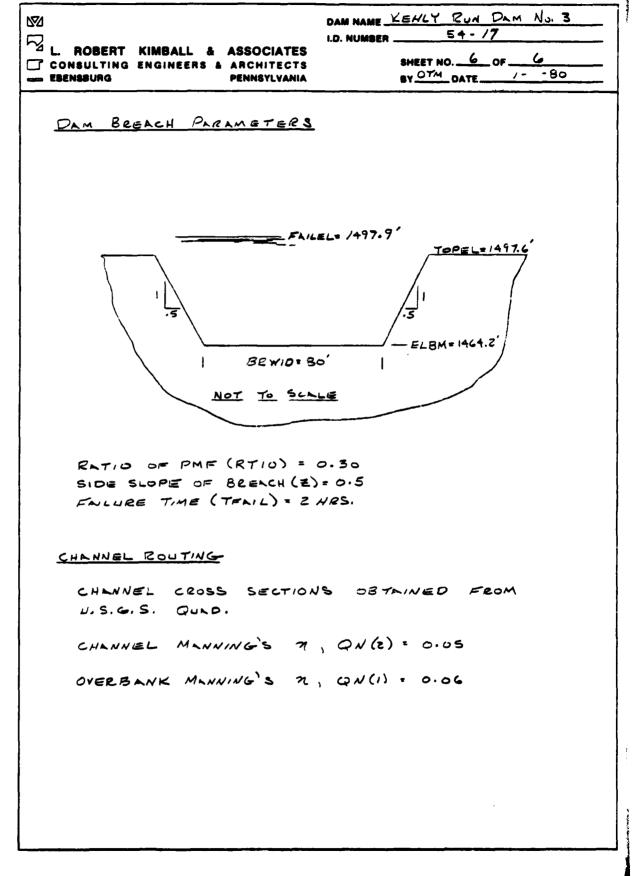
ELEV	hp	*Q	
(Ft)	(FT)	(cfs)	1646 _ (NOT TO SCALE)
······································			
1643	0	0	/643 -
1643.5	.5	/0	N- 10' -+
1644		30	
1644.5	1.5	60	* VALUES ROUNDED TO
1645	2	90	NEAREST 10 cfs.
1645.5	2.5	/+0	
1646	3	180	B = 10'
16 48	5	440	2=1
1650	7	810	6' = 0.95
1660	17	4563	1





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1000	FLOOD HVDROGRAPH PACKAGE (HEC-1)	ACKAGE 1	# ######											
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				1	-	N •								ŀ
* P =2			INFLOW 10	0 HESERVOIR 0.29 117	127 127	136	143	145	, or o			-	•	
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F S S			ROUTE	THRU KEHLT RESI	RESERVOIR NO.	- 10 · 0								
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282			16		1200								-	
222			INFLOW TO	O RESERVOIR 0.11	1 R NO. 5			-		-				
R % R		4 1 0.87			121	136	143	1+0	•05					
	-		2 A A COMBINE		•	۰.	·	-					-	
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53			9°6 1	1.5	1150			-						
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FLOOD HYDRE (APH PACKAGE LIEC-1) DAM SAFETY VERSION JULY 1978 LAST MODIFICATION 26 FEB 79	
kun Dates 40/01/24. TINEs 05.35.34.	
ANALYSTS OF DAM OVERTOPPTAG USING RATTOS NF PHF Hydrologic-hydraulic Analysis of Safety of Kemly Run No. 3 Ratios of PhF Ruvied The Reservoir PA. 54-19	
NO NMIN JOB SPECIFICATION ZEB V ID ID ZBF V ID O ZBF V ID O JOPER NVI LROPI TRACE S O O O S O O O S O O O S O O O	
MULTI-PLAN AMALYSES TO RE PERFORMED NPLANS 1 ANTIGS 6 LATION 1 ATIGS -10 -30 -50 -10 100	
SUB-AREA RUNOFF COMPUTATION	5 .
INFLOW FOR RESERVOIR NO. 6 ISTAD ICUMP LECON ITAPE JPLI JPRI INAME ISTAGE IAUTO I 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
SKAP 0.00	
SPFE PMS R5 PMS R5 PMCLT UNIN 0.00 22.3U 117.00 127.0U 136.40 143.0U 149.0U U.UU 183PC COMPUTED BY THE PROGRAM 15 - 6600	
TP= .87 CP= .50 NIA- 0	-
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND 7P ARE TC+ 3+67 AND R+ 4+76 INTERVALS	
UNIT HYDROGRAPH 28 END-OF-PERIOD URDIMATES: LAG= .87 MOUKS: CP= .50 VUL= 1.00 14. 52. 91. 105. 93. 75. 61. 49. 40. 3. 26. 21. 17. 14. 11. 9. 1. 6. 5. 4.	

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SUB-AREA RUNOFF COMPULATION
INFLOW TO RESERVOUR NOS 5 Istao Icomp Iecon Itape JPLT JPRT INAME ISTAGE LAUTO 3 0 0 0 0 0 0 0
KARPH DATA DA TREPC RATIO ISNOW ISAME LOCAL 11 0.00 0.000 0 0 1 0
ХАРИТЕВ ВУ ТИЕ РИОБАЛИ, 15 - 100 227-00 127-00 136-00 149-00 0.00 22-30 117-00 127-00 149-00 149-00 0.00
КОРТ <u>57 КК И DLTKN KTTOL</u> E 0 0.000 0.000 1.00
IP= .87 CP= .50 NJA- 0
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND 1P AKE TC= 3.61 AND R= 4.76 INTERVALS
Umit includation is END-OF-PERIOD URDINAIFS, LAG. BT HOURS, CP. 50 VOL.= 1.00 5. 20. 34. 40. 35. 28. 23. 19. 12. 10. 6. 6. 5. 4. 3. 2. 2. 12. 10. 1. 1. 1. 1. 1. 0. 0. 0.
END-OF-PERTOD FLOW

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PLAN 1	111	VALUE	SPILLWAY CREST 1675.00	10	P UF UAM . 1678.50		
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RATIO MAXIMUM UF RESERVOI		MAY IMUM STUHAGE	MAXIMUM OUTFLOW	UURATION UVEN TOP	TIME OF MAX OUTFLOW	TIME OF FALLURE	·
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			SUP	SUMMARY OF DAM	DAM SAFETY ANAL	ANALYS I S	•	-	e -
LAN 1		1	INITIAL VALUE		SPILLWAY CRES! 1660-00		10P 0F DAM 1663.10		
		ELEVATION STORAGE		24°	• • • • • • • • • • • • • • • • • • •		82. 766.		
	10	MAXIMUM	MUM	MAX I MUM 5 T CKAGF	MAXIMUM OUTFLUW	DURATION OVER TOP	TIME OF MAX OUTFLOW	TIME OF FALLURE	
	5	KE SERVOIN	OVER	.XC=F1 689	276.	HOURS 0.00	HOURS 41.75	100KS	
	4		INT TAL	VALUE	SPILLWAY CRE	-	OF DAM		
PLAN 2		STORAGE OUTFLOW	1660	0.00	1560-00 54.		7669•10 82 766•		
					90 14 1 14 140	NURATION	TIME OF	TIME OF	
	PMF	MAXIMUM RESERVOTR U.S.ELEV	DEPTH OVER DAM	STORAGE	CFS CFS	OVER TOP HOURS	MAX DUTFLOW	FATLURE	
	D: •		0.00	68•	276.	00•0	51-12	0.00	
ľ				L. NAJ4	NOLINIS	9			
			KATIO	HAY INUM	MAX1MUM STAGE oF 1	A IIME			
•	·	·. -	05.	276.	1620.9	9 42.00			
			-	PLAN 2	STATION		•		
4			• •	MAX IMUM FLUW+CFS	NAXIMUM	4 TIME			
			• 30	276.0	1620+9	9 42 • 00			-
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			TIME OF FALLURE	, MOURS U_0U	į		TIME OF	HOURS	0.00					•		
 	P 0F DAM 1646.00	17. 180.	TIME OF MAX OUTFLOW	40.5U	NAM	6.00 17. 180.	TIME OF	HOURS	40+20			•				
ANALYSIS			zε	HOURS 0+00	Ĩ	17. 17. 180.		HOURS	0.•00	10	7 IME	41•14	10	T I ME HOURS	41.75	
DAM SAFETY ANAI	SPILLWAY CREST 1643.00	•0	MAX 14UM SUIFLOW	46.	SPILLWAY CREST	1645-00 12. 0.	MUM I X M	CFS	40.0	STATION .	MUMIXAM		STATION	MAXIMUM STAGE .FT	1-1051	•
SUMMARY OF DAN	VALUE 00	12. 0.	MAX1MUM STURAGE	AC = F = -		3.00 .12. 0.	MUMIXIM	ACHET		PLAN I	MAX I MUM	305.	PLAN 2	MAXINUM FLOM+CFS	305 •	-
-S	104 164		MAX1MUM DEPTH	00°0	INITIAL VALUL	1649.00	MUMIXAM	UVER DAM	00.0	A		.30	e.	, kafiu	06•	
•	ELEVATION	STORAGE	MAXIMUM RESERVUIR	1644.27	-	ELEVATION 510RAGE 001FLON	MUMIXAM	M.S.ELEV	1044.21							
•			0	105.			RATIO		• 30							
	PLAN I				2		 									
	ĥ				PLAN		D-4						•••		•	

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		SUMMAN UP UAM			•	•	
1		VALUE	SPILLWAY CREST	10 1	0F DAM		
ELEVATION STORAGE OUTFLOW	6641	33.	·.		• 0 • • 4 • •		
RATIO MAXIMUM OF RESERVUIR	MAXIMUM DEPTH	MAX I MUM STUKAGE	MAX I MUM OU IF LOW	DURATION OVER TOP	11ME OF MAX OUTFLOW	TIME OF FAILURE	
An 1607.01	OVER DAM	AC-F1 41.	CFS 1227.	HCURS 1.08	41.38	41.00	
	1417141	MITIAL VALUE	CD111WAY CREST	•	TOP OF DAM	-	-
PLAN C STORAGE STORAGE OUTFLOW		8400 93.	•0 •66 00•54•1	-			
RATIO MAXIMUM RATIO MAXIMUM PHF FF RESERVOIR	MAXIMUM DEPTH DVER DAM	MAXIMUM STORAGE AC-FT	MAX I MUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOG HOURS	TIME OF FATLURE HOURS	
	• 32	•1 *	169.	3.50	62•14	0.00	
		PLAN I.	STATION] 6			
		MAX1MUM FLOUGEES	NAXIMUM	H TIME			-
	• 30	1238.	1394.46	6 41.50			
	-	PLAN 2	STATION	14			
	HAT10	HAXIMUN FLUW•CFS	N MAXIMUM	M 11ME T HOURS			
		159.	•, 13B3•6	6 41.25			
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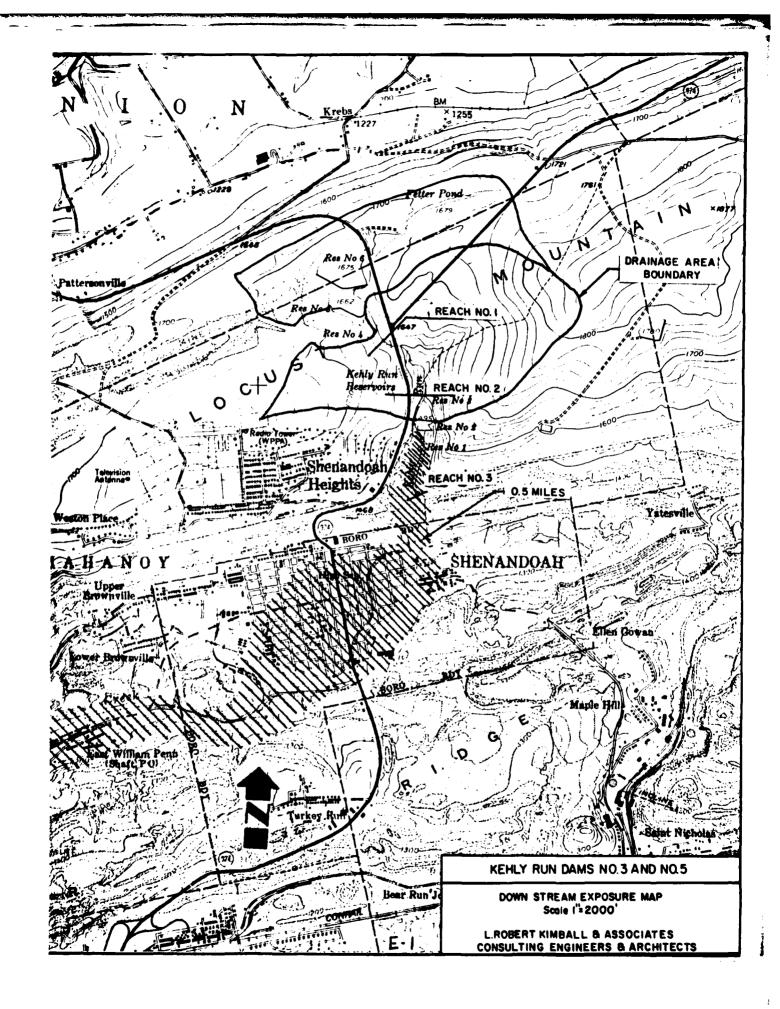
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APPENDIX E DRAWINGS

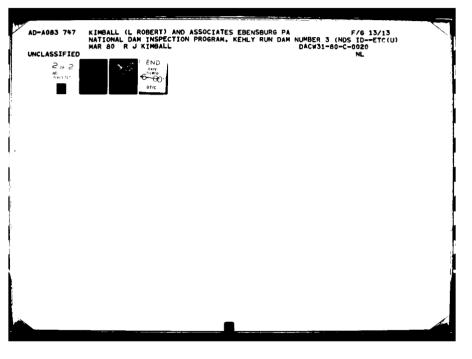
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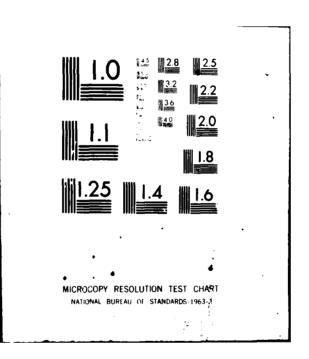
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APPENDIX F GEOLOGY





Kehly Run Dam No. 3 - General Geology

Kehly Run Dam No. 3 is located in the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. This province is typified by numerous synclinal and anticlinal features. Some minor faulting is indicated to the south of the reservoir. The bedrock underlying the dam consists of the Pennsylvanian aged Pottsville Group. This unit consists of light to dark gray, fine grained to conglomeratic sandstone, with lesser amounts of shale, siltstone, limestone, coal and underclay. The bedding is generally well developed with the sandstones and siltstones often cross-bedded. Joints are usually regular and moderately well formed.

Both deep mining and surface mining of anthracite coal have taken place in the vicinity of this dam. The extent of any deep mining is unknown without extensive research.

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