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PREFACE

This report is prepared under guidance contained in the <u>Recommended Guidelines for Safety Inspection of Dams</u> for Phase I investigations. Copies of these guidelines may be obtained from the Department of the Army, 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 visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for such studies which should be performed by the owner.

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 the dam depends on numerous and constantly changing internal and external factors which are 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 time 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.

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Phase I investigations 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" (PMF) 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 determining the need for more detailed hydrologic and hydraulic studies, considering of the size of the dam, its general condition, and the downstream damage potential.

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PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM: STATE LOCATION: COUNTY LOCATION: STREAM

COORDINATES:

DATE OF INSPECTION:

Treated Water Pond Pennsylvania Washington Unnamed tributary to Sawmill Creek. 7 May 1980 Lat. 40°11'24", Long. 80°00'16"

ASSESSMENT

Based on a review of available design information and visual observations of conditions as they existed on the date of the field inspection, the general condition of the Treated Water Pond is considered to be fair.

This assessment is based primarily on visual observations of embankment conditions and lack of information on the structural capacity of conduits through the embankment.

The structure is classified as an "intermediate" size, "high" hazard dam. Corps of Engineers guidelines recommend the Probable Maximum Flood (PMF) as the Spillway Design Flood for an "intermediate" size, "high" hazard dam. The Treated Water Pond's Spillway Design Flood is the Probable Maximum Flood. Spillway capacity is "adequate" because the non-overtopping flood discharge was found, by using the HEC-1 computer program, to be in excess of 100 percent of the PMF.

⁴ The visual inspection indicates several minor deficiencies in addition to those requiring further investigation. The deficiencies can be corrected or improved through implementation of the following recommended evaluation, remedial, monitoring and/or maintenance efforts.

RECOMMENDATIONS

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1. <u>Additional Investigations</u>: It is recommended that the owner immediately retain the services of a registered professional engineer knowledgeable and experienced in the design and construction of earth dams to provide an evaluation of the stability of the embankment and outlet facilities of the Treated Water Pond. The evaluation should include, but not be limited to the following:

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SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D) Treated Water Pond

a. Review and evaluation of observation well data.

b. Investigation of the flattened slope area and adjacent swampy condition near the right end of the dam.

c. Stability calculations for ultimate pool level conditions, if necessary.

d. Evaluation of the operability of the principal spillway conduit and gate valve.

e. Evaluation of the structural stability of the active outlet works conduit and the pond drain conduits.

f. Provide means for upstream flow control on active outlet works, Pond Drain 1 and Pond Drain 2.

2. <u>Emergency Operation and Warning Plan</u>: Concurrent with the additional investigations recommended above, the owner should develop an Emergency Operation and Warning Plan including:

a. Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

b. Procedures for around the clock surveillance during periods of heavy precipitation or runoff.

c. Procedures for drawdown of the reservoir under emergency conditions.

d. Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

3. <u>Remedial Work</u>. The Phase I Inspection of the Treated Water Pond also disclosed several other deficiencies which should be corrected during routine maintenance.

a. Remove trees from the upstream and downstream slopes of the embankment to the extent that all roots greater than one inch in diameter are excavated.

b. Repair wave erosion distress on the upstream slope.

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SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D) TREATED WATER POND

c. Determine the true elevation of the Embankment B crest with respect to Embankment A, and raise if necessary.

d. Repair the embankment slough adjacent to the underflow pipes outlet structure and monitor to assure that future movements do not imperil the structural integrity of the facility.

e. Repair the sloughs that have occurred along the diversion channel in the upper reservoir area.

f. Remove the sediments from the stilling pool area below Embankment A and monitor to determine source of any new sediments deposited therein.

Samuel G. Mazzella Date

Umin Approved by

Project Engineer

Olienter 197 march TINCLE James P. Hannan Project Engineer

James E. Barrick,

PA Registration No. 022639-E

24 Sp 80 JAMES W. PECK

Colonel, Corps of Engineers District Engineer

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TREATED WATER POND

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OVERVIEW

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PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM TREATED WATER POND NATIONAL I. D. NO. PA 01138 PennDER No. 63-91

SECTION 1 PROJECT INFORMATION

1.1 GENERAL

a. <u>Authority</u>: The Phase I Investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) to the Secretary of the Army through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. <u>Purpose</u>: The purpose of the investigation is to make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: The Treated Water Pond was designed and constructed as a earthfill structure with clay core and cutoff along the centerline. The embankment is 3400 feet long, with a maximum toe to crest height of 58.8 feet and a crest width ranging from 20 to 35 feet. The embankment's upstream slope was observed to be 1.9H:1V above the waterline; the downstream slope was observed to be 1.9H:1V.

(2) <u>Principal Spillway</u>: The principal spillway for the Treated Water Pond consists of a 16 inch diameter stainless steel pipe through the embankment near the right abutment The intake end is protected by a substantial trash cage. The outlet end contains a gate valve flow control and a sharp-crested weir flow measuring device. The principal spillway discharges to the emergency spillway chute via an 18 inch diameter concrete pipe.

(3) Active Outlet Works: An active outlet works consisting of a 12 inch diameter PVC pipe provides discharge capacity for normal inflows to the Treated Water Pond. The intake is submerged approximately 19 feet below the current pond surface (operating level) and is protected by a trash cage. Outlet structures include a gate valve, energy dissipation structures, and a sharp-crested weir flow measuring device. The active outlet works ultimately discharges to a relocated creek channel below the downstream toe of the Treated Water Pond embankment.

(4) <u>Pond Drain</u>: Two pond drains consisting of 24 inch diameter concrete pipes pass through the central portion of the embankment. Both drains are reported to have been blocked following construction of the dam.

(5) <u>Road Drain</u>: A storm sewer type road drain lies below the left groin of the embankment to drain surface runoff from the groin area.

(6) <u>Emergency Spillway</u>: The emergency spillway consists of a 8.5 feet wide, rectangular, reinforced concrete channel located on the right abutment. The channel crosses the right abutment and discharges to a drainage swale below the downstream toe of the dam

(7) <u>Freeboard Conditions</u>: Freeboard between the low point on the embankment and: the emergency spillway crest is 3.9 feet; the principal spillway crest is 9.9 feet; the operating pool level is 17.5 feet.

(8) <u>Downstream Conditions</u>: The unnamed creek below the Treated Water Pond flows through a relatively narrow, steep-sided valley for about 1.5 miles to a confluence with Sawmill Creek. Sawmill Creek flows into Pigeon Creek which enters the Monongahela River near Monongahela, Pennsylvania. In the first 1.5 miles below the Treated Water Pond, at least 8 inhabited dwellings and State Route 917 lie on the floodplain.

(9) <u>Reservoir</u>: The Treated Water Pond is about 2200 feet long at the operating pool elevation and has a surface area of 21 acres. When the pool is at the crest of the dam, the reservoir length increases to 2600 feet and the surface area is 27 acres.

(10) <u>Watershed</u>: The watershed contributing to the Treated Water Pond is a meadowland and contains the Raw Water Pond. The watershed is completely owned by the U. S. Steel Corporation.

b. Location: The Treated Water Pond is located in Fallowfield Township, Washington County, Pennsylvania approximately 4 miles west of Monongahela, Pennsylvania. c. <u>Size Classification</u>: The dam has a maximum storage capacity of 877 acre-feet and a toe to crest height of 58.8 feet. Based on the Corps of Engineers guidelines, this dam is classified as an "intermediate" size structure.

d. <u>Hazard Classification</u>: The Treated Water Pond is classified as a "high" hazard dam. In the event of a dam failure, at least 8 inhabited dwellings and State Route 917 could be subjected to substantial damage and loss of life could result.

e. <u>Ownership</u>: The Treated Water Pond is owned by the Unites States Steel Corporation, Raw Materials Division, Frick District. Correspondence can be addressed to:

United States Steel Corporation Raw Materials Division, Frick District Fayette Bank Building, 5th FLoor Uniontown, Pennsylvania 15401 Attention: Mr. Robert Witt, Jr., Chief Engineer (412) 438-3511, Ext. 256

f. <u>Purpose of Dam</u>: The Treated Water Pond was constructed to serve as a holding and settling impoundment for mine discharge water from the Raw Water Pond above. Both impoundments are part of the U. S. Steel Maple Creek Mine complex.

g. <u>Design and Construction History</u>: The dam was designed by C. A. Burchfield of the U. S. Steel Corporation in 1966. No additional information on design or construction was found.

h. Normal Operating Procedures: The Treated Water Pond was designed to operate as an uncontrolled structure. Under normal operating conditions, the pool level (operating pool level) is maintained by the active outlet works. A principal spillway provides for a maximum normal pool elevation of 1101.0.

Inflow to the Treated Water Pond includes runoff from the watershed above, and the discharge from the Raw Water Pond.

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1 3 PERTINENT DATA

	a.	Drainage Area	0.06	sq. mi.
	b.	Discharge at Dam Facility		
		Maximum flood at Dam Faci Emergency Spillway Capaci	ility ity	Unknown
		at Top of Dam		202 cfs
	c.	Elevation (feet above MSL	<u>.)</u> **	
		Design Top of Dam Current Top of Dam (low p Emergency Spillway Overf) Principal Spillway Overf) Operating Pool Pond Drain 1 Inlet Invert Active Outlet Works Inlet Active Outlet Works Outlet Pond Drain 2 Inlet Invert Pond Drain 2 Outlet Invert Toe of Embankmemt	point) low Crest low Crest t t Invert et Invert t rt	1115.0 1110.9 1107.0 1101.0 1093.4 1078.0 1075.0 1075.0 1060 <u>+</u> 1055 <u>+</u> 1052.1
d.	Reser	rvoir Length		
	Lengt Lengt Lengt	ch of Maximum Pool ch of Normal Pool ch of Operating Pool	26 24 22	000 feet 150 feet 200 feet
е.	Reser	voir Storage		
	Curre Emerg	ent Top of Dam gency Spillway Invert	877 ac 778 ac	ere-feet ere-feet
f.	Reser	voir Surface		
	Curre Emerg	ent Top of Dam gency Spillway Crest	25. 2	8 acres 5 acres
g.	Embar	hkment		
	Type Lengt Heigh Crest	th ht t Width Varies fr	34 58 rom 20 to	Earth [#] 00 feet 3.8 feet 35 feet
	Dov	wnstream		1.9H:1V
	ups Imper	rvious Core		Yes
	Cutof Grout	ff Provisions : Curtain		Unknown ^{**} Unknown ^{**}

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h. Emergency Spillway

Туре	Rectangular Open Channel*
Location	Right Abutment
Overflow Crest Length	8.5 feet
Invert Elevation	1108 feet#

i. Principal Spillway

Type 16 inch Diameter Stainless Steel Pipe* Location Through Embankment Near Emergency Spillway 1101.0* Inlet Invert Elevation Trash Cage Yes 200 feet* Conduit Length Gate Valve Downstream Yes, 5* Anti-Seep Collars

k. Pond Drain 1

24 inch Diameter Concrete Pipe Type Location Through Central Part of Embankment 1078+* Inlet Invert Yes* Trash Cage 200 feet[#] Conduit Length No* Gate Valve Yes, 5[#] Anti-Seep Collars Unknown Plugged After Construction

1. Pond Drain 2

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Туре	24 inch Diameter	Concrete Pipe
Location	Left Central Part	of Embankment
Inlet Invert		1060 <u>+</u> #
Trash Cage		No
Conduit Length		245 feet
Gate Valve		No
Anti-Seep Colla	ars	Yes, 5
Plugged After (Construction	Yes*

Taken or derived from available engineering drawings or reports.

SECTION 2 ENGINEERING DATA

2.1 DESIGN

The files of the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER) were reviewed but no engineering data related to the original design of the facility was found. Because of the small watershed, the Division of Dams and Encroachments, Pennsylvania DER, was not required to issue a permit for the construction or operation of this dam.

The dam was apparently designed by C. A. Burchfield of the United States Steel Corporation in 1966. The owner provided the design drawings listed in Appendix B and reproduced in Appendix E.

2.2 CONSTRUCTION

The Treated Water Pond was constructed in 1967 and 1968 by C. J. Langenfelder and Sons, Inc., of Baltimore, Maryland.

2.3 POST-CONSTRUCTION ENGINEERING STUDY

A post-construction engineering study was conducted by L. Robert Kimball Consulting Engineers in 1973 for both the Raw Water Pond and Treated Water Pond facilities. This report included the following investigation results:

1. Geology.

- 2. Seepage analysis.
- 3. Stability analysis:
 - a. Simplified Bishop analysis.
 - b. Modified Fellenius analysis.
 - c. Translational (Wedge) Failure analysis.
- 4. Field investigations and laboratory testing related to the Treated Water Pond included:

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- a. Test borings (7).
- b. Triaxial compression tests (4).
- c. Grain size distributions (12).
- d. Proctor densities (2).
- e. In-situ densities (4).
- f. Soil permeability tests (4).
- 5. Hydrologic Analyses:
 - a. Existing conditions.
 - b. Proposed conditions.

The report concluded that the embankment was stable for conditions analyzed, based on a recommended safety factor of 1.5. The analysis included earthquake induced forces. The report recommended:

1. Maintain and periodically check the water level in the observation wells installed in the embankment.

2. Maintain vegetal cover to minimize erosion.

2.4 OPERATION

The dam was designed to operate without a dam tender.

The principal spillway is a 16 inch diameter stainless steel pipe located near the right end of the embankment. The operating reservoir pool is maintained approximately 8 feet below the principal spillway inlet invert by the submerged inlet to the active outlet works conduit. A concrete, rectangular, uncontrolled chute spillway provides discharge capacity for large storm flows.

Performance and operation records are not maintained. There is no information available on the operation of any of the outlet works pipelines.

2.5 EVALUATION

a. <u>Availability</u>: Engineering data was provided by PennDER, Bureau of Dams and Waterway Management. The owner provided the design drawings listed in Appendix B and reproduced in Appendix E.

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b. <u>Adequacy</u>: The available engineering information, though greatly limited, was supplemented by field inspections and supporting engineering analyses and is considered adequate for the purpose of this Phase I Inspection Report.

c. <u>Validity</u>: Based on the review of the available information, there appears to be no reason to question the validity of the limited engineering data.

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SECTION 3 VISUAL INSPECTION

3.1 FINDINGS

a. <u>General</u>: The field inspection of the Treated Water Pond was performed on 7 May 1980, and consisted of:

(1) Visual observations of the embankment crest and slopes, groins and abutments;

(2) Visual observations of the principal and emergency spillways, outlet works structures, and pond drain facilities;

(3) Visual observations of the embankment's downstream toe areas including drainage channels, hydraulic structures, and surficial conditions;

(4) Visual observations of downstream conditions and evaluation of the downstream hazard potential.

(5) Visual observations of the reservoir shoreline and watershed;

(6) Transit stadia surveys of relative elevations along the embankment crest centerline, spillways, and across the embankment slopes.

The visual observations were made during a period when the reservoir and tailwater were at normal operating levels.

The visual observations checklist, field plan, profile and section containing the observations and comments of the field inspection team are contained in Appendix A. Specific observations are illustrated on photographs in Appendix C. Detailed findings of the field inspection are presented in the following sections.

The Maple Creek Mine Treated Water Pond is impounded by a long earthen embankment constructed on the hillside below the Maple Creek Mine Raw Water Pond. Normal discharge is via an outlet works through the central portion of the embankment that discharges to a relocated stream channel below. The principal spillway does not normally function as the pool level is maintained below the inlet invert. Flood flows are discharged through a concrete chute spillway on the right abutment.

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b. Embankment:

(1) <u>Crest</u>: The embankment crest was observed to be generally level throughout its length and of regular cross-section. The location of the crest was approximately as indicated by drawings provided by United States Steel Corporation.

Over the right portion of the embankment, the crest elevation was found by stadia survey to be 1115.1 at its low point and the crest width was measured to vary between 20 and 25 feet.

At the left end of the embankment, the elevation of the crest dropped to approximately elevation 1111.0 with a corresponding width increase to between 30 and 35 feet.

The crest was in good condition and no tension cracks and very few depressions capable of impounding water were observed. An access road has been constructed along the crest of the dam by building up a surface of "reddog" material. The access road surface was observed to be quite hard. The original embankment crest comprises the shoulders of the access road and these were observed to be covered with dense grass and ground cover vegetation. Minor drying cracks having no preferred orientation were observed at numerous places along the crest of the embankment.

(2) <u>Upsteam Slope</u>: The upstream slope of the Treated Water Pond was covered with a dense growth of grass, brush and other ground cover vegetation and contained numerous trees of the black locust variety. The slope was observed to be generally uniform though local unevenness was noted. Careful observation at some of the local non-uniformities failed to reveal any cracks or scarps in the embankment surface that might be indicative of deep type sloughing failures.

Moderately severe erosional distress was observed at and above the waterline along the left portion of the embankment. This is the slope that faces the west. In places, the upstream slope has been steepened significantly by wind driven wave erosion. The distress in places reached four or more feet above the water level and has created locally steep slopes near and above the waterline. This has resulted in minor sloughing of the lower portion of the upstream slope at several locations.

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A stadia survey cross-section of the upstream face indicated a slope of 1.9H:1V.

The central and right portions of the upstream slope have suffered significantly less erosional deterioration than the left portion of the embankment. One local area of erosional distress was noted on the far right portion of the embankment near the right abutment. The distressed area was small and had not yet affected a significant portion of the upstream slope.

(3) <u>Downstream Slope</u>: The downstream slope of the Treated Water Pond embankment was observed to be generally uniform and fully covered with grass and ground cover type vegetation. Also, a considerable number of trees were observed to be growing on the slope at all elevations between the crest and toe. The trees were relatively small diameter black locusts. No erosion or surface slough or slide type failures were observed anywhere on or below the downstream slope of the embankment.

Two areas on the embankment toward the right end indicated slope non-uniformities but close observation revealed no indication of embankment instability. The first condition, approximately 400 feet left of the right end of the embankment, was a pronounced flattening of the toe area at a deep section where the embankment turns approximatley 90°. Removal of ground cover material and careful observation of soil materials in the vicinity showed no cracking or no scarping. Finger penetration indicated the soil materials to be in a firm condition. The second area is approximatley 400 feet further left along the embankment and appeared to be a bench like formation near the downstream toe. Once again, careful observation below the ground cover vegetation indicated no cracks, scarps or wet conditions indicative of possible embankment stability distress. Two animal burrows were noted in the bench area.

No indication of a line of seepage was observed anywhere on the downstream slope of the embankment.

As was the case with the upstream slope of the embankment, the downstream slope was observed to be generally uniform across the surface but contained areas of local unevenness. Close observation of selected areas of unevenness indicated no cracks, scarps, seeping water or other indications of slope instability.

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A stadia survey cross-section of the downstream face indicated a slope of 1.9H:1V.

c. Groins:

(1) <u>Right</u>: The right groin (junction of the embankment and abutment) was observed to be in good condition with the exception of a wet, swampy zone approximately 300 to 400 feet left of the right end of the embankment. The wet spot was observed to be the result of seepage and contained soft soil materials, standing water and considerable water related vegetation. The seepage zone was an upper extension of a larger marshy area that exists beyond the toe of the right end of the embankment. This marshy area is associated with the drainage swale that receives the emergency spillway discharges from both the Treated Water Pond and the Refuse Settling Basin on the other side of the valley.

In general, no movement of fines or sedimentation was observed and no indications were observed of potentially dangerous seepage flows through or beneath the embankment. The remainder of the groin on the right portion of the embankment was dry and uneroded and generally well covered with vegetation.

(2) Left: The left groin of the embankment was observed to be marshy and quite swampy for a considerable distance along the left side of the embankment. The groin lies in a topographic low created between an adjacent hillside and the embankment. Plans provided by United States Steel Corporation indicate that a 15 inch reinforced concrete storm sewer (road drain) was installed to drain the area. However, it appears that either improper grading or clogging of the catch basins has resulted in a drainage impedence that has led to the development of the swampy conditions.

(3) <u>Central</u>: The junction of the embankment and the downstream toe area was observed to be in generally good condition with two exceptions. Two small areas that contained soft earth materials and water related type vegetation were observed near the center (1)

the embankment. The left area also contained a surface drainage channel that originated at the outfall of the 15 inch concrete road drain discussed above. No seeping water, no silt laden flows and no sedimentation were observed that would suggest the movement of fines from or beneath the impounding embankment.

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The remainder of the groin in the downstream toe area was observed to be dry and uneroded and well covered with vegetation.

d. Abutments:

(1) <u>Right</u>: The right abutment was observed to be mildly sloped, grassed and tree covered and gave no indication of seeping water or slope instability conditions.

The right abutment contains the concrete chute emergency spillway. Some erosion has occurred behind the right chute wall along the steeper downstream section of the spillway. Surface runoff appears to have eroded spillway wall backfill materials down to the chute footer.

(2) Left: The left abutment lies at the extreme upper end of the left end of the embankment and was observed to be in good condition. No erosion, instability or seepage was observed anywhere on the abutment.

e. Principal Spillway:

(1) <u>Conduit</u>: The principal spillway conduit is a 16 inch diameter stainless steel pipe that passes through the upper embankment slope to a gate valve and baffled weir box below. The principal spillway is located about 90 feet to the left of the emergency spillway near the right end of the embankment.

(2) <u>Inlet Structure</u>: The principal spillway inlet structure consists of a concrete slab on the upstream slope through which the conduit projects. The inlet is protected by a three foot cube trash cage constructed of one-half inch diameter stainless steel bars welded in a grid on six inch centers.

(3) <u>Outlet Structures</u>: The outlet structures consist of a gate valve control located in a standard concrete manhole followed by a concrete box containing concrete block baffles and a stainless steel, sharpcrested weir.

Discharge from the box is via an 18 inch diameter concrete pipe that discharges to the emergency spillway chute approximately 55 feet below.

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(4) <u>Condition</u>: All visible components of the principal spillway appeared to be in good condition. However, operability of the valve and pipelines could not be ascertained as there was no flow in the facility.

f. Active Outlet Works:

* *

(1) <u>Conduit</u>: The active outlet works conduit, as observed at its exit point on the downstream slope of the embankment, is 12 inch diameter PVC pipe. The pipe passes through the embankment approximately 950 feet to the left of the emergency spillway.

(2) <u>Intake Structure</u>: The intake structure could not be observed due to the Pond pool level. No evidence of an upstream flow control was found.

(3) <u>Outlet Structures</u>: The outlet structures consist of a gate valve in a standard concrete manhole, a reinforced concrete box energy dissipator that turns the flow 90°, and a concrete box with concrete block baffles and a sharp-crested weir. Discharge from the weir box is via an 18 inch diameter concrete pipe that parallels the embankment toe before entering another concrete manhole approximately 150 feet below.

At the lower manhole, the flow is again turned 90° and enters a 24 inch diameter concrete pipe that discharges to the creek channel approximately 90 feet below.

(4) <u>Condition</u>: All visible components of the active outlet works were in good condition except the energy dissipator box which contained a large hole that appeared to have been intentionally broken through the upper downstream side of the box. The hole did not affect the performance of the structure.

The discharge point of the 24 inch concrete pipe could not be observed because of a cyclone fence barrier.

g. Pond Drain 1:

(1) <u>Conduit</u>: Pond Drain 1 conduit, as observed at its exit point on the downstream slope, is a 24 inch diameter concrete pipe. The pipe passes through the embankment approximately 1100 feet to the left of the emergency spillway.

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(2) <u>Intake Structure</u>: The Pond Drain 1 intake structure could not be observed due to the Pond pool level. No evidence of an upstream flow control was found.

(3) <u>Outlet Structures</u>: The Pond Drain 1 conduit enters the standard concrete manhole that receives the 18 inch concrete pipe from the active outlet works weir box. Discharge is via the 24 inch concrete pipe described above.

(4) <u>Condition</u>: The operating and physical condition of Pond Drain 1 could not be determined.

h. Pond Drain 2:

(1) <u>Conduit</u>: Pond Drain 2 conduit, as observed at the outlet end, is a 24 inch diameter concrete pipe. The pipe passes through the embankment approximately 1390 feet to the left of the emergency spillway.

(2) <u>Intake Structure</u>: The Pond Drain 2 intake structure could not be observed due to the reservoir pool level. No evidence of an upstream flow control was found.

(3) <u>Outlet Structures</u>: The outlet structure for Pond Drain 2 consists of a concrete headwall in the embankment's downstream slope. Discharge from the pipe is onto the embankment slope and subsequently into a drainage swale below.

(4) <u>Condition</u>: On the date of observation, an estimated flow of 3 to 4 gpm was discharging from the pipe.

Remnants of a brick and mortar closure of the pipe end were observed and bricks with adhering mortar were scattered about the immediate vicinity. It appeared that the pipe had been sealed at one time, but the seal had been broken out.

Considerable erosion of the embankment slope below the concrete headwall was observed. The extent of erosional distress appeared to be greater than could be caused by the observed pipe flow. i. Road Drain:

(1) <u>Conduit</u>: The storm sewer road drain conduit is a 15 inch diameter concrete pipe. The sewer lies beneath the groin of the left end of the embankment.

(2) <u>Inlets</u>: No catch basin inlets were observed.

(3) Outlet: The road drain outlet is a concrete headwall that discharges to the left central groin of the embankment. Erosion of the groin has occurred at and below the headwall.

j. Emergency Spillway:

(1) <u>General</u>: The emergency spillway for the Treated Water Pond consists of a reinforced concrete chute structure constructed into the right abutment just beyond the right end of the embankment.

(2) <u>Concrete Weir</u>: Flow control for the emergency spillway is by broadcrested weir at the inlet to the spillway channel. In this reach, the spillway was measured to be 8.5 feet wide and 9 feet high.

(3) <u>Approach Channel</u>: The approach channel to the flow control area is via flared wingwalls (45°) at the entrance to the emergency spillway chute.

(4) <u>Discharge Channel</u>: The discharge channel is a reinforced concrete chute that proceeds with increasing slope over the right abutment at a point approximately 290 feet below the inlet. The emergency spillway channel narrows significantly at the point where the slope increases significantly.

(5) <u>Bridge and Piers</u>: The emergency spillway is crossed by a steel beam bridge containing steel grating and handrails. The bridge provides access for vehicles to the crest of the embankment beyond.

(6) <u>Condition</u>: The condition of emergency spillway components was generally good on the date of inspection.

The approach to the inlet was clear of significant obstructions and debris.

Some small trees and debris were noted in the upper reaches of the discharge channel. However, the extent of vegetal growth and debris did not appear to be sufficient to seriously impair the performance of the spillway.

The condition of concrete surfaces and construction joints appeared to be good.

Some erosion of the lower right chute wall backfill has occurred and is described above.

k. Instrumentation:

(1) Observation Wells: Three observation wells were observed on the embankment at the locations shown on the field plan. No readings were taken on the inspection date. The U.S.S. representative stated that data obtained from periodic readings of the instruments was maintained at the Maple Creek Mine Manager's office but that written permission to review the data was required.

(2) <u>Weirs</u>: Two weirs have been installed on outlet facilities at the dam. The principal spillway weir is rectangular, sharp-crested and has a 48 inch crest length.

The active outlet works weir is of the same type but has a 24 inch crest length.

1. Reservoir:

(1) <u>Slopes</u>: In general, the reservoir slopes are flat to moderate and were generally grass, brush and small tree covered. The reservoir slopes consist generally of the areas at and below the toe of the Raw Water Pond, which is situated in the watershed above the Treated Water Pond.

No serious erosion of the reservoir slopes was observed.

(2) Sedimentation: None observed.

(3) <u>Inlet Stream</u>: The inlet stream to the Treated Water Pond lies along the upper left end of the embankment. Inflow to the Pond is from the 10 inch diameter pipe that discharges from the Raw Water Pond above.

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(4) <u>Watershed</u>: The watershed was observed to be generally grass, brush and tree covered. The watershed is quite small as the Treated Water Pond is located relatively high on a hillside.

m. <u>Downstream Conditions</u>:

(1) <u>Downstream Channel</u>: The downstream channel for the Treated Water Pond consists of the original stream channel for the valley below the dam. The stream channel is relatively narrow, winding and lined with trees, brush and other vegetal growth.

(2) <u>Slopes</u>: The immediate downstream channel slopes are relatively steep, as the channel is of an erosional nature in alluvial soils. The valley slopes are generally mild and covered with brush and trees.

(3) <u>Floodplain Development</u>: In the 1.5 miles below the Treated Water Pond, eight inhabited dwellings lie in the lower part of the floodplain. Also, a mine portal and coal loading facility lie in the immediate valley bottom below the dam. Also Route 917, an important north-south highway in the area, would be threatened by high flows.

3.2 EVALUATION

The following evaluations are based on the results of the visual inspections performed on 8 May 1980.

a. <u>Embankment</u>: The Treated Water Pond embankment appeared to be in good condition with no strong evidence of anomalous seepage or instability. The slopes were measured to be relatively steep, but no indication of high ground water in the embankment was observed.

Two significant non-uniformities were observed on the downstream slope.

Some significant wave erosion of upstream slopes has occurred, but as yet does not seriously threaten the integrity of the embankment.

Numerous trees were observed growing on both the upstream and downstream slopes of the embankment.

Several wet zones were observed, but there was no indication of movement of fines from within or below the embankment. No significant springs or seepage zones were observed.

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A swampy zone along the left end of the embankment appeared to be the result of poor surface drainage conditions.

Erosional distress was observed on the embankment below the outlet headwall of Pond Drain 2. Also, erosion of the embankment groin has occurred below the road drain pipe outlet headwall and along the drainage channel below.

b. <u>Principal Spillway</u>: Operability of the principal spillway could not be evaluated because of a "no flow" condition. Otherwise, the facility appeared to be functional.

c. <u>Active Outlet Works</u>: The active outlet works appeared to be operational and functioning properly. However, the apparent lack of an upstream flow control is considered to be a deficiency. Also, the structural ability of the plastic conduit to withstand the weight of the embankment above is unknown.

d. <u>Pond Drain 1</u>: The functionality and structural condition of Pond Drain 1 could not be determined.

e. <u>Pond Drain 2</u>: Pond Drain 2 appeared to be leaking slightly but did not give strong indication of serious deficiencies. The structural condition could not be determined.

f. <u>Road Drain</u>: The condition of the road was considered to be poor. This is based on the apparent failure of the catch basins to provide adequate drainage, and erosion of the embankment groin below the outlet headwall.

g. <u>Emergency Spillway</u>: The condition of the emergency spillway appeared to be good. No significant flow obstructions were noted and structural conditions, with one exception, were adequate. The exception was an observed erosion of chute wall backfill by surface runoff.

h. <u>Hazard Potential</u>: Based on the observed height of the embankment and downstream floodplain conditions, the Treated Water Pond was assigned a "high" hazard potential rating.

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SECTION 4 OPERATIONAL FEATURES

4.1 PROCEDURE

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Reservoir pool level is maintained at an elevation approximately eight feet below the invert of the principal spillway pipe by the submerged active outlet works intake.

The outlet works conduit is controlled by a gate valve located downstream of the embankment. The valve is normally open and the pipeline is under full pressure through the embankment. No upstream flow control was observed during the field reconnaissance.

Operational features of the pond drains could not be identified.

Normal operating procedure does not require a dam tender.

4.2 MAINTENANCE OF DAM

The embankment and appurtenances are maintained by the United States Steel Corporation. Maintenance reportedly consists of periodically repairing eroded areas and making miscellaneous repairs as necessary.

4.3 INSPECTION OF DAM

The United States Steel Corporation is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

The United States Steel Corporation is required by MSHA to inspect the dam at least once every seven days and to make an annual report and certification of the dam.

4.4 WARNING SYSTEM

There is no warning system and no formal emergency procedure to alert or evacuate downstream residents upon threat of a dam failure.

4.5 EVALUATION

Lack of an upstream flow control for the outlet works conduit is considered to be a deficiency.

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The maintenance program should be continued. However, there are no written operation, maintenance or inspection procedures, nor is there a warning system or formal emergency procedure for this dam. These procedures should be developed in the form of checklists and step by step instructions, and should be implemented as necessary.

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SECTION 5 HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. <u>Design Data</u>: The Treated Water Pond has a watershed of 39 acres which is vegetated primarily by grassland. The watershed is about 1800 feet long and 1200 feet wide and has a maximum elevation of 1200 feet (MSL). At maximum normal pool, the dam impounds a reservoir with a surface area of 25 acres and a storage volume of 778 acre-feet. Maximum normal pool level is maintained at Elev. 1107 by the overflow crest of the emergency spillway. The impoundment has a principal spillway conduit with invert elevation 1101.0. For the purpose of this hydrologic analysis, the principal spillway was assumed to be inoperative.

A post-construction report by L. Robert Kimball, Consulting Engineers, routed a 6 hour PMP of 25.8 inches (SCS freeboard hydrograph) through the reservoir and obtained a maximum water surface of elevation of 1112.17.

No additional hydrologic calculations were found relating reservoir/spillway performance to the Probable Maximum Flood or fractions thereof.

b. <u>Experience Data</u>: Records are not kept of reservoir level or rainfall amounts. There is no record or report of the embankment ever being overtopped.

c. <u>Visual Observations</u>: On the date of the field inspection, no serious deficiencies were observed that would prevent the principal or emergency spillways from functioning. The water level at the time of the field inspection was observed to be 13.6 feet below the emergency spillway crest. The owner's representative reported that the water level observed was the normal operating pool level and that it has remained at that elevation for some time.

d. <u>Overtopping Potential</u>: Overtopping potential was investigated through the development of the Probable Maximum Flood (PMF) for the watershed and the subsequent

*Elevation based on L. Robert Kimball topographic map which indicated site elevations approximately 2.6 feet higher than elevations shown on the U. S. Steel drawings.

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routing of the PMF and fractions of the PMF through the reservoir and spillway. The Corps of Engineers guidelines recommends the Probable Maximum Flood (PMF) for "intermediate" size, "high" hazard dams. Therefore the Spillway Design FLood (SDF) is the PMF.

Hydrometeorological Report No. 33 indicates the adjusted 24 hour Probable Maximum Precipitation (PMP) for the subject site is 19.4 inches. Although calculations exist that relate the reservoir/spillway system to a PMP type precipitation event, an evaluation of the system was performed to determine whether or not the dam's spillway capacity is adequate under current Corps of Engineers' guidelines.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version 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 and key input data for this program are discussed briefly in Appendix D.

The peak inflow to the Treated Water Pond was determined by HEC-1 to be 250 cfs for the SDF. This value considers the controlled discharge from the Raw Water Pond.

An initial pool elevation of 1107.0 was assumed prior to commencement of the storm.

e. <u>Spillway Adequacy</u>: The capacity of the combined reservoir and spillway system was determined to be in excess of the PMF by HEC-1. According to Corps of Engineers' guidelines, the Treated Water Pond spillway is "adequate."

SECTION 6 STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

a. <u>Design and Construction Data</u>: All available design documentation, calculations and other data received from the Pennsylvania Department of Environmental Resources were reviewed. This data is discussed in Section 2 and a detailed listing is included in Appendix B. The owner provided the drawings that are presented in Appendix E.

b. <u>Operating Records</u>: There are no written operating records or procedures for this dam. Observation well readings were not available at the time of preparation of this report.

c. Visual Observations:

(1) Embankment: Visual observations made during the field inspection did not indicate evidence of a high groundwater level in the embankment. There was no pronounced "line of seepage", and no springs, seeps or surface sloughs were observed. Four areas at and beyond the toe of the embankment exhibited soft and swampy conditions but gave no indication of the existence of significant groundwater flows.

Two areas on the downstream slope exhibited non-uniform conditions. The first was a pronounced flattening of the embankment toe about 400 feet left of the right end of the dam Perhaps significantly, this area lies immediately above the largest of the four swampy areas referenced above. However, close observation of the embankment did not reveal any significant cracks, scarps or bulges and the soil materials were generally firm as determined by finger penetration. The second non-uniform area was a bench like configuration in the vicinity of the active outlet works outlet structures. There was no swampy area associated with the bench and no significant cracks, scarps or other indications of instability were observed.

That stadia survey showed a relatively steep downstream slope at 1.9H:1V.

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The embankment's upstream slope has suffered minor slumping, sloughing of surficial soils and erosion at and above the reservoir pool level. In general, these conditions appear to be the result of wave action.

(2) <u>Outlet Facilities</u>: Observations of visible components of the principal spillway, outlet works and pond drains gave no indication of instability.

(3) <u>Emergency Spillway</u>: Emergency spillway chute wall backfill has been eroded from behind the right wall in the lower chute area. No other evidence of instability of emergency spillway components was observed.

d. <u>Performance</u>: The Dam Safety Section, Pennsylvania Department of Environmental Resources has apparently never issued a permit for construction or operation of the Treated Water Pond. Consequently, there is no corresponence relative to this impoundment and no information available concerning performance over its operating life.

6.2 EVALUATION

A.

a. <u>Design, Construction, and Monitoring Information</u>: The design documentation was by itself, considered inadequate to evaluate the structure.

A post-construction report by L. Robert Kimball Consulting Engineers presented safety factors against sliding for several embankment conditions. The results of these analyses are discussed in Section 2. The adequacy of these analyses could not be assessed based on visual observations, and the observation well information on embankment groundwater levels was not available at the time of preparation of this report. This information, when available, should be reviewed and evaluated by a person knowledgeable in embankment design and performance.

b. <u>Embankment</u>: On the date of the field inspection, the embankment appeared to be stable. However, the observed embankment and toe conditions suggest that additional evaluations should be undertaken, particularly if significantly higher reservoir operating pool levels are anticipated.

c. <u>Principal Spillway</u>: The structural stability of the principal spillway conduit could not be evaluated because of lack of performance information. However,

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pipe material and embankment cover conditions would suggest satisfactory stability.

d. <u>Active Outlet Works</u>: The active outlet works was observed to be functional on the date of inspection. Visible components appeared to be stable.

The stability of the PVC conduit beneath 40 feet of embankment earthfill material was not evaluated. Long-term performance of the pipe under high surcharge conditions should be investigated.

e. <u>Pond Drains</u>: Stability of the two pond drain conduits could not be evaluated during the Phase I field inspection.

f. <u>Emergency Spillway</u>: The emergency spillway appeared to be structurally stable on the date of inspection. The eroded chute wall backfill condition should be corrected to prevent additional erosion that might reduce the stability of the structure to an unacceptable level.

g. <u>Seismic Stability</u>: According to the Seismic Risk Map of the United States, Treated Water Pond dam is located in Zone 1 where damage due to earthquakes would most likely be minor.

A dam located in Seismic Zone 1 may be assumed to present no hazard from an earthquake provided static stability conditions are satisfactory and conventional safety margins exist. No calculations were developed to verify this assessment, however.

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SECTION 7 ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: The Treated Water Pond's embankment is considered to be in good condition. This assessment is based primarily on visual observations that did not reveal strong evidence of inadequate embankment stability. However, a pronounced flattening of the embankment's downstream toe at a location immediately above a swampy zone, and the observed relatively steep downstream slope (1.9H:1V), are sufficient cause to warrant further investigation of the embankment. Existing observation well records should be reviewed and compared to existing stability analysis assumptions. Other minor deficiencies should be corrected.

(2) <u>Principal Spillway</u>: The operability of the principal spillway conduit and gate valve could not be evaluated. Visible components were in good condition.

(3) <u>Active Outlet Works</u>: The active outlet works is considered to be in poor condition. This assessment is based primarily on the inability to evaluate the condition of the conduit beneath the embankment. Also, the apparent lack of an upstream flow control is considered to be a deficiency.

(4) <u>Pond Drains</u>: The two pond drains are considered to be in poor condition. This assessment is based primarily on the lack of knowledge related to intake and conduit structural conditions.

(5) <u>Road Drain</u>: The road drain beneath the left groin is considered to be in poor condition. This assessment is based on the observed failure of catch basins to drain the upper groin area, and significant erosion of the lower left groin at and below the outlet headwall.

(4) <u>Emergency Spillway</u>: The emergency spillway is assessed to be in good condition. Minor deficiencies should be corrected.

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(7) <u>Spillway Design Flood</u>: The Spillway Design Floor (SDF) for the Treated Water Pond is the Probable Maximum Flood. This SDF is required by Corps of Engineers guidelines for an "intermediate" size, "high" hazard facility.

(8) Flood Discharge Capacity: The principal spillway discharge capacity is assessed to be "adequate". This is based on hydrologic/hydraulic computations using the HEC-1 Dam Safety Version computer program, that indicated the existing reservoir/spillway system is capable of passing in excess of 100% of PMF.

(9) <u>Downstream Conditions</u>: Based on visual observations, the lack of an emergency operation and warning plan is considered to be a deficiency.

b. <u>Adequacy of Information</u>: The information available on design, construction, operation and performance history in combination with visual observations and hydrologic and hydraulic calculations was sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I Investigation guidelines.

c. <u>Urgency</u>: The recommendations presented in Section 7.2a and 7.2b should be implemented immediately.

d. <u>Necessity for Additional Data/Evaluation</u>: Additional engineering information is required to adequately evaluate the structural stability of the facilities.

7.2 RECOMMENDATIONS

a. <u>Additional Investigations</u>: It is recommended that the owner immediately retain the services of a registered professional engineer knowledgeable and experienced in the design and construction of earth dams to provide an evaluation of the stability of the embankment and outlet facilities of the Treated Water Pond. The evaluation should include, but not be limited to, the following:

(1) Review and evaluation of observation well data.

(2) Investigation of the flattened slope area and adjacent swampy condition near the right end of the dam.

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(3) Stability calculations for ultimate pool level conditions, if necessary.

(4) Evaluation of the operability of the principal spillway conduit and gate valve.

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(5) Evaluation of the structural stability of the active outlet works conduit and the pond drain conduits.

(6) Provide means for upstream flow control on active outlet works, Pond Drain 1 and Pond Drain 2.

b. <u>Emergency Operating and Warning Plan</u>: Concurrent with the additional investigations recommended above, the owner should develop an Emergency Operation and Warning Plan including:

(1) Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

(2) Procedures for around the clock surveillance during periods of heavy precipitation or runoff.

(3) Procedures for drawdown of the reservoir under emergency conditions.

(4) Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

c. <u>Remedial Work</u>. The Phase I Inspection of the Treated Water Pond also disclosed several other deficiencies which should be corrected during routine maintenance.

(1) Remove trees from the upstream and downstream slopes of the embankment to the extent that all roots greater than one inch in diameter are excavated.

(2) Repair wave erosion distress on the upstream slope.

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(3) Mow dense vegetation on the upstream and downstream slopes.

(4) Carefully inspect upstream and downstream slopes and backfill all animal burrows and eroded areas.

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(5) Clean road drain ditch basins and regrade the surface as necessary to promote proper drainage in the left groin.

(6) Repair the eroded areas below the road drain outlet structure and provide an adequate erosion resistant drainage channel.

(7) Repair the eroded area below the Pond Drain 2 outlet and provide an adequate erosion resistant channel.

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(8) Replace the eroded backfill behind the emergency spillway chute's right wall and modify surface drainage patterns to assure the integrity of the replaced backfill.

(9) Clean vegetal growth and debris from the emergency spillway chute.

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APPENDIX A

3.8

VISUAL INSPECTION CHECKLIST

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J. P. Hannan J. P. Hannan Project Manager. S. G. Mazzella Ackenheil & Associates, C J. D. Floris Ackenheil & Associates, C Mecorder J. E. Barrick Recorder J. E. Barrick PennDE PennDE
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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Minor surface cracking was observed on the embankment's crest, upstream slope and downstream slope. The cracks appeared to be the result of drying of surface soil materials and showed a more or less random orientation.
	A few minor tension cracks were observed on the upstream slope near the waterline. They appeared to be associated with surficial slumping of soil masses near and above the steep erosional face near the pond level.
	No significant tension cracking was observed on either the crest or the embankment slopes.
UNUSUAL MOVEMENT OR Cracking at or beyond The toe	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No definite sloughing of the embankment's downstream slope was observed. However, two areas on the downstream slope indicated suspicious surficial configurations. The first area was located approximately 400 feet to the left of the right end of the embankment and appeared as a significant flattening of the embankment toe area near the downstream groin. However, no other indications of
	slope instability were apparent in the area. There was no bulging, cracking, or seepage, suggestive of wovement of the embankment toe. The earth materials in the flattened area were generally firm and dry to moist.

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EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR F	ECOMMENDATIONS
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (continued)	The second suspicious configuration w mately 800 feet to the left of the ri embankment and consisted of a bench l lower portion of the downstream slope there were no other indications of sl There was no cracking, significant bu of seepage or other indicators of sta careful observation of the bench area ing or scarps suggestive of embankmen bench may have been developed during embankment.	as located approxi- ght end of the ike formation on the . Again, however, ope instability. lging, indication bility distress. revealed no crack- t movement. The construction of the
	No significant erosion was observed a embankment crest or the embankment dc	nywhere on the wnstream slope.
	The embankment's upstream slope has s ing, sloughing of surficial soils and above the resevoir pool level. In ge sloughs were associated with movement that had been steepened by apparent w reach between 2 to 4 feet above the r In all cases, the erosion and the slo observed to immediately threaten the structure. However, continued steepe slope by wave erosion may ultimately movement of upstream slope soil mater	uffered minor slump- erosion at and neral, the observed of earth in areas ave erosion in the eservoir pool level. ughing was not integrity of the integrity of the ning of the upstream lead to detrimental ials.
	No sloughing or erosion of abutment s of the dam was observed.	lopes at either end

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VISUAL EXAMINATION OF SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (continued) SLOPES (continued) AUTMENT OF THE CREST ALIGNMENT OF THE CREST	EMBANKMENT (CONTINUED)OBSERVATIONSREMARKS OR RECOMMENDATIONSOBSERVATIONSREMARKS OR RECOMMENDATIONSRelatively extensive erosion has occurred behind the lower right wall of the emergency spillway on the right abutment. In some locations, the erosion has exposed the spillway footer at depths of 3 to 4 feet below the serond the spillway footer at depths of 3 to 4 feet below the of surface runoff collected and directed by the spillway wall.An erosional channel has developed below the toe of the embankment, downstream of the outfall from the 15 inch reinforced concrete storm drain that parallels the left side of the embankment, the diversion ditch jogs toward the toe of the embankment, paralleling the toe for a short distance before turning and entering the stream channel below the dam.The crest was observed to have more or less the intended horizontal alignment as indicated by a plan view drawing provided by United States Steel Corporation. No offsets
	The vertical alignment was approximately as indicated on the plan drawing. The creat was observed to be generally level throughout its entire length except for a portion of creat approximately 1500 feet right of the left end of the embankment. In this stretch, the creat drops approxi- mately 5 feet as indicated on the plan drawing. At this point, the creat widens from 25 feet to 35 feet and con- tinues at this elevation and width to the left end of the dam.

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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
RIPRAP FAILURES	No riprap observed.
SETTLEMENT	None observed.
JUNCTION OF EMBANKMENT AND ABUTMENT SPILLWAY AND DAM	The junction of the embankment and abutments was observed to be in generally good condition with no erosion noted. However, four areas along the toe of the downstream slope were noted that appeared to have seeping water or very soft soil conditions. Three of the areas were judged to be the result of seepage and are discussed in the follow- ing section. The fourth area, which exists for several hundred feet along the left end of the embankment appears to be the result of a lack of surface drainage from a tins area, the embankment. In thillside and a 15 inch reinforced concrete storm drain, equipped with catch basins, was placed to drain the area. However, it appears that the catch basins are block or grading does not permit drainage from the area. Conse- quently, swampy conditions have developed resulting in pooled, stagnant water containing considerable water related vegetation such as cattails.

The junction of the spillway and dam was discussed in a previous section.

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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Three areas were observed at and below the downstream toe of the embankment that were indicative of seepage zones. The first occurs near the right end of the embankment where wet swampy conditions approach the toe of the embankment. Considerable cattail growth and very soft soil conditions exist in this area and in the area beyond the toe of the dam. The condition extends to a drainage swale that drains an upper valley area.
	The second possible seep zone was observed just below the toe of the embankment near the central portion of the dam. The area observed was relatively small, contained some water related vegetation including cattails, and was observed to contain relatively soft soils. No flowing water was observed, though standing water was noted.
	The third possible seep zone existed at the toe of the embankment in the center of the embankment near the coutlet to the 24 inch diameter reinforced concrete pipe. This area also was observed to have very soft soils, standing water and water related vegetal growth. In addition, this area contained drainage from the ditch below the 15 inch reinforced concrete storm drain.
	No seepage conditions were observed anywhere on the down- stream slope of the embankment. In addition, there were no indications of a line of seepage on the downstream slope of the embankment. In general, the downsteam slope was dry to normally moist and was generally firm as indi- cated by finger penetration.

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AFF GAGE AND RECORDER None observed. AINS None observed.	IFF CACE AND RECORDER None observed. IFF CACE AND RECORDER None observed. AINS None observed.	IF GAGE AND RECORDER None observed. INS None observed.	AFF GAGE AND RECORDER None observed and the standard of the st	rved.
AFF GAGE AND RECORDER None observed. AINS None observed.	AFF GAGE AND RECORDER None observed. AINS None observed.	INS None observed.	AFF GAGE AND RECORDER None observor	rved.
AINS None observed.	INS None observed.	INS None observed.	AINS None observ	rved.

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	PRINCIPAL SPILLWAY
VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
GENERAL DESCRIPTION	The principal spillway consists of a 16 inch diameter stainless steel pipe which passes beneath the right end of the embankment and discharges to the lower emergency spillway chute. The facility was dry at the time of observation as the pond level was several feet below the inlet elevation.
INTAKE STRUCTURE	The intake structure consists of a concrete slab laid on the embankment's upstream slope, containing the pipe. A 3 foot by 3 foot by 3 foot trash cage is embedded in the concrete slab and protects the inlet to the pipe from clogging by debris. The trash cage structure was constructed of half inch diameter stainless steel rods welded into a grid at 6 inch centers.
FLOW CONTROL	Near the toe of the downstream slope, the stainless stee pipe has a gate valve control that is contained inside a standard concrete manhole.
FLOW MEASURING STRUCTURE	Below the gate valve, the pipe enters a reinforced con- crete box containing concrete block baffles followed by a stainless steel, sharp-edged weir which discharges to an outlet pipe. The weir crest length was measured to be 48 inches. The outlet pipe was 18 inch diameter reinforced concrete pipe that discharged through the emergency spillway chute wall approximately 75 feet below. The outlet at the spillway wall was observed to be unclogged.
EMERGENCY GATE	None.

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ACTIVE OUTLET WORKS	OBSERVATIONS REMARKS OR RECOMMENDATIONS	The active outlet works consists of a downstream arrange- ment similar to that of the principal spillway.	No intake structure was observed due to the reservoir pool level.	The observed portion of outlet works conduit was an 11 inch inside diameter plastic pipe that was observed to discharge to a concrete box energy dissipator at the downstream toe.	The active outlet works conduit contains a gate valve housed inside a standard concrete manhole embedded in the downstream slope of the embankment.	Just below the gate valve, the outlet works conduit enters a 6 foot square concrete box which was measured to be 5 feet deep. Discharge from the box was via a 15 inch diameter reinforced concrete pipe that parallels the toe of the embankment.	The 15 inch reinforced concrete pipe enters a reinforced concrete box containing concrete block baffles and a concrete box containing concrete block baffles and a stainless steel sharp-crested weir for flow measuring purposes. The crest length of the weir was 24 inches and discharge from the weir as to a pipe below. Diameter of the discharge pipe from the weir box could not be determined. The discharge pipe continues parallel to the toe of the embankment and enters a standard concrete manhole approximately 100 feet below.
	VISUAL EXAMINATION OF	GENERAL DESCRIPTION	INTAKE STRUCTURE	CONDUIT	FLOW CONTROL	DROP BOX	FLOW MEASURING DEVICE

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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
FLOW MEASURING DEVICE (continued)	From this point, flow was apparently directed via a 24 inch diameter reinforced concrete pipe to a discharge point in the creek channel beyond the toe of the dam. Careful observation of the outlet could not be made because of a cyclone fence with barbed wire parapet.
EMERGENCY GATE	No upstream flow control was observed for the active outlet works.

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POND DRAIN 1

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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
CONDUIT	The only observed portion of Pond Drain 1 was an exposed portion of 24 inch diameter reinforced concrete pipe that entered the standard concrete manhole described previously under active outlet works. The alignment of the 24 inch RCP was such as to indicate that it came through the embankment.
INTAKE STRUCTURE	No intake structure was observed because of the reservoir pool level.
OUTLET STRUCTURE	The outlet for Pond Drain 1 is the same 24 inch diameter reinforced concrete pipe that carries discharge from the active outlet works to the stream channel beyond the fence below the toe of the dam.
EMERGENCY GATE	No upstream flow control was observed for Pond Drain 1.
OPERABILITY	It could not be determined whether or not Pond Drain 1 was operating on the date of inspection as access could not be gained to the manhole flow junction.

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	POND DRAIN 2
VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
CONDUIT	The Pond Drain 2 conduit was observed to be 24 inch diameter reinforced concrete pipe that discharged below the downstream toe of the embankment near the central portion of the dam.
INTAKE STRUCTURE	No intake structure was observed for Pond Drain 2 because of the reservoir pool level.
OUTLET STRUCTURE	The outlet structure for Pond Drain 2 consists of concrete headwall at the downstream end of the conduit. At the time of observation, a small flow, perhaps 3 to 4 gallons per minute, was discharging from the conduit. The area immediately below the headwall was badly eroded to the point that the headwall foundation was in peril of being undermined. The flow observed from Pond Drain 2 did not appear to be sufficient to cause the extent of erosion observed below the headwall.
	Remnants of a brick and mortar closure of the 24 inch diameter reinforced concrete pipe was observed. In addition, numerous bricks with adhering mortar were observed at and below the outlet to the 24 inch diameter reinforced concrete pipe. It appears that the pipe had been sealed at one time but the seal had been broken out.
OUTLET CHANNEL	Discharge from Pond Drain 2 is into a natural drainage swale containing considerable vegetation and small trees. Flow in the outlet channel is directed to the stream beyond the fence below the toe of the dam.
EMERGENCY GATE	No upstream flow control was observed for Pond Drain 2.

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VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR	RECOMMENDATIONS
GENERAL DESCRIPTION	The emergency spillway for the Treat sists of a reinforced concrete chute into the right abutment just beyond embankment.	ed Water Pond con- structure constructed the right end of the
CONCRETE WEIR	Flow control for the emergency spill weir at the inlet to the spillway ch reach, the spillway was observed to 9 feet high.	way by broadcrested annel. In this be 8.5 feet wide and
APPROACH CHANNEL	The approach channel to the flow con flared wingwalls (45°) at the entran spillway chute.	trol area is via ce to the emergency
DISCHARGE CHANNEL	The discharge channel is a reinforce proceeds with increasing slopes over at a point approximately 150 feet be emergency spillway channel narrows s point where the slope increases sign	d concrete chute that the right abutment low the inlet. The ignificantly at the ficantly.
	Some small trees and debris were not reaches of the discharge channel. H of vegetal growth and debris did not sufficient to seriously impair the p spillway.	ed in the upper owever, the extent appear to be erformance of the
	The condition of concrete surfaces a joints appeared to be good.	nd construction
BRIDGE AND PIERS	The emergency spillway is crossed by containing steel grating and handrai vides access for vehicles to the Gre beyond. The condition of the bridge	a steel beam bridge ls. The bridge pro- st of the embankment was very good.

EMERGENCY SPILLWAY

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INSTRUMENTATION

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VISUAL EXAMINATION OF	UBSERVATIONS REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed.
OBSERVATION WELLS	None observed.
WEIRS	Two observed. Described under sections entitled "Principal Spillway" and "Active Outlet Works".

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PIEZOMETER

Three observed at locations indicated on field plan.

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DOWNSTREAM CHANNEL

	VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	DISCHARGE CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel consists of the origins below the dam. The str winding and lined with growth.	for the Treated Water Pond al stream channel for the valley eam channel is relatively narrow, trees, brush and other vegetal
	SLOPES	The immediate downstree steep, as the channel i alluvial soils. The ve and covered with brush	um channel slopes are relatively is of an erosional nature in alley slopes are generally mild and trees.
A15	APPROXIMATELY NOS. OF HOMES AND POPULATION	In the 1.5 miles below inhabited dwellings lie plain. Also, a mine po weigh station lie in th the dam. Also Route 9 highway in the area, wo	the Treated Water Pond, eight in the lower part of the flood- ortal, coal loading facility and ne immediate valley bottom below 17, an important north-south ould be threatened by high flows.

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RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
SLOPES	In general, the reservoir slopes are flat to me are generally grass, brush and small tree cover reservoir slopes consist generally of the areas below the toe of the Raw Water Pond, which is s the watershed above the Treated Water Pond.
	No serious erosion of the reservoir slopes was
SEDIMENTATION	None observed.
INLET STREAM	The inlet stream to the Treated Water Pond lie upper left end of the embankment. Inflow to th from the 10 inch diameter pipe that discharges Raw Water Pond above.
WATERSHED	The watershed was observed to be generally gra and tree covered. The watershed is quite smal Treated Water Pond is located relatively high hillside.

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APPENDIX B

ENGINEERING DATA CHECKLIST

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	ITEM	REMARKS
	Design Drawings ¹	Maple Creek Mine - Ginger Hill Shaft, M: Water Treatment Facilities, Plan; Drawin 70-Q-24, Sheet 1**
		Facility Plan, Mine Water Treatment Fac Ginger Hill Shaft - Maple Creek Mine; Di 70-Q-24, Sheets 1A and 1B ^{##}
		Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatement Facilities, Test Drawing 70-Q-24, Sheet 1B.
B 1		Maple Creek Mine - Ginger Hill Shaft Mine Water Treatment Facilities, Cross Drawing 70-Q-24, Sheet 4
		Maple Creek Mine - Ginger Hill Shaft Mine Water Treatment Facilities, Cross Drawing 70-Q-24, Sheet 5
		Maple Creek Mine - Ginger Hill Shaft Mine Water Treatment Facilities, Cross Drawing 70-Q-24, Sheet 6 ⁴⁴
		Maple Creek Mine - Ginger Hill Shaft Mine Water Treatment Facilities, Cross Drawing 70-Q-24, Sheet 7
	As-Built Drawings	None available.

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[TEN	REMARKS
legional Vicinity Map	U.S.G.S. 7-1/2 Minute Hackett and Monongahela, Pennsylvania Quadrangle Map.
Construction History	Unknown.
rypical Sections of Dam	Longitudinal and transverse sections, see Design Drawings.
Dutlets'-Plan Details Constraints Discharge Ratings	See Design Drawings.
lainfall/Reservoir Records	None available.
)esign Reports	. None available.
Geology Reports	See Post-Construction Report below.
esign Computations	None available.
Hydrology and Hydraulics	See Post-Construction Report below.
Dam Stability	See Post-Construction Report below.
Seepage Studies	See Post-Construction Report below.
Materials Investigations, oring Records, aboratory, ield	See Post-Construction Report below.

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ITEM	REMARKS
<pre>"Post-Construction Surveys of Dam</pre>	See Post-Construction Report below.
Borrow Sources	Data not available.
Monitoring Systems	See Post-Construction Report below.
Modifications	None reported.
High Pool Records	None reported.
Post-Construction Engineering Studies and Reports	"Engineering Report for Maple Creek Water Treatment Ponds on Sawmill Creek Watershed, Washington County, Pennsylvania," dated August 1973 by L. Robert Kimball Consulting Engineers Ebensburg, Pennsylvania.
Maintenance, Operation, Records	None available.
Spillway'-Plan Sections Details	See Design Drawings above.
Operating Equipment ¹ Plans and Details	See Design Drawings above.
Specifications	None available.

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rior Accidents or ailure of Dam Description eports	None reported.
Information and data may be obtained Reduced size reproductions contained Drawings obtained from United States	from the PennDER, Harrisburg, Pennsy 1 in Appendix E. Steel Corporation.

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APPENDIX C

PHOTOGRAPHS

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Photo 1 <u>Embankment</u> overview showing right central portion of dam. Channel below toe of dam is outlet channel from Refuse Settling Basin.

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Photo 2 <u>Embankment Toe Area</u> near center of dam showing swampy conditions.



Photo 3 Road Drain Outlet in groin at left center of dam.



Photo 4 Road Drain Discharge Channel at toe of dam.

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Photo 5 Active Outlet Works Outlet Structure showing baffles sharp crested weir flow control.



Photo 6 Inactive Outlet Works Outlet. Pipe was originally sealed but brick closure has been removed.

Photo 7 Emergency Spillway Inlet.



Photo 8 Emergency Spillway Discharge Channel, upper end.

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Photo 9 Emergency Spillway Discharge Channel overview.



Photo 10 Emergency Spillway Discharge Channel training wall showing effects of erosion due to surface runoff.
TREATED WATER POND



Photo 11 Downstream Hazards.





APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

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APPENDIX D HYDROLOGY AND HYDRAULICS

<u>Methodology</u>: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July, 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. 33" 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. <u>Inflow Hydrograph</u>: 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 analyses.

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Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers
L	Length of main stream channel	From U.S.G.S. 7.5 minute topographic map
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic map

From Corps of Engineers

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Watershed size

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7.5	minute	
topo	graphic	map

3. <u>Routing</u>: Reservoir routing is accomplished by using Modified Puls 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. <u>Spillway Discharge</u>: The steel conduit principal spillway with inlet invert Elevation 1101.0 was assumed to be blocked and inoperative at commencement of the SDF. The pond pool level was assumed to be at the inlet invert of the emergency spillway (Elev. 1107.0).

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

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HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominately grassland and water surface. Raw Water Pond in upper watershed.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1101.0 (632 acre-feet.)

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ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1110.9 (877 acre-feet.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1110.9 (minimum)

OVERFLOW SECTION (EMERGENCY SPILLWAY)

- Elevation 1107.0 а.
- Type Reinforced concrete open channel b.
- Width 8.5 feet c.
- d. Length N/A
- Location Spillover Right abutment e.
- Number and Type of Gates None f.

OUTLET WORKS (PRINCIPAL SPILLWAY)

- Type 16 inch diameter steel conduit a.
- Location Near emergency spillway ь.
- c. Entrance Inverts 1101.0
- d. Exit Inverts Unknown
- Emergency Drawdown Facilities Unknown е.

HYDROMETEOROLOGICAL GAGES

Type None a.

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- Location N/A b. Records None
- c.

MAXIMUM REPORTED NON-DAMAGING DISCHARGE None reported

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HEC-1 DAM SAFETY VERSION HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: Treated Water Pond	NDI ID NO. PA 01138
Probable Maximum Precipitation (PM	4P) 24.2 [#]
Drainage Area	0.06 sq. mi.
Reduction of PMP Rainfall for Data Reduce by 20%, therefore PMP rain	a Fit 0.8 (24.2) nfall = = = 19.4 in.
Adjustments of PMF for Drainage Ar 6 hrs. 12 hrs. 24 hrs. 48 hrs.	rea (Zone 7) 102% 120% 130% 140%
Snyder Unit Hydrograph Parameters Zone Cp Ct L L L _{ca} tp = Ct (L · L _{ca}) ^{0.3} =	29 ** 0.5 1.6 0.34 mile 0.12 mile 0.61 hours
Loss Rates Initial Loss Constant Loss Rate	1 0 inch 0.05 inch/hour
Base Flow Generation Parameters Flow at Start of Storm Base Flow Cutoff Recession Ratio	1.5 cfs/sq.mi=0.09 cfs 0.05 x Q peak 2.0
Overflow Section Data Crest Length Freeboard Discharge Coefficient Exponent Discharge Capacity	8.5 feet 3.9 feet 3.09 1.5 202 cfs

Hydrometerological Report 33
Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients $(C_p \text{ and } C_t).$

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100 Theated WATER for JOONO 79153 (N ACKENHEIL & ASSOCIATES GEO Systems, Inc. Subject DATA Input 1000 Banksville Road PITTSBURGH, PA. 15216 Mode By JPH Dore 6/30/Rechecked JES Dore \$18180 (412) 531-7111 LOSS PATE AND BASE Flow Presmelers As Recommended by Corps of Engineers BALTIMORE Distant STRTL = 1, Nch CNSTL = 0.05"/he STRTQ = 1.5 cfs/mi² QRCSN = 0.05 (5% of Park Flow) RTIOR: 2.0 Elevation - AREA - Capacity Recationships From USES QUAD, BrunDer Lices, Owners files and Field AT elevation 1107.0 STORAGE = 777.6 Acre-feet Pond Surface Acca = 25 Acres At elevation 1140 Area = 32 Acres FROM CONIC method of Reservoir Volume Flood HYDROgraph Prekage (HEC-1) Dam Safety Version (USPES MANUAL) H = 3u/4 = 3(777.6)/25 = 98.3Elevation where Area Equais Zero 1/07.0 - 93.3 = 10/3.7\$ A AREA 0.0 25. 32. \$ E 1107.0 1140.0 ELEVATION

DATA DERIVED FOR ELEVATIONS INDICATED ON U.S.S.CO. DESIGN DRAWINGS WHICH WERE SUBSEQUENTLY USED AS BEHICHMERK DETA FOR THE PHASE I INSPECTION

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ACKENHEIL & ASSOCIATES GEO Systems, Inc. 1000 Banksville Road PITTSBURGH, PA. 15216 (412) 531-7111 Sheet_____OT____ Job <u>TREATED Water POND</u> Job NO. <u>79153</u> W Subject <u>DATA Input</u> Mode By <u>JPH</u> Date 6/30/80 Checked **TBS** Date 8188

Dam Overctop Parameters

Top of Dam Elevation (minimum) 1110.9 Longth of Dam (Excluding Spiceway) 3475, feet Coefficient of Discharge 3.09

Spice any Parametus Crest elevation 1107.0 8.5 feet Crest Length Coefficient of DiscHARGE 3.09

Program Schedule



FLOOD HYDROGRAPH PACKAGE (HEC-1) DAM SAFETY VERSION JULY 1978 LAST NODIFICATION 26 FEB 79 1 **A**1 NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS 2 **A**2 HYDROLOGIC AND HYDRAULIC ANALYSIS OF TREATED WATER POND A3 B 3 PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD Ā 300 0 ō 0 10 0 0 0 ٥ · . . B1 5 5 J J1 6 1 2 1 7 1. .5 8 K 0 1 Ř1 M P INFLOW HYDROGRAPH FOR RAW WATER POND 9 10 1 0.02 0.02 1 11 24.2 102 120 130 140 12 T W X K K I Y 1.0 .05 13 14 0.48 0.50 -0.05 2.0 -1.5 15 16 1 2 1 ROUTING AT RAW WATER POND 17 1 18 ¥1 1 24.6 19 84 ٥. 5. 11. 3. \$E1108.4 \$\$1133.9 \$D1133.9 \$L 90. 1133.0 1180. 1200. 0.01 3.09 1.5 3.09 910. 1.5 1187. 1450. \$1133.9 1136. 1135.3 ĸ 0 1 K1 INFLOW HYDROGRAPH FOR TREATED WATER POND .04 130 M P 1 .04 1 24.2 102 120 120 T W X K 1.0 .05 0.61 0.5 -0.05 2.0 -1.5 h 2 1 COMBINE OUTFLOW OF RAW WATER POND WITH RUNOFF AT TREATED WATER POND **K**1 K K1 ROUTE COMBINED FLOWS AT TREATED WATER POND Y 1 Ŷ1 777.6 1 \$A 0. \$E1013.7 \$\$1107.0 \$D1110.9 25. 1107. 8.5 32. 1140. 3.09 1.5 3475. 3.09 1.5 42 99 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS RUNOFF HYDROGRAPH AT 1 ROUTE HYDROGRAPH TO 2 RUNOFF HYDROGRAPH AT 3 COMBINE 2 HYDROGRAPHS AT Ă ROUTE HYDROGRAPH TO 5 END OF NETWORK FLOOD HYDROGRAPH PACKAGE (HEC-1) AM SAFETY VERSION JULY 1978 LAST MODIFICATION 26 FEB 79 DAM SAFETY VERSION ********************* NUN DATE: 8 SEP 80 RUN TIME: 12.11.2 NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS HYDROLOGIC AND HYDRAULIC ANALYSIS OF TREATED WATER POND PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD JOB SPECIFICATION IDAY NSTAN IPLT IPRT NQ 300 MAR NMIN IHR IMIN METRO 0 10 ۵ ٥ ٥ n 0 0 LROPT **JOPER** Mit TRACE 0 5 0 O MULTI-PLAN ANALYSES TO BE PERFORMED MPLAN= 1 NRTIO= 2 LRTIO= 1 RTIOS= 1.00 0.50 ******* ----------********* D7

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INFLOW HYDROGRAPH FOR RAW WATER POND

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HYDROGRAPH DATA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL 0.0 0.02 0.0 0.0 0 1 0 IUHG TAREA IHYDG 0.02 1

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PRECIP DATA

PMS R6 R12 R24 R48 R72 24.20 102.00 120.00 130.00 140.00 0.0 R72 R96 SPFE 0.0

0.0 24 TRSPC COMPUTED BY THE PROGRAM IS 0.800

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LOSS DATA STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTDMP 0.0 0.0 1.00 0.0 0.0 1.00 1.00 0.05 0.0 0.0 LROPT ٥

UNIT HYDROGRAPH DATA TP= 0.48 CP=0.50 NTA= 0

RECESSION DATA STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES, LAG= 0.48 HOURS, CP= 0.50 VOL= 1.00 8. 13. 13. 10. 8. 6. 4. 3. 1. 1. 1. 1. 0. 0. 0. 0. 2. 2. 2. 0. ō.

END-OF-PERIOD FLOW

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q SUM 27.10 24.68 2.42 1920. (688.)(627.)(61.)(54.37)

-----********* ---------------HYDROGRAPH ROUTING

ROUTING AT RAW WATER POND

			ISTAQ 2	ICOMP 1	IECON	ITAF	PE JP 0	LT O	JPRT O	INAME 1	ISTAGE O	IAUTO 0
					RC	UTING I	DATA	-	-		1.000	
		QLOSS 0.0	0.0	AVG 0.0	IRES 1	S ISA	1965 IU 1	0	0		LSIR 0	
			NSTPS 1	NSTDL 0	LAG	AMS	CK 0.0	x	TSK 0.0	STORA 25.	ISPRAT 0	
SURFACE AREA=	٥.		3.	5.	11.							
CAPACITY=	0.	2	5.	211.	367.							
ELEVATION=	1108.	113	3.	11 8 0.	1200.							
		CR	el sp	WID (COQW	EXPW	ELEVL	000	ar ca	REA I	SCPL .	

3.1 1.5 0.0 0.0 0.0 0.0 1133.9 0.0

> DAM DATA TOPEL EXPD DAMATD COOD 1.5 1187. 3.1 1133.9

	CREST LENGTH	9 0.	9 10.	1450.	
	ELEVATION	1133.9	1135.3	1136.0	
PEAK	OUTFLOW IS	90. AT	TIME 40.17	HOURS	

44. AT TIME 40.17 HOURS PEAK OUTFLON IS

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SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR TREATED WATER POND

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ISTAQ ICOMP LECON ITAPE JPLT JPRT INAME ISTAGE LAUTO 3 0 0 0 Δ 0 0 0 HYDROGRAPH DATA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL 0.0 0.04 0.0 0.0 0 1 0 IHYDG IUHG TAREA 0.04 0.04 ٥ 1 PRECIP DATA SPFE PMS R6 R12 R24 R48 R72 0.0 24.20 102.00 120.00 130.00 140.00 0.0 TRSPU CIMPUTED BY THE PROGRAM IS 0.800 R72 **R96** 0.0 LOSS DATA LROPT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSHX RTDP 0.0 UNIT HYDROGRAPH DATA TP= 0.61 CP=0.50 NTA= 0

> RECESSION DATA STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

	UNIT	HYDROGRAPH	29 END-	OF-PERIOD	ORDINATES,	LAG=	0.62 HOURS,	CP= 0.50	VOL= 1.00		
	3.	9.	17.	21.	19.	16.	13.	10.	9.	7.	
	6.	5.	4.	3.	3.	2.	2.	1.	1.	1.	
	1.	1.	1.	Ō.	Ō.	0.	0.	0.	0.		
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0 END-OF-PERIOD FLOW MD.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MD.DA HR.MN PERIOD RAIN EXCS LOSS COMP C

> SUM 27.10 24.68 2.42 3817. (688.)(627.)(61.)(108.09

COMBINE HYDROGRAPHS

COMBINE OUTFLOW OF RAW WATER POND WITH RUNOFF AT TREATED WATER POND

	ISTAQ 4	ICOMP 2	LECON O	ITAPE 0	JPLT 0	JPRT 0	INAME 1	ISTAGE 0	IAUTO 0
*******	******		ee HYDROG	RAPH ROUT	ING	******			******
ROUTE	COMBINED FLO	DWS AT T	REATED W	ATER POND)				

ROOTE CONDINED FLOWS AT TREATED WATER FORD

.

		ISTAQ 5	ICOMP 1	IECON 0 BOIT	ITAPE O TNG DATA	JPLT O	JPRT I O	NAME ISTAGE 1 (iauto 0
	q.	055 CLOSS 0.0 0.0	AVG 0.0	I:25	ISANE 1	IOPT 0	IPMP 0	LSTI (i)
		NSTPS 1	NSTDL 0	LAG O	AMSKK 0.0	x 0.0	755K S 0.0	TORA ISPRAT 778. (
SURFACE AREA=	0.	జ.	32.						
CAPACITY=	0.	778.	1716.						
ELEVATION=	1014.	1107.	1140.						
		CREL SI 1107.0	WID 0	0QW EX 3.1 1	PW ELE	NL 00	OL CAREA	EXPL 0.0	
				TOPEL 1110.9	DAM 3.1	DATA EXPD 1.5	DAMMID 3475.		
EAK OUTFLOW IS	72. A t	TIME 42.6	HOURS						
BAR OUTFLOW IS	28. AT	TDE 42.8) HOURS						
•••				•	D9 **		*******	H P (

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND) AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 0.50	RATIOS APPLIED	TO FLOWS
HYDROGRAPH AT	1,	0.02 0.05)	1	92. 2.61)(46. 1.30)(
ROUTED TO	2(0.02 0.05)	1	90. 2.56)(44. 1.23)(
HYDROGRAPH AT	3 (0.04 0.10)	1	160. 4.54)(80. 2.27)(
2 COMBINED	4 (0.06 0.16)	1	251. 7.10)(124. 3.51)(
ROUTED TO	5 (0.06	1	72. 2.05)(28. 0.79)(
					SUMMARY O	F DAM SAFETY A	MLYSIS

NALYSIS

		RAW WATER POND							
PLAP	l	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 1133.00 25. 0.		SPILLWAY CRI 1133.90 27. 0.	est Top 1	TOP OF DAM 1133.90 27. 0.		
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	
	1.00 0.50	1134 <i>.2</i> 2 1134.12	0.32 0.22	28. 28.	90. 44.	16.50 12.67	40.17 40.17	0.0 0.0	
			SU	IMMARY OF I	dam safety an	ALYSIS			
PLAN	1	ELEVATION STORAGE OUTFLON	INITIA 1107 7	TREATED . VALUE 7.00 778. 0.	WATER POND SPILLWAY CR 1107.00 778. 0.	est top 1	OF DAM 110.90 877. 202.		

RA	NTIO	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
	OF	RESERVOIR	DEPTH	STORAGE	OUTFLOW	OVER TOP	MAX OUTFLOW	FAILURE
	PMF	W.S.ELEV	OVER DAM	AC-FT	CFS	HOURS	HOURS	HOURS
1.	.00	1108.97	0.0	827.	72.	0.0	42.67	0.0
0.	.50	1108.04	0.0	804.	28.	0.0	42.83	0.0

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1000 Banksville Road Subject HYDROLOGK FertFormatice Fill PITTSBURGH, PA. 15216 (412) 531-7111 Mode By JPH Date 9/9/80 Checked Date Date	ACKENHEIL & ASSOCIATES GEO Systems, Inc. 1000 Banksville Road PITTSBURGH, PA. 15216 (412) 531-7111	JOD TREATED WATER FORD JOD NO. 79153 SUDJECT HYDROLOGK PREFORMANCE P/C Mode By JPH Dote 9/9/80 Checked Dote
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LIST OF PLATES

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- Plate II Maple Creek Mine Ginger Hill Shaft, Mine Water Treatment Facilities, Plan.
- Plate III Facility Plans, Mine Water Treatment Facilities, Ginger Hill Shaft - Maple Creek Mine.
- Plate IV Maple Creek Mine Ginger Hill Shaft Mine Water Treatment Facilities, Cross-Sections.
- Plate V Maple Creek Mine Ginger Hill Shaft Mine Water Treatment Facilities, Cross-Sections.
- Plate VI Maple Creek Mine Ginger Hill Shaft Mine Water Treatment Facilities, Cross-Sections.
- Plate VII Maple Creek Mine Ginger Hill Shaft Mine Water Treatment Facilities, Cross-Sections.
- Plate VIII Maple Creek Mine Ginger Hill Shaft, Mine Water Treatment Facilities, Cross-Sections.

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THE REAL PROPERTY • , 10.14 - 14 £ ŕ -----Lillimete EL. 1107.0 The as Pana (TYPICAL) MATCH L EL. 1078.0 Initial Operating Lavel (Typical) X 1120 ____ -----100 Ξ. - **6**00 AL-0 \otimes MATCH LINE \otimes 1120 120 1100 110 1000 106 Initial Operating Level EL 1078.0 (Typical) \otimes 1120 11.95 ----1080 1060 Initial Operating Level EL. 1078.0 (Typical) Ultimate Ef. 1107.0' Top Of Pond (Typical) \otimes 1120 . . - 100 1080 3 1050 \bigotimes ile. \otimes Initial Operating Lent X 19 مدر 1.44 UNIT . 4 \otimes 12 48.0 υ., PLATE JE











Sector Sector Sector

GEOLOGY

Geomorphology

The Treated Water Pond is located within the Pittsburgh Plateau section of the Appalacian Plateau Physiographic Province. This area is characterized by essentially flat lying sedimentary rocks which have been deeply cut by streams to form steep sided valleys. The Treated Water Pond is located near the head of an unnamed tributary to Sawmill Creek. The valley bottom of the unnamed tributary is about 200 feet below the adjacent ridges. The rounded hilltops of these ridges are at Elevation 1200 to 1300 feet, and in a regional sense are part of a broad, undulating plateau.

Stratigraphy

<u>General</u>: The Treated Water Pond is located along the stratigraphic boundary of the Monongahela Group of Pennsylvania Age and the Dunkard Group of Permian Age. The Waynesburg Coal Seam, which marks the stratigraphic boundary between these two groups, outcrops near the dam site.

<u>Mining Activity</u>: The Waynesburg Coal Seam has been strip mined extensively in this area. The Pittsburgh Coal Seam, located about 300 feet below the dam, has been extensively deep mined.

<u>Rock Types:</u> Bedrock, which immediately underlies the site, consists of sandstones and shales.



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