PINEY RUN WATERSHED STUDY

EXISTING SITE CONDITIONS

CARROLL COUNTY BUREAU OF RESOURCE MANAGEMENT

Project number: 60614688

April 10, 2020

Prepared for:

CARROLL COUNTY BUREAU OF RESOURCE MANAGEMENT

Prepared by:

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Table of Contents

Visual Inspection

Piney Run Dam was inspected on November 5, 2019 by representatives of AECOM, Carroll County, Maryland [dam owner], the Maryland Department of the Environment Dam Safety Division (MDE) and the Maryland office of the United States Department of Agriculture Natural Resources Conservation Service (NRCS). The visual inspection was conducted by walking the crest, slopes, and abutments as well as the earthen spillway entrance, control, and exit channel sections. Visual observations were made of the exposed areas of the dam and appurtenant structures.

Primary observations from the inspection included the following:

- Depressions on the upstream and downstream slopes;
- Woody debris lodged in the trash rack of the principal spillway riser (see Image 18 in Appendix B);
- Broken / corroded animal grates on the internal drain outlets;
- Damage to two observation wells (#9 and #11) which made readings difficult to obtain and possibly inaccurate.

Primary recommendations from the inspection are summarized below:

- Fill the upstream depression with compacted fill material and over seed. Monitor the depression on the downstream slope;
- Remove woody debris from the principal spillway riser taking care not to allow debris to fall into the bottom of the riser (completed December 20, 2019);
- Repair/replace the animal guards on the internal drain outlets;
- Repair/replace the damaged sections of observation wells #9 and #11;

When compared with the last documented annual inspection report by MDE and NRCS, there were no observed changes identified in the dam, its appurtenant structures, or the reservoir within view of the dam. The Dam Inspection Report is included in Appendix B.

Embankment and Foundation Analysis

A topographic survey of the dam was completed by AECOM in the fall of 2019. The survey was based on Carroll County survey control points and used the North American Datum of 1983 Maryland State Plane (NAD83) for horizontal measurements and North American Vertical Datum of 1988 (NAVD88) for vertical measurements. A review of the as-built plans, original watershed study report, and design report did not indicate what vertical datum was used for the original design and construction work for the project. The surveyed elevations of permanent benchmarks located on the dam were found to be one foot lower than their as-built elevations. Therefore, all elevations presented in this report and in Appendix B are in NAVD88 vertical datum which is approximately one foot lower than the project vertical datum of the information shown on the as-built drawings. A selection of as-built drawings pertinent to this report are presented in Appendix A. A more detailed discussion of the datum adjustment was provided in the Hydrologic and Hydraulic Analysis report submitted separately from this report.

The dam is a 73.3-foot high earth embankment dam measured from the crest elevation of 540.5 feet to the original ground elevation of 467.2 feet at lowest elevation of the downstream toe of the dam which is the definition of overall dam height per NRCS' Earth Dams and Reservoirs [TR-60]. The downstream slope is three-horizontal-to-one vertical (3H:1V) while the upstream slope is 2.7H:1V. On the upstream slope is an 18-foot-wide bench at elevation 501.0 feet. See as-built drawing sheets 9 and 11 of 35 in Appendix A.

The emergency spillway, subsequently referred to as the auxiliary spillway is an approximately 250-foot-wide vegetated channel and is located in the right abutment of the dam. The auxiliary spillway control section elevation is 531.2 feet. The auxiliary spillway exit channel slope is approximately 1.7 percent downstream of the control section and outlets into a wooded valley. Its side slopes are approximately 2.5H:1V. The inlet to the auxiliary channel is contained within the 100-year pool and contains an unpaved access road to the dam, which is currently the only access road leading to the dam. The slope of the wooded valley at the outlet of the exit channel varies but averages approximately 2.7H:1V. See as-built drawing sheet 5 of 35 in Appendix A for a plan view of the auxiliary spillway.

According as-built drawing sheet 11 of 35 in Appendix A, the dam is zoned as follows:

- Section I is a central core zone consisting of fine-grained material which was borrowed from an area approximately 100 feet downstream of the left abutment of the dam. This material consisted of brown silty sands [SM], orange-brown and brown clayey sands [SC], and reddish brown and brown sandy lean clays [CL] with some locations having gravel and micaceous components. Soil materials were confirmed during the 2019 subsurface geologic and geotechnical investigation. This zone extends 10 feet downstream from the centerline of the dam at the top and 18 feet downstream from the centerline at the bottom. On the upstream side, the zone extends from the centerline of the dam at the top to a point 30 to 35 feet upstream from the centerline of the dam at the bottom. The upper limit of the zone is at elevation 534.0 feet. The lower limit of the zone forms a cutoff trench at the grout-able rock line. Cutoff trench depths vary from approximately two feet near the location of the original stream channel to up to 15 feet at the dam abutments. Side slopes of the cutoff trench are 1H:1V. Section I material was installed as controlled fill and compacted to 95 percent of the maximum dry density determined by American Society of Testing and Materials International (ASTM) standard D-698 with moisture content between zero and three percent wet of optimum, according to the design documents.
- Section II are shell zones consisting of coarser grained material which was borrowed from the area excavated to create the auxiliary spillway on the right abutment of the dam. This material was residual material derived from the underlying weathered schist and gneiss rock. Soils were generally clayey sands [SC] and silty sands [SM] with rock fragments. Soil materials were confirmed during the 2019 subsurface geologic and geotechnical investigation. Section II zones comprised the bulk of the remaining volume of the dam, from the Section I central core to the outer face of the dam, except for in the locations of the zones noted below. Section II material was installed as controlled fill and compacted to 95 percent of the maximum dry density determined by ASTM D-698 with moisture content between zero and three percent wet of optimum.
- A chimney filter was installed immediately downstream of the Section I zone. The fine-grained portion of the filter is four feet thick and extends horizontally from approximately station 3+75 to station 8+50. Vertically the fine-grained portion of the filter extends from

the normal pool elevation of 523.0 feet to a point five feet above the bottom of the cutoff trench bottom. Immediately downstream of the fine-grained portion is a coarse-grained portion measuring four-feet thick and containing eight-inch diameter bitumen-coated perforated corrugated metal pipes (CMP). The CMP extend approximately 10 feet along the chimney filter before turning 90 degrees to run parallel and next to the principal spillway conduit approximately 205 feet to their outfalls in the left and right training walls of the impact basin. Approximately 20 feet prior to the outfalls, each CMP has a series of four 45-degree bends to run around the impact basin and tie in perpendicularly to the training wall at the outlet. The fine-grained chimney filter material as specified on as-built drawing sheet 12 of 35 in Appendix A ranges in size from #200 sieve (0.075 mm) to 3/8-inches (9.5 mm) and is similar in gradation to the coarse limit of ASTM C-33 Fine Aggregate. The coarse-grained material reportedly ranges in size from #16 sieve (1.2 mm) to three inches and is a mix of 60 percent #2 gravel and 40 percent #5 gravel. The coarse-grained filter material was not encountered during the 2019 subsurface investigation. See as built drawing, sheet 12 of 35. A review of the specified materials against current NRCS filter gradation guidelines (NRCS, 2017) was completed and found that the fine-grained filter specification was compatible with the soils used in both zones (Section I and II materials) of the embankment based on soil samples taken during the 2019 subsurface geologic and geotechnical investigation. The analysis also showed that the coarse-grained filter specification as specified on as-built drawing sheet 12 of 35 in Appendix A was compatible with the fine-grained filter specification. The coarse-grained filter specification lies partially outside the maximum allowable limits for larger grain sizes (greater than the 60th percentile diameter).

- A toe drain was installed along the toe of the downstream slope from station 3+92 to station 8+10. The cross section of the toe drain consists generally of a coarse-grained material measuring two feet wide by 10 feet high surrounded on the upstream and downstream sides as well as the top by one foot of fine-grained material. A perforated eight-inch bitumen-coated CMP extends approximately 125 feet into the left toe drain and approximately 40 feet into the right toe drain. Each CMP connects via a “tee” connection to the perforated CMP extending from the chimney drain to the impact basin approximately 80 feet upstream of the outlet. The gradations of the coarse and fine-grained materials are the same as the gradations of the materials used in the chimney drain and the compatibility findings were the same for the toe drain compared with the filter materials. The toe drain is located directly on foundation rock. See sheet 12 of 35.
- A riprap protection blanket extends from the left abutment to the right abutment of the upstream slope between the upstream bench at elevation 501.0 feet and four feet above normal pool at elevation 527.0 feet. The riprap blanket consists of 18 inches of stone weighing between 30 and 70 pounds on top of nine inches of bedding stone which consists of quarry tailings on top of filter cloth. The blanket is keyed into the bench to a depth of 27 inches for a distance of eight feet. See sheets 10 and 11 of 35.

Construction of the embankment was performed in two phases: foundation preparation and embankment fill. The dam’s foundation was prepared by excavating and removing unsuitable soils and weathered rock from the foundation area. A grouting program was performed to fill foundation rock fractures. The grouting program consisted of six grout lines laid out in a 3-4-5 right triangle pattern with primary holes located on lines one (downstream), three (centerline of dam), and five and six (upstream) and spaced 12 feet apart and secondary holes located on lines three and four and spaced half-way between primary holes (six feet). Holes were grouted in up to three stages for up to a total of 60 feet with the deepest grout holes extending to approximately

elevation 414.0 feet. Pressure tests were performed and permeabilities calculated during the program. The results showed higher initial permeabilities in the left side of the foundation compared with the right which showed little to no permeability. See sheet 9 of 35 for the grouting plan.

The embankment fill was completed initially around the principal spillway pipe and in the cutoff trench using select clay soil from the borrow area. The filter and drain materials were then placed along the principal spillway conduit. From that point, the embankment was raised together with the adjacent lifts of fill for Section I (core), Section II (shell), and the chimney filter placed concurrently. The chimney filter material was placed by excavating through the placed material to the previously placed chimney filter and placing material for the chimney filter in the excavation (known as the *cut-and-fill* method). Testing of Section I and II materials was performed by SCS using the sand cone method. Average compaction of the 74 tests made was 101.4 percent of Standard Proctor density (per ASTM D-698). Following completion of the embankment, the riprap blanket was placed on the upstream slope of the dam.

Foundation soils at Piney Run Dam consist of residual soils on the abutments and alluvial soils along the floodplain of the prior stream channel (RK&K, 1971). Based on the original geologic investigation, both residual and alluvial soils contain an upper layer of inorganic silts and clays with some sand underlain by silty sand with gravel or rock fragments (SCS, 1971). Foundation soils lie beneath the embankment fill material to the grouted rock line, except for at the cutoff trench in which foundation materials extend to the bedrock. From twelve samples taken during the original geologic investigation, the soil beneath the embankment footprint consists of SILT (ML), silty SAND (SM), poorly graded GRAVEL (GP) and Silty GRAVEL (GM). The average natural dry density of these samples is 95 pounds per cubic foot. Thickness of the soil along the principal spillway conduit prior to stripping for construction ranged from 7.5 feet at boring DH-305 to 13 feet at boring DH 304 (RK&K, 1971).

The rock foundation of Piney Run dam consists of Pre-Cambrian metamorphic rock, which is made up predominately of schist and quartzite (RK&K, 1971). Local geology of Piney Run Dam shown on the Geologic Map of the Finksburg Quadrangle (Muller, 1994) indicates that the dam is located within the Morgan Run Formation [mr, a, um, and g] adjacent to areas of Alluvium [Qal] upstream and downstream of the dam. According to Muller's 1994 geologic map, the Morgan Run Formation primarily consists of fine- to medium-grained, lustrous, silver-gray to greenish-gray, garnetiferous mica schist and quartz-mica schist containing discontinuous layers and lenses of quartzite ranging from five centimeters to one meter thick. Areas of Alluvium are typically one to five meters thick, occur in floodplains of streams, and consist of interbedded light gray to brown gravel, sand, silt, and gray-blue to gray-brown clay. The gravel is dominantly quartz, and the sand and silt are dominantly quartz-mica mixtures. Outcrops within the area indicate the foundation rock strikes N10-35E, corresponding to the synclinorium and dips 65-75SE (RK&K, 1971). During the original geologic investigation, two borings (DH-6 and DH303A) indicated the potential for existing faults. Both of these borings are within the footprint of the existing dam. In boring DH-6, "gouge" like material was observed between approximate elevations 469 feet and 470 feet and the original investigation noted that the faulting was probably "slight" (RK&K, 1971). In boring 303A, a fault gouge was indicated in a fracture rock area between approximate elevations 404 feet and 407 feet. There were no observations of faults or gouges similar to these findings made during the 2019 subsurface geologic and geotechnical investigation. However it should be noted that 2019 borings, which were drilled in

the vicinity of borings DH-6 and DH-303A did not extend to the elevations where these observations were made.

Bedrock elevation along the principal spillway conduit ranged from elevation 466.9 feet at boring DH-302 to elevation 460.0 feet at boring DH-304. Boring logs indicate the rock contained layers for Mica Schist and Mica Gneiss with some inter-banded Quartz. Boring logs further indicate that the rock was moderately to highly weathered. Rock Quality Designation (RQD) values determined along the principal spillway alignment between elevations 455 feet and 464.5 feet ranged between 0 and 57 in the first 10 feet of rock indicating highly fractured rock. The exception to this was at DH-303A which had RQD values between 80 and 100 in the first 10 feet. DH 303A was drilled approximately two feet offset from DH-303, as the casing was bent during drilling of this hole.

Bedrock in the left abutment is classified as predominately Mica Schist. The upper layers of the rock were observed to be highly weathered to decomposed Mica Schist during the original geologic investigation (RK&K, 1971). The right abutment consists of Quartz-Mica Gneiss and Mica Schist, changing to predominately Mica Schist at the interface with the existing auxiliary spillway.

Borrow material for the embankment was sourced primarily from the auxiliary spillway. The base of the constructed auxiliary spillway consists predominately of decomposed rock that is classified at Silty SAND (SM). The bedrock within the auxiliary spillway is predominately Mica Schist, based on boring DH-23 from the original geologic investigation report (RK&K, 1971) and confirmed during the 2019 subsurface geologic and geotechnical investigation. Low RQD values determined from boring DH-23 indicated that the bedrock in the auxiliary spillway generally was highly weathered and fractured to approximate elevation 475.7 feet. It should be noted in the original investigation, there were a limited number of borings (six) drilled in the area of the auxiliary spillway and of those borings, only boring DH-23 was located in the spillway channel itself and proceeded into rock where rock cores could be taken.

During the investigation phase of this Watershed Study, the following additional investigations and analyses were performed on the embankment and foundation:

- Visual Inspection: see Appendix B of this document.
- Subsurface Geologic and Geotechnical Investigation: the investigation's drilling and lab testing program included 24 boreholes and one hand-dug test pit. The 24 drilled boreholes included both soil sampling and rock coring in the dam, auxiliary spillway, and left and right abutments. Lab testing included classification, sieve and Atterberg analyses, strength testing, and other tests that inform the physical properties of the soil and rock samples collected. This work was supplemented by geophysical surveys using seismic refraction techniques. The field investigation was intended to do the following:
  - Characterize and assess the materials in the embankment for the purposes of assessing slope stability under both existing conditions and increased normal pool conditions for additional raw water supply capability and/or raising the dam crest to provide additional flood and spillway capacity,
  - Characterize and assess materials in the auxiliary spillway for the purpose of assessing performance and stability under spillway design flood discharge conditions,

  - Characterize and assess materials in the left and right abutments for the purpose of determining if these areas are suitable for either a second auxiliary / emergency spillway (left abutment) or an expansion of the existing auxiliary spillway (right abutment)

  The subsurface geologic and geotechnical investigation report is provided as a separate report.

- Field-Run and Aerial Photogrammetric Topographic Survey: an aerial photogrammetric survey covering the dam, auxiliary spillway, and non-wooded left abutment was performed. This survey was based on ground control set using field-run methods. Field-run survey covering the wooded areas of the right abutment, downstream toe, and left and right groins of the dam supplemented the aerial photogrammetric survey data. This work was performed to confirm the topography and geometric parameters of the dam, auxiliary spillway, and abutments. The survey is provided as a separate document.

Analysis of Non-Earthen Components

The dam includes several non-earthen components or appurtenances that serve a variety of purposes:

- The principal spillway riser is a 57.85-foot high (measured from top of footing), reinforced concrete enclosure with inside dimensions of nine-feet-long by three-feet-wide, sitting on a two-foot-thick foundation. The riser has overflow weirs on the two nine-foot long sides at the normal pool elevation of 523.0 feet and drains into a 36-inch reinforced concrete (RCP) pipe which lies on a concrete cradle extending from rock to the spring line of the conduit and has six concrete anti-seep collars spaced evenly between the riser and the centerline of the dam. The weirs are protected with horizontal steel bar trash racks below elevation 522.5 feet and with expanded metal grating from elevation 522.5 feet to the top slab of the riser. The riser is accessed via boat and can be entered through a locking hatch in the top slab and a safety ladder on the downstream wall extending to within six feet of the invert of the structure. From that point, there was a traditional ladder installed on the left wall extending the last six feet to the invert of the structure, however that ladder has since been removed. The 36-inch conduit extends approximately 304 feet and discharges to a reinforced concrete impact basin. The impact basin also has outlets for both internal drains (which capture internal drainage from the toe drain and chimney filter) and for the rate control pipes which discharge from the water intake conduit discussed below. There is a chain link fence that surrounds the impact basin on the upstream, left, and right sides. See Appendix A sheets 10, 13, and 20 for the principal spillway profile, riser structure, and impact basin respectively.
- A lake drain consisting of a headwall intake structure, 24-inch reinforced concrete pipe, and slide gate that discharges into the riser on the upstream side. The intake structure of the lake drain system is a reinforced concrete headwall and footing slab with two angle iron bars extending diagonally from the top of the headwall to the upstream edge of the footing slab to act as a trash rack. The 24-inch conduit lies on a concrete cradle and has three anti-seep collars spaced evenly between the riser and a point 54 feet upstream. The slide gate is mounted on the inside of the spillway riser, has a rising stem with guides spaced approximately 8.33 feet apart per the construction documents and a hand-operated crank to open it mounted to the top slab of the riser. See as-built drawing sheet 19 of 35 in Appendix A for the lake drain intake structure.

- In parallel with the principal spillway is a water intake tower which was installed during construction of the dam and intended to be used to deliver raw water to a future water treatment plant. However, at the time of this report, the water treatment plant has never been built and this system has never been fully activated. The infrastructure installed as part of this system consists of a reinforced concrete intake tower with six rising stem gates, located at varying depths (elevations 518.0, 515.0, 512.0, and 509.0 feet, and two gates at elevation 504.0 feet) and two rising stem gates to control the water flow out of the intake tower, at approximate elevation 496.0 feet. The top slab of the intake tower is covered in an enclosed structure which houses the riser stem gate operators and prevents vandalism. The structure can be accessed via a steel catwalk. The intake tower leads to a 24-inch reinforced concrete pipe which runs through the embankment approximately 352 feet downstream before terminating at a bulkhead and has rate control piping and a monometer vault accessible at the downstream toe of the dam. The rate control pipe system consists of twin 16-inch ductile iron pipes with butterfly valves to control flow. One of the pipes has a venturi fitting to measure flow. A manometer was originally included in the installation but was vandalized and does not currently exist. Reportedly, the valves that control the flow to the manometer are inoperable. The flow meter infrastructure including the venturi fitting is located in an underground vault located between the 24-inch conduit and the principal spillway outfall. See as-built drawing sheets 11, 26, and 32 of 35 in Appendix A for the water intake system profile, water intake tower, and rate control system respectively.

All concrete used for construction of the dam was specified to be Class 4000 concrete. This concrete was specified to have a 28-day strength of 4,000 PSI and a slump of two inches for footings, three inches for walls over 12 inches and four inches for walls 12 inches or less. Of the 33 concrete tests performed, no tests failed slump requirements and four failed compressive strength requirements. Those four failures were along the principal spillway cradle (two tests), the water intake tower walls between elevations 517.0 and 529.0 feet, and the foundation slab of the rate controller vault (the engineer suspected the failure at the rate controller vault slab was due to a reduced amount of cement in the mix).

During the investigation phase of this Watershed Study, the following additional investigations and analyses were performed on the non-earthen components of the dam:

- Remotely-Operated Vehicle (ROV) Inspections: ROVs were used to inspect the accessible portions of the principal spillway, lake drain, and internal CMP drains, as well as the principal spillway riser of the dam. The ROV inspections were performed to determine the condition and inform the remaining service life estimate of the subject components. The results of this investigation are provided as a separate report.

To date, the existing infrastructure has generally performed as intended. The maximum hydrologic loading on the dam occurred in September 1975 during Hurricane Eloise when the pool rose to approximately the auxiliary spillway control section elevation of 531.2 feet. All structures and conduits performed as expected. Since that time, there have been noted minor issues such as the aforementioned woody debris jams in the riser which are removed by maintenance staff. Historically, there is documentation of a leak from the water supply pipe that, was investigated and attributed to a poorly seated gasket in the water supply pipe. The pipe was repaired by welding in 1977 based on records provided by MDE. A video inspection of the water supply pipe in 2013 did not show anything that indicated a deficiency that would result in a leak. Additionally, the lake drain gate and gates on the water supply intake tower were repaired in 2013 to restore operability.

Despite acceptable historical performance, subsequent analyses have indicated that the dam may not be able to pass its designated spillway design flood (SDF) which is the probable maximum flood (PMF) event. The original design report noted that the "MPS" or Maximum Probable Storm, which was defined as five times the 100-year precipitation depth for a six-hour duration event (26.5 inches), would "overflow". Furthermore, the same report also noted that a six-hour duration event equivalent to 2.58 times the 100-year precipitation depth for the same duration (13.7 inches) would have a peak water surface elevation of 539.0 feet which is approximately the crest elevation of the dam (RK&K, 1972). A dam breach analysis prepared in 2016 indicated that the PMF event for a 72-hour duration of 39.4 inches would overtop the dam by more than three feet. The analysis also indicated that an event equal to 50% of the PMF for a 72-hour duration would fill the dam to the crest elevation making the 50% PMF the dam's brim-full event (CPJ, 2016). In 2017, a letter from the dam's regulator, MDE, was issued stating that the 2016 analysis showed that the dam's SDF would overtop the dam and that this would "likely result in failure and loss of life" (MDE, 2017). The letter also requested that the owner retain the services of a qualified engineer to conduct a comprehensive analysis of the dam investigating among other items, the potential of the [auxiliary] spillway to erode and to provide preliminary options for upgrading the dam to safely pass the PMF. These two dam performance aspects: spillway capacity and spillway integrity during high flow events are apparent shortcomings of the dam that may not allow it to perform as intended per the original Purpose and Need under the maximum design loading.

Remaining service life recommendations for non-earthen components of the dam vary based on the use of the component and the construction of the component. However, based on the records reviewed including inspection findings, construction documentation and photos, concrete components are likely to have a remaining service life of at least 50 years if regularly inspected and properly maintained, particularly those not continually exposed to water. Metal components such as gates, stems, and conduits are likely to have a shorter remaining service life of 10 to 30 years particularly for thinner gage metal and metal that is more frequently exposed to water such as the CMP drain conduits.

References

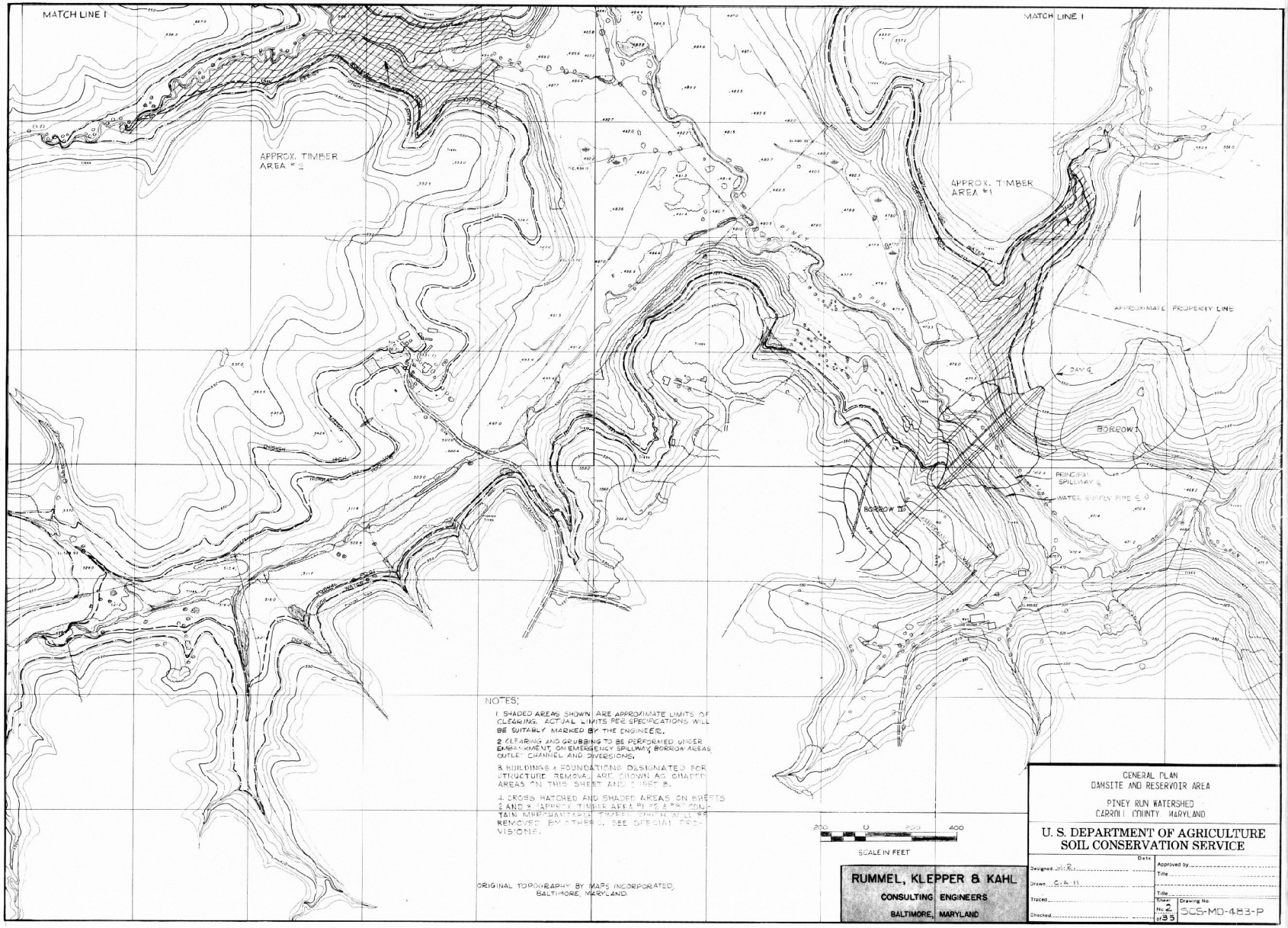
CPJ. (2016). "Piney Run Dam, Dam Breach Analysis".

MDE (2017). "Piney Run Dam Spillway Capacity Evaluation". Letter to Carroll County Department of Recreation and Parks.

RK&K. (1971). "Geologic Investigations, Field"

RK&K. (1972). "Piney Run Watershed, Carroll County, Maryland, Design Report"

Appendix A Selected Dam Construction Plans



NOTES:

1. SHADED AREAS SHOWN ARE APPROXIMATE LIMITS OF CLEARING. ACTUAL LIMITS PER SPECIFICATIONS WILL BE SUITABLY MARKED BY THE ENGINEER.

2. CLEARING AND GRUBBING TO BE PERFORMED UNDER EMBANKMENT, ON EMERGENCY SPILLWAY, BORROW AREAS, OUTLET CHANNEL AND DIVERSIONS.

3. BUILDINGS & FOUNDATIONS DESIGNATED FOR STRUCTURE REMOVAL ARE SHOWN AS CHARTED AREAS ON THIS SHEET AND SHEET 8.

4. CROSS HATCHED AND SHADED AREAS ON SHEETS 2 AND 3 APPROX. TIMBER AREA # 1 & # 2 CONTAIN MERCHANTABLE TIMBER. THIS WILL BE REMOVED BY OTHERS. SEE SPECIAL PROVISIONS.

ORIGINAL TOPOGRAPHY BY MAPS INCORPORATED, BALTIMORE, MARYLAND.

200 0 200 400
SCALE IN FEET

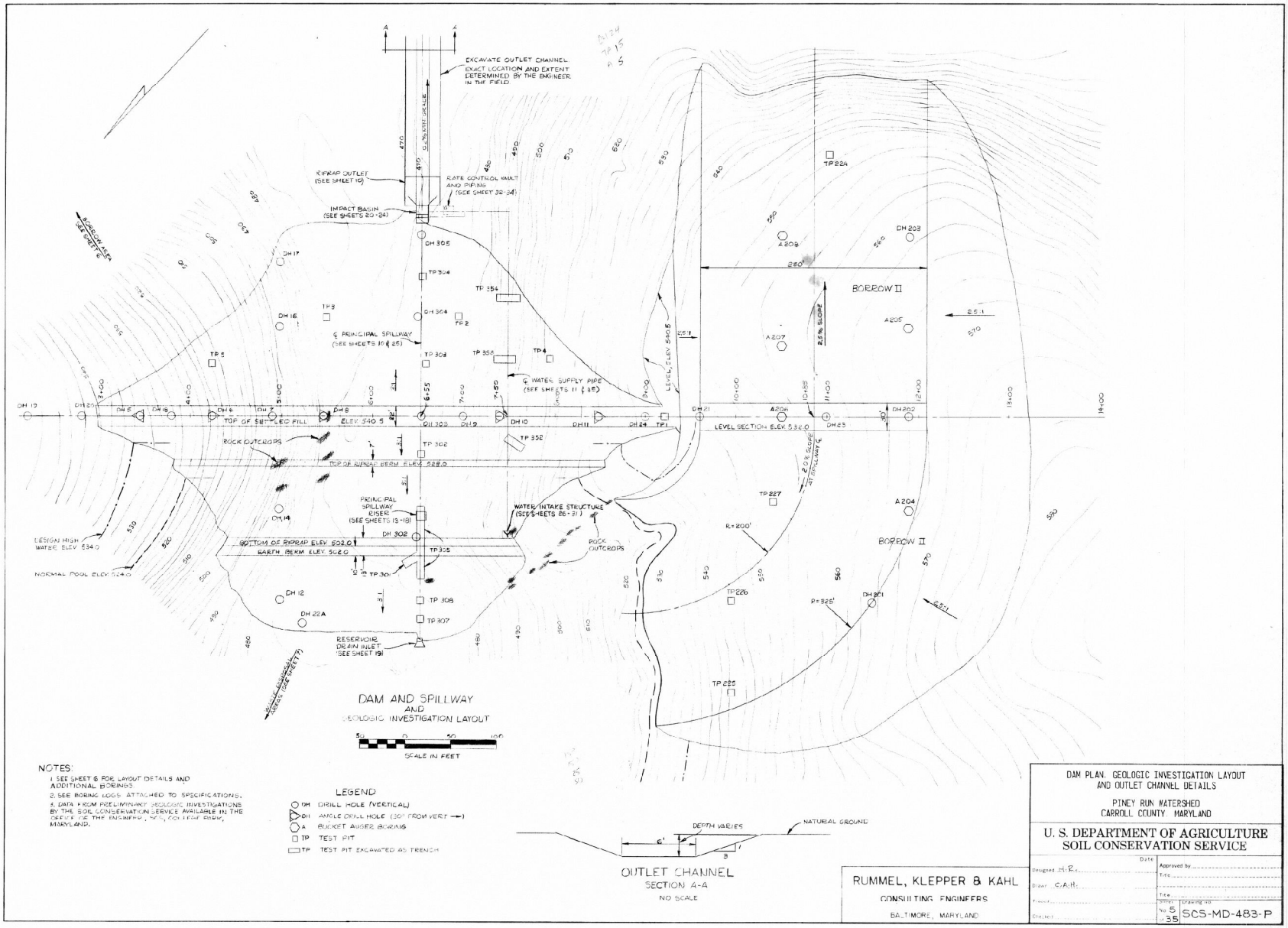
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

GENERAL PLAN
DAMSITE AND RESERVOIR AREA

PINEY RUN WATERSHED
CARROLL COUNTY MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date	
Designed		Approved by
Drawn		Title
Traced		Title
Checked		Sheet No. 2 of 35 — Drawing No. SCS-MD-483-P



RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

DAM PLAN, GEOLOGIC INVESTIGATION LAYOUT AND OUTLET CHANNEL DETAILS

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.H.R. Date
Approved by
Drawn C.A.H.
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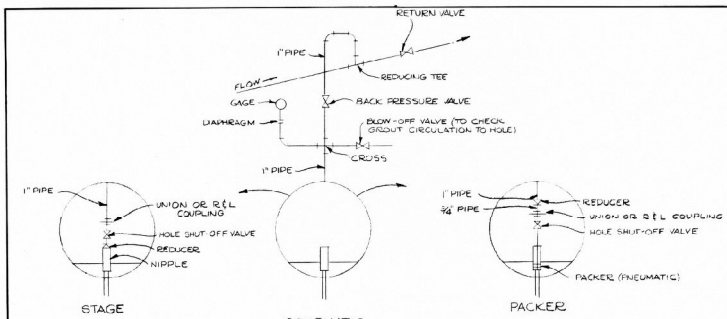
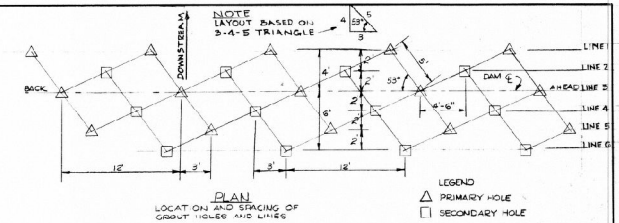
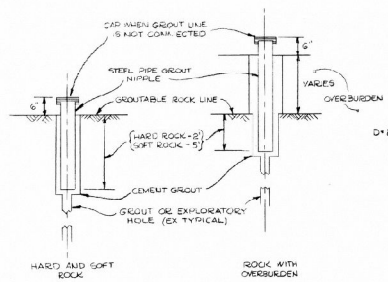
Sheet No. 5 of 35
Drawing No. SCS-MD-483-P



SCHEMATIC
TYPICAL HEADER ARRANGEMENTS
NO SCALE



PLAN
LOCATION AND SPACING OF GROUT HOLES AND LINES



TYPICAL NIPPLE SETTING
FOR GROUT OR EXPLORATORY HOLES
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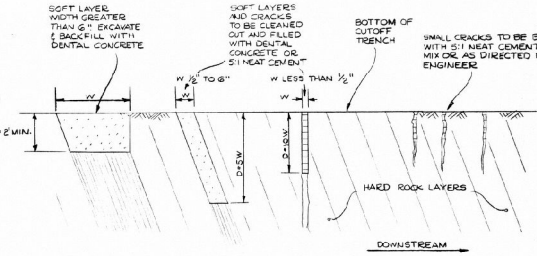
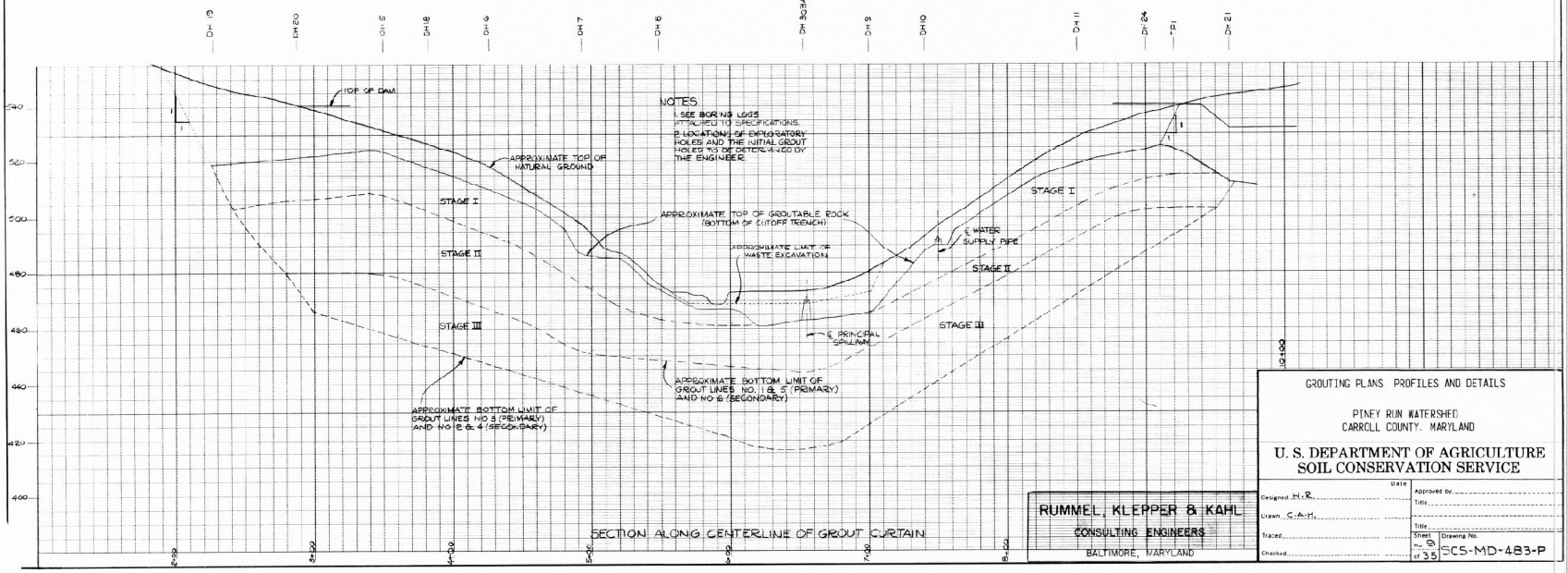


SCHEMATIC SECTION PERPENDICULAR TO DAM CENTERLINE
DENTAL TREATMENT OF SOFT LAYERS & CRACKS
NO SCALE



SECTION ALONG CENTERLINE OF GROUT CURTAIN

GROUTING PLANS PROFILES AND DETAILS

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

Designed H.T.R. Date
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Title
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Sheet No. 9 of 35
Drawing No. SCS-MD-483-P

DRAIN PIPE CONDUIT - SPEC 41B

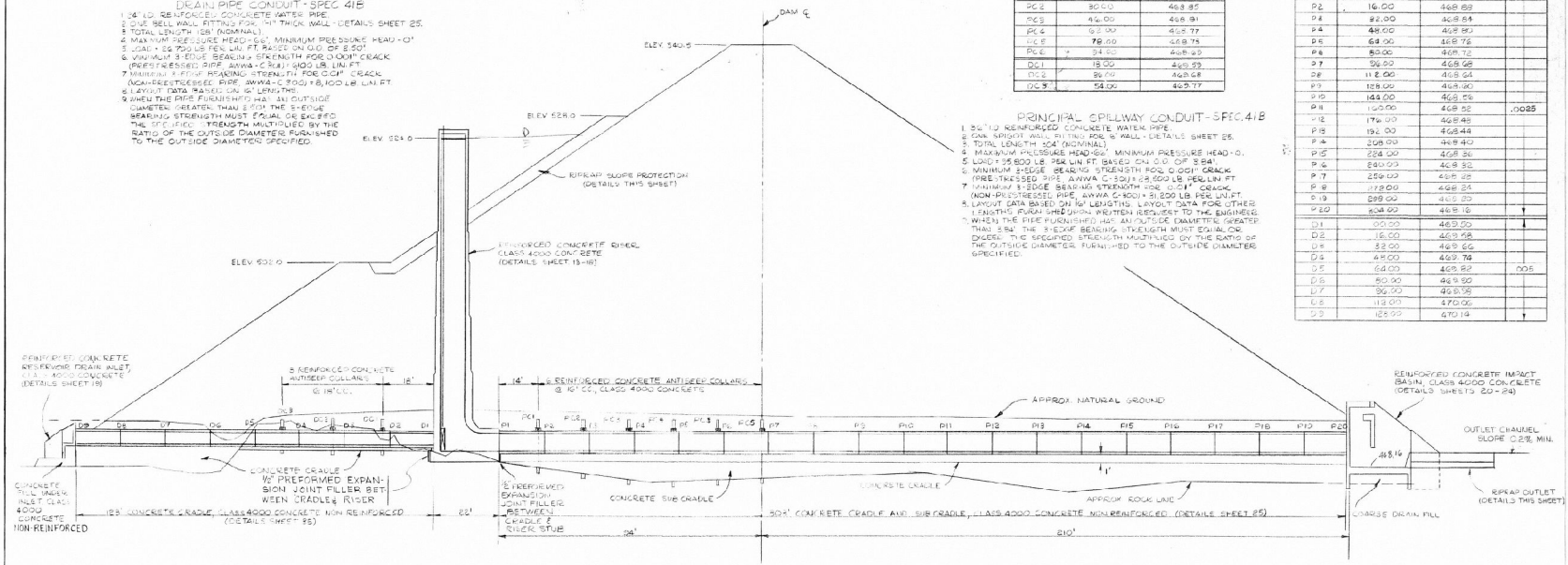
1. 24" I.D. REINFORCED CONCRETE WATER PIPE.
2. ONE BELL WALL FITTING FOR 14" THICK WALL - DETAILS SHEET 25.
3. TOTAL LENGTH 124' (NOMINAL).
4. MAXIMUM PRESSURE HEAD = 56'. MINIMUM PRESSURE HEAD = 0'
5. LOAD = 26,750 LB PER LIN. FT. BASED ON O.D. OF 2.50'.
6. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRESTRESSED PIPE, AWWA-C 900) = 4100 LB. LIN. FT.
7. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED PIPE, AWWA-C 900) = 8,100 LB. LIN. FT.
8. LAYOUT DATA BASED ON 16' LENGTHS.
9. WHEN THE PIPE FURNISHED HAS AN OUTSIDE DIAMETER GREATER THAN 8' FROM THE SPECIFIED, THE SPECIFIED 3-EDGE BEARING STRENGTH MUST EQUAL OR EXCEED THE SPECIFIED STRENGTH MULTIPLIED BY THE RATIO OF THE OUTSIDE DIAMETER FURNISHED TO THE OUTSIDE DIAMETER SPECIFIED.

COLLAR	DISTANCE FROM RISER STUB (FT)	PIPE INVERT ELEV. (FT)
PC1	14.00	468.89
PC2	30.00	468.85
PC3	46.00	468.81
PC4	62.00	468.77
PC5	78.00	468.73
PC6	94.00	468.69
DC1	18.00	469.53
DC2	86.00	469.68
DC3	54.00	469.77

JOINT	DISTANCE FROM RISER STUB (FT)	PIPE INVERT ELEVATION (FT)	SLOPE FT/FT
P1	00.00	468.92	
P2	16.00	468.88	
P3	32.00	468.84	
P4	48.00	468.80	
P5	64.00	468.76	
P6	80.00	468.72	
P7	96.00	468.68	
P8	112.00	468.64	
P9	128.00	468.60	
P10	144.00	468.56	
P11	160.00	468.52	.0025
P12	176.00	468.48	
P13	192.00	468.44	
P14	208.00	468.40	
P15	224.00	468.36	
P16	240.00	468.32	
P17	256.00	468.28	
P18	272.00	468.24	
P19	288.00	468.20	
P20	304.00	468.16	
D1	00.00	469.50	
D2	16.00	469.48	
D3	32.00	469.46	
D4	48.00	469.44	
D5	64.00	469.42	.005
D6	80.00	469.40	
D7	96.00	469.38	
D8	112.00	470.06	
D9	128.00	470.14	

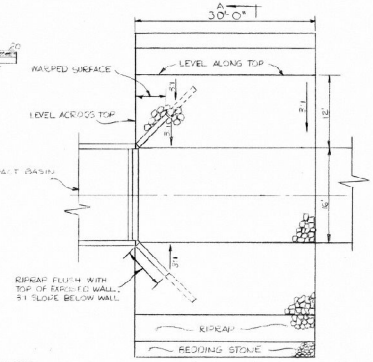
PRINCIPAL SPILLWAY CONDUIT - SPEC. 41B

1. 36" I.D. REINFORCED CONCRETE WATER PIPE.
2. CAK SPIGOT WALL FITTING FOR 9" WALL - DETAILS SHEET 25.
3. TOTAL LENGTH 304' (NOMINAL).
4. MAXIMUM PRESSURE HEAD = 66'. MINIMUM PRESSURE HEAD = 0.
5. LOAD = 35,800 LB PER LIN FT (BASED ON O.D. OF 3.84').
6. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.001" CRACK (PRE-STRESSED PIPE, AWWA C-302) = 2,600 LB PER LIN FT
7. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED PIPE, AWWA C-900) = 31,200 LB PER LIN FT.
8. LAYOUT DATA BASED ON 16' LENGTHS. LAYOUT DATA FOR OTHER LENGTHS FURNISHED UPON WRITTEN REQUEST TO THE ENGINEER.
9. WHEN THE PIPE FURNISHED HAS AN OUTSIDE DIAMETER GREATER THAN 3.84' THE 3-EDGE BEARING STRENGTH MUST EQUAL OR EXCEED THE SPECIFIED STRENGTH MULTIPLIED BY THE RATIO OF THE OUTSIDE DIAMETER FURNISHED TO THE OUTSIDE DIAMETER SPECIFIED.



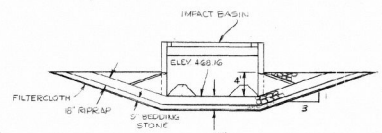
PROFILE ALONG CENTERLINE
PRINCIPAL SPILLWAY AND DRAIN PIPE

VERTICAL SCALE, FEET
HORIZONTAL SCALE FEET



PLAN
NO SCALE

NOTE
USE RIPRAP, BEDDING STONE AND FILTER CLOTH EQUAL TO THAT USED FOR EMBANKMENT SLOPE PROTECTION



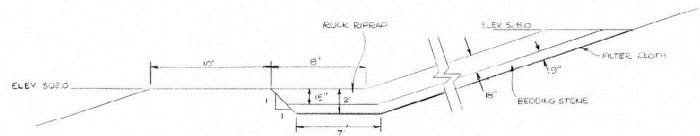
SECTIONAL - ELEVATION
A-A

RIPRAP OUTLET DETAILS
NO SCALE

BEDDING STONE GRADATION

STONE SIZE	% PASSING
6"	100
5"	90 - 100
4"	30 - 60
3"	15 - 30
2"	0 - 5

NOTE 1. PLACEMENT OF ALL MATERIALS PER CONSTRUCTION SPECIFICATION 51, LOOSE ROCK RIPRAP.
2. RIPRAP TO BE COMPOSED OF STONE WEIGHING 30 TO 70 POUNDS.
3. BEDDING STONE PER GRADATION SHOWN.



TYPICAL SECTION
RIPRAP SLOPE PROTECTION
NO SCALE

PRINCIPAL SPILLWAY PROFILE
RIPRAP SLOPE PROTECTION AND OUTLET DETAILS

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

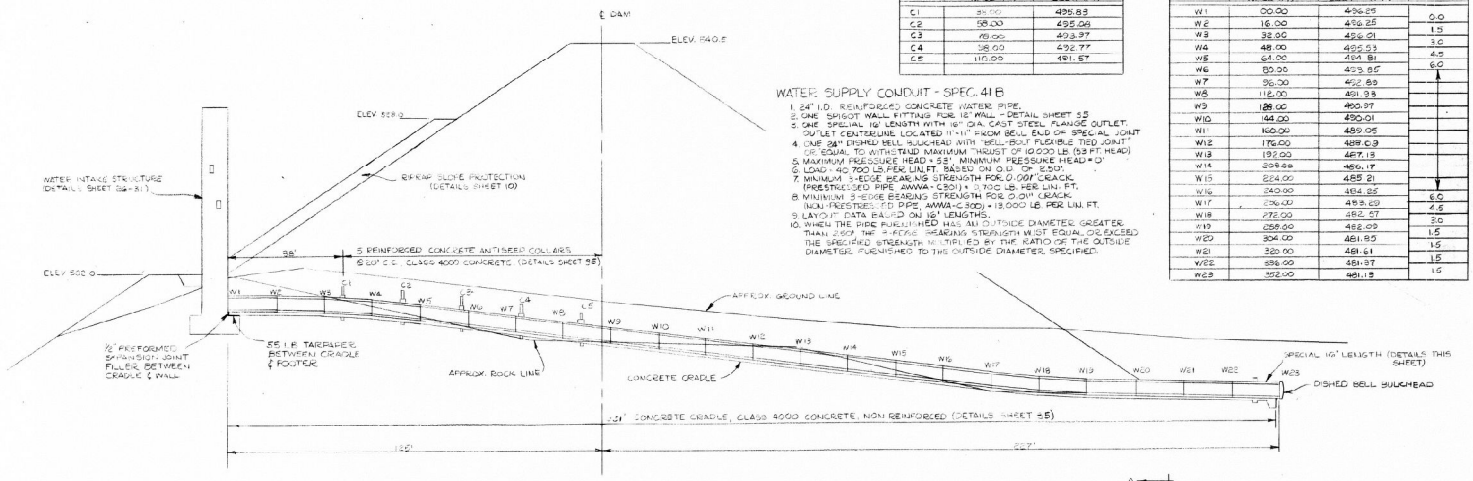
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

Designed H.E.B. Date
Drawn C.A.H.
Traced
Checked
Approved by
Title
Sheet No. 10 of 35
Drawing No. SCS-MD-483-P

COLLAR	DISTANCE FROM WALL (FT)	PIPE INVERT ELEV. (FT)
C1	8.00	495.83
C2	58.00	495.08
C3	78.00	493.97
C4	98.00	492.77
C5	110.00	491.67

JOINT	DISTANCE FROM WALL (FT)	PIPE INVERT ELEV. (FT)	SLOPE (%)
W1	00.00	496.25	
W2	16.00	496.25	0.0
W3	32.00	496.01	1.5
W4	48.00	495.53	3.0
W5	64.00	494.81	4.5
W6	80.00	493.85	6.0
W7	96.00	492.89	
W8	112.00	491.93	
W9	128.00	490.97	
W10	144.00	490.01	
W11	160.00	489.05	
W12	176.00	488.09	
W13	192.00	487.13	
W14	208.00	486.17	
W15	224.00	485.21	
W16	240.00	484.25	
W17	256.00	483.29	6.0
W18	272.00	482.57	4.5
W19	288.00	482.09	3.0
W20	304.00	481.85	1.5
W21	320.00	481.61	1.5
W22	336.00	481.37	1.5
W23	352.00	481.13	1.5



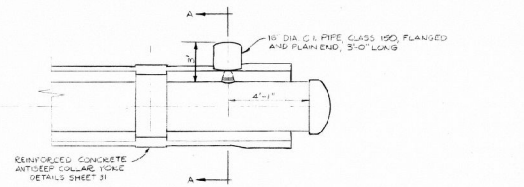
PROFILE ALONG CENTERLINE OF WATER SUPPLY PIPE

VERTICAL SCALE, FEET

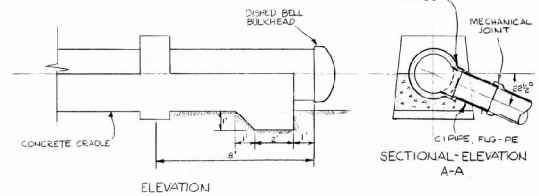
HORIZONTAL SCALE, FEET

WATER SUPPLY CONDUIT - SPEC. 41B

1. 24" I.D. REINFORCED CONCRETE WATER PIPE.
2. ONE SPIGOT WALL FITTING FOR 12" WALL - DETAIL SHEET 38
3. ONE SPECIAL 16' LENGTH WITH 16" O.A. CAST STEEL FLANGE OUTLET. OUTLET CENTERLINE LOCATED 11'-11" FROM BELL END OF SPECIAL JOINT
4. ONE 24" DISHED BELL BULKHEAD WITH "BELL-BOLT FLEXIBLE TIED JOINT" OR EQUAL TO WITHSTAND MAXIMUM THRUST OF 10,000 LB (33 FT. HEAD)
5. MAXIMUM PRESSURE HEAD = 53'. MINIMUM PRESSURE HEAD = 0'
6. LOAD - 40,700 LB. PER LIN. FT. BASED ON O.D. OF 2.50'.
7. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (PRESTRESSED PIPE - AWWA - C301) = 2,700 LB. PER LIN. FT.
8. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (NON-PRESTRESSED PIPE, AWWA-C 300) = 13,000 LB. PER LIN. FT.
9. LAYOUT DATA BASED ON 16' LENGTHS.
10. WHEN THE PIPE FURNISHED HAS AN OUTSIDE DIAMETER GREATER THAN 2.50% THE 3-EDGE BEARING STRENGTH MUST EQUAL OR EXCEED THE SPECIFIED STRENGTH MULTIPLIED BY THE RATIO OF THE OUTSIDE DIAMETER FURNISHED TO THE OUTSIDE DIAMETER SPECIFIED.



PLAN



ELEVATION

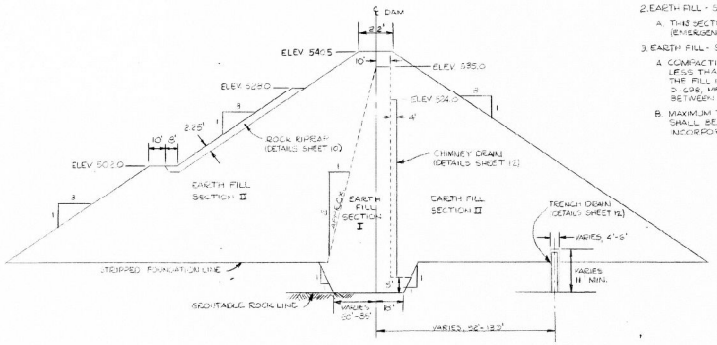
SECTIONAL-ELEVATION A-A

CAST STEEL FLANGE OUTLET AND DISHED BELL BULKHEAD DETAILS

NO SCALE

CONSTRUCTION DETAILS

1. EARTH FILL - SECTION I
   - A. THIS SECTION SHALL CONSIST OF MATERIALS OBTAINED FROM BORROW I AND SELECTED MATERIAL OBTAINED FROM BORROW II (EMERGENCY SPILLWAY) AS DIRECTED BY THE ENGINEER.
   - B. THE PRINCIPAL SPILLWAY, CRADLE, PIPE AND WATER SUPPLY TRENCH EXCAVATIONS ARE ALSO CONSIDERED SECTION I AND WILL BE BACK-FILLED USING MATERIALS OBTAINED OR SELECTED FROM BORROW I. MAXIMUM SIZE OF ROCK FRAGMENTS THAT MAY BE INCORPORATED IN BACKFILL IS 3 INCHES WHEN COMPACTION IS BEING PERFORMED BY HAND OR MANUALLY DIRECTED POWER TAMPERS.
2. EARTH FILL - SECTION II
   - A. THIS SECTION SHALL CONSIST OF MATERIALS OBTAINED FROM BORROW II (EMERGENCY SPILLWAY).
3. EARTH FILL - SECTIONS I & II
   - A. COMPACTION SHALL BE CLASS A. THE FILL SHALL BE COMPACTED TO NO LESS THAN 95% OF MAXIMUM DENSITY OBTAINED BY COMPACTION TESTS OF THE FILL MATERIALS PERFORMED IN ACCORDANCE WITH ASTM DESIGNATION D-698, METHOD A. MOISTURE CONTENT OF THE FILL MATERIALS SHALL BE BETWEEN OPTIMUM AND 3% ABOVE OPTIMUM MOISTURE CONTENT.
   - B. MAXIMUM THICKNESS OF FILL MATERIAL LAYERS BEFORE COMPACTION SHALL BE 9 INCHES. MAXIMUM SIZE OF ROCK FRAGMENTS THAT MAY BE INCORPORATED IN THE FILL IS 6 INCHES.



TYPICAL EMBANKMENT SECTION

NO SCALE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

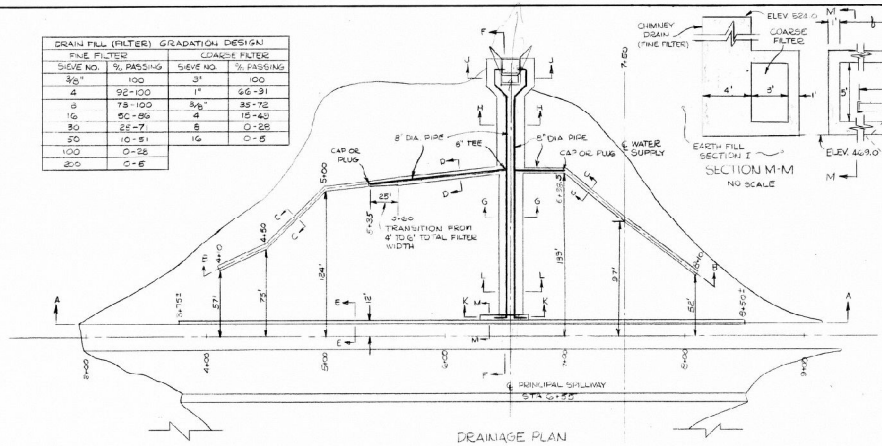
WATER SUPPLY PIPE PROFILE AND EMBANKMENT CROSS SECTION

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

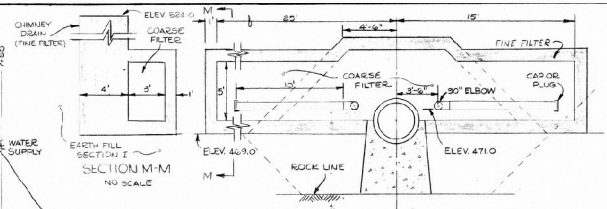
Designed E.J.R. Date
Drawn C.A.H.
Traced
Checked
Approved by
Title
Title
Drawing No. 11 of 35
SCS-MD.-188-P

DRAIN FILL (FILTER) GRADATION DESIGN			
FINE FILTER		COARSE FILTER	
SIEVE NO.	% PASSING	SIEVE NO.	% PASSING
3/8"	100	3"	100
4	92-100	1"	66-91
8	73-100	3/8"	35-72
16	50-86	4	15-40
30	22-71	8	0-28
50	10-51	16	0-15
100	0-28		
200	0-6		



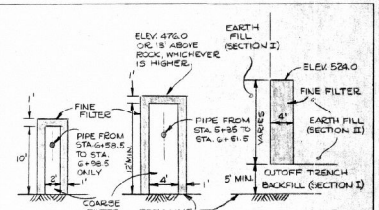
DRAINAGE PLAN

SCALE IN FEET



SECTION M-M
NO SCALE

SECTION K-K
NO SCALE

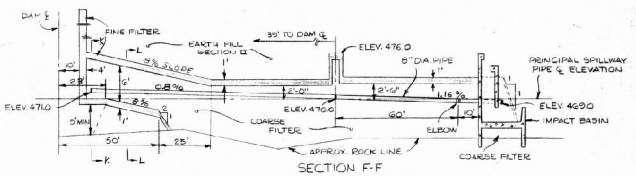


SECTION C-C
NO SCALE

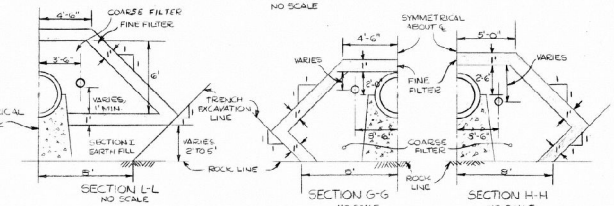
SECTION D-D
NO SCALE

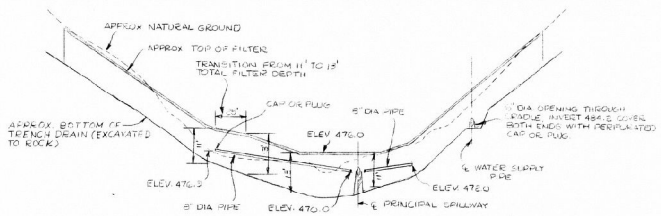
SECTION E-E
NO SCALE

NOTES:
1. ALL CORRUGATED METAL PIPE AND FITTINGS 8" DIA. 14 GAGE, GALVANIZED, ASBESTOS IMPREGNATED AND ASPHALT COATED (COATING S).
2. ALL PIPE TO BE PERFORATED EXCEPT FITTINGS.

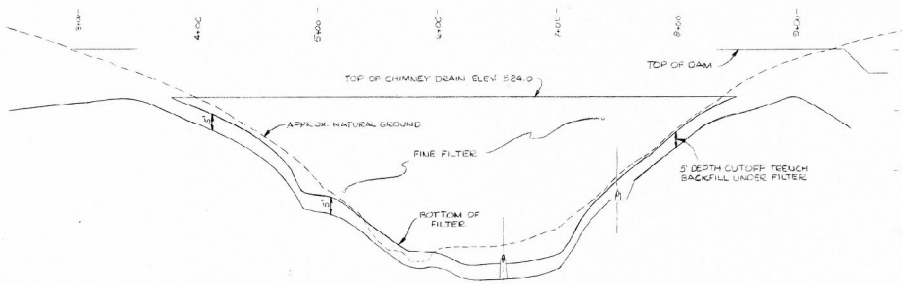


SECTION F-F
NO SCALE

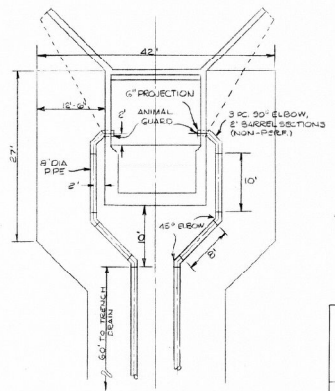




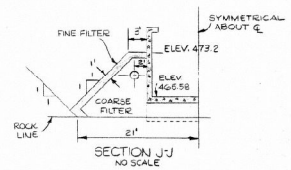
SECTION B-B
(PROJECTED SECTION, NOT TRUE LENGTH)



SECTION A-A



PLAN OF DRAIN OUTLET
NO SCALE



SECTION J-J
NO SCALE

ANIMAL GUARD DETAILS
NO SCALE

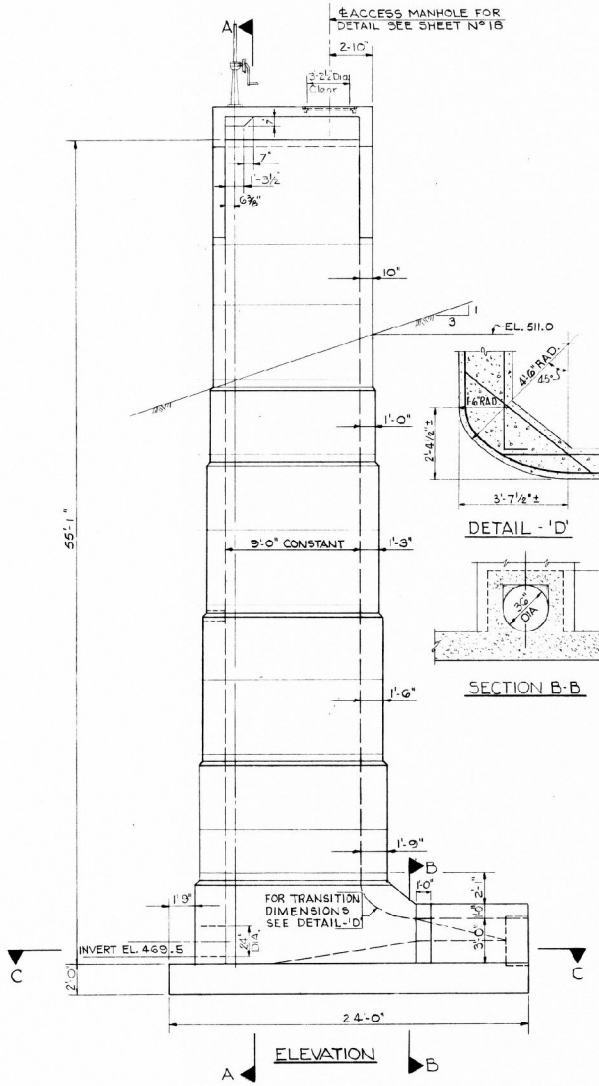
DRAINAGE
LAYOUT AND DETAILS

FINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

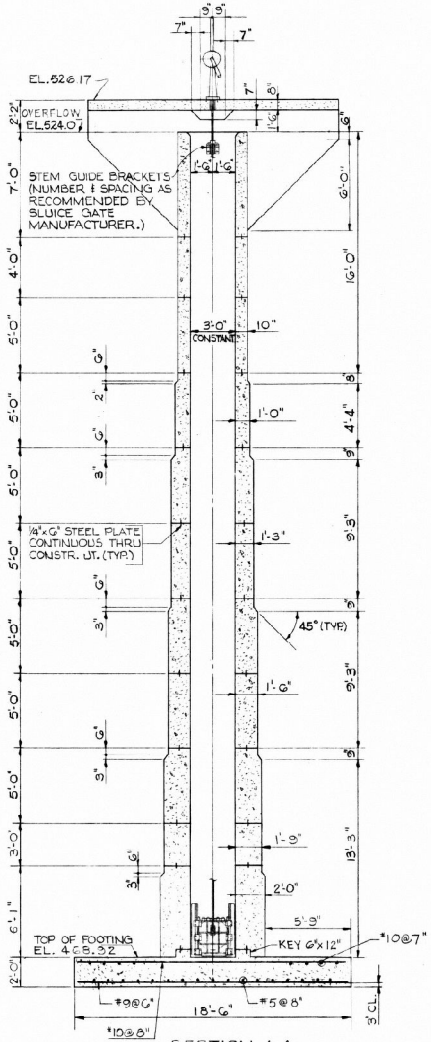
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

Designed M.F.R. Date
Drawn C.A.H. Approved by
Traced Title
Checked Title
Sheet No. 12 of 35
Drawing No. SCS-MD.-183-P

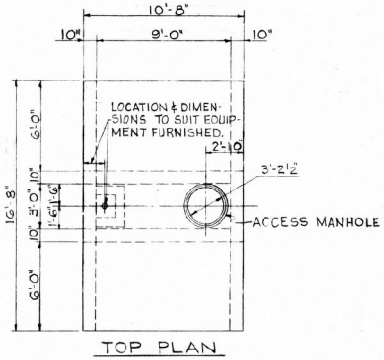


DETAIL - 'D'

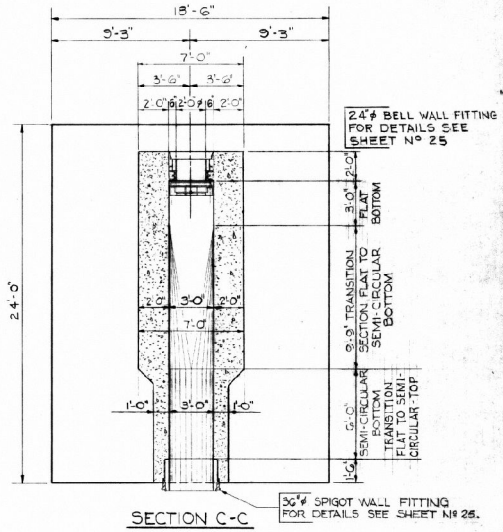
SECTION B-B



SECTION A-A



TOP PLAN



SECTION C-C

0 5 10
SCALE IN FEET

RISER STRUCTURE
PLAN, ELEVATION AND SECTIONS
PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

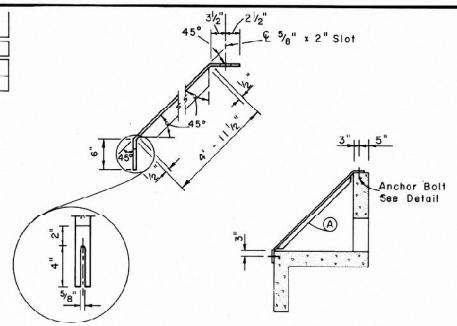
	Date	Approved by
Designed C.H.M.		Title
Drawn C.B.B.		Title
Traced		Date
Checked J.G.S.	Sheet No. 18 of 50	Drawing No. 368-MD-483-P

RESERVOIR DRAIN TRASH RACK BILL OF MATERIALS

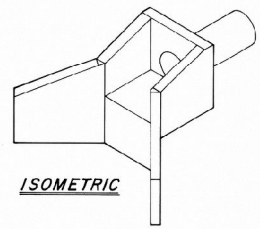
Item	Size	Length	Quan.
Angle Ⓐ	1½" x 1½" x ¼"	5' - 11½"	2
Anchor Bolt	½" Dia.	2" x 8"	4

CONSTRUCTION DETAILS

1. Material in reservoir drain trash rack shall conform to Spec. 581 for structural steel.
2. Trash rack to be galvanized in accordance with Spec. 582.

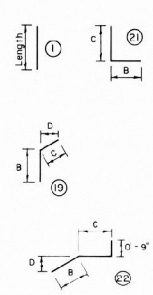


TRASH RACK



ISOMETRIC

BAR TYPES



RESERVOIR DRAIN STEEL SCHEDULE

Mark	Quan.	Size	Length	Type	B	C	D	Total Length
D-1	5	4	5'-9"	21	2'-2"	3'-7"		28.75'
D-2	4	4	9'-5"	19	6'-8"	2'-9"	2'-4"	37.67'
D-3	2	4	8'-0"	19	6'-8"	1'-4"	0'-8"	16.00'
D-4	2	4	9'-4"	22	4'-9"	3'-10"	1'-11"	18.67'
D-5	2	4	5'-10"	22	1'-3"	3'-10"	0'-6"	11.67'
D-6	2	4	2'-11"	21	2'-2"	0'-9"		5.83'
D-7	2	4	11'-11"	22	7'-2"	4'-0"	3'-7"	23.83'
D-8	4	4	2'-9"	1				11.00'
D-9	4	4	3'-3"	1				13.00'
D-10	4	4	3'-9"	1				15.00'
D-11	2	4	4'-6"	1				9.00'
D-12	4	4	5'-5"	21	2'-9"	2'-8"		21.67'
D-13	4	4	6'-0"	21	2'-9"	3'-3"		24.00'
D-14	4	4	5'-0"	21	2'-9"	2'-3"		20.00'
D-15	3	4	3'-6"	1				10.50'

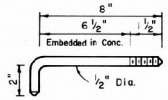
QUANTITIES (This Sheet Only)

STEEL

No. 4 Bar 266.6 * 178. Lbs.

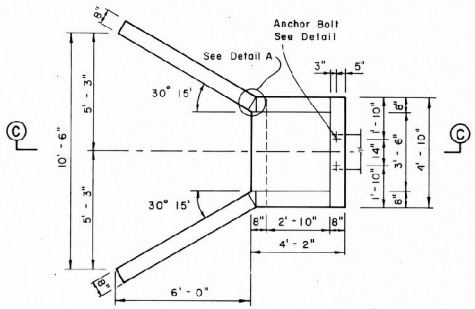
CONCRETE

Class 4000 3.0 Cu. Yds. Reinforced

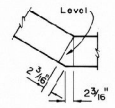


ANCHOR BOLT

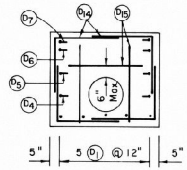
A.S.T.M. A-276, ½" dia., Class 302 or 303, w/ Type-2 nuts and washers.



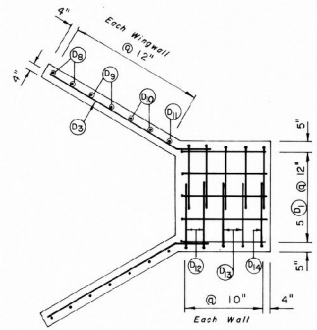
PLAN



DETAIL A



SECTION BB



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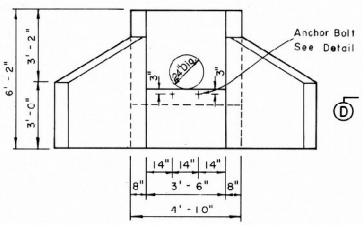
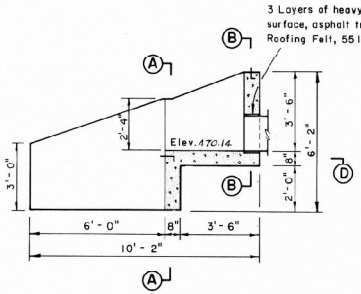


UPSTREAM ELEVATION



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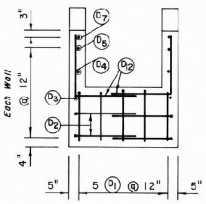

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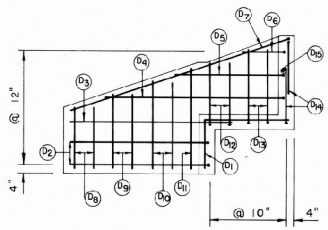


SECTION C C

REINF. CONCRETE RESERVOIR DRAIN INLET
(CLASS 4000 CONC.)

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

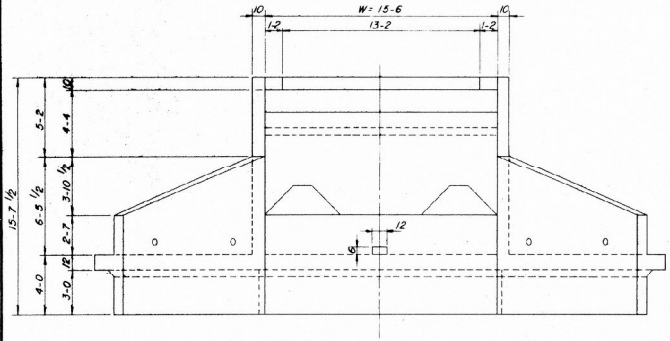
RESERVOIR DRAIN INLET DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

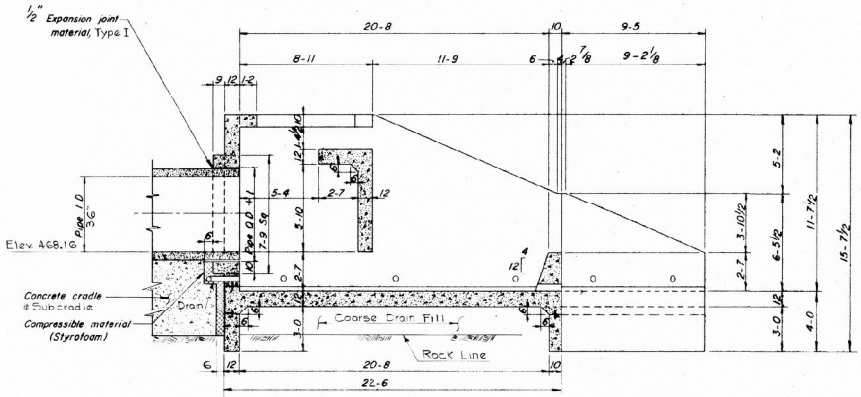
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

	Date	Approved by	
Designed		Title	
Drawn H. T. Browning		Title	
Traced R. L. Allen	11/68	Sheet No. 19 of 35	Drawing No. SCS-MD-483-P
Checked			

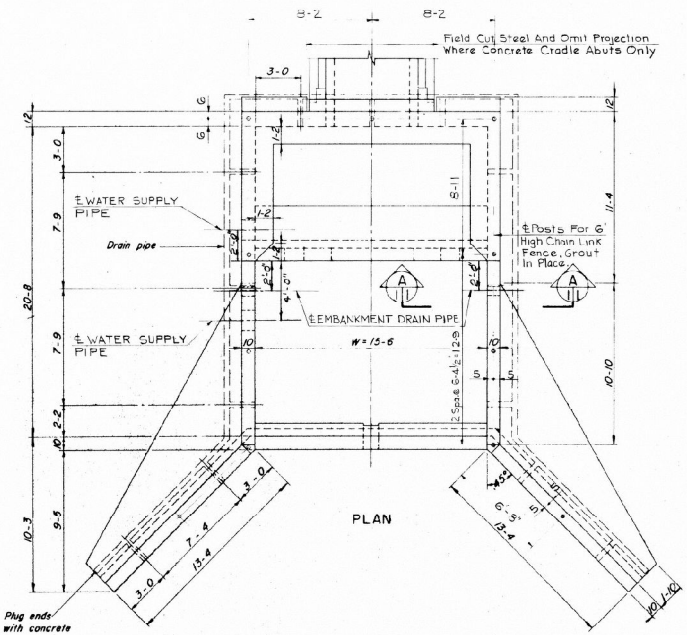
MD-7-E (Jan. 67)



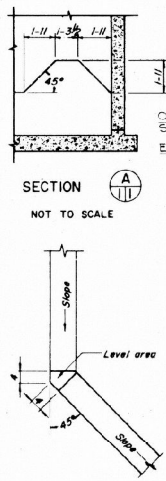
DOWNSTREAM ELEVATION



SECTION ON CENTERLINE

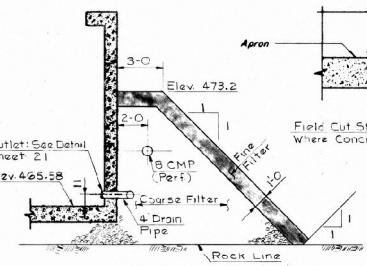


PLAN

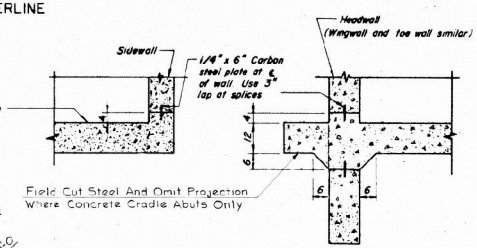


PLAN - JUNCTION SIDEWALL AND WINGWALL
NOT TO SCALE

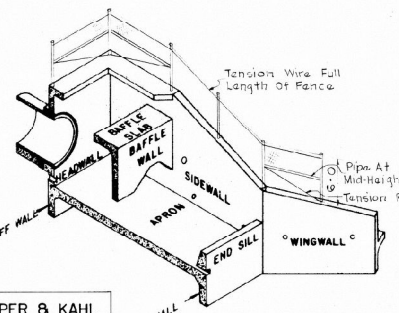
SECTION
NOT TO SCALE



SECTION THROUGH DRAIN & FILTER
NOT TO SCALE



CONSTRUCTION JOINT DETAILS
NOT TO SCALE



ISOMETRIC VIEW

QUANTITIES

Formwork (Contact area)	2500	Sq Ft
Reinforced Concrete (See Sheet 2 of 5)		Cu Yds
Reinforcing Steel		lbs
Drainage		
4" Perforated drain pipe	100	Lin Ft
Animal screen detail, sheet 2 of 5	13	ea
Drain pipe tees	13	ea
Drain pipe 90° ells	2	ea
Drain pipe 45° ells	2	ea
Drain Fill, Coarse And Fine Filter	As Req'd	
Joints		
1/4" x 6" Carbon steel plate, Structural grade 880		lbs

STANDARD IMPACT BASIN		
DESIGN CONSTANTS	f'_c = 4000 psi	f_c = 1600 psi
	n = 8	f_s = 20,000 psi
STANDARD DRAWING NO. ES-4155		
DATE 1-70	SHEET 1 OF 5	

CARL ROHDE
Consulting Engineer
654 Ridgeway Rd Lake Oswego, Ore

SCALE 1 0 5 10 IN FEET
EXCEPT AS NOTED

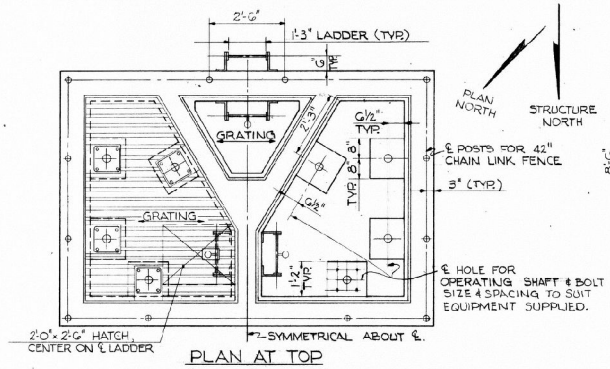
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

IMPACT BASIN DETAILS
PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

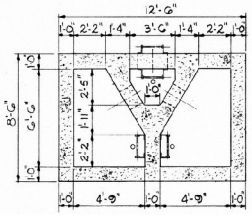
Designed — Date — Approved by
Drawn — Title
Traced — Title
Checked H.E. — Sheet No. 20 of 25 — Drawing No. SCS-MD-483-P

Form SCS-31.4 (November 1959)

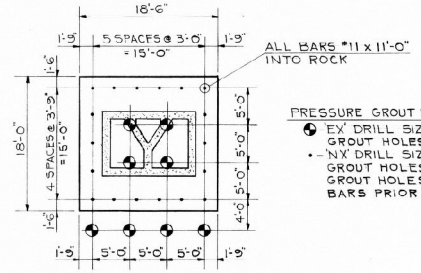


PLAN AT TOP

SCALE IN FEET



SECTION A-A



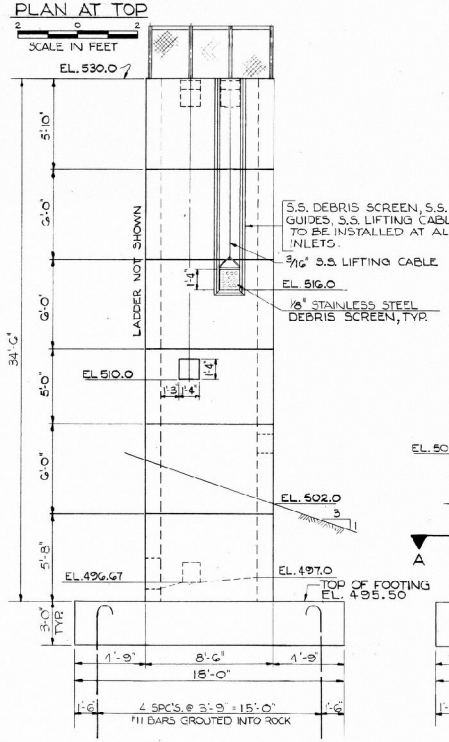
PRESSURE GROUT HOLE NOTES:

- EX' DRILL SIZE (1½" DIA.) DEPTH OF GROUT HOLES 11'-0".
- NY' DRILL SIZE (3" DIA.) DEPTH OF GROUT HOLES 12'-0". PRESSURE GROUT HOLES FOR REINFORCING BARS PRIOR TO INSERTING BARS.

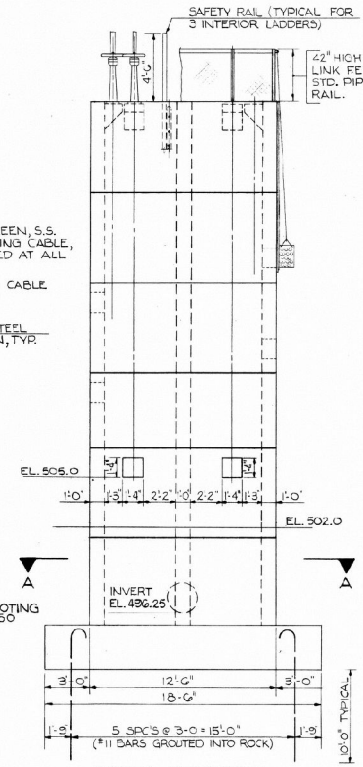
PRESSURE GROUT HOLE LOCATION PLAN

0 5 10

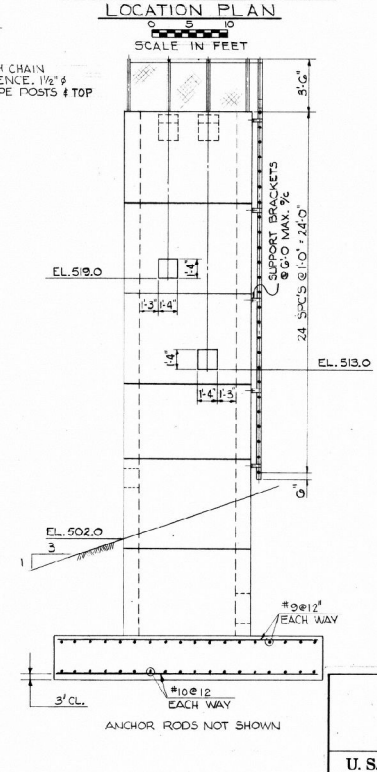
SCALE IN FEET



EAST ELEVATION



NORTH ELEVATION



ANCHOR RODS NOT SHOWN

WEST ELEVATION

0 5 10

SCALE IN FEET
EXCEPT AS OTHERWISE NOTED

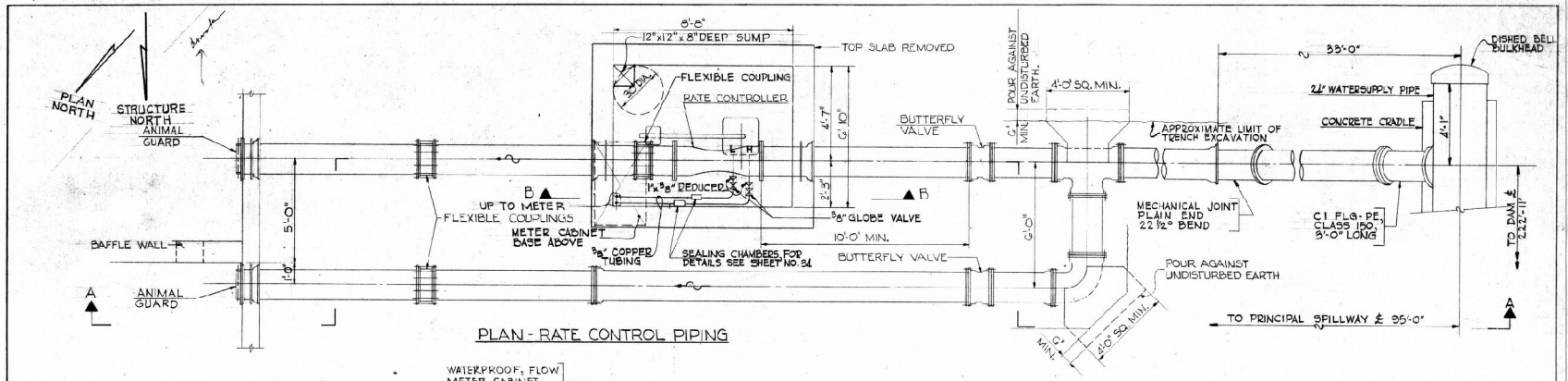
WATER INTAKE STRUCTURE
PLAN, ELEVATIONS AND SECTIONS

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

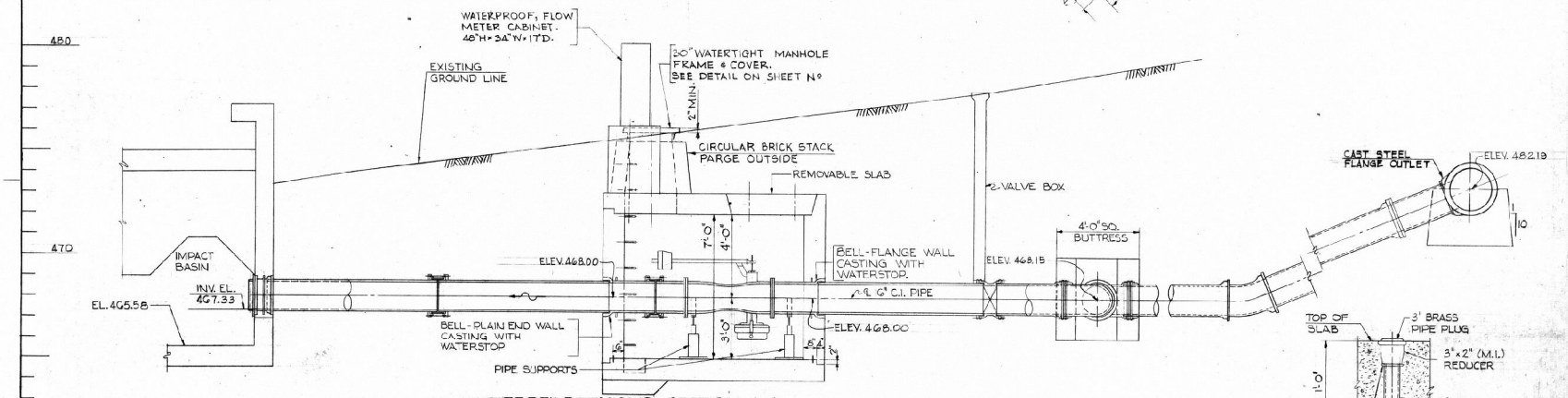
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

	Date		
Designed CHM		Approved by	
Drawn C.E.B.		Title	
Traced		Title	
Checked J.G.S.		Sheet No. 20 of 35	Drawing No. 3CS-MD.-483-P



PLAN - RATE CONTROL PIPING

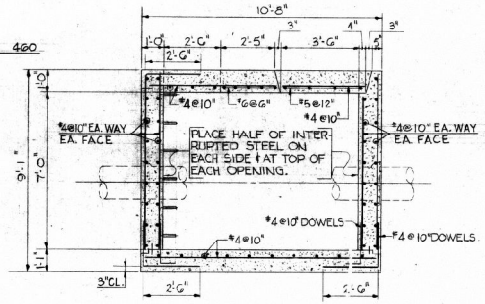


PROFILE - ALONG SECTION A-A

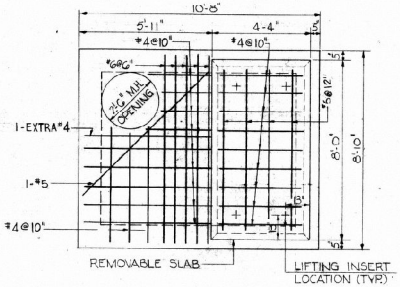
NOTE: PIPE & FITTINGS TO BE THREADED & GALVANIZED.

LIFTING INSERT

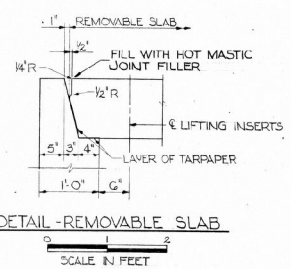
SCALE IN FEET



SECTION B-B



PLAN-TOP SLAB



DETAIL - REMOVABLE SLAB

SCALE IN FEET

SCALE IN FEET
EXCEPT AS OTHERWISE NOTED

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

RATE CONTROL PIPING AND VAULT

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.G.S. Date
Drawn C.E.P.
Traced
Checked C.H.M.
Approved by
Title
Sheet No. 32 of 35
Drawing No. SCS-MD.-483-P

Appendix B Dam Inspection Report

2019 Inspection Report
Piney Run Dam
Maryland Dam #139

Prepared for:

The County Commissioners
of Carroll County
225 North Center Street
Westminster, Maryland 21157

Prepared by:

AECOM
12420 Milestone Center Drive, Suite 150
Germantown, MD 20876

December 2019

Table of Contents

Photographs

Appendices

1.0 Introduction

AECOM performed an on-site visual inspection of Piney Run Dam in Sykesville, Maryland. The purpose of the inspection was to provide a 2019 Dam Safety Inspection Report for the County Commissioners of Carroll County as part of the Piney Run Watershed Study. The inspection was performed by representatives from AECOM, the Maryland Department of the Environment, Dam Safety Division, Carroll County, and the United States Department of Agriculture, Natural Resources Conservation Service. AECOM was represented by Mr. Bob Pinciotti, P.E., Mr. Kris Wachtel, E.I.T., and Ms. Nicolette Schluter, E.I.T. The inspection was completed in general accordance with the Maryland Dam Safety Manual (1996, rev. November 2003) and the Natural Resources Conservation Service Maryland Conservation Practice Standard, Pond Code 378 (2000). This report describes the observations and overall conditions of Piney Run Dam, as well as recommendations for remedial action.

At approximately the same time as the inspection, a topographic survey of the dam was completed by AECOM. The survey was based on Carroll County survey control points and used the North American Datum of 1983, Maryland State Plane for horizontal measurements and North American Vertical Datum of 1988 for vertical measurements. The surveyed elevations of permanent benchmarks located on the dam were found to be one foot lower than their as-built elevations. Therefore, all elevations presented are in North American Veridical Datum of 1988 which is approximately one foot lower than the project vertical datum of the information shown on the dam's as-built drawings.

2.0 Background

Piney Run Dam is an earthen dam constructed in 1974, located approximately 1.5 miles northwest of Sykesville, Maryland and approximately 1.75 miles southwest of Eldersburg, Maryland. The dam is approximately 73 feet in height (from principal spillway outlet invert) and 624 feet in length. It is classified as a High Hazard dam. The dam was designed for flood control, water supply, and recreation purposes but is currently only used for flood control and recreation. The dam's principal spillway consists of a single-stage riser with a crest at elevation 523.0 feet that discharges into a 36-inch diameter reinforced concrete pipe which outlets at the toe of the dam into an impact basin. There are thirteen observation wells installed within the embankment, left abutment, and emergency spillway.

The emergency spillway, hereby referred to as the auxiliary spillway is a 250-foot-wide vegetated channel and is located in the right abutment of the dam. The auxiliary spillway control section is designed to activate at elevation 531.2 feet. The total drainage area to the dam is 10.56 square miles.

The reservoir is equipped with a water supply intake structure that has six rising stem gates, located at varying depths (elevations 518.0, 516.0, 512.0, and 509.0 feet, as well as two gates at elevation 504.0 feet) and two rising stem gates to control the water flow out of the intake structure, at approximately elevation 496 feet. The structure discharges to a 24-inch diameter reinforced concrete pipe which runs through the embankment approximately 352 feet downstream before terminating at a bulkhead and has rate control piping and a monometer vault accessible at the downstream toe of the dam.

3.0 Dam Inspection

Inspection of the dam and appurtenant structures was performed on November 5, 2019. The weather was approximately 60 degrees and cloudy. There was a precipitation event in the area on October 30 and 31, 2019 that totaled approximately 3.5 inches of rain. The pool at the time of inspection was approximately elevation 523.5 feet.

Inspection of the dam revealed that Piney Run Dam is in good condition overall. During inspection some minor issues were observed. These consisted mainly of general maintenance issues, vandalism, some areas of bare soil, few minor depressions, and damage to a few of the appurtenant structures. The dam inspection checklist for Piney Run Dam is presented in **Appendix B-1**. A photographic log of observations made during the inspection is presented in **Appendix B-2**.

4.0 Dam Crest

The dam crest shown in **Photograph 1** is approximately 22 feet wide with a design elevation of 539.5 feet and constructed top of dam elevation of 540.5 feet. There were no indications of recent cracking, settlement, or misalignment, and no apparent low spots in the dam crest.

Photograph 1: Dam crest looking towards left abutment.

5.0 Upstream Slope

The upstream embankment surface was constructed with a three-horizontal-to-one-vertical (3H:1V) slope and was generally vegetated with turfgrass which was recently mowed. There was a bench at elevation 501.0 feet and riprap slope protection from the bench to elevation 527.0 feet. One depression was observed on the left side of the embankment upstream slope measuring approximately three feet in diameter and 6.5 inches deep, as shown in **Photograph 2**. This depression was reported to have developed since construction, but the cause and time of the

development was unknown. Several man-made trails were identified from the reservoir pool to the embankment crest. These were identified by noticeably displaced grasses, however, with minimal ground disturbance. Woody debris was observed extending approximately ten feet above the riprap section, including several very large logs along the reservoir rim. The riprap protection was minimal and consisted of small diameter stone. No signs of animal burrows, cracking, or bulges were observed at the time of inspection.

Photograph 2: Upstream embankment slope depression.

6.0 Downstream Embankment Slope

Like the upstream slope, the downstream embankment surface was constructed at 3H:1V slope and was vegetated with turfgrass which was recently mowed. A small depression was observed near the toe of the dam on the left side, as shown in **Photograph 3**. This was reported to possibly be the remains of an erosional feature that developed shortly after construction. Soft, wet areas were observed at the toe, which may have been due to a recent precipitation event and poor drainage. No animal burrows were observed on the downstream embankment slope. No cracks or signs of movement were observed.

Photograph 3: Downstream embankment slope depression.

7.0 Abutment Contacts

The downstream groins of the dam, defined as where the dam embankment and abutment meet, reportedly had some stone placed in them during construction, however, only some small diameter stones were barely visible in the groins during inspection and appeared to have either been overgrown or transported downstream. Minor erosion was observed on the left upstream groin, and a few minor bare areas were observed on the left abutment above the upstream groin. Multiple areas of minor erosion, rutting, and exposed soil were observed along both left and right downstream groins. These appeared to be from mower turning movements and can be seen in **Photograph 4**. Several trees were observed growing within 15 feet of the downstream groins.

Photograph 4: Disturbance of left downstream slope, likely by grass cutting equipment.

8.0 Drainage and Seepage Control

The dam was constructed with a chimney drain, which is aligned along the downstream side of the embankment crest, and a foundation drain, which is located under the downstream slope of the dam. The drains were primarily constructed of fine filter material with zones of coarse filter material surrounding the perforated corrugated metal pipe drainage pipes which outlet at the impact basin. At the time of inspection, the right and left drains were visually estimated to be flowing at approximately one to two gallons per minute. Both drain outlets were corroded, and the animal guards for both drains were broken, as shown in **Photograph 5**. No seepage was observed on the upstream or downstream embankment slopes. The drainage conduits were inspected by camera using a remotely-operated vehicle under a separate inspection.

Photograph 5: Damage to right drain animal guard.

9.0 Principal Spillway Riser

The principal spillway riser is a 57.85-foot high (measured from top of footing), reinforced concrete enclosure with inside dimensions of nine-feet-long by three-feet-wide, sitting on a two-foot-thick foundation. The principal spillway consists of slotted and grated openings on two sides and discharges to a 36-inch diameter reinforced concrete pipe. The overflow of the weir crest riser is at elevation 523.0 feet.

Trash racks are located at the top of the riser along the two intake weirs. The trash racks on the intake are made of horizontal steel bars below elevation 522.5 feet and grated metal openings above elevation 522.5 feet. The side grates were observed to be intact and free of corrosion but, were obstructed by leaf litter. A log was lodged in the horizontal slotted trash rack, extending several feet into and out of the riser, as shown in **Photograph 6**. The anchor bolts connecting the trash rack to the riser appeared to be in overall good condition.

Photograph 6: Log lodged in principal spillway riser.

Some minor chipping of the riser concrete was visible at the top edges, but no steel reinforcement was exposed. The riser top slab, hatch opening, and lake drain gate operator all appeared to be in adequate working condition.

A 24-inch diameter lake drain conduit extends from the principal spillway riser into the reservoir to a concrete headwall which acts as the intake located at the upstream toe of the dam. The headwall has a trash rack consisting of two metal bars across the headwall. A wheel located on top of the principal spillway riser operates the lake drain sluice gate. The sluice gate was operated during inspection and shown to be in adequate working condition. Neither the lake drain conduit, nor the interior of the riser were observed during the dam inspection. These structures were inspected by camera using a remotely-operated vehicle under a separate inspection.

10.0 Principal Spillway Outlet

The principal spillway conduit outlets at an invert elevation of approximately elevation 467.16 feet into the impact basin at the downstream toe of the embankment. A 36-inch reinforced concrete pipe discharges into the impact basin and then into riprap and stone lined stream channel. Some pitting was observed at the edges of both concrete wingwalls. Undermining and erosion were observed in the native soil banks along both sides of the outlet channel, extending approximately 50 feet downstream of the outlet and up to approximately five feet in height, as shown in **Photograph 7**. There were minor erosion channels leading from the right downstream groin to the outlet channel which have eroded the right channel slope. The principal spillway pipe was flowing less than half-full at the time of inspection. The interior of the conduit was not visible at the time of inspection due to the high flow but was inspected by camera using a remotely-operated vehicle under a separate inspection.

Photograph 7: Erosion and undermining on right outlet channel slope.

11.0 Auxiliary Spillway

The auxiliary spillway is a 250-foot-wide vegetated channel around the right side of the embankment. The control section of the auxiliary spillway shares the same centerline with the dam embankment and has an elevation of 531.2 feet. The auxiliary spillway exit channel slope in the direction of flow is approximately 1.7 percent and the spillway channel outlets into a wooded valley downstream of the dam. The spillway channel side slopes are approximately 2.5H:1V. The left side slope is formed by a training dike extending from the control section to the outlet of the spillway channel. The right-side slope is formed by the hillside. The inlet to the auxiliary spillway channel is contained within the 100-year pool and contains an unpaved access road to the dam, which is currently the only access road leading to the dam. The slope of the outlet of the spillway channel in the direction of flow is approximately 2.5H:1V.

During inspection, a possible man-made trail was observed running up the auxiliary spillway outside slope. Some sloughing and/or erosion was observed at the bottom of this trail, accumulating into a small colluvial pile at the base of the slope as shown in **Photograph 8**. The inlet to the auxiliary spillway channel had little to no shoreline protection and showed signs of erosion. Trees and brush were observed along the inside and outside slopes within 15 feet of the auxiliary spillway.

Photograph 8: Colluvial pile on outside auxiliary spillway slope.

The control section and outlet channel appeared to be in adequate condition. The control section was properly vegetated with turfgrass and no visible disturbance. The topographic survey indicated that the control section elevation is consistent across width of the spillway channel. The spillway channel outlet is a steep, wooded slope at the end of the turfgrass section. This wooded vegetation does not appear to impede potential flow of the auxiliary spillway channel during activation, but the steep slope may be subject to head cutting and erosion during an event that activates the spillway.

12.0 Reservoir

The Piney Run Dam reservoir is maintained at the normal pool elevation of 523.0 feet as the water intake function of the dam is not used. The reservoir shoreline contained woody debris including large logs. This debris has the potential to block the principal spillway opening, impeding the flow of water through the principal spillway. Impediment could lead to premature and/or unnecessary activation of the auxiliary spillway, reducing the designed flood control capabilities. As detailed in Section 5.0, the existing riprap cover on the upstream embankment slope was minimal and consisted of small diameter stone. Both are shown in **Photograph 9**.

Photograph 9: Reservoir upstream slope riprap and debris.

13.0 Additional Observations

In addition to the dam and appurtenant structures, several other structures were observed during the inspection of the dam. However, detailed review of these structures is outside the scope of this report.

13.1 Water Intake Structure

The water intake structure riser is located to the right of the principal spillway riser and is accessible via a short concrete staircase and steel catwalk protected by a locked gate. The catwalk was in generally good condition, but the support beams were beginning to corrode and the sign on the catwalk gate was faded. The steps leading to the catwalk had minor cracks along the bottom on both sides. A frame structure was constructed on top of the intake structure to prevent access and vandalism to the equipment on the top of the riser. There were eight rising stem gate operators inside the structure with hand operators. The hand operators generally were in good working condition, and the handles which were turned during inspection did so freely. However, multiple hand operator handles had broken spokes connecting the handles to the operating shafts including one handle with all broken spokes. These are shown in **Photograph 10**. The damage was reportedly due to vandalism prior to the construction of the structure.

Photograph 10: Handle broken off the hand operator handle.

13.2 Rate Control Piping and Monometer Structures

A monometer vault is located at the downstream toe of the dam to the right of the impact basin with an exposed concrete top slab. An empty meter cabinet is located on top of the vault. Reportedly, the manometer was destroyed by vandals and has not been replaced. A second concrete slab located to the right of the vault has two valve covers which allow access to the butterfly valves in the rate-control piping system. The valves connect the water intake discharge conduit to the principal spillway's impact basin, but the pipe outlets could not be observed at the time of inspection due to flow in the impact basin. The upstream butterfly valve was operated during inspection, and though the valve action could not be observed, the sound of water flowing was apparent.

The rate control/monometer vault concrete top slab was in fair condition, with some cracks apparent. The meter cabinet had some graffiti on it.

13.3 Observation Wells

Thirteen observation wells in the dam, auxiliary spillway, and left abutment. Six wells are located in dam embankment, three in the left abutment, and four in the auxiliary spillway. Water level readings were taken at all observation wells at the time of inspection. Two observation well pipes, observation well #9 (on the dam embankment downstream slope) and observation well #11 (in the auxiliary spillway) were tilted at approximately 45 and 75 degrees from vertical respectively, possibly due to mower impact. Observation well #11 is shown in **Photograph 11**. Readings were able to be taken from these wells, but with difficulty. Accurate measurements may be affected by the existing geometry of the wells.

A fourteenth well was observed on the auxiliary spillway outside slope, reportedly installed to observe water conditions for a potential pump station, but it was locked and therefore inaccessible.

Photograph 11: Damage to observation well #11.

14.0 Recommendations

Overall the dam is in good condition. However, some issues were found as detailed below. The majority of concerns generally consist of minor maintenance issues and a few damaged structures. The following are the recommended remedial actions for Piney Run Dam based on observations made during the inspection.

14.1 Dam Crest

The dam crest was in overall good condition, and no remedial action is recommended. Because recreational vehicles and mowers have been known to drive over the dam, the crest should continue to be monitored for damage, such as grass cover loss and rutting. See Section 4.0 for details.

14.2 Upstream Embankment Slope

The upstream slope had a depression on the left side that should be filled with approved soil similar to the existing embankment fill material. The filled hole should be hand-tamped to compact the fill material and the disturbed area seeded with an orchard grass mix or similar non-bunching grass mix. There were a few man-made paths leading from the dam crest to the water which have worn away the grass cover, and these should also be seeded.

The upstream slope had some woody debris which should be removed. The riprap cover is thin and may deteriorate overtime due to wave action from the reservoir on the shoreline. The riprap should be monitored for signs of erosion and supplemental riprap should be installed within the next five years. See Section 5.0 for details.

14.3 Downstream Embankment Slope

The depression observed near the toe at the left side should be monitored for signs of additional depression or additional erosion. If additional depression or erosion is noted, the area should be filled with soil similar to the existing embankment fill material and approved by a registered

professional engineer. The filled hole should be hand tamped to compact the fill material and the disturbed area seeded with an orchard grass mix or similar non-bunching grass mix. The wet/soft area near the toe should be monitored for water ponding. See Section 6.0 for details.

14.4 Abutment

The downstream slope had areas of rutting, erosion, and bare soil along the groins. These are minor and do not require repair at this time but should be monitored.

There were several trees on the downstream side of the embankment at the groins which encroach within 15 feet of the groins. It is recommended that these trees be removed according to the Maryland Department of the Environment Dam Safety Policy Memorandum #1 (2019). See Section 7.0 for details.

14.5 Principal Spillway Riser

The principal spillway riser structure was in good condition overall. However, there was a log lodged in the intake which is partially blocking flow and could potentially lead to raised pool elevation and premature and/or unnecessary activation of the auxiliary spillway. The log should be removed to allow for proper functioning of the riser. Care should be taken to not allow pieces of the log to go down the spillway riser during removal, as this could block or damage the riser or pipes. See Section 9.0 for details.

14.6 Principal Spillway Outlet and End Wall

The principal spillway outlet impact basin and end wall were in good condition. The pitting at the end of both wingwalls at the principal spillway outlet should be monitored for further deterioration. The exposed broken animal guards should be replaced with stainless steel nuts and bolts of similar size to original design. Erosion and undermining along the outlet channel sides should be monitored and should they become worse, repaired and supplemented with larger riprap. See Section 10.0 for details.

14.7 Auxiliary Spillway

The auxiliary spillway was in good condition. However, there was some minor sloughing in the outside slope of the auxiliary spillway just downstream of the control section. This slough could potentially restrict the designed flow capacity of the auxiliary spillway during activation. It is recommended that the eroded material be removed from the auxiliary spillway bottom and the slope be monitored for continuation of erosion. As the erosion appears to be caused by all-terrain vehicle use, it is recommended that measures be taken to restrict all-terrain vehicle access to the slope.

There was tree growth on the training dike along the inside slope of the auxiliary spillway, and on the outside slope of the auxiliary spillway. It is recommended to remove trees along the auxiliary spillway side slopes up to nine feet above the control section (to dam embankment crest elevation) or to the top of the training dike, whichever is less, to improve flow capacity of the auxiliary spillway. See Section 11.0 for details.

14.8 Reservoir

No action is recommended on the reservoir beyond general debris removal. The riprap along the shoreline should be monitored for signs of erosion. See Sections 5.0 and 12.0 for details.

14.9 Water Intake Structure

The stairway and catwalk leading to the water intake structure need minor repairs. The sides of the stairway at the bottom had minor cracks which should be monitored. The sign along the catwalk was faded and should be replaced. The chain link fencing of the gate entrance was no longer galvanized and should be repaired or replaced. The water intake rising stem operators should be routinely greased in order to ensure free movement, with particular attention paid to the hand operator that no longer has a handle. See Sections 13.1 and 13.2 for details.

14.10 Instrumentation

Two observation wells, observation well #9 and observation well #11, were bent beyond practical and accurate use. The exposed bent sections should be replaced in order to put them back into service for monitoring purposes. See Section 13.8 for details.

15.0 Limitations

The inspection of Piney Run Dam has been carried out in general accordance with the Maryland Dam Safety Manual, Natural Resources Conservation Service Maryland Conservation Practice Standard, Pond Code 378 and accepted engineering practices. No warranty or guarantee, either written or implied, is applicable to this work. AECOM should be immediately notified if any changes in the condition of the dam occur from what is described in this inspection report.

Appendix B-1: Dam Inspection Checklist

APPENDIX B-1

DAM INSPECTION CHECKLIST

Based on Maryland Dam Safety Manual (1996) and United States Department of Agriculture, Natural Resources Conservation Service Conservation Practice Standard POND, MD-378 Appendix A (January 2000)

To help the dam owner perform periodic safety inspections of the structure, a checklist is provided. Each item of the checklist should be completed. Repair is required when obvious problems are observed. Monitoring is recommended if there is potential for a problem to occur in the future. Investigation is necessary if the reason for the observed problem is not obvious.

A brief description should be made of any noted irregularities, needed maintenance, or problems. Abbreviations and short descriptions are recommended. Space at the bottom of the form should be used for any items not listed.

DAM: Piney Run Dam DATE: November 5, 2019
OWNER: The County Commissioners of Carroll County WEATHER: Cloudy, 60 degrees F
INSPECTED BY: Robert Pinciotti, P.E., POOL LEVEL: Normal
T. Kris Wachtel, E.I.T., and Nicolette Schluter, E.I.T.

Item	Comments	Y/N	Monitor	Repair	Investigate
1. CREST					
a. Visual Settlement?		N			
b. Misalignment?		N			
c. Cracking?		N			
2. UPSTREAM SLOPE					
a. Erosion?	Minor erosion on left upstream groin	Y	Y		
b. Ground cover in good condition?	Some minor bare areas on abutment above left groin.	Y	Y		
c. Trees, shrubs, or other woody vegetation?		N			
d. Longitudinal/Vertical cracks?		N			
e. Adequate riprap protection?	Riprap cover appears thin and of small diameter. Monitor for erosion and supplement with additional riprap in the next 5 years.	N	Y	Y	
f. Stone deterioration?		N			
g. Settlements, depressions, or bulges?	Depression on left side of slope measuring approximately 3 feet in diameter and 6.5 inches depth.	Y		Y	
3. DOWNSTREAM SLOPE					
a. Erosion?	Minor erosion on groins. Groins are not riprap protected	Y	Y		
b. Ground cover in good condition?	Along groins there are some bare areas. Appears to be from mowers turning. Recommend monitoring locations.	N	Y		
c. Trees, shrubs, or other woody vegetation?	Trees are encroaching left and right downstream groins. Recommend clearing to 15 feet offset from groins.	Y		Y	
d. Longitudinal/Vertical cracks?		N			
e. Riprap protection adequate?		N/A			
f. Settlements, depressions, or bulges?	Small settlement near toe, left of center. Recommend monitoring for continuation of movement.	Y	Y		
g. Soft spots or boggy areas?	Soft, wet areas on toe. Likely from recent precipitation event and no runoff area. Recommend monitoring.	Y	Y		
h. Movement at or beyond toe?		N			
i. Boils at toe?		N			
4. DRAINAGE-SEEPAGE CONTROL					
a. Internal drains flowing?	Estimated 1-2 gpm for right toe drain, 1-2 gpm for left toe drain. Animal guards for both drains are in disrepair.	Y		Y	
b. Seepage at toe?		N			
c. Does seepage contain fines?		N			

INSPECTION CHECKLIST - PAGE 2 DATE: November 5, 2019

INSPECTED BY: Robert Pinciotti, P.E.,
T. Kristopher Wachtel, E.I.T., and Nicolette Schluter, E.I.T.

Item	Comments	Y/N	Monitor	Repair	Investigate
5. ABUTMENT CONTACTS					
a. Erosion?	Some erosion along left and right groins	Y	Y		
b. Differential movement?		N			
c. Cracks?		N			
d. Seepage?		N			
e. Adequate erosion protection for ditches?	There is no erosion protection on groins.	N			
6. INLET STRUCTURE:					
a. Seepage into Structure?		N			
b. Debris or obstructions?	Log is wedged inside intake structure. Recommend removal.	Y	Y	Y	
c. If Concrete, do surfaces show:					
1. Spalling?		N			
2. Cracking?		N			
3. Erosion?		N			
4. Sealing?		N			
5. Exposed reinforcement?		N			
6. Other?	Some minor chipping of concrete visible at top edges. No reinforcement exposure.	Y	Y		
d. If metal, do surfaces show:					
1. Corrosion?		N			
2. Protective Coating deficient?		N			
3. Misalignment or split seams?		N			
e. Do the joints show:					
1. Displacement or offset?		N			
2. Loss of joint material?		N			
3. Leakage?		N			
f. Are the trash racks:					
1. Broken or bent?		N			
2. Corroded or rusted?		N			
3. Obstructed?		N			
4. Operational?		Y			
g. Sluice/Drain gates:	Operated during inspection, was in adequate working condition. Gate was not visible from top of riser.				
1. Broken or bent?		N/A			
2. Corroded or rusted?		N/A			
3. Leaking?		N/A			
4. Not seated correctly?		N/A			
4. Periodically maintained?		Y			
5. Operational?		Y			

INSPECTION CHECKLIST - PAGE 3 DATE: November 5, 2019 INSPECTED BY: Robert Pinciotti, P.E., T. Kristopher Wachtel, E.I.T., and Nicolette Schluter, E.I.T.		Page 3 of 3			
		Y/N	Monitor	Repair	Investigate
Item	Comments				
7. PRINCIPAL SPILLWAY PIPE: Concrete Pipe					
a. Seepage into conduit?		N/A			
b. Debris present?		N/A			
c. Do concrete surfaces show:					
1. Spalling?		N/A			
2. Cracking?		N/A			
3. Erosion?		N/A			
4. Sealing?		N/A			
5. Exposed reinforcement?		N/A			
6. Other?		N/A			
d. Do the joints show:					
1. Displacement or offset?		N/A			
2. Loss of joint material?		N/A			
3. Leakage?		N/A			
8. STILLING BASIN/POOL: Riprap					
a. If concrete, condition of surfaces?	Some pitting on left and right wingwall edges		Y		
b. Deterioration or displacement of Joints?		N			
c. Outlet channel obstructed?		N			
d. Is released water:					
1. Undercutting the outlet?		N			
2. Eroding the embankment?	Erosion and head-cutting observed downstream of concrete wingwall on left and right embankments. Erosion channel coming from right groin.	Y	Y		
3. Displacing riprap?		N/A			
4. Scouring the plunge pool?		N			
e. Tailwater elevation and flow condition:	Principal spillway flow visibly observed to be approximately one half full flow				
9. EMERGENCY SPILLWAY					
a. Is the channel:					
1. Eroding or back cutting?		N			
2. Obstructed?		N			
b. Trees or shrubs in the channel?	Trees on training dike and outside slope. Remove to crest of dam elevation.	Y		Y	
c. Seepage present?		N			
d. Soft spots or boggy areas?		N			
e. Channel slopes eroding or sloughing?	On outside slope, just downstream of control section. Appears to be a man-made trail going up outside slope. Some sloughing/erosion accumulation at toe of outside slope.	Y		Y	
10. RESERVOIR					
a. High water marks?	Within riprap on upstream dam slope. Logs and woody debris along reservoir rim on upstream slope. Recommend removing debris.	N		Y	
b. Erosion/Slides into pool area?		N			
c. Sediment accumulation?		N			
d. Floating debris present?		N			
e. Adequate riprap protection for ditches?	Existing riprap is minimal and small diameter. Monitor riprap for erosion.	N	Y		

Appendix B-2: Photographic Log

AECOM Imagine it. Delivered.	**PHOTOGRAPHIC LOG**	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 1: Embankment crest, Looking Northeast

Image 2: Embankment crest, Looking Southwest

Image 3: Worn path from crest to Normal Pool Elevation

Image 4: Upstream slope from left groin. Note depression on left side of slope

Image 5: Depression in left side of upstream slope

Image 6: Riprap on upstream slope

AECOM Imagine it. Delivered.	PHOTOGRAPHIC LOG	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 7: Debris and small riprap at upstream waterline

Image 8: Downstream slope from left groin

Image 9: Depression in downstream slope near toe

Image 10: Depression in downstream slope near toe, looking upstream

Image 11: Bare spot at right toe

Image 12: Right downstream groin

AECOM Imagine it. Delivered.	**PHOTOGRAPHIC LOG**	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 13: Left upstream groin

Image 14: Bare spots on left upstream abutment

Image 15: Left downstream groin. Note rutting

Image 16: Downstream face of PSW riser

Image 17: Leaves collected on PSW riser trash rack

Image 18: Inside of PSW riser. Note log lodged in inlet

AECOM Imagine it. Delivered.	PHOTOGRAPHIC LOG	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 19: Lake drain gate wheel

Image 20: PSW outlet channel

Image 21: PSW outlet impact basin

Image 22: Impact basin from above

Image 23: Right toe drain outlet at impact basin

Image 24: Damaged right toe drain animal guard

AECOM Imagine it. Delivered.	**PHOTOGRAPHIC LOG**	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 25: Left toe drain outlet at impact basin

Image 26: Damaged left toe drain animal guard

Image 27: Pitting in right impact basin wingwall

Image 28: PSW outlet channel left slope

Image 29: PSW outlet left slope undermining

Image 30: Close-up of PSW outlet channel right slope head cutting

AECOM Imagine it. Delivered.	**PHOTOGRAPHIC LOG**	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 31: Training dike. Note woody debris

Image 32: Woody debris and logs along ASW inlet

Image 33: ASW training dike slope. Note vehicle path and bare areas

Image 34: ASW vegetated channel facing upstream

Image 35: ASW vegetated channel facing downstream

Image 36: ASW outlet into wooded valley

AECOM Imagine it. Delivered.	**PHOTOGRAPHIC LOG**	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 37: Slough from outside ASW slope

Image 38: View from top of ASW outside slope likely ATV path

Image 39: ASW outside slope, downstream

Image 40: ASW outside slope at outlet. Note path which leads to electrical standpipe and fourteenth observation well

Image 41: ASW inside slope, training dike facing downstream. Note trees within 15 feet of channel

Image 42: Water intake structure

AECOM Imagine it. Delivered.	PHOTOGRAPHIC LOG	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 43: Water intake tower minor concrete damage

Image 44: Catwalk support beams; rusted gate

Image 45: Catwalk leading to intake tower

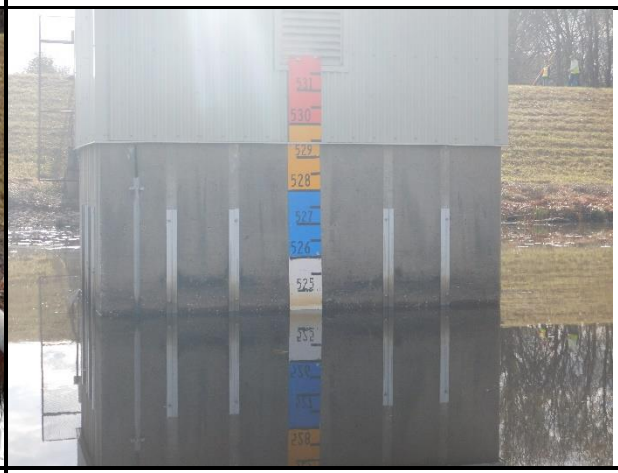


Image 46: Water Level Staff Gauge

Image 47: Stairway to water intake tower catwalk. Note deterioration in concrete

Image 48: Cracks and efflorescence at base of right side of stairway

AECOM Imagine it. Delivered.	PHOTOGRAPHIC LOG	
Client Name: The County Commissioners of Carroll County	**Site Location:** Sykesville, MD	**Project No.** Piney Run Dam No. 60614688

Image 49: Inside water intake structure, intake slide gate operators on right side. Note broken operator handle

Image 50: Close-up on one of the multiple slide gate operator's broken spoke

Image 51: Rate control piping butterfly valve operation

Image 52: Locked observation well, ASW outside slope

Image 53: Damage to observation well #9

Image 54: Damage to observation well #11