

October 24, 2025

Ms. Kendra Schiappa
Pennsylvania General Energy Company
120 Market Street
Warren, PA 16365

Dear Ms. Schiappa:

Subject: Geotechnical Report
Saluda Area Access Projects (Pad G)
Gamble and Cascade Townships, Lycoming County, Pennsylvania
CEC Project 334-659.0720

Civil & Environmental Consultants, Inc. (CEC) presents this geotechnical report for the staging area (Pad C) as part of the Saluda Area Access Projects located in Gamble and Cascade Townships, Lycoming County, Pennsylvania. The geotechnical investigation was performed, and this report was prepared in general accordance with CEC's proposal for Professional Engineering Services dated March 28, 2025. CEC received authorization from Pennsylvania General Energy Company (PGE) on April 1, 2025, prior to providing geotechnical engineering services.

This report presents CEC's opinions on the soil, bedrock, and groundwater conditions at the site and our conclusions and recommendations for earthwork and subgrade preparation.

1.0 SOILS AND GEOLOGY

1.1 Site Soils

The United States Department of Agriculture (USDA) web soil survey indicates that the near surface soils within the site limit of disturbance (LOD) consist of Clymer very stony silt loam (CnB), extremely stony Oquaga and Lordstown channery loams (OxE), and Wurtsboro very stony sandy loam (WxB). Parent materials for these soils are glacial till derived from sandstone, siltstone, and/or shale. According to this source the estimated depth to a restrictive feature (a layer that significantly impedes water, air, or root movement) is 20 to 60 inches.

1.2 Bedrock Geology

According to the Pennsylvania GEOlogic Data Exploration (PaGEODE) map, bedrock within the proposed Pad G LOD is sedimentary, belonging to the Huntley Mountain formation of Mississippian and Devonian age, and Burgoon Sandstone formation of Mississippian age. The Huntley Mountain Formation consists mostly of gray sandstone, with siltstone and shale. The Burgoon Sandstone formation is the upper part of the Mississippian Pocono Group, consisting of coarse-grained, cross-bedded sandstone that formed from ancient stream deposits.

1.3 Mining Conditions and Acid Producing Rock

According to the Pennsylvania Mine Map Atlas published by Pennsylvania Department of Environmental Protection (PADEP) and the Pennsylvania Spatial Data (PASDA), no surface or underground mining has occurred within or near the LOD. Additionally, the PADEP mine subsidence insurance map does not recommend mine subsidence insurance for the area within the LOD.

1.4 Karst Features

Based on PADEP's eMapPA, no documented surface depressions or sinkholes were identified within the LOD and the presence of carbonate bedrock (limestone, dolomite) is highly unlikely within the LOD resulting in low to very low risk for karstic features. According to the Pennsylvania Department of Conservation and Natural Resources (PADCNR) Bureau of Topographic and Geologic Survey publication, no karst features (depressions and/or sinkholes) have been identified within the proposed LOD.

2.0 SUBSURFACE INVESTIGATION AND LABORATORY TESTING

2.1 Subsurface Investigation

CEC subcontracted Test Boring Services, Inc. (TBS) to drill nine test borings, designated as GB-1 through GB-9 on July 24 through July 29, 2025. A total of approximately 109 feet of soil was sampled and 40 feet of bedrock was cored as part of the investigation. The locations of the borings are shown on the figures in Attachment B.

The test borings were performed using a track-mounted drill rig equipped with an automatic hammer. The soil zone was generally sampled at 3-foot centers using hollow-stem augers and split-spoon sampling in accordance with the standard penetration test (SPT) and ASTM D1586. A split-spoon sampler is a 2-inch outside-diameter (OD) tube, which is driven into the soil. The soil is captured in the split-spoon sampler, then removed, and identified. The SPT consists of driving the split-spoon sampler through the soil using a 140-pound hammer freely falling 30 inches. The number of blows required to drive the split-spoon sampler through four successive 6-inch increments is recorded. The sum of the number of blows required to drive the split-spoon sampler through the second and third increments is the N-value of the soil, which is used to estimate soil density and shear strength. CEC's project representative described the soil color, texture, apparent origin, apparent moisture content, and relative density or consistency of the split-spoon samples obtained during drilling. CEC defines refusal as the depth at which 50 blows, or more are required to drive the sampling spoon six inches or less.

The bedrock samples were generally obtained using a core barrel equipped with a diamond-tipped drill bit. During rock coring, water was introduced into the outer core barrel to cool and flush the cuttings away from the core bit. The rock cores were collected in an inner core barrel, retrieved with a wire line, and retained in core boxes. Rock recovery percentage, or the length of rock core recovered compared to the length of the core run, was measured. Rock Quality Designation (RQD), which is defined as the ratio of the sum of the rock core pieces greater than or equal to 4 inches, expressed as a percentage of a given total drilled length, was also measured. Rock recovery

and RQD percentage can be used to characterize and estimate the strength of the rock mass and excavation difficulty.

Detailed soil and rock descriptions, and other pertinent geotechnical information, including pocket penetrometer readings are presented on the test boring logs included in Attachment D. A summary of the definitions of standard terms and symbols used in this report is also included in Attachment D. A summary of pertinent subsurface data collected from the test borings is presented in Table 1, included in Attachment C.

2.2 Laboratory Testing Program

CEC subcontracted Geotechnical Testing Services Inc. (GTS) to perform laboratory testing on selected soil samples obtained during the subsurface investigation. The laboratory testing program included grain size distribution, Atterberg limits (plasticity), moisture content, and laboratory compaction (standard Proctor) tests. Attachment F includes the complete results for performed laboratory tests on selected samples. A summary of test results is included in Table 2 in Attachment C.

2.3 Water Level Measurements

Water level measurements were obtained from the test borings at the completion of soil sampling and approximately 24 hours after drilling, when possible. All of the test borings were observed to be dry at the completion of soil sampling. Water was present in the boreholes after rock coring ranging in depth from 3 to 5 feet. Water was introduced into the test borings to flush cuttings from the borehole during rock coring operations, therefore, the measurements obtained from test borings where rock coring was performed may not be indicative of actual groundwater conditions. Water level measurements were not obtained 24 hours after drilling. The water level measurements obtained from the test borings are summarized on Table 1 in Attachment C.

3.0 CONCLUSIONS

CEC presents the following conclusions based on the data obtained, our observations, analyses performed, and our previous experience on similar projects. The test borings performed at the site represent the subsurface conditions at the locations of the test borings at the time they were drilled. Conditions at other locations or at a different times may differ.

3.1 Topsoil Conditions

Topsoil is defined as surficial soil supporting vegetative growth with elevated concentrations (visually exceeding about 10 percent) of organic material. Topsoil was encountered in all borings except for Test Boring GB-5. Thickness of topsoil encountered across the borings ranged between 0.2 to 0.4 feet. The topsoil information recorded at the test boring locations was based on observations/measurements performed by CEC personnel at the time of drilling and may be interpreted differently by others. The topsoil thicknesses recorded should not be the only consideration when developing a volume (cubic yards) to be stripped by an earthwork contractor. It is generally not possible for a contractor to remove a consistent amount of material during stripping operations. Other factors can also impact the actual amount of material removed during stripping operations. CEC is not responsible for the final amount of material removed by the contractor.

Topsoil is generally compressible and contains organic materials that decompose over time. Topsoil is not suitable for reuse as new fill or to support new fills, foundations, or roads. The topsoil may be suitable for reuse in landscaping or re-vegetation applications. Testing the topsoil for fertility or landscaping suitability was not part of this investigation.

3.2 Glacial Till Conditions

Glacial till can be defined as a non-uniform soil deposited by and underneath a glacier, generally consisting of a heterogeneous, unstratified mixture of clay, sand, gravel, and boulders. Glacial till

was encountered in all test borings. The glacial till was encountered directly below topsoil and underlain by weathered rock. The thickness of glaciated till ranged from approximately 4 feet to 11 feet. Glacial till encountered during the investigation was predominantly coarse-grained consisting of silty sand, silty sand with gravel, well-graded gravel with sand, , and well-graded sand with gravel. Relative density of the coarse-grained glacial till ranged from very loose to very dense but was mostly medium dense, and was described at moist at the time of drilling.

Laboratory testing was conducted on six glacial till samples obtained from the test boring. Grain size analysis in accordance with ASTM D422 and Atterberg limits testing in accordance with ASTM D4318 were performed. According to the Unified Soil Classification System (USCS) soil samples were identified as clayey sand and clayey sand with gravel (SC), and poorly graded sand with clay and gravel (SP-SC). The percentage of fines ranges between 8% to 36% with an average of 26%. Atterberg limits testing resulted in liquid limits ranging from 24 to 48 with a plasticity index ranging from 8 to 22. Moisture content testing (ASTM D2116) results indicate that the natural moisture content of the selected samples varies from approximately 8% to 25%, averaging 16%. Standard Proctor (compaction) testing was performed on bulk samples obtained from Test Borings GB-2 and GB-3 resulting in optimum moisture contents (OMCs) of 12.7% and 11.7%, and maximum dry densities (MDDs) of 119.0 pounds per cubic foot (pcf) and 119.3 pcf, respectively.

Glacial till soils will be encountered during earthwork operations and are suitable for use as new fill provided they are placed and compacted in accordance with the recommendations presented in Section 4.1.2. The average moisture contents of the glacial till samples tested were below the OMCs of the standard Proctor result. Therefore, water may need to be added to materials to achieve proper compaction.

3.3 Weathered Rock Conditions

Weathered rock maintains relic structures of the parent bedrock but are soft enough to penetrate with a split-spoon sampler. CEC defines weathered rock as material which distinctly resembles

the parent bedrock and meets the following criteria described in Chapters 3 and 4 of the USDA (United States Department of Agriculture), Part 631, “Geology National Engineering Handbook” for classifying materials as rock.

- Cohesionless soil with an N-value greater than 50.
- Cohesive soil with an N-value greater than 30.
- Cohesive soil with a pocket penetrometer or unconfined compressive strength greater than 6.5 tons per square foot (tsf).

Weathered rock was encountered in all test borings except for GB-6 and GB-8, where the borings was terminated before reaching the weathered rock. Weathered rock will be encountered during earthwork to grade the site. The thickness of weathered rock ranged from approximately 0.2 to 4 feet. Weathered rock encountered consisted of weathered sandstone, which can likely be excavated using heavy earth moving equipment. Weathered rock is suitable for reuse as new fill if placed and compacted in accordance with the recommendations in Section 4.1.2.

3.4 Bedrock Conditions

The top of bedrock is defined by CEC as the depth at which 50 blows or more are required to drive the sampling spoon 6 inches or less. Bedrock was encountered in all test borings except for B-6j and B-8. The depth to bedrock ranged from approximately 5 to 11 feet. The elevation of the top of bedrock ranged from approximately 1534 to 1570 feet. The bedrock encountered in the test borings consisted of moderately to slightly weathered, moderately to very broken, soft to medium hard (predominantly medium hard) sandstone.

The rock quality designation (RQD) ranged from 0% to 66%, averaging 23%. The recovery ranged from 50% to 100%, averaging 85%. Bedrock descriptions, recoveries, and RQD values are shown on the test boring logs in Attachment D, along with the rock core photographs in Attachment E. Excavation of broken to very broken, medium hard bedrock will be required to grade Pad G in the

southeast corner of the pad near Test Boring GB-2. Due to the brokenness of this rock, heavy earthwork equipment may be capable of excavating and properly sizing this material. However, special rock removal techniques may be needed such as rippers or hydraulic hammers. The bedrock encountered is suitable to support moderate to heavy foundation loads and for reuse as new fill if placed and compacted in accordance with the recommendations in Section 4.1.2.

3.5 Groundwater Conditions

All test borings were found dry after the completion of soil sampling. However, borehole water was present after rock coring in Test Borings GB-2, GB-3, and GB-7. No 24-hour water level readings were taken, since the test borings were backfilled immediately after drilling. Groundwater conditions fluctuate based on precipitation, season, temperature, and other factors. CEC does not anticipate that groundwater will be encountered during construction. If groundwater is encountered, it can likely be controlled using diversion ditches, subsurface drains, and pumping.

3.6 Slope Stability

CEC analyzed the stability of the proposed cut and fill slopes at Cross Sections A, which was the critical section for the project, using Rocscience's Slide Version 7.0 software (Slide) and the minimum factor of safety (FS) was calculated using Spencer's method. A FS is commonly used to quantify the stability of a slope and is defined as the ratio of a slope's resisting forces to driving forces. Long-term/steady state conditions were analyzed using a target minimum factor of safety of 1.50. CEC concludes that the proposed site slopes will meet the required factor of safety if constructed in accordance with the recommendations presented in Section 4.1 and using the geotechnical treatments (fill foundation keys, bonding benches, and subsurface drains) shown on the figures in Attachment B.

4.0 RECOMMENDATIONS

CEC presents the following recommendations for earthwork and construction phase services. It is CEC's understanding that foundations and on-grade concrete slabs will not be utilized at the site. If needed, CEC can provide recommendations for foundation and on-grade concrete slab design. If the grading and/or other site conditions change from what is described herein, or if the subsurface conditions during construction differ from those indicated by our test borings, CEC must review the new information and determine if our conclusions and recommendations are applicable or if revisions are required. CEC stresses our continued involvement with the project during both the design and construction phases.

4.1 Site Development and Earthwork

4.1.1 Subgrade Preparation

New fill and pad subgrades should be cleared of any debris, organic matter, existing pavement, mud/wet material, and other deleterious or highly compressible materials. Proof-roll the subgrades at existing moisture contents before placing fill or pavement. Perform proof-rolling using a fully loaded triaxle or fully loaded off-road dump truck weighing at least 10 tons, or other suitable heavy equipment approved by CEC. If the subgrade displays excessive elasticity or deformation during the proof-roll (as determined by CEC), overexcavate the material and backfill with suitable fill material in accordance with Section 4.1.2. Excavate the subgrade to a depth where when backfilled will result in a passing proof-roll test as determined by a CEC representative. Immediately prior to fill placement, lightly scarify subgrade soils (or previously placed lift that was rolled with a smooth drum compactor) with tracked equipment or a padded drum soil compactor to increase the bond between the new fill and subgrade soils.

4.1.2 Fill Materials and Placement

Soil Fill Materials: Suitable soil fill consists of material classifying as GW, GP, GM, GC, SW, SP, SM, SC, ML, or CL according to the USCS. Fat clay or elastic silt (USCS classifications CH or MH) soil should not be used as fill unless blended with other suitable soils or activated lime or other approved drying agents. If the fill material is not within 3% of the optimum moisture content based on the standard proctor compaction test (ASTM D698), it should not be used as new fill or it should be moisture conditioned by wetting or drying as needed. Fill can be air dried, amended with activated lime or other approved drying agents, or mixed with dryer material as a means of reducing the moisture content. The fill should be free of carbonaceous, organic, or other deleterious materials. CEC recommends that all new fills needed to develop the site be constructed as controlled and well-compacted engineered fills to limit settlement.

Soil Fill Placement: Place suitable soil fill materials as controlled and well-compacted fills in loose lifts not exceeding 12-inches thick and with a maximum particle size of 10 inches. Each lift should be compacted with at least 5 passes using “heavy” compaction equipment. Fill material containing more than 10% fines should be compacted to at least 95% of the maximum dry density and within 3% of optimum moisture content as estimated by the standard proctor (ASTM D698) compaction test. Adjustments to soil moisture by wetting or drying should be made as needed. Padded drum compactors should be used to compact fine-grained fill material (silts and clays). Clean coarse-grained cohesionless soil containing less than 10% fines should be compacted with at least 5 passes using a 10-ton or heavier smooth-drum vibratory soil compactor and proof-rolled in accordance with Section 4.1.1. Soil fill should be compacted with a smooth-drum roller at the end of the workday to “seal” the fill and reduce the impact of precipitation. Scarify the fill surface prior to continuing fill placement. Do not place new fill over frozen, snow-covered, or saturated ground. CEC recommends using a reduced maximum loose lift thickness of 6-inches in areas where steel-plate tampers or other hand-operated equipment are used for compaction. A reduced maximum particle size of 4-inches should be used in areas where hand-operated compactors are being used.

Rock Fill: Rock fill is excavated bedrock that does not break down to meet the soil fill requirements. Rock fill should be placed in maximum 24-inch-thick loose lifts, be compacted with at least 5 passes using a 10-ton or heavier smooth-drum vibratory soil compactor, and proof-rolled in accordance with Section 4.1.1. Rock that does not break down to 24 inches or less during placement should not be incorporated into the fill. Rock may be mechanically reduced to the required size prior to placement. Do not dump rock fill in its final position; rather, distribute the rock fill by blading/dozing it into its final location along with an adequate amount of soil fill to minimize voids, pockets, and bridging. If hard rock is produced during excavation, it will need to be broken down and reduced in size to facilitate handling and placement or not incorporated into the fill. Neither boulders nor rock fill should be placed within 5 feet of proposed finished grade.

4.1.3 Quality Assurance and Testing

Prior to placement, perform grain size analysis (ASTM D422), Atterberg limits (ASTM D4318), natural moisture content (ASTM D2216), and standard proctor (ASTM D698) testing on new fill material to verify its suitability. As necessary, perform testing periodically during fill placement for each type of material used. Perform density and moisture content testing in accordance with ASTM D6938 on all new fill material placed at the site for every 10,000 square feet of fill placed at the site, with a minimum of two tests per lift. Also perform density and moisture testing every 100 linear feet along utility trenches (if applicable), with a minimum of one test per lift.

4.1.4 Temporary Excavations

All temporary cut slopes extending through glaciated till and residual soils including excavations for foundations should comply with applicable Occupational Safety and Health Administration (OSHA), federal, state, and local guidelines. Temporary excavations cut into existing soft or loose soils may require benching or flattening based on field observations to reduce the potential for temporary slope failures. The use of shoring or flattening of temporary excavations may be required for some materials. A competent person, as defined by OSHA, should evaluate all temporary excavations. CEC can provide services for temporary excavation evaluation if needed.

4.1.5 Weather Conditions

Soils more than 3 percent above their optimum moisture content cannot be properly placed as new fill and will need to be wasted, dried, or otherwise amended. If earthwork is performed during winter or spring months, or during inclement weather, proper fill compaction will be difficult, and the contractor should expect a reduction in productivity. Earthwork operations of this scope can be significantly affected by inclement weather and/or precipitation. If possible, CEC recommends performing earthwork during summer or early fall to reduce the impact of inclement weather.

4.2 Construction Phase Services

Geotechnical engineering is a two-phase process. The first phase includes a subsurface investigation, analysis, and preparation of a report presenting conclusions and recommendations. The second phase involves observing field subsurface conditions, verifying the geotechnical recommendations are appropriate, and confirming that the recommendations are properly implemented. The recommendations presented in this report are contingent on CEC observing:

- On-grade slab and shallow foundation subgrade conditions;
- Over-excavation, fill placement and compaction;
- Foundation construction; and
- Compliance with the geotechnical recommendations.

5.0 STANDARD OF CARE AND REPORT LIMITATIONS

This report was prepared for the purpose of design development. Reliance on this report by any party other than PGE or its authorized agents is expressly forbidden. Contractors should not rely on this report for purposes of bid development.

The services performed by CEC were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No warranty, express or implied, is made. Attachment A contains a document entitled "Important Information About This Geotechnical-Engineering Report". This document further explains the realities of geotechnical engineering and the limitations that exist in evaluating geotechnical issues. Furthermore, the information obtained from the test borings is localized; subsurface conditions could differ at other locations.

6.0 CLOSING REMARKS

CEC appreciates the opportunity to be of service to you on this project. Please contact us if you have any questions or comments.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.



Md Shams Razi Shopnil
Assistant Project Manager



Jonathan M. Niemiec, P.E.
Senior Project Manager

Attachments:

- Attachment A – Important Information about This Geotechnical Eng
- Attachment B – Figures
- Attachment C – Tables
- Attachment D – Test Boring Logs
- Attachment E – Rock Core Photographs
- Attachment F – Laboratory Test Results



ATTACHMENT A

**IMPORTANT INFORMATION ABOUT THIS
GEOTECHNICAL-ENGINEERING REPORT**

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



**GEOPROFESSIONAL
BUSINESS
ASSOCIATION**

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

ATTACHMENT B

FIGURES



N/F
COMMONWEALTH OF PENNSYLVANIA
14-500-001

RAISE FILL KEY DRAIN TO OUTLET
WITHIN LOD AS NEEDED (TYP.)

SOIL TYPE
BOUNDARY (TYP.)

REFERENCES

1. EXISTING CONTOURS DERIVED FROM A BARE-EARTH DIGITAL ELEVATION MODEL CONSTRUCTED FROM PAMAP LIDAR (LIGHT DETECTION AND RANGING) ELEVATION POINTS, TOPOGRAPHIC CONTOURS MAPPED AT AN INTERVAL OF 1 FOOT; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY, DATED 2020.
2. PROPERTY LINES FROM PUBLICLY AVAILABLE LYCOMING COUNTY PARCEL DATA, ACCESS 2023.
3. DCON NON-DEVELOPMENT AREAS TAKEN FROM SHAPEFILE TITLED "DCON_AO5C_Non_Development_Areas" PROVIDED BY PGE ON AUGUST 4, 2023.

LEGEND

-
- _____ EXISTING PROPERTY LINE
 - - - - - EXISTING TAX PARCEL LINE
 - - - - - 1200 EXISTING INDEX CONTOUR
 - - - - - EXISTING INTERMEDIATE CONTOUR
 - - - - - PROPOSED LIMIT OF DISTURBANCE
 - - - - - 1150 PROPOSED INDEX CONTOUR
 - - - - - PROPOSED INTERMEDIATE CONTOUR
 - - - - - PROPOSED EDGE OF ROAD
 - - - - - PROPOSED EDGE OF GRAVEL PAD
 - - - - - G PROPOSED GAS PIPELINE
 - - - - - PROPOSED CHANNEL
 (GB-1) TEST BORING LOCATION
 ■■■■■ PROPOSED FILL FOUNDATION KEY
 ○○○○○ PROPOSED OUTLET DRAIN

PROPOSED ACCESS ROAD ALIGNMENT AND STATIONING

PROPOSED STOCKPILE

WxB

SCALE IN FEET

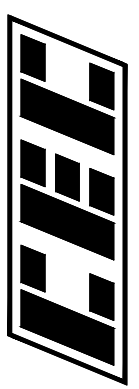
TEST BORING LOCATION PLAN

DRAWING NO.:

G902

DATE:	OCTOBER 2025	DRAWN BY:	BMV
DWG SCALE:	1" = 50'	CHECKED BY:	SS
PROJECT NO:	334-659		
APPROVED BY:	JMN		

PENNSYLVANIA GENERAL
ENERGY COMPANY, LLC
SALUDA ACCESS AREA-PAD G
GAMBLE TOWNSHIP
LYCOMING COUNTY, PENNSYLVANIA



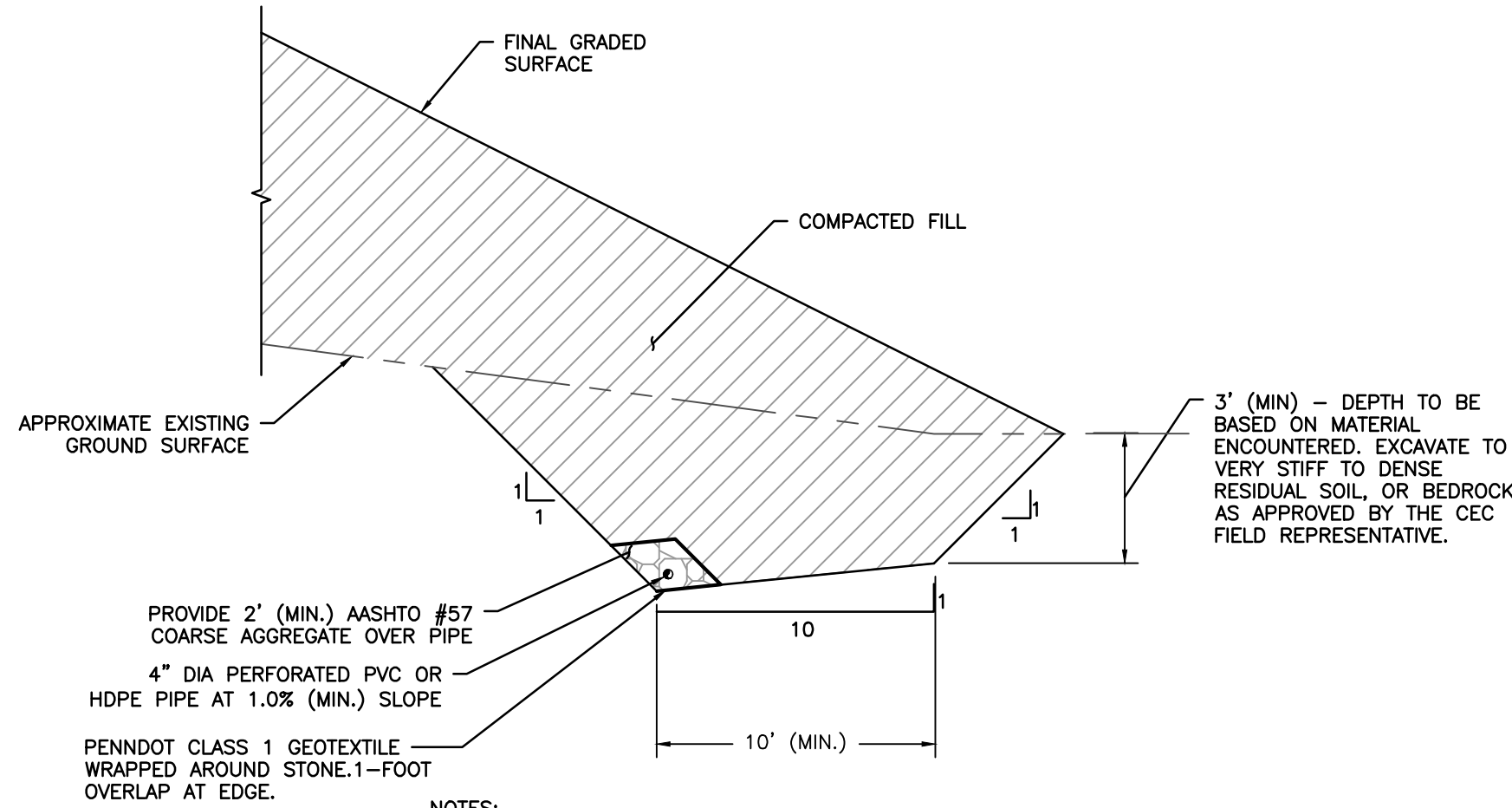
Civil & Environmental
Consultants, Inc.

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com

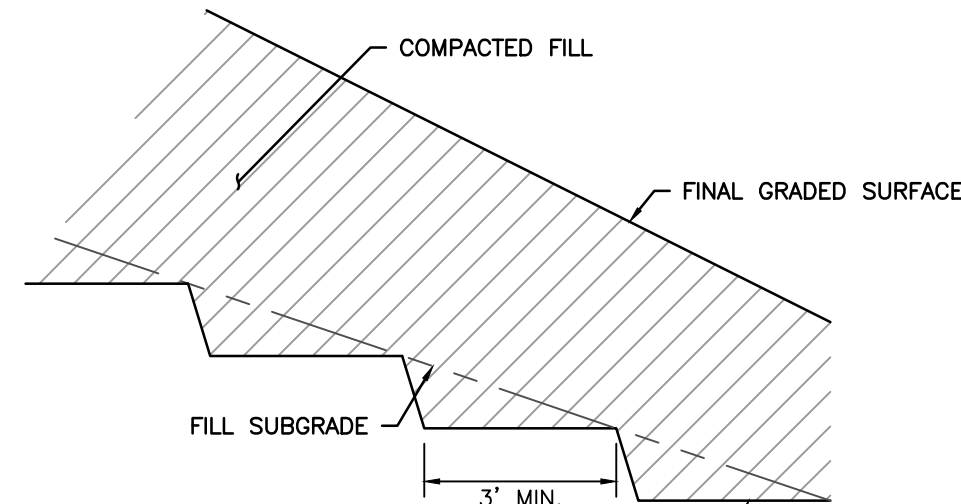
REVISION RECORD

[illegible]

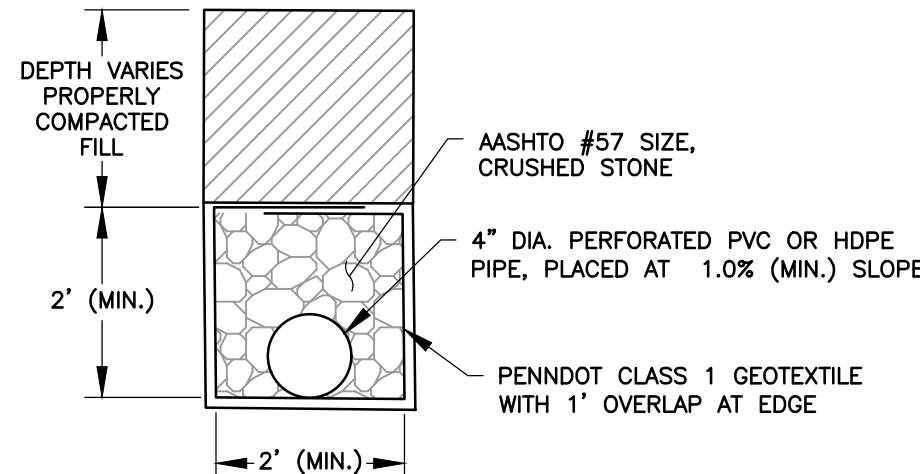
A:\300-0001\334-6591-CADD\dwg\0702-Pad 0134659-0702-0206.dwg(9/12/15)10/22/2025 - m.mahmud - LP: 10/24/2025 8:19 AM



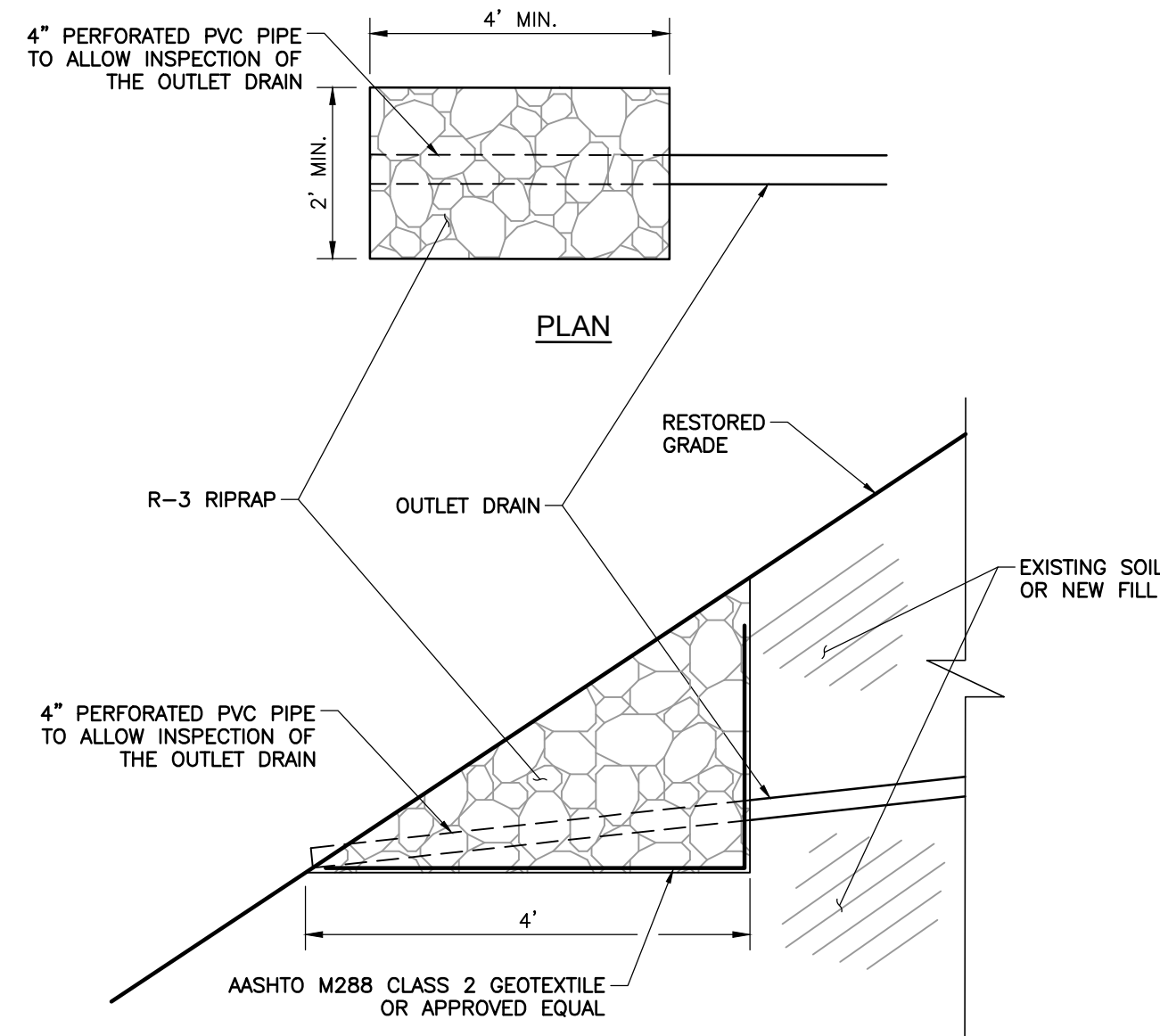
DETAIL 22
FILL FOUNDATION KEY
N.T.S



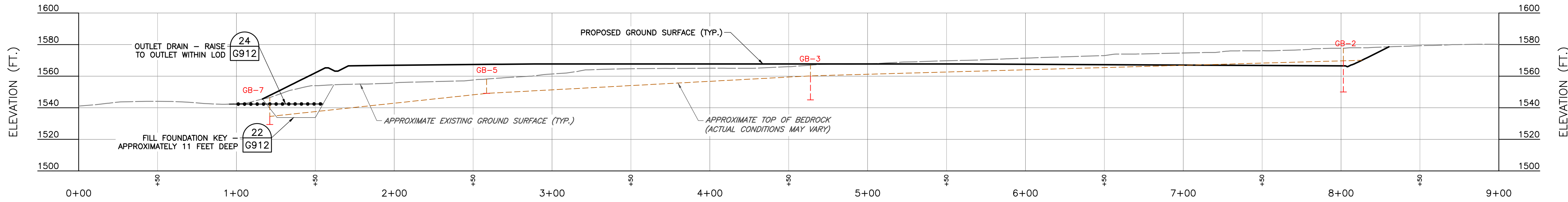
DETAIL 23
BONDING BENCH
N.T.S



DETAIL 24
OUTLET DRAIN/SUBSURFACE DRAIN
N.T.S



DETAIL 25
OUTLET DRAIN RIPRAP APRON
N.T.S



CROSS SECTION A-A
SCALE H:1"=40'; V:1"=40'
SCALE IN FEET

GEOLOGIC CONDITIONS

1. THE TEST BORING INFORMATION PRESENTED HEREIN DEPICTS SUBSURFACE CONDITIONS AT THE TEST BORING LOCATIONS AND AT THE TIME OF DRILLING. SOIL CONDITIONS AT OTHER LOCATIONS MAY DIFFER.
2. GEOLOGIC CORRELATIONS BETWEEN TEST BORINGS ARE GENERALLY BASED ON STRAIGHT-LINE INTERPOLATION. ACTUAL CONDITIONS BETWEEN TEST BORINGS MAY DIFFER.

NOTES

1. TEMPORARY EXCAVATIONS SHALL BE PERFORMED IN ACCORDANCE WITH OSHA REGULATIONS. CONTRACTOR IS RESPONSIBLE FOR STABILITY OF TEMPORARY EXCAVATIONS.

REVISION RECORD

NO.	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.ccecinc.com



PENNSYLVANIA GENERAL
ENERGY COMPANY, LLC
SALUDA ACCESS AREA-PAD G
GAMBLE TOWNSHIP
LYCOMING COUNTY, PENNSYLVANIA

**GEOTECHNICAL DETAILS AND
CROSS SECTIONS**

DRAWING NO.:

G912

DATE:	OCTOBER 2025	DRAWN BY:	BMV
DWG SCALE:	AS SHOWN	CHECKED BY:	SS
PROJECT NO.:	334-659	APPROVED BY:	JMN

ATTACHMENT C

TABLES

Table 1
Subsurface Investigation Summary

BORING INFORMATION			SOIL THICKNESS				BEDROCK THICKNESS		WATER LEVELS		
Test Boring	Existing Ground Elevation (ft)	Boring Depth (ft bgs)	Topsoil (ft)	Glacial Till (ft)	Weathered Rock Sampling (ft)	Soil Total (ft)	Bedrock Coring (ft)	Top of Bedrock Elevation (ft)	After Soil Sampling (ft bgs)	After Rock Coring (ft bgs)	After 24 Hours (ft bgs)
GB-1	1570.9	6.9	0.2	5.8	0.9	6.9	--	1564.0	Dry	--	Backfilled Immediately
GB-2	1575.0	25.0	0.2	4.3	0.8	5.3	19.7	1569.7	Dry	4.2	Backfilled Immediately
GB-3	1570.0	25.0	0.3	5.7	3.8	9.8	15.2	1560.2	Dry	5.2	Backfilled Immediately
GB-4	1563.3	5.4	0.2	4.8	0.4	5.4	--	1557.9	Dry	--	Backfilled Immediately
GB-5	1555.3	6.2	--	6.0	0.2	6.2	--	1549.1	Dry	--	Backfilled Immediately
GB-6	1544.7	11.0	0.3	10.7	--	11.0	--	--	Dry	--	Backfilled Immediately
GB-7	1545.7	16.3	0.4	10.7	0.2	11.3	5.0	1534.4	Dry	3.1	Backfilled Immediately
GB-8	1557.9	8.1	0.2	7.9	--	8.1	--	--	Dry	--	Backfilled Immediately
GB-9	1564.0	5.4	0.2	4.3	0.9	5.4	--	1558.6	Dry	--	Backfilled Immediately
Total	--	109.3				69.4	39.9	--	--		--

Table 2
Laboratory Testing Summary

BORING INFORMATION				SOIL CLASSIFICATION							SOIL DENSITY AND STRENGTH	
Test Boring	Sample #ID	Sample Depth (ft bgs)	Sample Origin	USCS Classification or (Visual Description)	USCS Group Symbol (Visual)	Moisture Content (%)	% Passing No. 200 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Dry Density ⁽¹⁾ (pcf)	Optimum Moisture Content ⁽¹⁾ (%)
GB-1	SS-1	0-1.5	Glacial Till	Clayey Sand with Gravel	SC	23.2	26.5	39	25	14	--	--
GB-2	Bulk-1	0-5.3	Glacial Till	Clayey Sand	SC	9.0	35.2	29	18	11	119.0	12.7
GB-3	Bulk-1	0-5.0	Glacial Till	Clayey Sand	SC	7.9	36.0	24	16	8	119.3	11.7
GB-4	SS-1	0-1.5	Glacial Till	Poorly-graded Sand with Clay and Gravel	SP-SC	20.5	8.0	46	27	19	--	--
GB-6	SS-3	6-7.5	Glacial Till	Clayey Sand	SC	25.3	23.7	48	26	22	--	--
GB-7	SS-1/SS-2	0-4.5	Glacial Till	Clayey Sand with Gravel	SC	8.0	23.5	26	17	9	--	--
Average		--	--	--	--	15.7	25.5	35	22	14	119.2	12.2

Notes:

1. Optimum moisture content and maximum dry density based on standard Proctor test (ASTM D698)

ATTACHMENT D

TEST BORING LOGS

Rock Types

Rock Name	Characteristics	Symbol
Claystone	Clay sized particles that are consolidated, lacking fissility.	
Coal	Black and shiny, can break into cubes or conchoidally.	
Conglomerate	Gravel sized grains and larger held together by finer material, called a breccia if clasts are angular.	
Limestone	Effervescences w/ diluted HCl, can be composed of clay up to gravel particles (fossils).	
Sandstone	Primarily sand sized particles modified w/ the descriptor fine, medium, or coarse.	
Shale	Clay sized particles, shale has fissility which is a horizontal sheet-like or laminated feature.	
Siltstone	Composed of silt, normally breaks as irregular chunks.	

Rock Quality Descriptions

Weathering

Completely Weathered: All rock material is decomposed and/or disintegrated. The original rock structure may still be intact.

Highly Weathered: More than half of the rock material is decomposed. Fresh rock is present only as a discontinuous framework or as corestones.

Moderately Weathered: Less than half of the rock material is decomposed. Fresh rock is present at a discontinuous framework or as corestones.

Slightly Weathered: Discoloration or staining indicates weathering of rock material on discontinuity surfaces. Rock may be discolored and softened.

Fresh: No visible signs of rock material weathering.

RQD

Descriptor	%
Very Poor	<25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	>90

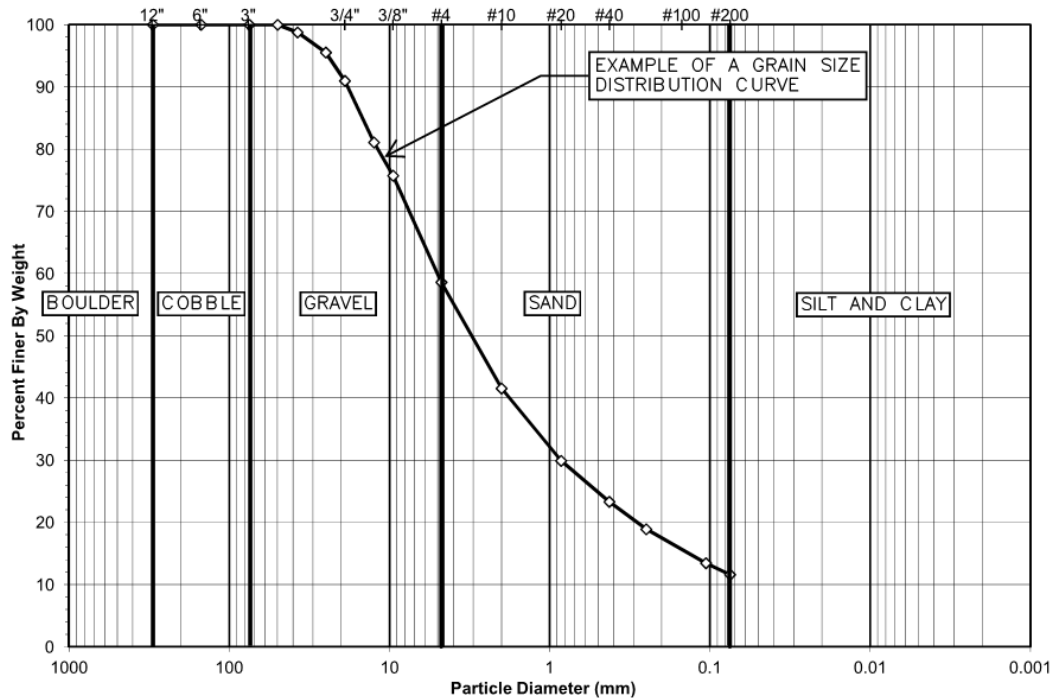
Brokenness

Descriptor	Fracture Spacing (in & ft)
Very Broken	<1 (<0.08)
Broken	1-3 (0.08-0.25)
Moderately Broken	3-6 (0.25-0.5)
Slightly Broken	>6 (>0.5)

Rock Hardness

Descriptor	Field Criterion	Relative Unconfined Compressive Strength
Very Hard	Difficult to break w/ Hammer	> 30,000 psi
Hard	Hand-held sample breaks w/ Hammer	8,000 to 30,000 psi
Medium Hard	Cannot scrape surface w/ knife	2,000 to 8,000 psi
Soft	Cutting or scraping w/ knife difficult	500 to 2,000 psi
Very Soft	Can be cut w/ knife	< 500 psi

Grain Size Distribution Curve



UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS
(more than 50% of material is larger than No. 200 sieve size.)

GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	GW	Clean Gravels (Less than 5% fines)
	GP	Well-graded gravels, gravel-sand mixtures, little or no fines
	GM	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	GC	Gravels with fines (More than 12% fines)
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Silty gravels, gravel-sand-silt mixtures
	SP	Clayey gravels, gravel-sand-clay mixtures
	SM	Clean Sands (Less than 5% fines)
	SC	Well-graded sands, gravelly sands, little or no fines
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SP	Poorly graded sands, gravelly sands, little or no fines
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
	SC	Clayey sands, sand-clay mixtures

SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Clean Sands (Less than 5% fines)
	SP	Well-graded sands, gravelly sands, little or no fines
	SM	Poorly graded sands, gravelly sands, little or no fines
	SC	Silty sands, sand-silt mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SP	Clayey sands, sand-clay mixtures
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
	SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS
(50% or more of material is smaller than No. 200 sieve size.)

SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
	PT	Peat and other highly organic soils
	PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

$$C_u = \frac{D_{60}}{D_{10}} \text{ greater than } 4; C_c = \frac{D_{30}}{D_{10} \times D_{60}} \text{ between } 1 \text{ and } 3$$

GP Not meeting all gradation requirements for GW

GM Atterberg limits below "A" line or P.I. less than 4
GC Atterberg limits above "A" line with P.I. greater than 7

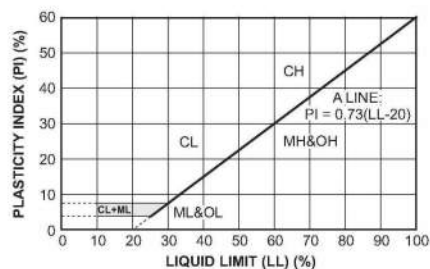
$$C_u = \frac{D_{60}}{D_{10}} \text{ greater than } 4; C_c = \frac{D_{30}}{D_{10} \times D_{60}} \text{ between } 1 \text{ and } 3$$

SP Not meeting all gradation requirements for GW

SM Atterberg limits below "A" line or P.I. less than 4
SC Atterberg limits above "A" line with P.I. greater than 7

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:
Less than 5 percent GW, GP, SW, SP
More than 12 percent GM, GC, SM, SC
5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART



Glossary

Alluvial Soil or Alluvium: Soil deposited by water in a river, stream, floodplain, or delta.

Bedrock: Materials underlying soil or other unconsolidated surficial materials in which refusal is consistently encountered on lithified, undisturbed, natural bedrock.

Colluvial Soil or Colluvium: Incoherent soil on or at the base of a slope deposited by gravity or slope movement.

Fill: Soil derived from natural soil, rock, or processed materials that was placed by artificial methods, such as construction, waste disposal, or dumping.

Glacial Outwash: Soil, typically sand and gravel, deposited by glacial streams or meltwater in a preexisting valley or over a plain.

Glacial Till: Soil deposited by and underneath a glacier, generally consisting of a heterogeneous, unstratified mixture of clay, sand, gravel, and boulders.

N-Value: The blow count representation of the penetration resistance of the soil determined by the Standard Penetration Test (SPT). It is the sum of the number of blows required to drive the sampler the second and third 6-inch increments (sample depth interval of 6 to 18 inches) and is recorded in blows per foot (bpf). The N-value is considered to be an indication of the relative density of coarse-grained soils (sand and gravel) or consistency of fine-grained soils (silt and clay).

Pocket Pen (PP): Field penetration test performed using a hand-held penetrometer that estimates unconfined compressive strength of cohesive soil in tons per square foot (tsf).

Recovery %: Total length of rock core or soil sample retrieved divided by the total length of the core run or sample interval, expressed as a percentage.

Refusal: The depth at which greater than 50 SPT hammer blows are required to drive the sampling spoon 6 inches or less.

Residual Soil or Residuum: Soil derived from the physical or chemical weathering of the underlying parent bedrock, generally with N-values less than 30 and 50 bpf in cohesive and cohesionless materials, respectively.

Rock Quality Designation (RQD): The sum of the length of intact rock core pieces longer than 4 inches (excluding mechanical breaks) divided by the total length of the core run, expressed as a percentage.

Shelby Tube: A 2" to 3" diameter, thin walled sampling tube that is pushed into the soil to obtain a relatively undisturbed soil sample for geotechnical laboratory tests.

Split Spoon Sampler: A soil sampling tube which is driven, retrieved, and split-open lengthwise for removal and visual inspection, and testing of the soil obtained.

Standard Penetration Test (SPT) ASTM D1586 : Field penetration test consisting of driving a 2-inch outside diameter split-spoon sampler 18 inches using a 140-pound hammer free falling a distance of 30 inches. The number of blows required to advance the spoon through successive 6-inch increments is recorded to determine the N-value.

Weathered Rock: Materials derived from lithified, undisturbed, natural bedrock which are able to be sampled with a split-spoon. Cohesive and cohesionless materials generally have N-values greater than 30 and 50 bpf, respectively.

N-Value Rating

Fine-Grained Soils

Consistency	Blows/ft	PP (tsf)
Very Soft	0-2	<0.25
Soft	3-4	0.25-0.5
Medium Stiff	5-8	0.5-1
Stiff	9-15	1-2
Very Stiff	16-32	2-4
Hard	>32	>4

Coarse-Grained Soils

Relative Density	Blows/ft
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

Unconsolidated Material

Term	Grain Size in mm (in)	Approximate Example Size
Clay and Silt	<.075	can't see grains to barely visible
Fine Sand	0.075-0.4	table salt to sugar
Med. Sand	0.4-2.0 (~<1/16)	openings in a window screen
Coarse Sand	2.0-4.75 (~1/16-1/8)	sidewalk salt
Gravel	4.75-75 (~1/8-3)	pea to tennis ball
Cobble	75-300 (3-12)	tennis ball to basketball
Boulder	>300 (>12)	larger than a basketball

Other Features – Used to describe other identifiable, pertinent features (e.g., angularity of coarse-grained soils, organics, construction debris, etc.)

Term	%
Trace	< 5
Few	5-15
Some	15-45

Moisture Content

Dry: Sample is dusty or obviously dry.
Moist: Anything that does not fit the definition of dry or wet.
Wet: Sample contains free water.



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Definitions of Standard
Terms and Symbols

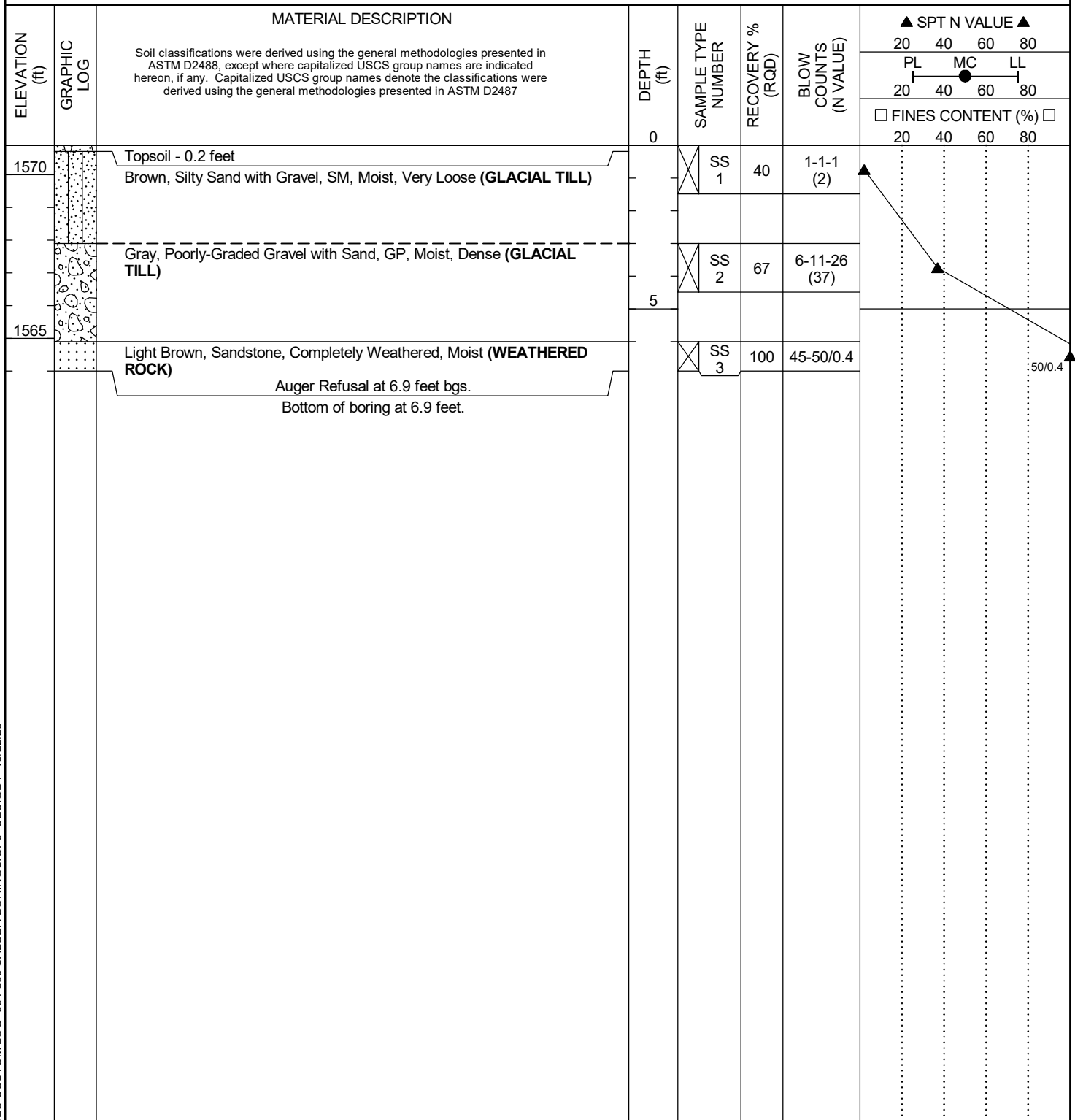


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700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-1

PAGE 1 OF 1

CLIENT	Pennsylvania General Energy Company	PROJECT NAME	Saluda Access Area
PROJECT NUMBER	334-659	PROJECT LOCATION	Gamble and Cascade Townships, Pennsylvania
DATE STARTED	7/29/25	COMPLETED	7/29/25
GROUND ELEVATION	1570.9 ft	BACKFILL	Auger Cuttings
SOIL SAMPLING CONTRACTOR	Test Boring Services, Inc.	WATER LEVELS:	
SOIL SAMPLING METHOD	HSA, SPT, and NQ-Core	AT END OF SOIL SAMPLING	--- / Dry
CEC REP	JGW	CHECKED BY	SRS
AT END OF CORING	--- / Not Applicable		
NOTES	Elevation estimated from existing topography.	24hrs AFTER DRILLING	--- / Backfilled Immediately





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700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-2

PAGE 1 OF 1

CLIENT Pennsylvania General Energy Company

PROJECT NAME Saluda Access Area

PROJECT NUMBER 334-659

PROJECT LOCATION Gamble and Cascade Townships, Pennsylvania

DATE STARTED 7/29/25

COMPLETED 7/29/25

GROUND ELEVATION 1575 ft

BACKFILL Auger Cuttings

SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.

WATER LEVELS:

SOIL SAMPLING METHOD HSA, SPT, and NQ-Core

AT END OF SOIL SAMPLING --- / Dry

CEC REP JGW

CHECKED BY SRS

▼ AT END OF CORING 4.2 ft / Elev 1570.8 ft

NOTES Elevation estimated from existing topography.

24hrs AFTER DRILLING --- / Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲			
							20	40	60	80
1575		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487					PL	MC	LL	
							20	40	60	80
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
		Topsoil - 0.2 feet	0	SS 1	27	1-1-1 (2)				
		Brown, Silty Sand, SM, Moist, Very Loose (GLACIAL TILL)								
		Bulk sample collected from approximately 0 to 5.3 feet bgs.								
		Light Brown, Poorly-Graded Gravel with Sand, GP, Moist, Dense (GLACIAL TILL)		SS 2	100	14-11-21 (32)				
1570		Brownish White, Sandstone, Completely Weathered, Moist (WEATHERED ROCK)	5	SS 3	100	34-50/0.3				50/0.3
		Auger Refusal at 5.3 feet								
		Reddish Brown, Sandstone, Moderately Weathered To Highly Weathered, Very Broken To Moderately Broken, Medium Hard		NQ 1	90 (0)					
1565			10							
		Gray, Sandstone, Slightly Weathered To Moderately Weathered, Very Broken To Broken, Medium Hard		NQ 2	100 (0)					
1560			15							
		Gray, Sandstone, Fresh To Slightly Weathered, Broken To Slightly Broken, Medium Hard		NQ 3	100 (48)					
1555			20							
				NQ 4	89 (66)					
1550			25							
		Bottom of boring at 25.0 feet.								

CEC CUSTOM LOG 334-659 SALUDA BORINGS.GPJ CEC.GDT 10/22/25



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Moon Township, PA 15108

BORING NUMBER GB-4

PAGE 1 OF 1

CLIENT Pennsylvania General Energy Company

PROJECT NAME Saluda Access Area

PROJECT NUMBER 334-659

PROJECT LOCATION Gamble and Cascade Townships, Pennsylvania

DATE STARTED 7/28/25

COMPLETED 7/28/25

GROUND ELEVATION 1563.3 ft

BACKFILL Auger Cuttings

SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.

WATER LEVELS:

SOIL SAMPLING METHOD HSA & SPT

AT END OF SOIL SAMPLING --- / Dry

CEC REP JGW

CHECKED BY SRS

AT END OF CORING --- / Not Applicable

NOTES Elevation estimated from existing topography.

24hrs AFTER DRILLING --- / Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 20 40 60 80 □ FINES CONTENT (%) □ 20 40 60 80			
		Topsoil - 0.2 feet	0	SS 1	40	2-2-4 (6)				
1560		Brown, Poorly-Graded Sand with Gravel, SP, Moist, Loose (GLACIAL TILL)								
		White To Brown, Well-Graded Gravel with Sand, GW, Moist, Very Dense (GLACIAL TILL)	5	SS 2	100	35-39-50/0.3				50/0.3
		Brownish White, Sandstone, Completely Weathered, Moist (WEATHERED ROCK)		SS 3	100	50/0.4				50/0.4
		Bottom of boring at 5.4 feet.								

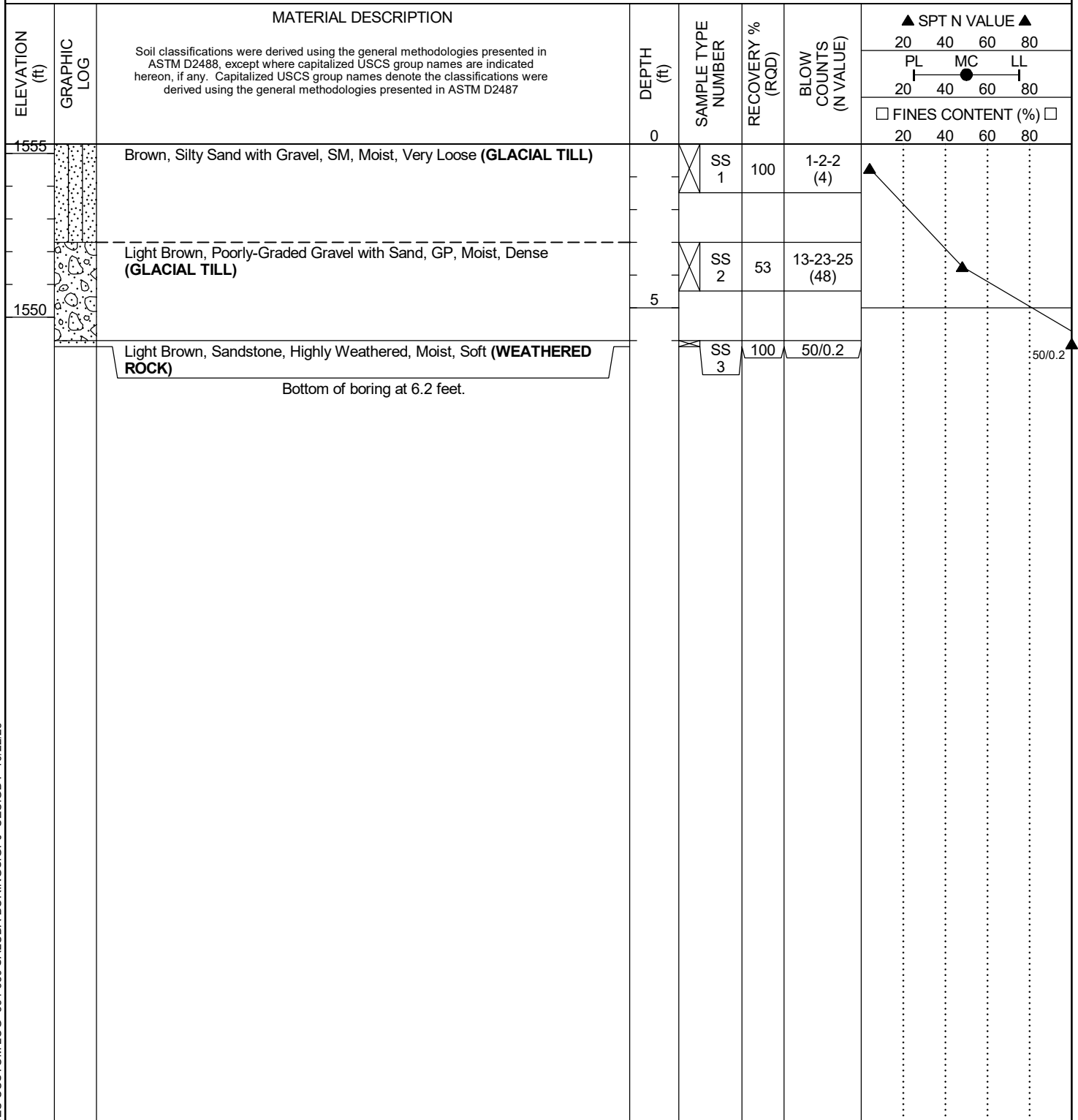


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Moon Township, PA 15108

BORING NUMBER GB-5

PAGE 1 OF 1

CLIENT	Pennsylvania General Energy Company	PROJECT NAME	Saluda Access Area
PROJECT NUMBER	334-659	PROJECT LOCATION	Gamble and Cascade Townships, Pennsylvania
DATE STARTED	7/25/25	COMPLETED	7/25/25
GROUND ELEVATION	1555.3 ft	BACKFILL	Auger Cuttings
SOIL SAMPLING CONTRACTOR	Test Boring Services, Inc.	WATER LEVELS:	
SOIL SAMPLING METHOD	HSA & SPT	AT END OF SOIL SAMPLING	--- / Dry
CEC REP	JGW	CHECKED BY	SRS
NOTES	Elevation estimated from existing topography.		
		AT END OF CORING	--- / Not Applicable
		24hrs AFTER DRILLING	--- / Backfilled Immediately





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700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-6

PAGE 1 OF 1

CLIENT Pennsylvania General Energy Company

PROJECT NAME Saluda Access Area

PROJECT NUMBER 334-659

PROJECT LOCATION Gamble and Cascade Townships, Pennsylvania

DATE STARTED 7/24/25

COMPLETED 7/24/25

GROUND ELEVATION 1544.7 ft

BACKFILL Auger Cuttings

SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.

WATER LEVELS:

SOIL SAMPLING METHOD HSA & SPT

AT END OF SOIL SAMPLING --- / Dry

CEC REP JGW

CHECKED BY SRS

AT END OF CORING --- / Not Applicable

NOTES Elevation estimated from existing topography.

AFTER DRILLING ---

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
								20	40	60	80
								□ FINES CONTENT (%) □			
								20	40	60	80
		Topsoil - 0.3 feet	0	SS 1	67	1-1-2 (3)					
1540		Brown, Silty Sand with Gravel, SM, Moist, Very Loose (GLACIAL TILL)									
		Light Brown To Brown, Poorly-Graded Sand with Gravel, SP, Moist, Medium Dense (GLACIAL TILL)	5	SS 2	67	6-14-12 (26)					
		Brown, Sandy Lean Clay with Gravel, CL, Moist, Stiff (GLACIAL TILL)		SS 3	100	6-5-6 (11)	2.25				
1535		White To Brown, Poorly-Graded Gravel with Sand, GP, Moist, Very Dense (GLACIAL TILL)	10	SS 4	93	12-24-32 (56)					
		Auger Refusal at 11 feet bgs. Bottom of boring at 11.0 feet.									



Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-7

PAGE 1 OF 1

CLIENT Pennsylvania General Energy Company

PROJECT NAME Saluda Access Area

PROJECT NUMBER 334-659

PROJECT LOCATION Gamble and Cascade Townships, Pennsylvania

DATE STARTED 7/25/25

COMPLETED 7/25/25

GROUND ELEVATION 1545.7 ft

BACKFILL Auger Cuttings

SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.

WATER LEVELS:

SOIL SAMPLING METHOD HSA, SPT, and NQ-Core

AT END OF SOIL SAMPLING --- / Dry

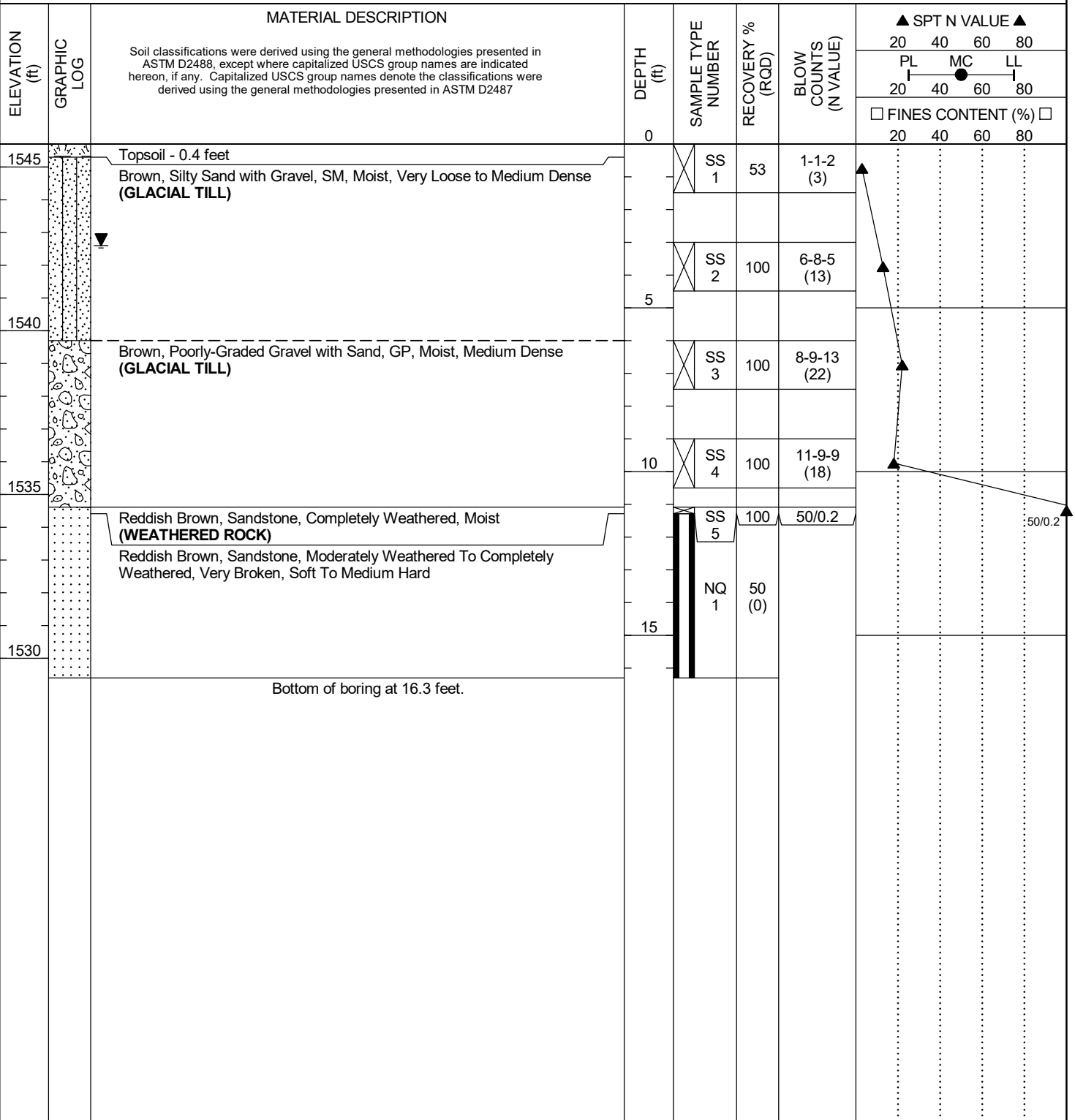
CEC REP JGW

CHECKED BY SRS

AT END OF CORING 3.1 ft / Elev 1542.6 ft

NOTES Elevation estimated from existing topography.

24hrs AFTER DRILLING --- / Backfilled Immediately





Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-8

PAGE 1 OF 1

CLIENT	Pennsylvania General Energy Company	PROJECT NAME	Saluda Access Area
PROJECT NUMBER	334-659	PROJECT LOCATION	Gamble and Cascade Townships, Pennsylvania
DATE STARTED	7/25/25	COMPLETED	7/25/25
GROUND ELEVATION	1557.9 ft	BACKFILL	Auger Cuttings
SOIL SAMPLING CONTRACTOR	Test Boring Services, Inc.	WATER LEVELS:	
SOIL SAMPLING METHOD	HSA & SPT	AT END OF SOIL SAMPLING	--- / Dry
CEC REP	JGW	CHECKED BY	SRS
AT END OF CORING	--- / Not Applicable	24hrs AFTER DRILLING	--- / Backfilled Immediately
NOTES	Elevation estimated from existing topography.		

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲			
							20	40	60	80
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487					PL	MC	LL	
							20	40	60	80
							□ FINES CONTENT (%) □			
							20	40	60	80
		Topsoil - 0.2 feet	0	SS 1	40	1-3-3 (6)				
1555		Gray And Brown, Poorly-Graded Gravel with Silt and Sand, GP-GM, Moist, Loose (GLACIAL TILL)								
		White To Brown, Silty Sand with Gravel, SM, Moist, Dense to Very Dense (GLACIAL TILL)	5	SS 2	100	22-20-27 (47)				
1550				SS 3	100	33-39-43 (82)				
		Auger Refusal at 8.1 feet bgs. Bottom of boring at 8.1 feet.								



Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER GB-9

PAGE 1 OF 1

CLIENT	Pennsylvania General Energy Company	PROJECT NAME	Saluda Access Area
PROJECT NUMBER	334-659	PROJECT LOCATION	Gamble and Cascade Townships, Pennsylvania
DATE STARTED	7/28/25	COMPLETED	7/28/25
GROUND ELEVATION	1564 ft	BACKFILL	Auger Cuttings
SOIL SAMPLING CONTRACTOR	Test Boring Services, Inc.	WATER LEVELS:	
SOIL SAMPLING METHOD	HSA & SPT	AT END OF SOIL SAMPLING	--- / Dry
CEC REP	JGW	CHECKED BY	SRS
AT END OF CORING	--- / Not Applicable	24hrs AFTER DRILLING	--- / Backfilled Immediately
NOTES	Elevation estimated from existing topography.		

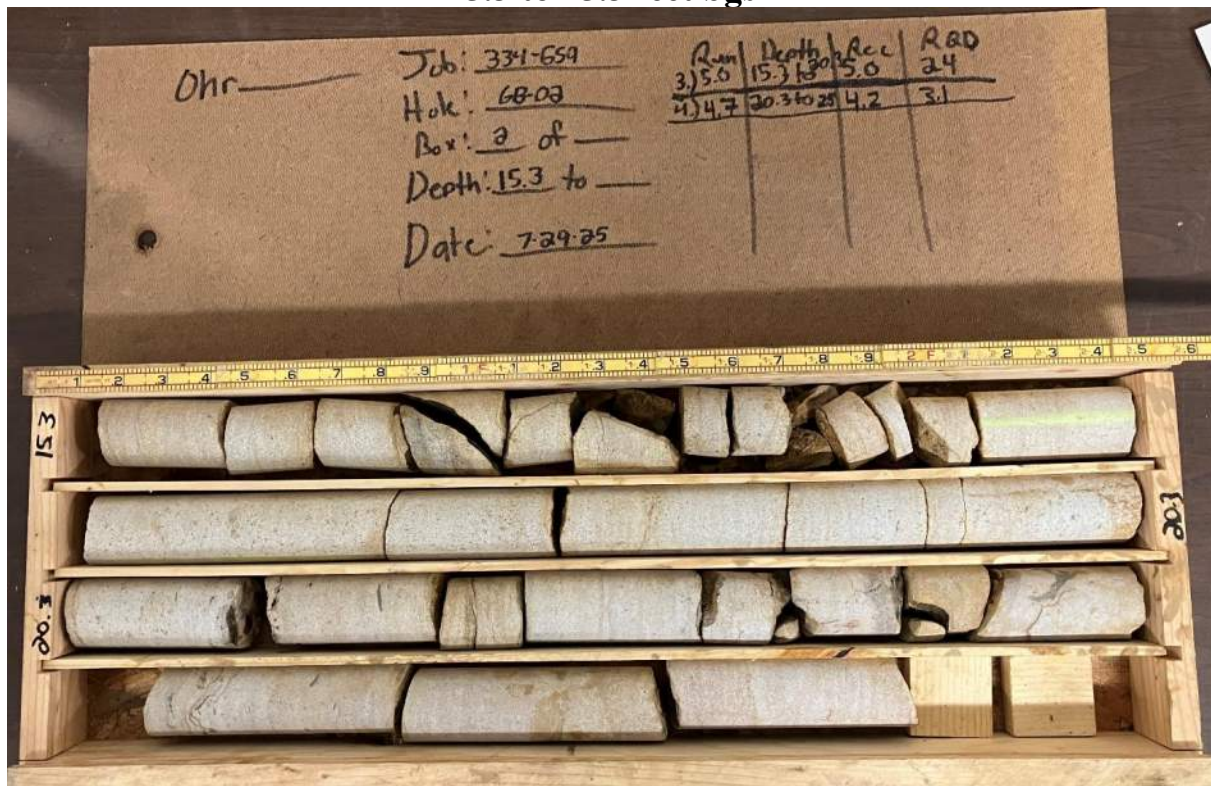
ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲			
							20	40	60	80
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487					PL	MC	LL	
			0				20	40	60	80
		Topsoil - 0.2 feet		SS 1	53	1-1-2 (3)				
		Brown, Silty Sand with Gravel, SM, Moist, Very Loose (GLACIAL TILL)								
1560		White To Brown, Well-Graded Gravel with Sand, GW, Moist, Very Dense (GLACIAL TILL)		SS 2	100	25-47-44 (91)				
		Reddish White, Sandstone, Completely Weathered, Moist (WEATHERED ROCK)	5	SS 3	100	15-50/0.4				
		Auger Refusal at 5.4 feet bgs. Bottom of boring at 5.4 feet.								50/0.4

ATTACHMENT E

ROCK CORE PHOTOGRAPHS



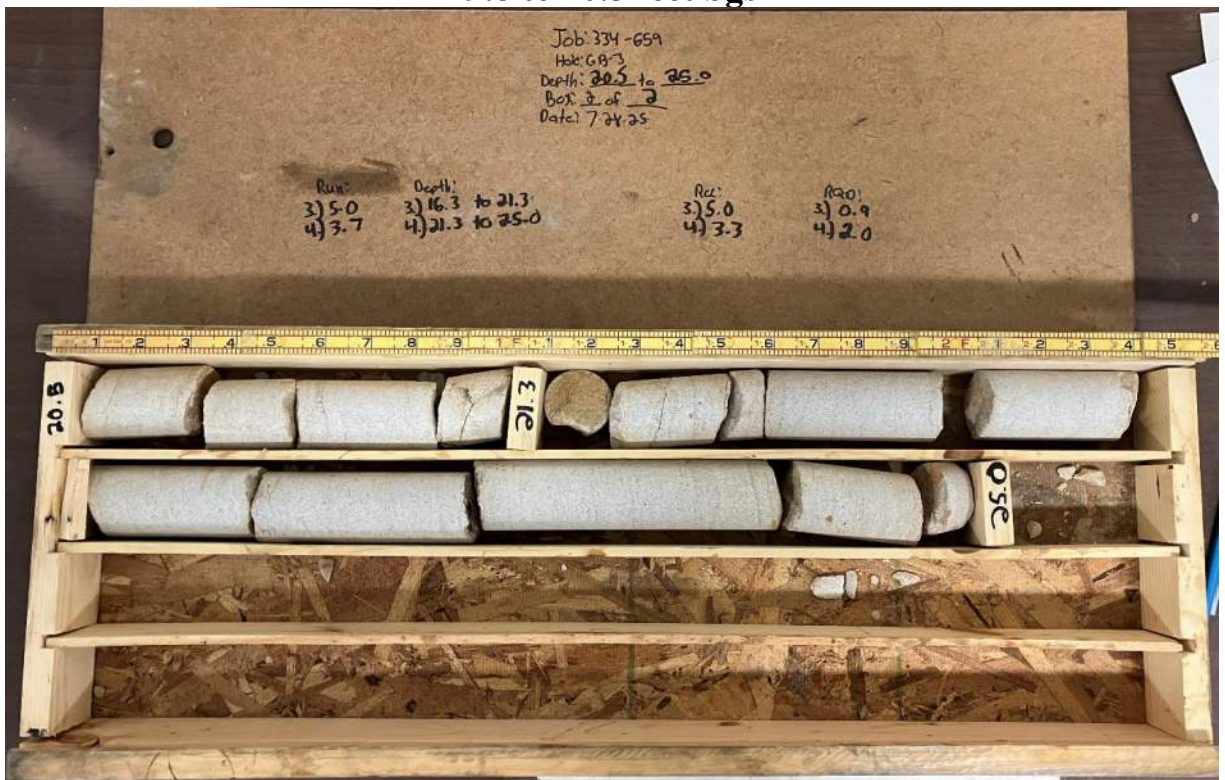
Test Boring GB-02 (Box 1 of 2)
5.3 to 15.3 feet bgs



Test Boring GB-02 (Box 2 of 2)
15.3 to 25.0 feet bgs



Test Boring GB-3 (Box 1 of 2)
9.8 to 20.5 feet bgs



Test Boring GB-3 (Box 2 of 2)
20.5 to 25.0 feet bgs



Test Boring GB-7 (Box 1 of 1)
11.3 to 16.3 feet bgs

ATTACHMENT F

LABORATORY TEST RESULTS

PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

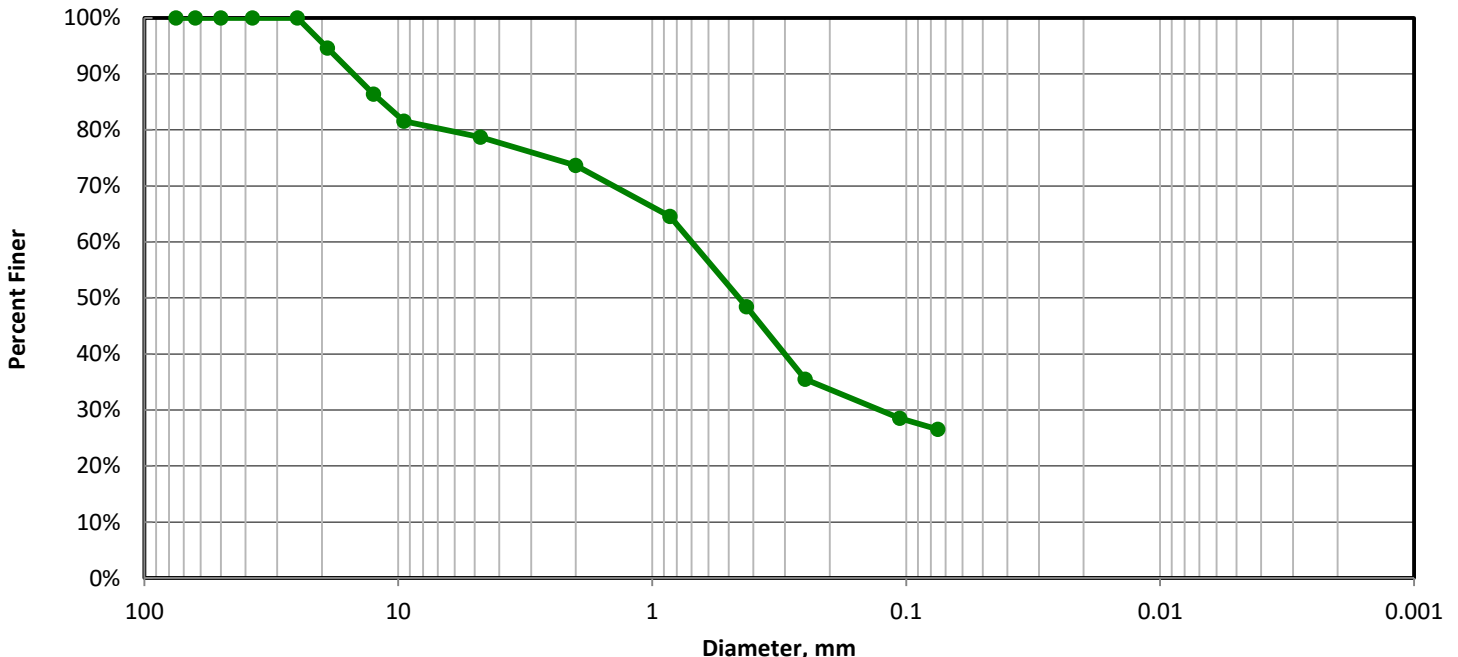
Boring GB-1
 Depth 0.0' - 1.5'
 Sample SS-1
 Lab Sample 25-04815-05

Sample Color: **BROWN**
 USCS Group Name: **CLAYEY SAND WITH GRAVEL**
 USCS Group Symbol: **SC**

USDA: **NA** AASHTO: **A-2-6 (0)**

MECHANICAL SIEVE						
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized % Retained	Project Specifications
Total Sample Wet Wt, gm (-3")	217.89	No. 4	3"	75	0	0.0%
Sample Split on Sieve	No. 4					100.0%
Coarse Washed Dry Sample, gm	39		2-1/2"	63	0	0.0%
Wet Wt Passing Split, gm	179		2"	50	0	0.0%
Dry Wt. Passing Split, gm	145		1-1/2"	37.5	0	0.0%
Total Sample Dry Wt, gm	184		1"	25	0	0.0%
			3/4"	19	9.95	5.4%
			1/2"	12.5	15.11	8.2%
			3/8"	9.5	8.93	4.8%
			No. 4	4.75	5.24	2.8%
			No. 10	2	3.19	5.0%
			No. 20	0.85	5.79	9.1%
			No. 40	0.425	10.24	16.1%
			No. 60	0.25	8.21	12.9%
			No. 140	0.106	4.43	7.0%
			No. 200	0.075	1.25	2.0%

USCS SOIL CLASSIFICATION				USCS Description			
Corrected For 100% Passing a 3" Sieve				CLAYEY SAND WITH GRAVEL			
% Gravel (-3" & + #4)	21.3	Silt=NA	Clay=NA	USCS Group Symbol			
Coarse=5.4; Fine=15.9		D60, mm	NA	Atterberg Limits Group Symbol			
% Sand (-#4 & + #200)	52.2	D30, mm	NA	CL - LEAN CLAY			
Coarse=5; Medium=25.3; Fine=21.9		D10, mm	NA	Auxiliary Information			
% Fines (-#200)	26.5	Cc	NA	12" Sieve - 300 mm	Wt Ret, gm	% Retained	% Finer
% Plus #200 (-3")	73.5	Cu	NA	6" Sieve - 150 mm	0	0.0	100.0
				3" Sieve - 75 mm	0	0.0	100.0



Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested:10/1/25

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-1
 Depth 0.0' - 1.5'
 Sample SS-1
 Lab Sample 25-04815-05

Soil Description: BROWN LEAN CLAY
 (-#40 Fraction)

AS-RECEIVED W.C.		SAMPLE SUMMARY	
Tare Number	213	Liquid Limit (LL), %	39
Wt. Tare & WS, gm	240.31	Plastic Limit (PL), %	25
Wt. Tare & DS, gm	228.71	Plasticity Index (PI)	14
Wt. Tare, gm	178.76	USCS Group Symbol (-#40 Fraction)	CL
Water Content, %	23.2	USCS Group Name (-#40 Fraction)	LEAN CLAY
		Sample Color:	BROWN
PLASTIC LIMIT		LIQUID LIMIT	
Points Run	1 Point		1 Point
Tare Number	458		414
Wt. Tare & WS, gm	19.72		17.62
Wt. Tare & DS, gm	17.92		15.71
Wt. Tare, gm	10.84		10.75
Water Content, %	25.4		38.5
		# of Blows	26
		1pt adj. WC	38.7
PLASTICITY CHART		FLOW CURVE	

Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested: 10/1/25

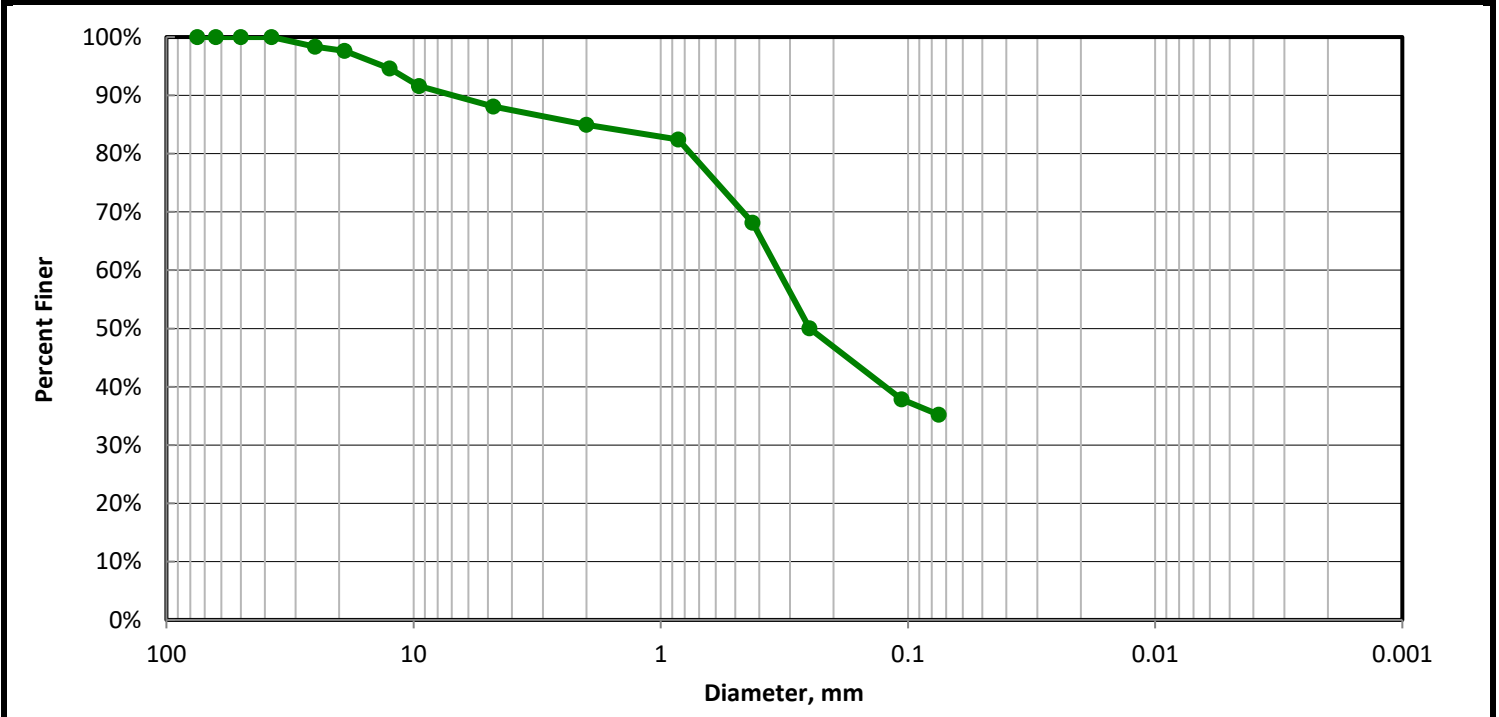
PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client	Civil & Environmental Consultants, Inc	Boring	GB-2
Client Project	334-659.0613 Saluda	Depth	0.0' - 5.0'
Project No.	25-04815	Sample	Bulk-1
		Lab Sample	25-04815-16

Sample Color:	BROWN		
USCS Group Name:	CLAYEY SAND		
USCS Group Symbol:	SC	USDA:	NA
		AASHTO:	A-6 (0)

MECHANICAL SIEVE						
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized	
					% Retained	% Finer
Total Sample Wet Wt, gm (-3")	15752.00	3"	75	0	0.0%	100.0%
Sample Split on Sieve	3/4"	2-1/2"	63	0	0.0%	100.0%
Coarse Washed Dry Sample, gm	345	2"	50	0	0.0%	100.0%
Wet Wt Passing Split, gm	15407	1-1/2"	37.5	0	0.0%	100.0%
Dry Wt. Passing Split, gm	14135	1"	25	240.64	1.7%	98.3%
Total Sample Dry Wt, gm	14480	3/4"	19	104.47	0.7%	97.6%
Split Sample - Passing 3/4"		1/2"	12.5	16.29	3.0%	94.6%
Tare No.	203	3/8"	9.5	16.21	3.0%	91.6%
Tare + WS., gm	752.10	No. 4	4.75	19.02	3.5%	88.1%
Tare + DS., gm	704.66	No. 10	2	17.01	3.2%	84.9%
Tare, gm	177.60	No. 20	0.85	13.65	2.5%	82.4%
Water Content of Split Sample	9.0%	No. 40	0.425	76.81	14.2%	68.2%
Wt. of DS., gm	527.06	No. 60	0.25	97.86	18.1%	50.0%
		No. 140	0.106	65.86	12.2%	37.8%
Wt. of + #200 Sample, gm	336.99	No. 200	0.075	14.28	2.6%	35.2%

USCS SOIL CLASSIFICATION				USCS Description			
Corrected For 100% Passing a 3" Sieve				CLAYEY SAND			
% Gravel (-3" & + #4)	11.9	Silt=NA	Clay=NA	USCS Group Symbol	Atterberg Limits Group Symbol		
Coarse=2.4; Fine=9.5		D60, mm	NA	SC	CL - LEAN CLAY		
% Sand (-#4 & + #200)	52.9	D30, mm	NA	Auxiliary Information	Wt Ret, gm	% Retained	% Finer
Coarse=3.2; Medium=16.8; Fine=33		D10, mm	NA	12" Sieve - 300 mm	0	0.0	100.0
% Fines (-#200)	35.2	Cc	NA	6" Sieve - 150 mm	0	0.0	100.0
% Plus #200 (-3")	64.8	Cu	NA	3" Sieve - 75 mm	0	0.0	100.0

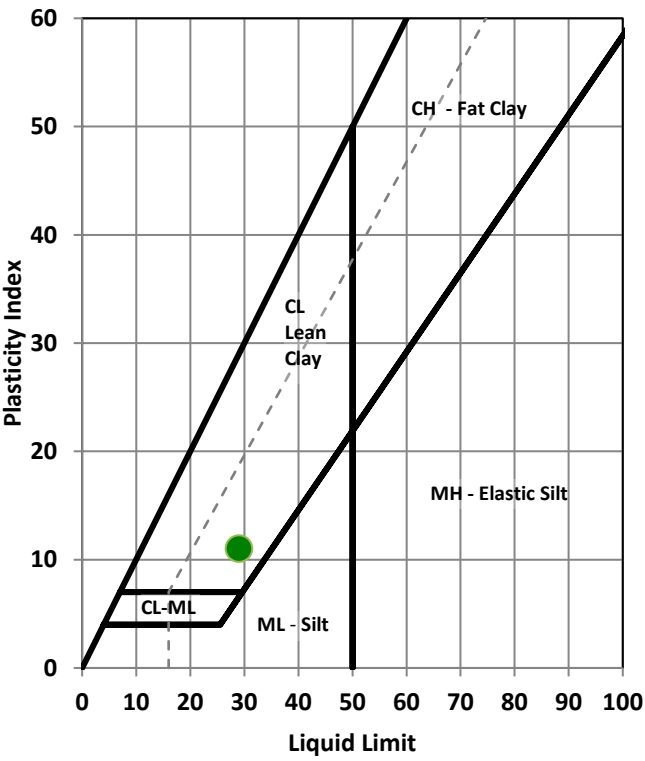
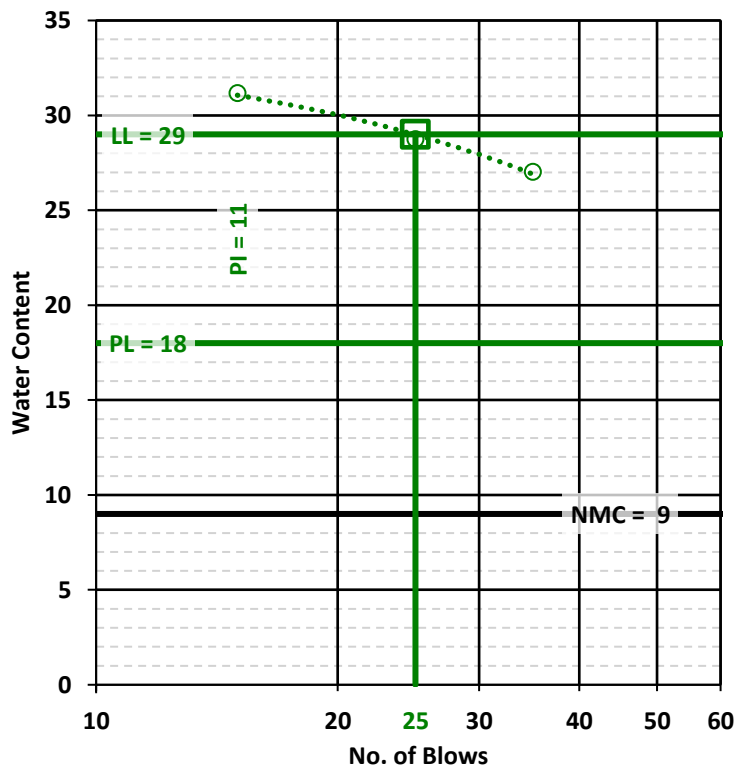


LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-2
 Depth 0.0' - 5.0'
 Sample Bulk-1
 Lab Sample 25-04815-16

Soil Description: BROWN LEAN CLAY
 (-#40 Fraction)

AS-RECEIVED W.C.				SAMPLE SUMMARY			
Tare Number 203				Liquid Limit (LL), % 29			
Wt. Tare & WS, gm 752.10				Plastic Limit (PL), % 18			
Wt. Tare & DS, gm 704.66				Plasticity Index (PI) 11			
Wt. Tare, gm 177.60				USCS Group Symbol (-#40 Fraction) CL			
Water Content, % 9.0				USCS Group Name (-#40 Fraction) LEAN CLAY			
				Sample Color: BROWN			
PLASTIC LIMIT				LIQUID LIMIT			
Points Run 3 Points				3 Points			
Tare Number	325	711	301		510	508	707
Wt. Tare & WS, gm	22.63	20.60	23.62		16.48	16.96	17.93
Wt. Tare & DS, gm	20.91	19.19	21.76		15.13	15.58	16.76
Wt. Tare, gm	11.48	11.45	11.53		10.80	10.78	12.43
Water Content, %	18.2	18.2	18.2		31.2	28.8	27.0
				# of Blows	15	25	35
PLASTICITY CHART				FLOW CURVE			
							

Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested: 10/2/25

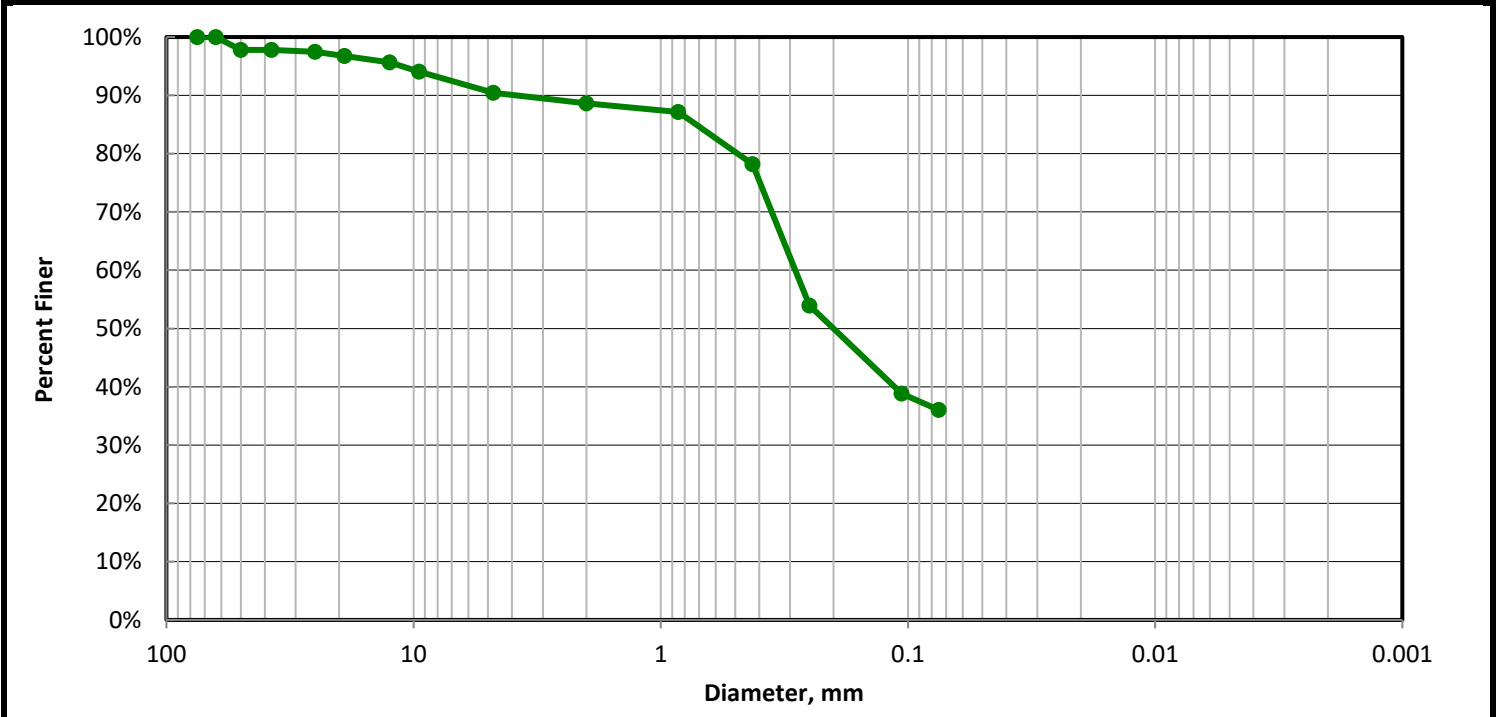
PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client	Civil & Environmental Consultants, Inc	Boring	GB-3
Client Project	334-659.0613 Saluda	Depth	0.0' - 5.0'
Project No.	25-04815	Sample	Bulk-1
		Lab Sample	25-04815-17

Sample Color:	LIGHT BROWN		
USCS Group Name:	CLAYEY SAND		
USCS Group Symbol:	SC	USDA:	NA
		AASHTO:	A-4 (0)

MECHANICAL SIEVE						
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized	
					% Retained	% Finer
Total Sample Wet Wt, gm (-3")	9644.00	3"	75	0	0.0%	100.0%
Sample Split on Sieve	3/4"	2-1/2"	63	0	0.0%	100.0%
Coarse Washed Dry Sample, gm	290	2"	50	199.75	2.2%	97.8%
Wet Wt Passing Split, gm	9354	1-1/2"	37.5	0	0.0%	97.8%
Dry Wt. Passing Split, gm	8669	1"	25	28.93	0.3%	97.4%
Total Sample Dry Wt, gm	8959	3/4"	19	61.64	0.7%	96.8%
Split Sample - Passing 3/4"		1/2"	12.5	8.52	1.1%	95.7%
Tare No.	893	3/8"	9.5	12.58	1.6%	94.1%
Tare + WS., gm	1010.10	No. 4	4.75	28.91	3.7%	90.4%
Tare + DS., gm	949.88	No. 10	2	14.24	1.8%	88.6%
Tare, gm	187.60	No. 20	0.85	11.32	1.4%	87.2%
Water Content of Split Sample	7.9%	No. 40	0.425	70.61	9.0%	78.2%
Wt. of DS., gm	762.28	No. 60	0.25	191.04	24.2%	54.0%
		No. 140	0.106	119.08	15.1%	38.8%
Wt. of + #200 Sample, gm	478.53	No. 200	0.075	22.23	2.8%	36.0%

USCS SOIL CLASSIFICATION				USCS Description			
Corrected For 100% Passing a 3" Sieve				CLAYEY SAND			
% Gravel (-3" & + #4)	9.6	Silt=NA	Clay=NA	USCS Group Symbol	Atterberg Limits Group Symbol		
Coarse=3.2; Fine=6.3		D60, mm	NA	SC	CL - LEAN CLAY		
% Sand (-#4 & + #200)	54.4	D30, mm	NA	Auxiliary Information	Wt Ret, gm	% Retained	% Finer
Coarse=1.8; Medium=10.4; Fine=42.2		D10, mm	NA	12" Sieve - 300 mm	0	0.0	100.0
% Fines (-#200)	36.0	Cc	NA	6" Sieve - 150 mm	0	0.0	100.0
% Plus #200 (-3")	64.0	Cu	NA	3" Sieve - 75 mm	0	0.0	100.0

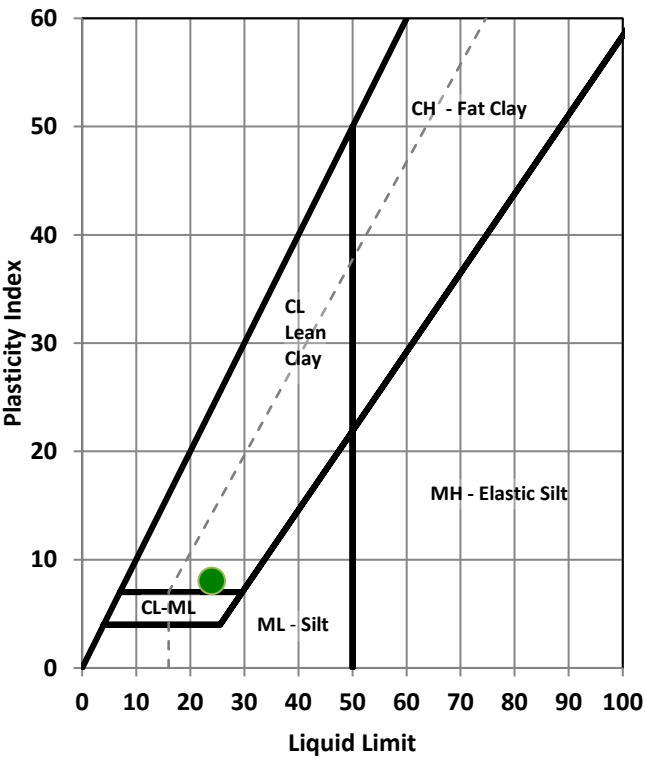
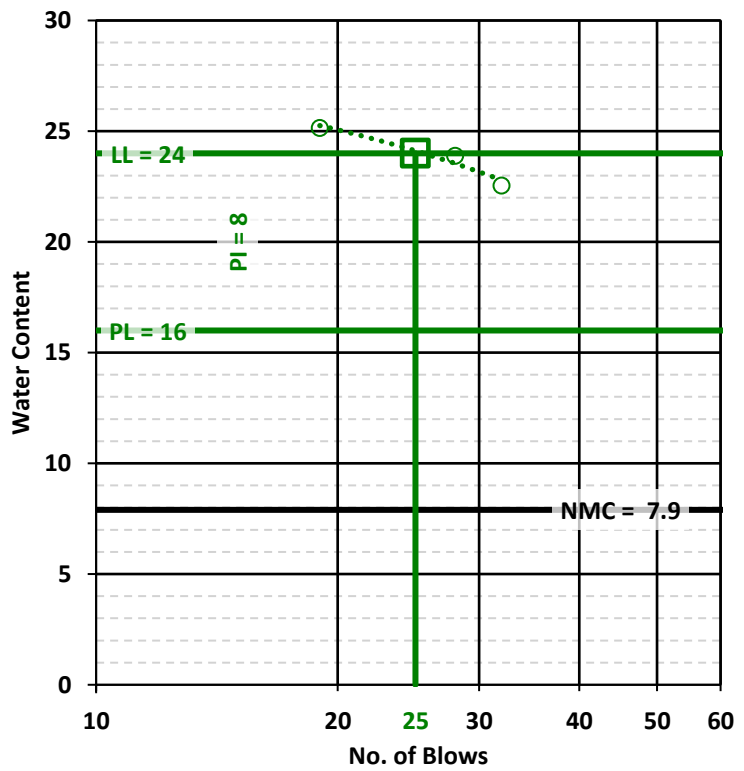


LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-3
 Depth 0.0' - 5.0'
 Sample Bulk-1
 Lab Sample 25-04815-17

Soil Description: LIGHT BROWN LEAN CLAY
 (-#40 Fraction)

AS-RECEIVED W.C.				SAMPLE SUMMARY			
Tare Number 893				Liquid Limit (LL), % 24			
Wt. Tare & WS, gm 1010.10				Plastic Limit (PL), % 16			
Wt. Tare & DS, gm 949.88				Plasticity Index (PI) 8			
Wt. Tare, gm 187.60				USCS Group Symbol (-#40 Fraction) CL			
Water Content, % 7.9				USCS Group Name (-#40 Fraction) LEAN CLAY			
				Sample Color: LIGHT BROWN			
PLASTIC LIMIT				LIQUID LIMIT			
Points Run 3 Points				3 Points			
Tare Number	345	708	498		500	316	348
Wt. Tare & WS, gm	19.57	23.20	22.11		17.25	17.15	16.84
Wt. Tare & DS, gm	18.45	21.73	20.55		15.95	16.02	15.76
Wt. Tare, gm	11.34	12.48	10.70		10.78	11.29	10.97
Water Content, %	15.8	15.9	15.8		25.1	23.9	22.5
				# of Blows	19	28	32
PLASTICITY CHART				FLOW CURVE			
							

Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested: 10/2/25

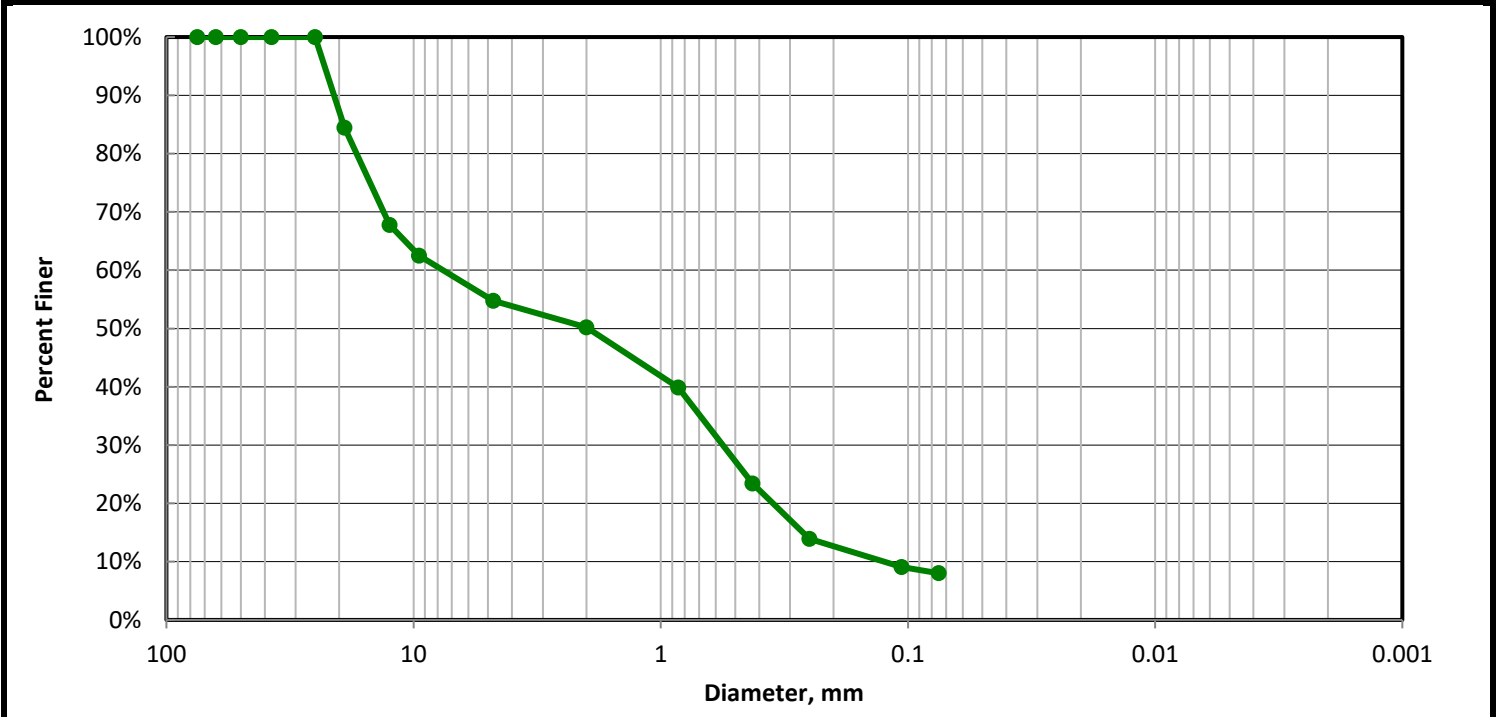
PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client	Civil & Environmental Consultants, Inc	Boring	GB-4
Client Project	334-659.0613 Saluda	Depth	0.0' - 1.5'
Project No.	25-04815	Sample	SS-1
		Lab Sample	25-04815-06

Sample Color:	BROWN		
USCS Group Name:	POORLY GRADED SAND WITH CLAY AND GRAVEL		
USCS Group Symbol:	SP-SC	USDA:	NA
		AASHTO:	A-2-7 (0)

MECHANICAL SIEVE							
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized		Project Specifications
Total Sample Wet Wt, gm (-3")	254.10	3"	75	0	% Retained	% Finer	
Sample Split on Sieve	No. 4	2-1/2"	63	0	0.0%	100.0%	
Coarse Washed Dry Sample, gm	103	2"	50	0	0.0%	100.0%	
Wet Wt Passing Split, gm	151	1-1/2"	37.5	0	0.0%	100.0%	
Dry Wt. Passing Split, gm	125	1"	25	0	0.0%	100.0%	
Total Sample Dry Wt, gm	229	3/4"	19	35.52	15.5%	84.5%	
Split Sample - Passing No. 4		1/2"	12.5	38.16	16.7%	67.8%	
Tare No.	210	3/8"	9.5	12.03	5.3%	62.5%	
Tare + WS., gm	244.35	No. 4	4.75	17.64	7.7%	54.8%	
Tare + DS., gm	233.68	No. 10	2	4.37	4.6%	50.2%	
Tare, gm	181.51	No. 20	0.85	9.82	10.3%	39.9%	
Water Content of Split Sample	20.5%	No. 40	0.425	15.68	16.5%	23.4%	
Wt. of DS., gm	52.17	No. 60	0.25	9.04	9.5%	13.9%	
		No. 140	0.106	4.60	4.8%	9.1%	
Wt. of +#200 Sample, gm	44.54	No. 200	0.075	1.03	1.1%	8.0%	

USCS SOIL CLASSIFICATION				USCS Description			
Corrected For 100% Passing a 3" Sieve				POORLY GRADED SAND WITH CLAY AND GRAVEL			
% Gravel (-3" & + #4)	45.2	Silt=NA Clay=NA		USCS Group Symbol	Atterberg Limits Group Symbol		
Coarse=15.5; Fine=29.7		D60, mm	7.60	SP-SC	CL - LEAN CLAY		
% Sand (-#4 & + #200)	46.8	D30, mm	0.56	Auxiliary Information		Wt Ret, gm	% Retained
Coarse=4.6; Medium=26.8; Fine=15.4		D10, mm	0.13	12" Sieve - 300 mm		0	0.0
% Fines (-#200)	8.0	Cc	0.33	6" Sieve - 150 mm		0	0.0
% Plus #200 (-3")	92.0	Cu	60.98	3" Sieve - 75 mm		0	0.0

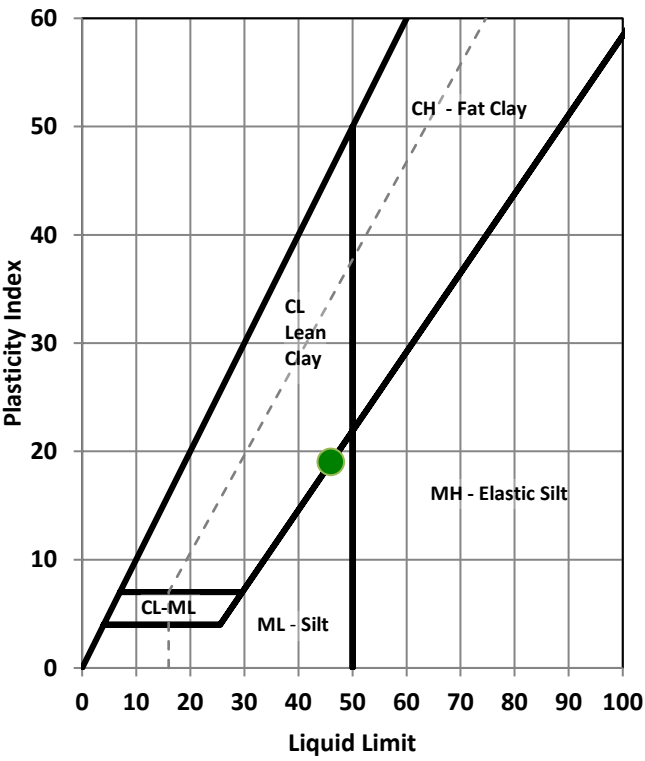
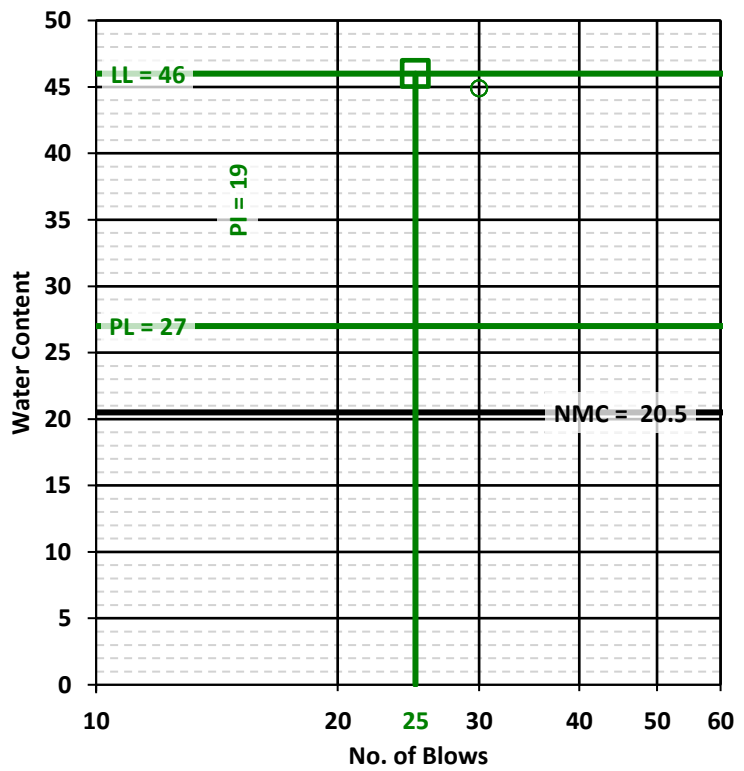


LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-4
 Depth 0.0' - 1.5'
 Sample SS-1
 Lab Sample 25-04815-06

Soil Description: BROWN LEAN CLAY
 (-#40 Fraction)

AS-RECEIVED W.C.		SAMPLE SUMMARY	
Tare Number	210	Liquid Limit (LL), %	46
Wt. Tare & WS, gm	244.35	Plastic Limit (PL), %	27
Wt. Tare & DS, gm	233.68	Plasticity Index (PI)	19
Wt. Tare, gm	181.51	USCS Group Symbol (-#40 Fraction)	CL
Water Content, %	20.5	USCS Group Name (-#40 Fraction)	LEAN CLAY
		Sample Color:	BROWN
PLASTIC LIMIT		LIQUID LIMIT	
Points Run	1 Point		1 Point
Tare Number	427		493
Wt. Tare & WS, gm	17.27		16.29
Wt. Tare & DS, gm	15.89		14.57
Wt. Tare, gm	10.82		10.74
Water Content, %	27.2		44.9
		# of Blows	30
		1pt adj. WC	45.9
PLASTICITY CHART		FLOW CURVE	
			

Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested: 10/1/25

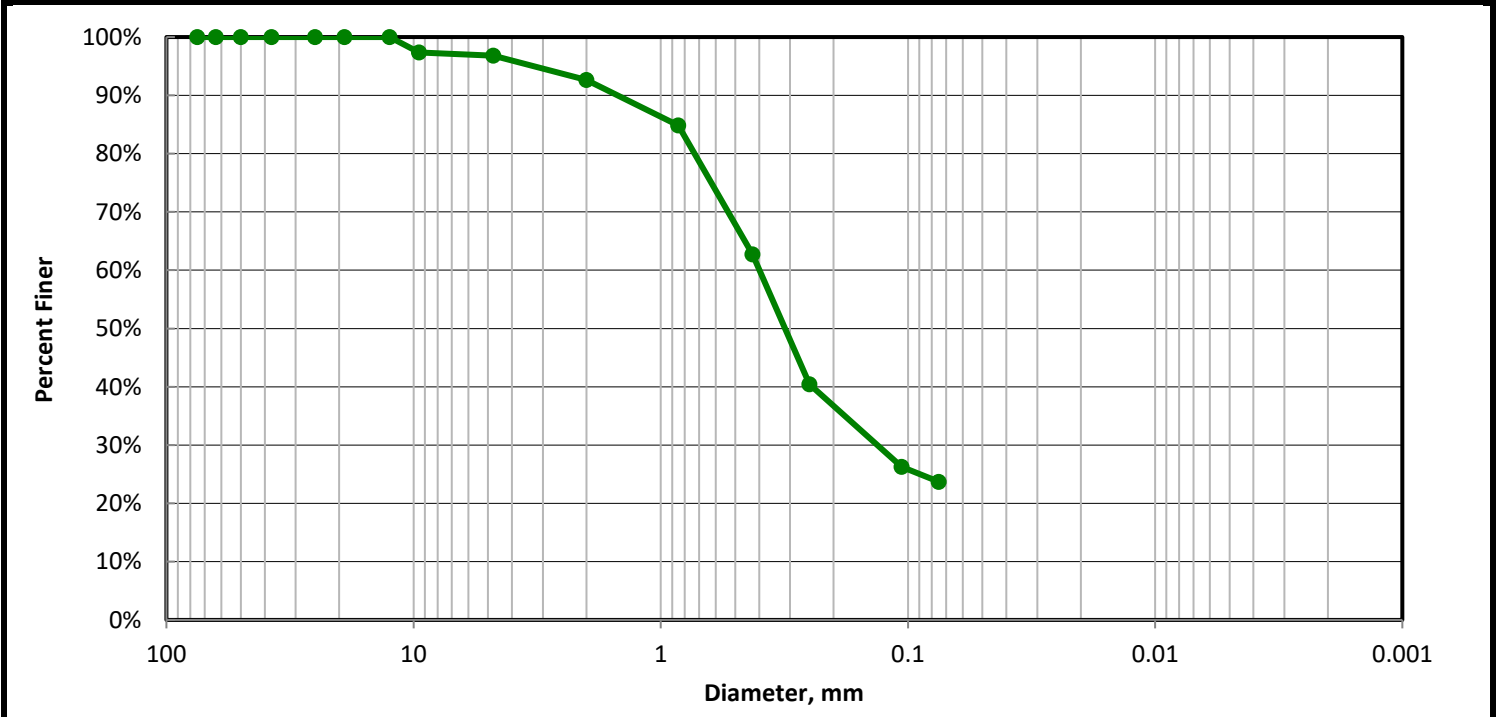
PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client	Civil & Environmental Consultants, Inc	Boring	GB-6
Client Project	334-659.0613 Saluda	Depth	6.0' - 7.5'
Project No.	25-04815	Sample	SS-3
		Lab Sample	25-04815-07

Sample Color:	YELLOWISH RED		
USCS Group Name:	CLAYEY SAND		
USCS Group Symbol:	SC	USDA:	NA
		AASHTO:	A-2-7 (1)

MECHANICAL SIEVE						
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized	
					% Retained	% Finer
Total Sample Wet Wt, gm (-3")	178.86	3"	75	0	0.0%	100.0%
Sample Split on Sieve	No. 4	2-1/2"	63	0	0.0%	100.0%
Coarse Washed Dry Sample, gm	5	2"	50	0	0.0%	100.0%
Wet Wt Passing Split, gm	174	1-1/2"	37.5	0	0.0%	100.0%
Dry Wt. Passing Split, gm	139	1"	25	0	0.0%	100.0%
Total Sample Dry Wt, gm	144	3/4"	19	0	0.0%	100.0%
Split Sample - Passing No. 4		1/2"	12.5	0	0.0%	100.0%
Tare No.	740	3/8"	9.5	3.82	2.7%	97.3%
Tare + WS., gm	268.86	No. 4	4.75	0.79	0.5%	96.8%
Tare + DS., gm	252.48	No. 10	2	2.78	4.2%	92.6%
Tare, gm	187.72	No. 20	0.85	5.22	7.8%	84.8%
Water Content of Split Sample	25.3%	No. 40	0.425	14.80	22.1%	62.7%
Wt. of DS., gm	64.76	No. 60	0.25	14.92	22.3%	40.4%
		No. 140	0.106	9.48	14.2%	26.2%
Wt. of + #200 Sample, gm	48.90	No. 200	0.075	1.70	2.5%	23.7%

USCS SOIL CLASSIFICATION									
Corrected For 100% Passing a 3" Sieve				USCS Description					
				CLAYEY SAND					
% Gravel (-3" & + #4)		3.2	Silt=NA Clay=NA		USCS Group Symbol		Atterberg Limits Group Symbol		
Coarse=0; Fine=3.2			D60, mm NA		SC		CL - LEAN CLAY		
% Sand (-#4 & + #200)		73.1	D30, mm NA		Auxiliary Information		Wt Ret, gm	% Retained	% Finer
Coarse=4.2; Medium=29.9; Fine=39			D10, mm NA		12" Sieve - 300 mm		0	0.0	100.0
% Fines (-#200)		23.7	Cc NA		6" Sieve - 150 mm		0	0.0	100.0
% Plus #200 (-3")		76.3	Cu NA		3" Sieve - 75 mm		0	0.0	100.0

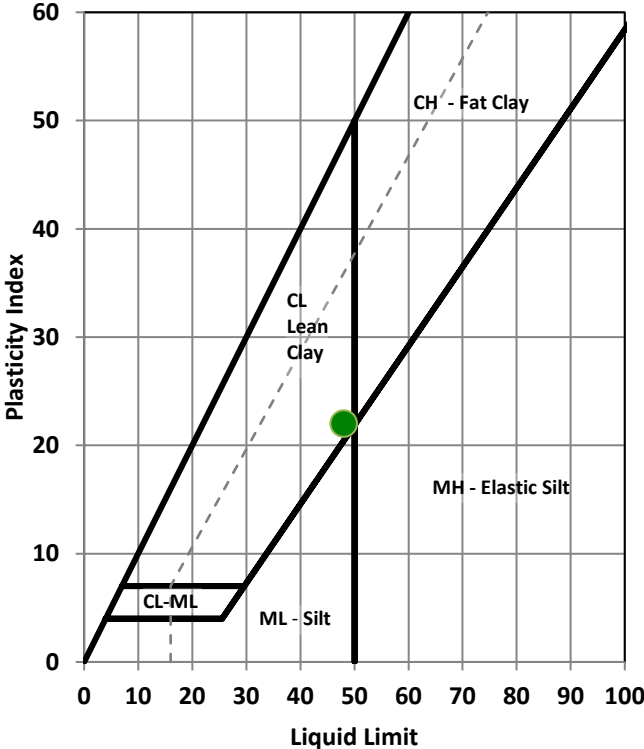
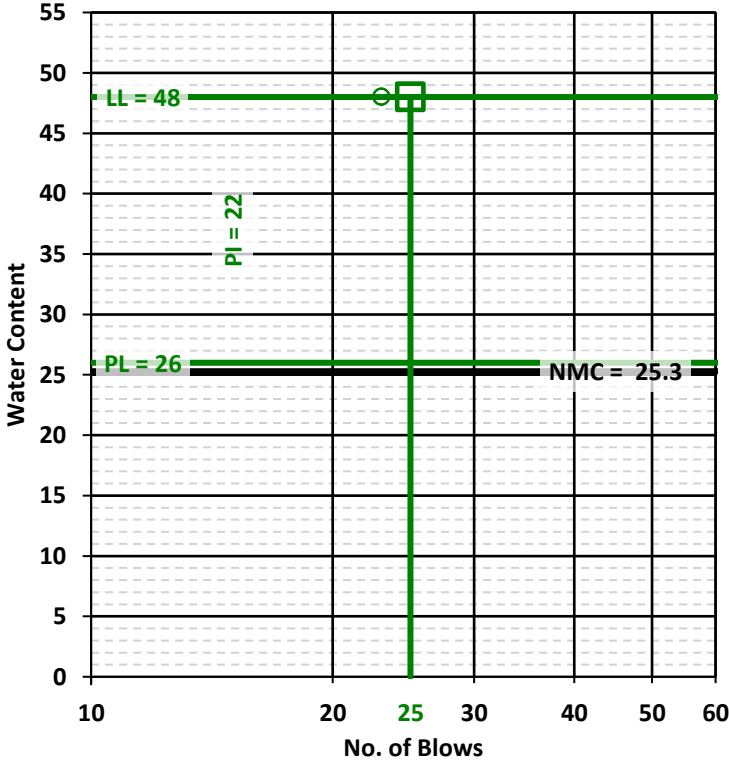


LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-6
 Depth 6.0' - 7.5'
 Sample SS-3
 Lab Sample 25-04815-07

Soil Description: YELLOWISH RED LEAN CLAY
 (-#40 Fraction)

AS-RECEIVED W.C.		SAMPLE SUMMARY	
Tare Number	740	Liquid Limit (LL), %	48
Wt. Tare & WS, gm	268.86	Plastic Limit (PL), %	26
Wt. Tare & DS, gm	252.48	Plasticity Index (PI)	22
Wt. Tare, gm	187.72	USCS Group Symbol (-#40 Fraction)	CL
Water Content, %	25.3	USCS Group Name (-#40 Fraction)	LEAN CLAY
		Sample Color:	YELLOWISH RED
PLASTIC LIMIT		LIQUID LIMIT	
Points Run	1 Point		1 Point
Tare Number	443		467
Wt. Tare & WS, gm	16.90		19.45
Wt. Tare & DS, gm	15.62		16.62
Wt. Tare, gm	10.76		10.73
Water Content, %	26.3		48.0
		# of Blows	23
		1pt adj. WC	47.6
PLASTICITY CHART		FLOW CURVE	
			

Performed By: RH

Input Validation: MA

Reviewed By: BS

Date Tested: 10/1/25

PARTICLE-SIZE ANALYSIS OF SOILS - ASTM D422-63(2007)

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

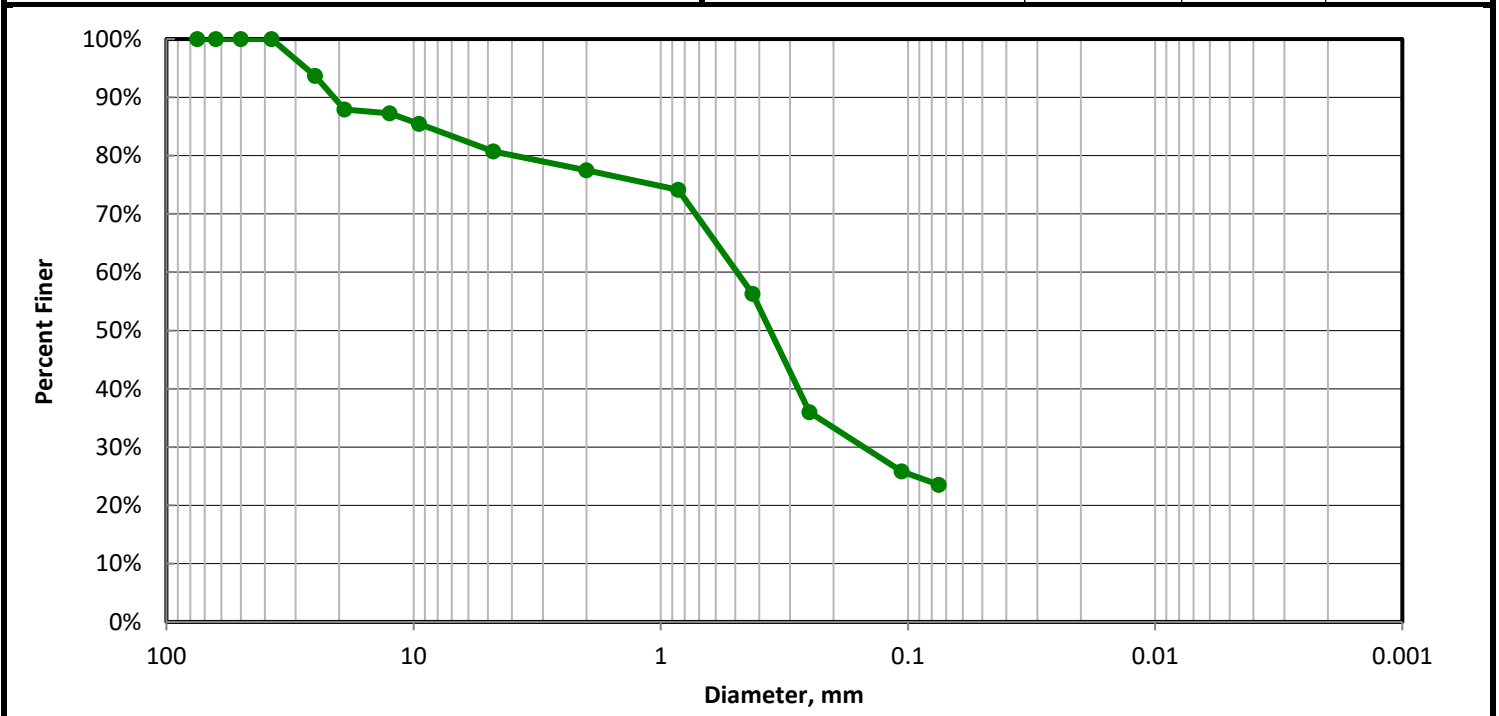
Boring GB-7
 Depth 0.0' - 4.5'
 Sample SS-1/SS-2
 Lab Sample 25-04815-08

Sample Color: **STRONG BROWN**
 USCS Group Name: **CLAYEY SAND WITH GRAVEL**
 USCS Group Symbol: **SC**

USDA: **NA** AASHTO: **A-2-4 (0)**

MECHANICAL SIEVE							
Total Sample		Sieve Size	Nominal Opening, mm	Dry Wt, gm	Split Normalized		Project Specifications
Total Sample Wet Wt, gm (-3")	469.09	3"	75	0	% Retained	% Finer	
Sample Split on Sieve	No. 4	2-1/2"	63	0	0.0%	100.0%	
Coarse Washed Dry Sample, gm	85	2"	50	0	0.0%	100.0%	
Wet Wt Passing Split, gm	384	1-1/2"	37.5	0	0.0%	100.0%	
Dry Wt. Passing Split, gm	356	1"	25	27.98	6.3%	93.7%	
Total Sample Dry Wt, gm	441	3/4"	19	25.31	5.7%	87.9%	
Split Sample - Passing No. 4		1/2"	12.5	2.95	0.7%	87.2%	
Tare No.	601	3/8"	9.5	7.95	1.8%	85.4%	
Tare + WS., gm	310.46	No. 4	4.75	20.83	4.7%	80.7%	
Tare + DS., gm	297.90	No. 10	2	6.35	3.3%	77.5%	
Tare, gm	140.30	No. 20	0.85	6.46	3.3%	74.1%	
Water Content of Split Sample	8.0%	No. 40	0.425	34.84	17.8%	56.3%	
Wt. of DS., gm	157.60	No. 60	0.25	39.66	20.3%	36.0%	
		No. 140	0.106	19.84	10.2%	25.8%	
Wt. of +#200 Sample, gm	111.65	No. 200	0.075	4.50	2.3%	23.5%	

USCS SOIL CLASSIFICATION				USCS Description			
Corrected For 100% Passing a 3" Sieve				CLAYEY SAND WITH GRAVEL			
% Gravel (-3" & + #4)	19.3	Silt=NA	Clay=NA	USCS Group Symbol	Atterberg Limits Group Symbol		
Coarse=12.1; Fine=7.2		D60, mm	NA	SC	CL - LEAN CLAY		
% Sand (-#4 & + #200)	57.2	D30, mm	NA	Auxiliary Information	Wt Ret, gm	% Retained	% Finer
Coarse=3.3; Medium=21.2; Fine=32.8		D10, mm	NA	12" Sieve - 300 mm	0	0.0	100.0
% Fines (-#200)	23.5	Cc	NA	6" Sieve - 150 mm	0	0.0	100.0
% Plus #200 (-3")	76.5	Cu	NA	3" Sieve - 75 mm	0	0.0	100.0



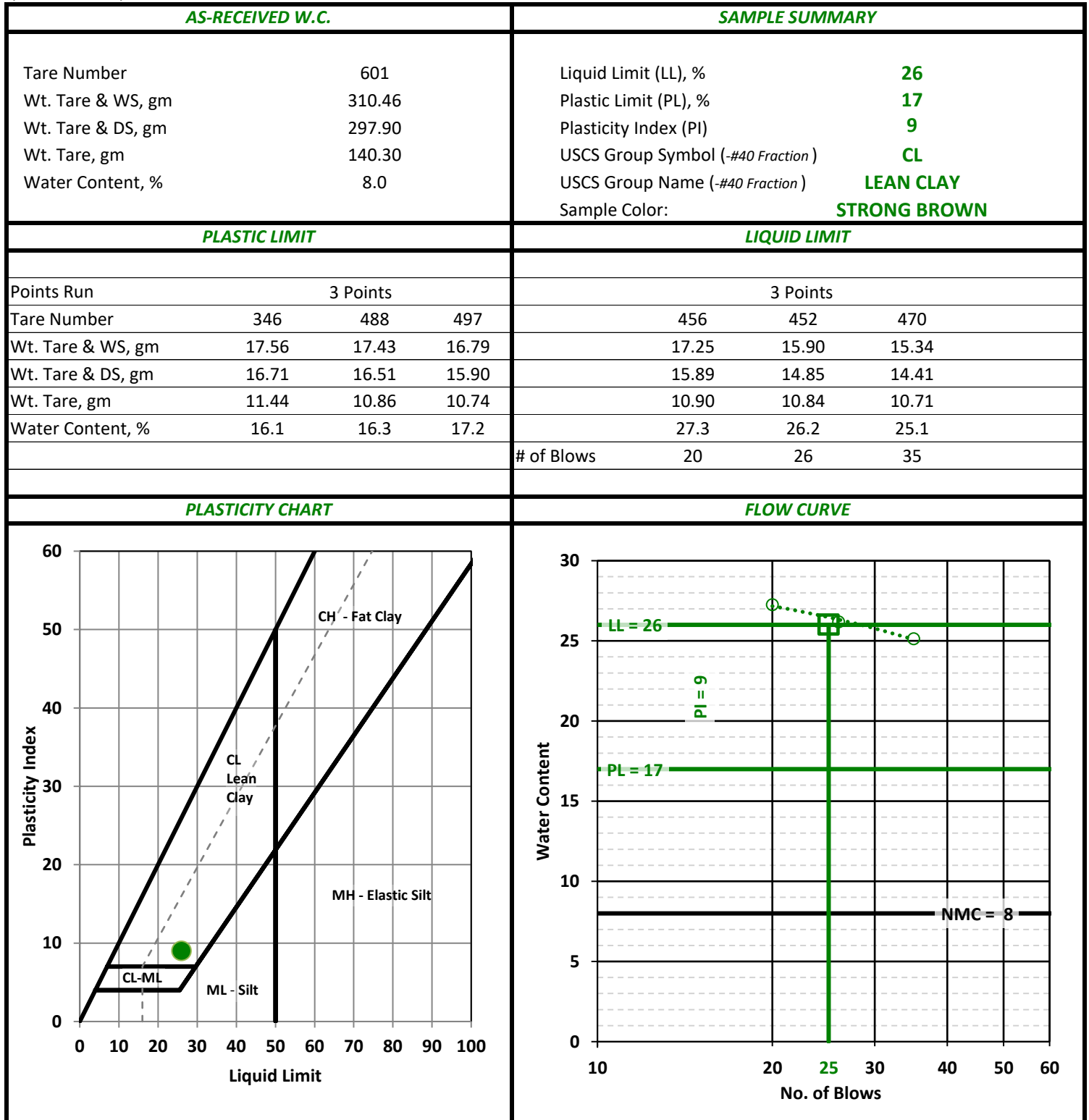
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LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS
ASTM D4318-17e1

Client Civil & Environmental Consultants, Inc
 Client Project 334-659.0613 Saluda
 Project No. 25-04815

Boring GB-7
 Depth 0.0' - 4.5'
 Sample SS-1/SS-2
 Lab Sample 25-04815-08

Soil Description: STRONG BROWN LEAN CLAY
 (-#40 Fraction)



Performed By: RH

Input Validation: MA

Reviewed By: BS

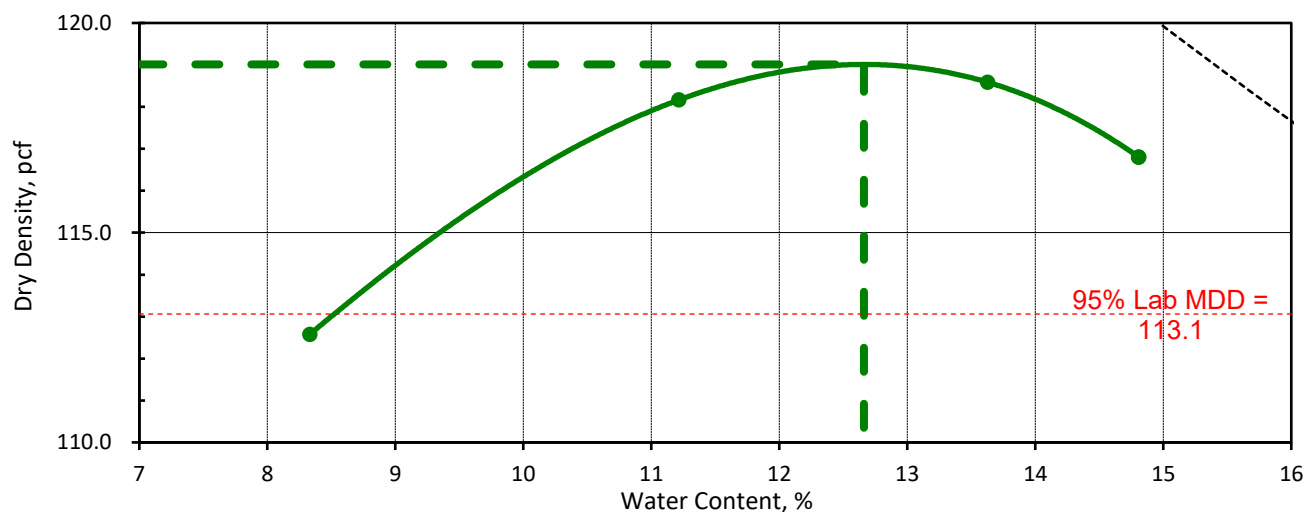
Date Tested: 10/1/25

LABORATORY COMPACTION CHARACTERISTICS OF SOIL

Client	Civil & Environmental Consultants, Inc. Boring	GB-2
Client Project	334-659.0613 Saluda	Depth 0.0' - 5.0'
Project No.	25-04815	Sample Bulk-1
	Lab Sample No.	25-04815-16
Visual Description:	BROWN CLAYEY SAND	

WET DENSITY					TEST PARAMETERS	
Mold ID	F	F	F	F	Test Method	ASTM D698
Compaction Point #	1	2	3	4	Compaction Energy	Standard
Wt. Mold & WS, gm.	6006	6148.6	6198.8	6189	Test Procedure	B
Wt. Mold, gm.	4167	4167	4167	4167	Mold Diameter, in	4
Wt. WS, gm.	1839	1981	2032	2022	Compacted Layers	3
Mold Volume, cc	941	941	941	941	Blows Per Layer	25
Wet Density, gm./cc	1.95	2.11	2.16	2.15	Rammer Weight / Fall	5.5 lbs / 12 in.
Wet Density, pcf	122.0	131.4	134.7	134.1	Size of Material Used	-3/8" Sieve
					Use: <5% Retained on 3/8"	
WATER CONTENT					OVERSIZE PARTICLE CORRECTION	
Tare Number	831	890	575	709	No Corrections Needed	
Wt. Tare & WS, gm.	313.2	318.8	439.6	402.5		
Wt. Tare & DS, gm.	296.9	305.6	410.3	363.1	Percent of Oversize Rock (+3/8" Sieve) = <5% (Based on As-received Screening & Soaking)	
Wt. Tare, gm.	101.3	187.9	195.3	97		
Water Content, %	8.3	11.2	13.6	14.8	W.C. of Finer Material, % (-3/8" Sieve) = NA	
DRY DENSITY vs. WATER CONTENT					SAMPLE SUMMARY	
LABORATORY TEST VALUES						
Water Content, %	8.3	11.2	13.6	14.8	Lab Optimum Water Content, %	12.7
Dry Density, pcf	112.6	118.2	118.6	116.8	Lab Maximum Dry Density, pcf	119.0

Note: Maximum Density and Optimum Water Content reported from estimated best fit smooth curve!



Note: Compacted with automatic compaction machine

Input Validation: MA

Reviewed By: BLS

Date Tested: 10/01/25

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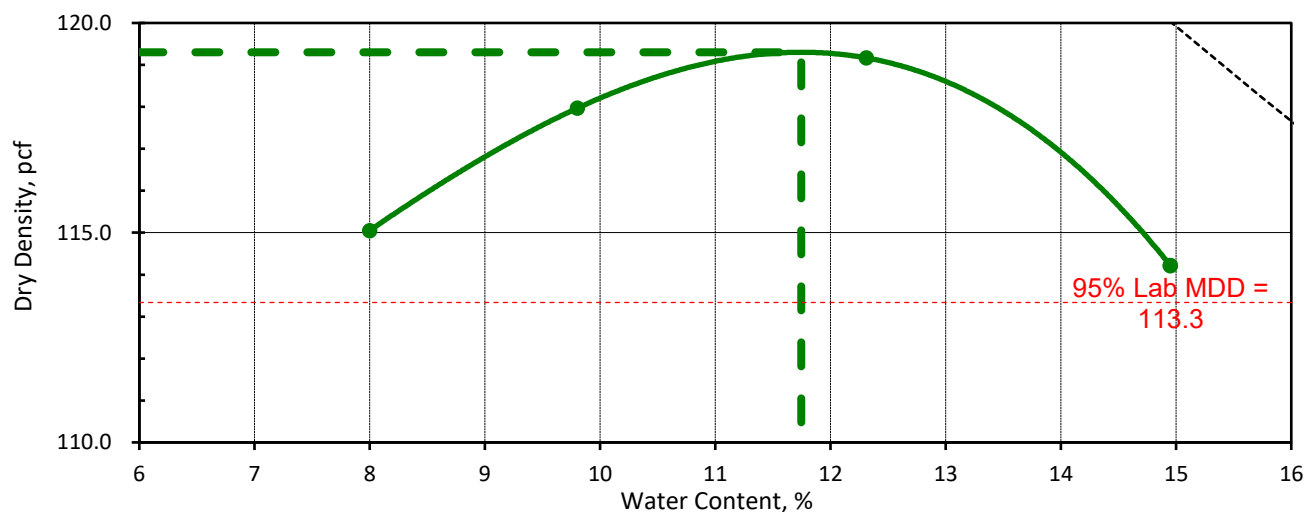
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LABORATORY COMPACTION CHARACTERISTICS OF SOIL

Client	Civil & Environmental Consultants, Inc. Boring	GB-3
Client Project	334-659.0613 Saluda	Depth 0.0' - 5.0'
Project No.	25-04815	Sample Bulk-1
		Lab Sample No. 25-04815-17
Visual Description:	LIGHT BROWN CLAYEY SAND	

WET DENSITY					TEST PARAMETERS	
Mold ID	J	J	J	J	Test Method	ASTM D698
Compaction Point #	1	2	3	4	Compaction Energy	Standard
Wt. Mold & WS, gm.	10676	10855.5	11002	10915.5	Test Procedure	C
Wt. Mold, gm.	6449	6449	6449	6449	Mold Diameter, in	6
Wt. WS, gm.	4227	4407	4553	4467	Compacted Layers	3
Mold Volume, cc	2123	2123	2123	2123	Blows Per Layer	56
Wet Density, gm./cc	1.99	2.08	2.14	2.10	Rammer Weight / Fall	5.5 lbs / 12 in.
Wet Density, pcf	124.3	129.5	133.8	131.3	Size of Material Used	-3/4" Sieve
					Use: <5% Retained on 3/4"	
WATER CONTENT					OVERSIZE PARTICLE CORRECTION	
Tare Number	800	548	3007	503	No Corrections Needed	
Wt. Tare & WS, gm.	545.4	490.7	457.1	520.7		
Wt. Tare & DS, gm.	512.9	464.5	427	466.3	Percent of Oversize Rock (+3/4" Sieve) = <5% (Based on As-received Screening & Soaking)	
Wt. Tare, gm.	106.6	197.2	182.5	102.4		
Water Content, %	8.0	9.8	12.3	14.9	W.C. of Finer Material, % (-3/4" Sieve) = NA	
DRY DENSITY vs. WATER CONTENT					SAMPLE SUMMARY	
LABORATORY TEST VALUES						
Water Content, %	8.0	9.8	12.3	14.9	Lab Optimum Water Content, %	11.7
Dry Density, pcf	115.1	118.0	119.2	114.2	Lab Maximum Dry Density, pcf	119.3

Note: Maximum Density and Optimum Water Content reported from estimated best fit smooth curve!



Note: Compacted with automatic compaction machine

Input Validation: MA

Reviewed By: BLS

Date Tested: 10/01/25

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**SALUDA ACCESS AND STAGING AREA
GAMBLE AND CASCADE TOWNSHIPS
LYCOMING COUNTY, PENNSYLVANIA**

**HYDROLOGY AND HYDRAULICS (H&H) EVALUATION
MEMORANDUM**

Prepared for:

PENNSYLVANIA GENERAL ENERGY COMPANY, LLC.

Prepared by:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Cherrington Corporate Center, Building 700

700 Cherrington Parkway

Moon Township, Pennsylvania 15108

CEC PROJECT 334-659

OCTOBER 2025

REVISED: MARCH 2026

REVISED: AUGUST 2026



Civil & Environmental Consultants, Inc.

1.0 Hydrologic and Hydraulic Analysis

1.1 PURPOSE

The Saluda Access and Staging Area Project is located in Gamble and Cascade Townships, Lycoming County, Pennsylvania. It consists of constructing a 12'-16' wide access road, replacing the bridge at the existing access road crossing over Wallis Run, and installing 16 additional bridges for stream crossings that intersect the proposed access road. The access road will connect Wallis Run Road (SR 1006) at the northern end to Dad Chapman Road at the southern end. It will provide access to Pennsylvania General Energy Company, LLC facilities along its alignment.

The existing single-span, open-grate deck, steel bridge over Wallis Run, currently on private property, is proposed to be replaced by a 17.67' wide, single-span steel rolled beam bridge with an open grate deck. It is designed to facilitate the movement of a 10-axle, 200,000-lb. vehicle across Wallis Run. CEC developed a hydraulic model in HEC-RAS version 6.5 to compare existing and proposed conditions and to conduct a scour analysis for the proposed structure. The scour analysis provides potential for scour of the streambed and proposed abutments and is used to size anti-scour measures.

The subject property is included in the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) Number 42081C0225F with an effective date of June 2, 2016 (see **Attachment 1**). The included FIRMette shows the proposed crossing is located within FEMA Zone A, a special flood hazard area without base flood elevations.

1.2 Wallis Run Replacement Bridge Crossing Analysis

The H&H model was developed using the US Army Corps of Engineers HEC-RAS software, version 6.5. A topographic survey was conducted along Wallis Run for 500 feet upstream and downstream of the proposed crossing. The overbanks were surveyed for approximately 50' on either side of Wallis Run, from the existing edge of water. LiDAR data from PASDA and USGS elevation data were used to supplement the survey data.

Hydrologic data was gathered using USGS StreamStats (SIR 2019 5094), a generally accepted data source for drainage areas greater than 1 square mile. The total drainage area to the point of interest at the proposed stream crossing is 10 square miles. The H&H model used the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year storm events from StreamStats to develop water surface profiles for Wallis Run, with the 100-year event being used for comparison purposes.

A total of 17 cross sections were developed and spaced across the study reach of Wallis Run. Manning's n coefficients for the study reach were determined using survey data, field photos, and

the HEC-RAS Hydraulic Reference Manual. The streambed of Wallis Run varies between clean and straight to having vegetation and large obstructions in certain areas, and accordingly, n values of 0.035-0.045 were chosen for the stream channel. The left overbank to the south is heavily forested ($n = 0.1$) while the right overbank to the north is heavily vegetated with areas of open grass ($n = 0.07$).

Once the existing model was established, it was used to develop the proposed model by replacing the existing structure at section 7.5 with the proposed structure. The proposed structure's low chord was lowered to account for the flatter roadway profile at the crossing. Based on the results of the HEC-RAS model, the 100-year water surface elevations at cross section 8, directly upstream of the structure, the proposed water surface elevation of 955.02 is 0.02 ft lower than the existing water surface elevation of 955.04.

1.3 Intermittent Stream Crossing Analysis

A series of sixteen (16) streams were identified crossing the Saluda access road alignment. Each stream was identified and mapped. The existing streams will be spanned by a series of fifteen (15) separate prefabricated bridges. The prefabricated bridges will consist of steel girders, timber decking, and abutments at each end. The bridges vary in length based on the crossing geometry and will ultimately be designed by the manufacturer. For the purposes of this study, a deck thickness of 26-1/2" was used as provided by the manufacturer for other prefabricated bridges that accommodate the loading of PGE's equipment.

A hydrologic and hydraulic (H&H) analysis was conducted for each bridge location. The rational method was used to develop 25- and 100-year flows for each stream. A drainage area with ground cover was delineated, and the time of concentration was calculated for each stream to determine rainfall intensities for the studied storm events. A summary table of the rational calculations is included below.

Table 1. Rational Method Stream Flow Calculations Summary Table

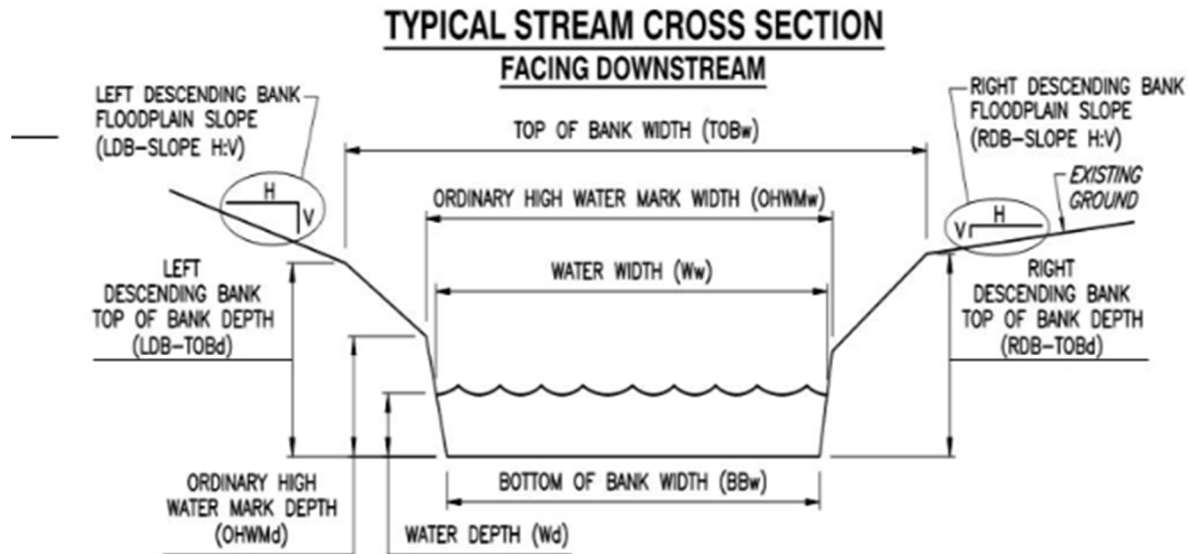
Rational Method Stream Flow Calculations					
Stream Name	Drainage Area (acre)	25-Year Intensity (in/hr)	100-Year Intensity (in/hr)	25-Year Contributing Flow (cfs)	100-Year Contributing Flow (cfs)
S-20230821-1402-JT	55.86	1.85	2.24	16.89	20.43
S-20230822-1015-JT	5.73	3.17	4.64	2.91	4.02
S-20230822-1218-JT	4.92	3.21	4.64	2.53	3.65
S-20230822-1243-JT	10.72	3.12	4.64	5.35	7.96
S-20230823-1130-JT	3.97	3.44	4.64	2.19	2.79
S-20230823-1225-JT	3.25	3.56	4.64	1.85	2.28
S-20230823-1240-JT	13.22	2.15	3.13	4.55	6.62
S-20230823-1338-JT	2.08	3.23	4.64	1.07	1.46
S-20230823-1433-JT	11.66	2.73	3.35	5.09	5.84
S-20230824-1355-DJ	1.41	3.71	4.64	0.84	1.05
S-20230824-1304-JT	19.89	2.49	3.35	7.92	10.66
S-20230824-1305-JT	10.89	2.61	3.35	4.55	5.84
S-20230823-1117-DJ	35.38	2.63	3.35	14.89	18.96
S-20231017-1725-JR*	0.18	4.27	5.60	0.12	0.16
S-20230822-0014-DJ*	7.89	2.06	3.35	2.60	4.23
S-20230821-0005-DJ	27.9	2.63	5.6	11.74	25.00

* S-20231017-1725-JR and S-20230822-0014-DJ are spanned by a single bridge

To develop an existing conditions model for each stream, four cross-sections were created along the mapped stream centerline. One cross-section was created upstream of the proposed bridge location, with a second created downstream. The cross sections are located beyond the limits of the proposed bridge abutments and are used as the bridge bounding sections in the proposed conditions models. Cross sections 3 and 4 were created approximately 50 ft. upstream and downstream, respectively, of the proposed bridge. Each cross-section was created using a combination of survey and publicly available LiDAR data for the project area. The topographic data was supplemented with stream-channel properties measured during field investigations, as documented in the stream data forms submitted with the wetland report. A summary table of the stream channel properties and typical sections used in the HEC-RAS models is provided below.

Table 2. Stream Channel Properties Summary Table

Stream Name	Stream Classification	~Roadway Station	Top of Bank Width (TOB) (ft)	Right Descending Bank (RDB-TOBd) (ft)	Left Descending Bank (LDB-TOBd) (ft)	Bottom of Bank Width (BBw) (ft)	Bottom of Bank Depth (BBD) (in.)
S-20230821-1402-JT	Intermittent	16+00	10	3	3	8	4
S-20230822-1015-JT	Intermittent	30+00	8	3	3	2	2
S-20230822-1218-JT	Intermittent	35+50	7	2	2	2	2
S-20230822-1243-JT	Intermittent	37+00	8	1.5	1.5	3	3
S-20230823-1130-JT	Intermittent	39+00	7	1	1	1	2
S-20230823-1225-JT	Intermittent	41+00	7	2	2	2	2
S-20230823-1240-JT	Intermittent	44+50	10	5	6	3	3
S-20230823-1338-JT	Intermittent	48+50	5	1	1	1	2
S-20230823-1433-JT	Intermittent	53+50	5	1	1	1	2
S-20230824-1355-DJ	Ephemeral	58+00	3.5	0.4	0.6	2	0.1
S-20230824-1304-JT	Intermittent	60+00	4	1	1	1	2
S-20230824-1305-DJ	Intermittent	60+50	4.75	1.5	1	1.5	0.1
S-20230823-1117-DJ	Perennial	135+00	8	0.6	0.8	2	0.1
S-20231017-1725-JR	Intermittent	139+00	1.3	0.8	0.8	0.5	0.1
S-20230822-0014-DJ	Intermittent	139+25	4	0.2	0.3	1	N/A
S-20230821-0005-DJ	Intermittent	170+50	4	1	0.7	1.5	0.1



The proposed HEC-RAS models were developed from the existing models established for each stream crossing location. High chord elevations were derived from the vertical profile established for the access road and low chord elevations were determined using a deck thick of 26-1/2". Clear span lengths were calculated based on the locations of proposed abutments on either side of the proposed crossings. It was determined that the proposed bridge crossings do not adversely affect the 25- and 100-year water surface elevations established in the existing models. In accordance with Pennsylvania Code Section 105.161, each bridge passes the 100-year frequency flood with less than 1.0-foot increase in the natural unobstructed 100-year water surface elevation. Comparison tables of the existing and proposed 25- and 100-year storm events are provided in Attachment 5. A summary table comparing water surface elevations between existing and proposed conditions for the 25- and 100- year storm events is provided in Table 3.

Table 3. Existing vs. Proposed Condition Water Surface Elevations

Stream	River Station	Storm Event	Existing Water Surface Elevation (ft)	Proposed Water Surface Elevation (ft)	Difference
S-20230821-1402-JT	214	25-Year	990.26	990.26	0.00
		100-Year	990.29	990.29	0.00
	162	25-Year	989.67	988.85	-0.82
		100-Year	989.73	988.96	-0.77
	140	Existing Culvert/Proposed Bridge			
	117	25-Year	986.21	986.21	0.00
		100-Year	986.28	986.28	0.00
	51.9	25-Year	985.43	985.43	0.00
		100-Year	985.46	985.46	0.00
S-20230822-1015-JT	155	25-Year	1052.67	1052.67	0.00
		100-Year	1052.69	1052.69	0.00
	145	25-Year	1051.64	1051.64	0.00
		100-Year	1051.67	1051.67	0.00
	120	Existing Culvert/Proposed Bridge			
	106	25-Year	1047.71	1047.71	0.00
		100-Year	1047.77	1047.77	0.00
	61	25-Year	1042.05	1042.05	0.00
		100-Year	1042.09	1042.09	0.00
S-20230822-1218-JT	239	25-Year	1106.12	1106.12	0.00
		100-Year	1106.14	1106.14	0.00
	208	25-Year	1097.79	1097.49	-0.30
		100-Year	1097.95	1097.62	-0.33
	185	Existing Culvert/Proposed Bridge			
	174	25-Year	1094.24	1094.24	0.00
		100-Year	1094.33	1094.33	0.00
	119	25-Year	1086.24	1086.24	0.00
		100-Year	1086.27	1086.27	0.00
S-20230822-1243-JT	302	25-Year	1113.28	1113.28	0.00
		100-Year	1113.34	1113.34	0.00
	267	25-Year	1108.07	1107.17	-0.90
		100-Year	1108.26	1107.30	-0.96
	250	Existing Culvert/Proposed Bridge			
	227	25-Year	1101.98	1101.98	0.00
		100-Year	1102.11	1102.11	0.00
	172	25-Year	1093.95	1093.95	0.00
		100-Year	1093.97	1093.97	0.00

Stream	River Station	Storm Event	Existing Water Surface Elevation (ft)	Proposed Water Surface Elevation (ft)	Difference
S-20230823-1130-JT	464	25-Year	1130.89	1130.89	0.00
		100-Year	1130.92	1130.92	0.00
	427	25-Year	1129.13	1128.47	-0.66
		100-Year	1129.25	1128.5	-0.75
	400	Existing Culvert/Proposed Bridge			
	366	25-Year	1122.42	1122.63	0.21
		100-Year	1122.45	1122.69	0.24
	313	25-Year	1115.64	1115.64	0.00
		100-Year	1115.67	1115.67	0.00
S-20230823-1225-JT	325	25-Year	1153.15	1153.15	0.00
		100-Year	1153.16	1153.16	0.00
	267	25-Year	1141.04	1141.04	0.00
		100-Year	1141.10	1141.10	0.00
	200	Existing Culvert/Proposed Bridge			
	182	25-Year	1127.31	1127.31	0.00
		100-Year	1127.33	1127.33	0.00
	115	25-Year	1119.18	1119.18	0.00
		100-Year	1119.19	1119.19	0.00
S-20230823-1240-JT	425	25-Year	1186.61	1186.61	0.00
		100-Year	1186.65	1186.65	0.00
	367	25-Year	1171.86	1171.25	-0.61
		100-Year	1172.14	1171.33	-0.81
	300	Existing Culvert/Proposed Bridge			
	295	25-Year	1155.14	1155.14	0.00
		100-Year	1155.23	1155.23	0.00
	235	25-Year	1146.13	1146.13	0.00
		100-Year	1146.17	1146.17	0.00
S-20230823-1338-JT	315.38	25-Year	1225.85	1225.85	0.00
		100-Year	1225.88	1225.88	0.00
	265.38	25-Year	1212.68	1212.98	0.30
		100-Year	1212.71	1212.71	0.00
	230	Proposed Bridge			
	220.41	25-Year	1205.54	1205.59	0.05
		100-Year	1205.58	1205.64	0.06
	154.8	25-Year	1198.80	1198.74	-0.06
		100-Year	1198.84	1198.76	-0.08

Stream	River Station	Storm Event	Existing Water Surface Elevation (ft)	Proposed Water Surface Elevation (ft)	Difference
S-20230829-1433-JT	162	25-Year	1267.5	1267.50	0.00
		100-Year	1267.51	1267.51	0.00
	114	25-Year	1259.42	1259.91	0.49
		100-Year	1259.45	1259.97	0.52
	100	Proposed Bridge			
	80	25-Year	1255.77	1255.80	0.03
		100-Year	1255.79	1255.82	0.03
	16	25-Year	1248.07	1248.05	-0.02
		100-Year	1248.09	1248.06	-0.03
S-20230824-1355-DJ	197.47	25-Year	1320.31	1320.31	0.00
		100-Year	1320.32	1320.32	0.00
	144.31	25-Year	1309.68	1309.94	0.26
		100-Year	1309.69	1309.98	0.29
	120	Proposed Bridge			
	100.96	25-Year	1300.27	1300.33	0.06
		100-Year	1300.3	1300.35	0.05
	49.19	25-Year	1295.21	1295.14	-0.07
		100-Year	1295.22	1295.15	-0.07
S-20230824-1304-JT	281	25-Year	1329.89	1329.89	0.00
		100-Year	1329.92	1329.92	0.00
	227.25	25-Year	1322.14	1322.15	0.01
		100-Year	1322.21	1322.21	0.00
	200	Proposed Bridge			
	195.23	25-Year	1318.39	1318.47	0.08
		100-Year	1318.49	1318.57	0.08
	135	25-Year	1310.05	1309.97	-0.08
		100-Year	1310.13	1310.06	-0.07
S-20230824-1305-JT	410	25-Year	1330.41	1330.41	0.00
		100-Year	1330.47	1330.47	0.00
	357	25-Year	1326.35	1326.56	0.21
		100-Year	1326.42	1326.67	0.25
	330	Proposed Bridge			
	319	25-Year	1324.57	1324.68	0.11
		100-Year	1324.63	1324.76	0.13
	260	25-Year	1315.63	1315.54	-0.09
		100-Year	1315.68	1315.58	-0.10

Stream	River Station	Storm Event	Existing Water Surface Elevation (ft)	Proposed Water Surface Elevation (ft)	Difference
S-20230823-1117-DJ	365	25-Year	1695.12	1695.12	0.00
		100-Year	1695.15	1695.15	0.00
	306	25-Year	1693.29	1693.45	0.16
		100-Year	1693.33	1693.52	0.19
	290	Proposed Bridge			
	278	25-Year	1691.87	1691.98	0.11
		100-Year	1691.92	1692.02	0.10
	223	25-Year	1687.17	1687.08	-0.09
		100-Year	1687.20	1687.11	-0.09
S-20231017-1725-JR	730	25-Year	1704.54	1704.54	0.00
		100-Year	1704.56	1704.56	0.00
	675	25-Year	1695.03	1695.04	0.01
		100-Year	1695.05	1695.05	0.00
	650	Proposed Bridge			
	624	25-Year	1684.22	1684.23	0.01
		100-Year	1684.24	1684.28	0.04
	560	25-Year	1675.45	1675.42	-0.03
		100-Year	1675.52	1675.45	-0.07
S-2020230821-0005-DJ	320	25-Year	1600.63	1600.63	0.00
		100-Year	1600.71	1600.71	0.00
	270	25-Year	1595.58	1596.08	0.50
		100-Year	1595.78	1596.41	0.63
	230	Proposed Bridge			
	215	25-Year	1589.27	1589.43	0.16
		100-Year	1589.41	1589.66	0.25
	165	25-Year	1581.84	1581.68	-0.16
		100-Year	1582.01	1581.81	-0.20

Note: A positive number in the difference column indicates a rise in the water surface elevation from existing to proposed while a negative indicates a drop.

Based on the results and output from the individual HEC-RAS models, the 100-year storm profiles do not exceed the low chord elevations of the proposed bridges. Increases in water surface elevations are contained within the existing stream channel and do not exceed 1-ft. In all cases the proposed 100-year stream profiles are below or converge to existing at the upstream and downstream bounds of each study reach.

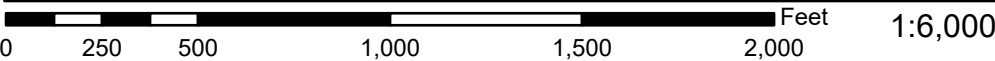
ATTACHMENT 1

FEMA FIRM 42049C0180E

National Flood Hazard Layer FIRMMette



76°52'24"W 41°25'5"N



Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/3/2025 at 3:51 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

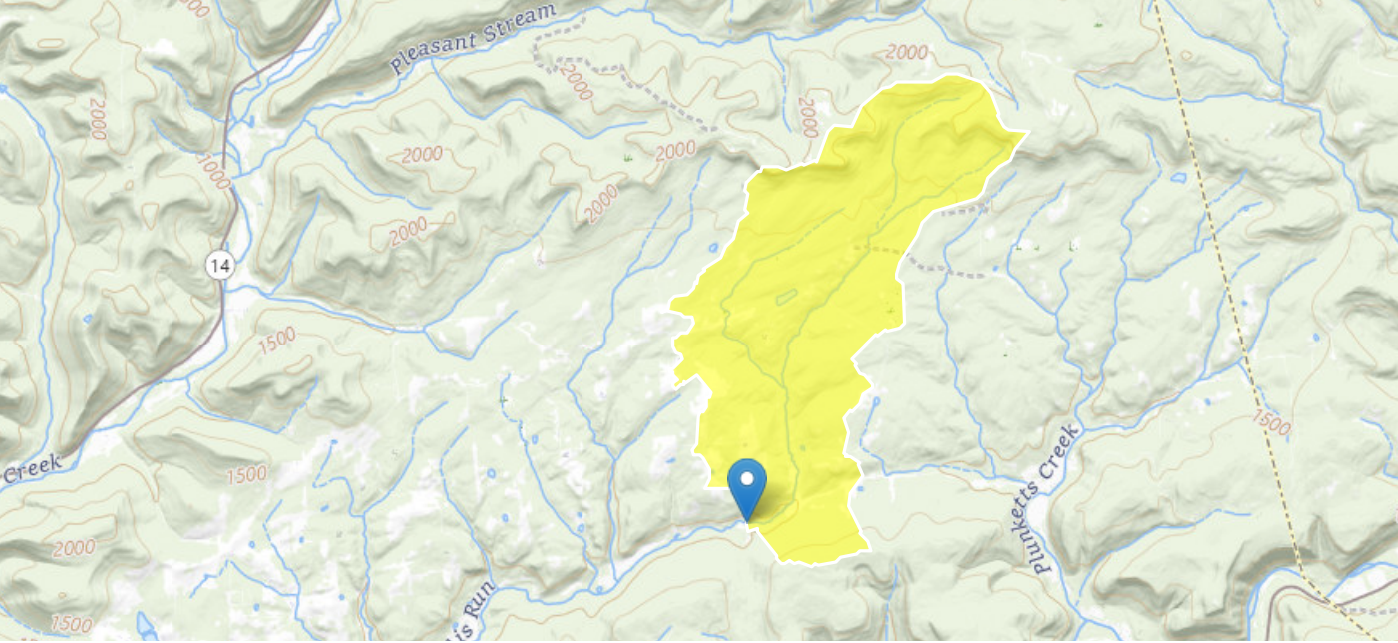
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT 2

StreamStats Hydrology Report

StreamStats Report

Region ID: PA
Workspace ID: PA20250804184333011000
Clicked Point (Latitude, Longitude): 41.41410, -76.86885
Time: 2025-08-04 14:44:01 -0400



Collapse All

➤ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLOPD	Mean basin slope measured in degrees	7.9138	degrees
BSLOPDRAW	Unadjusted basin slope, in degrees	8.1356	degrees
BSLPDRPA20	Unadjusted basin slope, in degrees, from PA v1	8.1507	degrees
CARBON	Percentage of area of carbonate rock	0	percent
CENTROXA83	X coordinate of the centroid, in NAD_1983_Albers, meters	95885.7606	meters
CENTROYA83	Basin centroid horizontal (y) location in NAD 1983 Albers	272624.6259	meters
DRN	Drainage quality index from STATSGO	3.8	dimensionless
DRNAREA	Area that drains to a point on a stream	10	square miles
ELEV	Mean Basin Elevation	1450	feet
ELEVMAX	Maximum basin elevation	2212	feet
FOREST	Percentage of area covered by forest	91.2236	percent
GLACIATED	Percentage of basin area that was historically covered by glaciers	100	percent
IMPNLCD01	Percentage of impervious area determined from NLCD 2001 impervious dataset	0.0692	percent

Parameter Code	Parameter Description	Value	Unit
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	1.4897	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	1.4654	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.0694	percent
LONG_OUT	Longitude of Basin Outlet	-76.868894	degrees
MAXTEMP	Mean annual maximum air temperature over basin area from PRISM 1971-2000 800-m grid	56.3	degrees F
OUTLETXA83	X coordinate of the outlet, in NAD_1983_Albers,meters	94553.1472	meters
OUTLETYA83	Y coordinate of the outlet, in NAD_1983_Albers, meters	268665.7139	meters
PRECIP	Mean Annual Precipitation	39	inches
ROCKDEP	Depth to rock	4	feet
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	3.32	percent
STRDEN	Stream Density -- total length of streams divided by drainage area	1.86	miles per square mile
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	18.58	miles
URBAN	Percentage of basin with urban development	0.0382	percent

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Flow Region 3 SIR 2019 5094]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CARBON	Percent Carbonate	0	percent	0	100
DRNAREA	Drainage Area	10	square miles	1.42	1280

Peak-Flow Statistics Flow Report [Peak Flow Region 3 SIR 2019 5094]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	452	ft^3/s	41.7
20-percent AEP flood	812	ft^3/s	39.6
10-percent AEP flood	1120	ft^3/s	38.3
4-percent AEP flood	1590	ft^3/s	38.5
2-percent AEP flood	2000	ft^3/s	38.9
1-percent AEP flood	2460	ft^3/s	40.1
0.5-percent AEP flood	2980	ft^3/s	41.3
0.2-percent AEP flood	3760	ft^3/s	43.7

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2019, Development of regression equations for the estimation of flood flows at ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2019–5094, 36 p. (<https://doi.org/10.3133/sir20195094>)

➤ Low-Flow Statistics

Low-Flow Statistics Parameters [Low Flow Region 2]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CARBON	Percent Carbonate	0	percent	0	99
DRNAREA	Drainage Area	10	square miles	4.93	1280
PRECIP	Mean Annual Precipitation	39	inches	35	50.4
ROCKDEP	Depth to Rock	4	feet	3.32	5.65
STRDEN	Stream Density	1.86	miles per square mile	0.51	3.1

Low-Flow Statistics Flow Report [Low Flow Region 2]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE	ASEp
7 Day 2 Year Low Flow	0.652	ft^3/s	38	38
30 Day 2 Year Low Flow	0.948	ft^3/s	33	33
7 Day 10 Year Low Flow	0.253	ft^3/s	51	51
30 Day 10 Year Low Flow	0.377	ft^3/s	46	46
90 Day 10 Year Low Flow	0.675	ft^3/s	36	36

Low-Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (<http://pubs.usgs.gov/sir/2006/5130/>)

➤ Annual Flow Statistics

Annual Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	10	square miles	2.26	1720
ELEV	Mean Basin Elevation	1450	feet	130	2700
FOREST	Percent Forest	91.2236	percent	5.1	100
PRECIP	Mean Annual Precipitation	39	inches	33.1	50.4
URBAN	Percent Urban	0.0382	percent	0	89

Annual Flow Statistics Flow Report [Statewide Mean and Base Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE	ASEp
Mean Annual Flow	14.1	ft^3/s	12	12

Annual Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (<http://pubs.usgs.gov/sir/2006/5130/>)

➤ General Flow Statistics

General Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CARBON	Percent Carbonate	0	percent	0	99
DRNAREA	Drainage Area	10	square miles	2.26	1720
FOREST	Percent Forest	91.2236	percent	5.1	100
PRECIP	Mean Annual Precipitation	39	inches	33.1	50.4
URBAN	Percent Urban	0.0382	percent	0	89

General Flow Statistics Flow Report [Statewide Mean and Base Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE	ASEp
Harmonic Mean Streamflow adjusted for proportion of zero flow days	2.54	ft^3/s	38	38

General Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (<http://pubs.usgs.gov/sir/2006/5130/>)

➤ Base Flow Statistics

Base Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CARBON	Percent Carbonate	0	percent	0	99
DRNAREA	Drainage Area	10	square miles	2.26	1720
FOREST	Percent Forest	91.2236	percent	5.1	100
PRECIP	Mean Annual Precipitation	39	inches	33.1	50.4
URBAN	Percent Urban	0.0382	percent	0	89

Base Flow Statistics Flow Report [Statewide Mean and Base Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE	ASEp
Base Flow 10 Year Recurrence Interval	5.53	ft^3/s	21	21
Base Flow 25 Year Recurrence Interval	4.91	ft^3/s	21	21
Base Flow 50 Year Recurrence Interval	4.55	ft^3/s	23	23

Base Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (<http://pubs.usgs.gov/sir/2006/5130/>)

➤ Bankfull Statistics

Bankfull Statistics Parameters [Statewide Bankfull Noncarbonate 2018 5066]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CARBON	Percent Carbonate	0	percent		
DRNAREA	Drainage Area	10	square miles	2.62	207

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	10	square miles	0.07722	940.1535

Bankfull Statistics Parameters [Appalachian Plateaus P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	10	square miles	0.081081	536.995602

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	10	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Statewide Bankfull Noncarbonate 2018 5066]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE
Bankfull Area	76.9	ft^2	64
Bankfull Streamflow	336	ft^3/s	74
Bankfull Width	41.1	ft	59
Bankfull Depth	1.91	ft	56

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	39.5	ft
Bieger_D_channel_depth	2.17	ft
Bieger_D_channel_cross_sectional_area	87.2	ft^2

Bankfull Statistics Flow Report [Appalachian Plateaus P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	42.3	ft
Bieger_P_channel_depth	2.19	ft
Bieger_P_channel_cross_sectional_area	91.9	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	27.9	ft
Bieger_USA_channel_depth	1.97	ft
Bieger_USA_channel_cross_sectional_area	59.3	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	SE
Bankfull Area	76.9	ft^2	64
Bankfull Streamflow	336	ft^3/s	74
Bankfull Width	41.1	ft	59
Bankfull Depth	1.91	ft	56
Bieger_D_channel_width	39.5	ft	
Bieger_D_channel_depth	2.17	ft	
Bieger_D_channel_cross_sectional_area	87.2	ft^2	
Bieger_P_channel_width	42.3	ft	
Bieger_P_channel_depth	2.19	ft	
Bieger_P_channel_cross_sectional_area	91.9	ft^2	
Bieger_USA_channel_width	27.9	ft	
Bieger_USA_channel_depth	1.97	ft	
Bieger_USA_channel_cross_sectional_area	59.3	ft^2	

Bankfull Statistics Citations

Clune, J.W., Chaplin, J.J., and White, K.E., 2018, Comparison of regression relations of bankfull discharge and channel geometry for the glaciated and nonglaciated settings of Pennsylvania and southern New York: U.S. Geological Survey Scientific Investigations Report 2018–5066, 20 p. (<https://doi.org/10.3133/sir20185066>)

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G., 2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign=PDFCoverPages)

➤ Maximum Probable Flood Statistics

Maximum Probable Flood Statistics Parameters [Crippen Bue Region 4]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	10	square miles	0.1	10000

Maximum Probable Flood Statistics Flow Report [Crippen Bue Region 4]

Statistic	Value	Unit
Maximum Flood Crippen Bue Regional	22800	ft ³ /s

Maximum Probable Flood Statistics Citations

Crippen, J.R. and Bue, Conrad D. 1977, Maximum Floodflows in the Conterminous United States, Geological Survey Water-Supply Paper 1887, 52p. (<https://pubs.usgs.gov/wsp/1887/report.pdf>)

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

ATTACHMENT 3
Wallis Run
Existing HEC-RAS Output

HEC-RAS HEC-RAS 6.5 February 2024
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X        X  X      X  X      X  X      X
X      X  X        X        X  X      X  X      X
XXXXXXX XXXX      X        XXX XXXX      XXXXXX   XXXX
X      X  X        X        X  X      X  X        X
X      X  X        X  X      X  X      X  X      X
X      X  XXXXXX   XXXX      X  X      X  X      XXXXX

```

PROJECT DATA

Project Title: 334659-Saluda Access
Project File : 334659SaludaAccess.prj
Run Date and Time: 9/8/2025 9:50:11 AM

Project in English units

PLAN DATA

Plan Title: Existing
Plan File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.p01

Geometry Title: Existing
Geometry File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.g01

Flow Title : StreamStats Wallis Run
Flow File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.f01

Plan Summary Information:

Number of: Cross Sections	=	19	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	0
Bridges	=	2	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: StreamStats Wallis Run
Flow File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.f01

Flow Data (cfs)

River (4%)	50 YR (2%)	Reach Study Reach	RS 17	2 YR (50%) 500 YR (0.2%)	5 YR (20%)	10 YR (10%)	25 YR
Wallis Run	1590	2000	2460	3760	452	812	1120

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Wallis Run	Study Reach	2 YR (50%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	5 YR (20%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	10 YR (10%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	25 YR (4%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	50 YR (2%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	100 YR (1%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	500 YR (0.2%)	Normal S = 0.009	Normal S = 0.007

GEOMETRY DATA

Geometry Title: Existing

Geometry File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.g01

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 17

INPUT

Description:

Station Elevation Data				num=	92				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-75.8	974.68	-73.3	974.03	-58	969.86	-45.7	966.45	-39.5	962.26
-34.6	958.74	-29.5	955.25	-28.5	954.72	-27.8	954.45	-27.5	954.36
-25.4	954.4	-24.3	954.41	-20.3	954.52	-19.3	954.3	-16.3	953.38
-15.3	953.03	-14.2	952.91	-13.1	952.83	-12.2	952.75	-11.2	952.66
-11	952.64	-10.5	952.61	-10.2	952.59	-9.2	952.5	-7.9	952.41
-6.1	952.25	-5.1	952.06	-2.1	951.41	-1	951.15	0	951.1
1	951.2	2.4	951.32	2.6	951.33	3	951.37	3.9	951.45
4.2	951.47	5	951.53	8.1	951.83	8.5	951.88	8.8	951.92
9.1	951.96	9.3	951.99	10.1	952.12	10.2	952.14	11.1	952.38
11.3	952.42	12.2	952.67	14.2	953.2	14.5	953.28	15	953.42
19.3	954.56	19.7	954.67	20.5	954.89	21.1	955.04	21.3	955.09
22.3	955.37	22.3	955.38	24.3	955.9	24.8	956.03	24.9	956.04
25.4	956.18	25.7	956.29	27.3	956.58	27.4	956.59	27.8	956.64
28.4	956.72	30.4	956.97	32.5	957.24	32.6	957.26	33.5	957.34
38.4	957.97	39.5	958.09	45	958.79	50.7	959.56	57.9	960.48
59.4	960.74	62.2	961.27	62.8	961.39	62.9	961.41	63.1	961.44
63.7	961.55	64.3	961.67	64.5	961.71	65.4	961.86	65.6	961.88
66	961.96	66.3	962.01	66.6	962.09	102.9	962.93	103.4	962.94
103.7	962.95	110.67	963.86						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
-75.8	.1	-34.6	.035	27.3	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-34.6	27.3		55 52.7	49.8		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 16

INPUT

Description:

Station	Elevation	Data	num=	122
Sta	Elev	Sta	Elev	Sta Elev Sta Elev
-79.3	968.76	-75.1	968.06	-73.1 967.75 -72 967.61 -71 967.5
-69	967.22	-67.9	967.11	-66.9 966.97 -65.9 966.87 -63.8 966.58
-62.7	966.46	-60.7	966.2	-59.7 966.09 -57.6 965.81 -56.6 965.7
-54.5	965.42	-53.5	965.31	-51.5 964.97 -50.4 964.82 -46.3 964.14
-45.3	964	-42.2	963.48	-35 962.69 -34.5 962.54 -34.4 962.46
-34	962.3	-28.4	958.89	-27.8 958.49 -26.8 957.88 -23.8 956.04
-21.6	954.92	-19.4	953.76	-18.5 953.31 -18 953.07 -17.5 952.89
-16.7	952.9	-16.5	952.9	-15.4 952.87 -14.4 952.48 -13.4 952.03
-12.3	951.72	-10.5	951.38	-9.9 951.27 -9.7 951.24 -9.3 951.17
-7.2	950.97	-6.2	950.9	-3.1 950.59 -2.3 950.54 -2.1 950.52
-1.7	950.49	0	950.32	.2 950.33 1 950.37 4.1 950.77
5.1	950.87	8.5	951.31	9.1 951.39 9.3 951.4 9.3 951.41
9.6	951.44	10.2	951.49	12.4 951.77 12.6 951.98 13.2 952.47
13.4	952.59	13.5	952.68	16.5 955.52 16.8 955.79 17.5 956.33
21.6	958.68	22.6	958.89	23.4 958.96 23.7 958.98 24.7 959.09
25.9	959.18	26.6	959.23	26.7 959.24 27.5 959.33 27.8 959.36
28.2	959.39	29.8	959.51	30.9 959.62 32.9 959.78 33.3 959.82
33.6	959.85	34	959.89	37.1 960.13 37.7 960.16 38.1 960.18
38.3	960.2	41.2	960.39	42.4 960.44 43.3 960.48 47.7 960.68
56.2	961	56.5	961.02	56.6 961.02 56.7 961.03 57.3 961.08
57.6	961.09	64.8	961.37	68.9 961.56 69 961.56 69.8 961.61
70	961.64	70.3	961.7	70.6 961.73 71 961.8 71.4 961.88
71.7	961.94	72	962.01	72.2 962.04 73.1 962.19 73.9 962.36
74.1	962.4	75.4	962.62	75.6 962.67 75.7 962.7 82.3 962.47
96	961.56	107.27	963.33	

Manning's	n Values	num=	3
Sta	n Val	Sta	n Val
-79.3	.1	-28.4	.035
		21.6	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-28.4	21.6		40.1 42.2	40		.3	.5

Ineffective Flow	num=	2
Sta L Sta R Elev	Permanent	
-79.3 -33.9 957.74	F	
33.9 107.27 957.74	F	

BRIDGE

RIVER: Wallis Run
 REACH: Study Reach RS: 15.5

INPUT

Description:

Distance from Upstream XS = 15.7
 Deck/Roadway Width = 10
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates
 num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-100	958.05		-18.17	958.05		-18.17	958.05	957.74
18.17	958.05	957.74	18.17	958.05		100	958.05	

Upstream Bridge Cross Section Data

Station Elevation Data		num= 122							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-79.3	968.76	-75.1	968.06	-73.1	967.75	-72	967.61	-71	967.5
-69	967.22	-67.9	967.11	-66.9	966.97	-65.9	966.87	-63.8	966.58
-62.7	966.46	-60.7	966.2	-59.7	966.09	-57.6	965.81	-56.6	965.7
-54.5	965.42	-53.5	965.31	-51.5	964.97	-50.4	964.82	-46.3	964.14
-45.3	964	-42.2	963.48	-35	962.69	-34.5	962.54	-34.4	962.46
-34	962.3	-28.4	958.89	-27.8	958.49	-26.8	957.88	-23.8	956.04
-21.6	954.92	-19.4	953.76	-18.5	953.31	-18	953.07	-17.5	952.89
-16.7	952.9	-16.5	952.9	-15.4	952.87	-14.4	952.48	-13.4	952.03
-12.3	951.72	-10.5	951.38	-9.9	951.27	-9.7	951.24	-9.3	951.17
-7.2	950.97	-6.2	950.9	-3.1	950.59	-2.3	950.54	-2.1	950.52
-1.7	950.49	0	950.32	.2	950.33	1	950.37	4.1	950.77
5.1	950.87	8.5	951.31	9.1	951.39	9.3	951.4	9.3	951.41
9.6	951.44	10.2	951.49	12.4	951.77	12.6	951.98	13.2	952.47
13.4	952.59	13.5	952.68	16.5	955.52	16.8	955.79	17.5	956.33
21.6	958.68	22.6	958.89	23.4	958.96	23.7	958.98	24.7	959.09
25.9	959.18	26.6	959.23	26.7	959.24	27.5	959.33	27.8	959.36
28.2	959.39	29.8	959.51	30.9	959.62	32.9	959.78	33.3	959.82
33.6	959.85	34	959.89	37.1	960.13	37.7	960.16	38.1	960.18
38.3	960.2	41.2	960.39	42.4	960.44	43.3	960.48	47.7	960.68
56.2	961	56.5	961.02	56.6	961.02	56.7	961.03	57.3	961.08
57.6	961.09	64.8	961.37	68.9	961.56	69	961.56	69.8	961.61
70	961.64	70.3	961.7	70.6	961.73	71	961.8	71.4	961.88
71.7	961.94	72	962.01	72.2	962.04	73.1	962.19	73.9	962.36
74.1	962.4	75.4	962.62	75.6	962.67	75.7	962.7	82.3	962.47
96	961.56	107.27	963.33						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-79.3	.1	-28.4	.035	21.6	.07

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	-28.4	21.6		.3	.5

Ineffective Flow		num= 2			
Sta L	Sta R	Elev	Permanent		
-79.3	-33.9	957.74	F		
33.9	107.27	957.74	F		

Downstream Deck/Roadway Coordinates

num= 6					
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-100	958.05		-18.17	958.05	
18.17	958.05	957.74	18.17	958.05	
			100	958.05	

Downstream Bridge Cross Section Data

Station Elevation Data		num= 221							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-81.4	968.41	-78.1	967.49	-75.3	966.69	-71.1	965.53	-66.9	964.34
-62.7	963.19	-58.6	962.03	-57.5	961.83	-55.5	961.49	-54.4	961.3
-50	960.58	-46.3	959.96	-45.8	959.91	-45.2	959.85	-44.1	959.79
-40	959.4	-38	959.25	-33.8	958.87	-33.7	958.86	-32.8	958.8
-28.7	958.42	-27.7	958.38	-21.5	958.32	-21.3	958.22	-20.5	957.43
-17.4	952.45	-17.2	952.23	-16.3	951.6	-15.5	951.57	-14.3	951.56
-13.3	951.58	-13	951.59	-12.2	951.59	-11.4	951.62	-11.2	951.62
-9.7	951.63	-8.1	951.66	-7.2	951.66	-7.1	951.66	-6.8	951.67
-6.1	951.69	-5	951.69	0	951.54	.1	951.53	1	951.48
1.2	951.47	6.3	951.31	7.3	951.25	8.4	951.4	8.5	951.42
9	951.52	9.3	951.59	9.4	951.6	9.5	951.63	10.1	951.76

11	951.97	11.4	952.12	13.4	953.15	13.6	953.24	14.5	953.8
16.6	955.31	16.8	955.43	17.6	956.06	21.8	959.09	22.8	959.83
23.1	959.95	23.4	960.07	23.8	960.17	24.2	960.19	24.5	960.21
24.8	960.23	25	960.24	25.9	960.28	26.9	960.33	27.9	960.41
29.9	960.5	30	960.5	30.8	960.56	32	960.62	33.1	960.68
33.3	960.69	34.1	960.75	35.1	960.79	35.4	960.81	35.8	960.84
36.2	960.86	36.6	960.88	36.7	960.89	37.2	960.92	37.4	960.93
38.1	960.96	38.2	960.96	38.3	960.97	38.5	960.97	39.1	960.98
39.2	960.98	39.5	960.99	39.9	961.01	40.3	961.03	41.3	961.04
42.2	961.08	42.3	961.09	43.4	961.1	44.1	961.13	44.9	961.15
45.4	961.16	46.3	961.2	46.4	961.21	47.4	961.22	47.6	961.23
48.2	961.25	49	961.22	49.9	961.15	50.7	961.06	51.2	961.01
51.5	960.97	51.6	960.97	52.6	960.88	54.7	960.67	54.8	960.65
55.4	960.59	55.6	960.57	55.7	960.57	55.8	960.57	56.5	960.54
56.7	960.55	57.2	960.59	57.3	960.6	57.8	960.64	62.6	961.08
62.9	961.11	63.1	961.13	63.8	961.21	63.9	961.22	64	961.23
64.7	961.29	65	961.32	65.3	961.4	65.6	961.44	66	961.54
66.4	961.74	66.7	961.9	67	962.07	67.2	962.16	68	962.55
68.1	962.56	68.1	962.57	69.1	963.09	69.4	963.22	69.7	963.35
70.1	963.48	70.5	963.59	70.8	963.63	71.1	963.71	71.4	963.74
72.2	963.87	72.2	963.88	73	963.98	73.2	964.01	73.5	964.06
73.8	964.11	74.2	964.17	74.7	964.24	74.9	964.27	75.3	964.33
75.5	964.37	76.3	964.47	76.5	964.49	77.2	964.6	77.3	964.63
77.6	964.68	78	964.74	78.4	964.8	78.8	964.85	79	964.87
79.4	964.93	79.6	964.97	81.3	965.23	81.4	965.25	81.7	965.28
82.1	965.34	82.5	965.39	82.9	965.46	83.1	965.48	83.8	965.59
84.4	965.67	84.5	965.69	84.6	965.7	84.9	965.74	85.6	965.85
85.8	965.88	86.3	965.95	87.1	966.07	87.1	966.08	87.6	966.15
87.9	966.19	88.5	966.29	88.6	966.31	88.7	966.32	89.1	966.37
89.6	966.43	89.9	966.47	90.4	966.55	91.2	966.66	91.7	966.74
92	966.79	92.8	966.9	92.9	966.92	93.3	966.97	93.7	967.02
93.8	967.03	93.9	967.06	94.5	967.15	95.3	967.27	95.4	967.28
95.9	967.34	96.2	967.39	96.7	967.46	96.9	967.5	97	967.51
97.54	967.58								

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-81.4 .1 -21.5 .035 23.4 .07

Bank Sta: Left Right Coeff Contr. Expan.
 -21.5 23.4 .3 .5

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
-81.4 -34.67 958.05 F
34.67 97.54 958.05 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8

Max Low Cord

=

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach

RS: 15

INPUT

Description:

Station Elevation Data		num= 221							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-81.4	968.41	-78.1	967.49	-75.3	966.69	-71.1	965.53	-66.9	964.34
-62.7	963.19	-58.6	962.03	-57.5	961.83	-55.5	961.49	-54.4	961.3
-50	960.58	-46.3	959.96	-45.8	959.91	-45.2	959.85	-44.1	959.79
-40	959.4	-38	959.25	-33.8	958.87	-33.7	958.86	-32.8	958.8
-28.7	958.42	-27.7	958.38	-21.5	958.32	-21.3	958.22	-20.5	957.43
-17.4	952.45	-17.2	952.23	-16.3	951.6	-15.5	951.57	-14.3	951.56
-13.3	951.58	-13	951.59	-12.2	951.59	-11.4	951.62	-11.2	951.62
-9.7	951.63	-8.1	951.66	-7.2	951.66	-7.1	951.66	-6.8	951.67
-6.1	951.69	-5	951.69	0	951.54	.1	951.53	1	951.48
1.2	951.47	6.3	951.31	7.3	951.25	8.4	951.4	8.5	951.42
9	951.52	9.3	951.59	9.4	951.6	9.5	951.63	10.1	951.76
11	951.97	11.4	952.12	13.4	953.15	13.6	953.24	14.5	953.8
16.6	955.31	16.8	955.43	17.6	956.06	21.8	959.09	22.8	959.83
23.1	959.95	23.4	960.07	23.8	960.17	24.2	960.19	24.5	960.21
24.8	960.23	25	960.24	25.9	960.28	26.9	960.33	27.9	960.41
29.9	960.5	30	960.5	30.8	960.56	32	960.62	33.1	960.68
33.3	960.69	34.1	960.75	35.1	960.79	35.4	960.81	35.8	960.84
36.2	960.86	36.6	960.88	36.7	960.89	37.2	960.92	37.4	960.93
38.1	960.96	38.2	960.96	38.3	960.97	38.5	960.97	39.1	960.98
39.2	960.98	39.5	960.99	39.9	961.01	40.3	961.03	41.3	961.04
42.2	961.08	42.3	961.09	43.4	961.1	44.1	961.13	44.9	961.15
45.4	961.16	46.3	961.2	46.4	961.21	47.4	961.22	47.6	961.23
48.2	961.25	49	961.22	49.9	961.15	50.7	961.06	51.2	961.01
51.5	960.97	51.6	960.97	52.6	960.88	54.7	960.67	54.8	960.65
55.4	960.59	55.6	960.57	55.7	960.57	55.8	960.57	56.5	960.54
56.7	960.55	57.2	960.59	57.3	960.6	57.8	960.64	62.6	961.08
62.9	961.11	63.1	961.13	63.8	961.21	63.9	961.22	64	961.23
64.7	961.29	65	961.32	65.3	961.4	65.6	961.44	66	961.54
66.4	961.74	66.7	961.9	67	962.07	67.2	962.16	68	962.55
68.1	962.56	68.1	962.57	69.1	963.09	69.4	963.22	69.7	963.35
70.1	963.48	70.5	963.59	70.8	963.63	71.1	963.71	71.4	963.74
72.2	963.87	72.2	963.88	73	963.98	73.2	964.01	73.5	964.06
73.8	964.11	74.2	964.17	74.7	964.24	74.9	964.27	75.3	964.33
75.5	964.37	76.3	964.47	76.5	964.49	77.2	964.6	77.3	964.63
77.6	964.68	78	964.74	78.4	964.8	78.8	964.85	79	964.87
79.4	964.93	79.6	964.97	81.3	965.23	81.4	965.25	81.7	965.28
82.1	965.34	82.5	965.39	82.9	965.46	83.1	965.48	83.8	965.59
84.4	965.67	84.5	965.69	84.6	965.7	84.9	965.74	85.6	965.85
85.8	965.88	86.3	965.95	87.1	966.07	87.1	966.08	87.6	966.15
87.9	966.19	88.5	966.29	88.6	966.31	88.7	966.32	89.1	966.37
89.6	966.43	89.9	966.47	90.4	966.55	91.2	966.66	91.7	966.74
92	966.79	92.8	966.9	92.9	966.92	93.3	966.97	93.7	967.02
93.8	967.03	93.9	967.06	94.5	967.15	95.3	967.27	95.4	967.28
95.9	967.34	96.2	967.39	96.7	967.46	96.9	967.5	97	967.51
97.54	967.58								

Manning's n Values			num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-81.4	.1	-21.5	.035	23.4	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-21.5	23.4		28.1	28.1		.3	.5
Ineffective Flow	num=		2					
Sta L	Sta R	Elev	Permanent					
-81.4	-34.67	958.05	F					
34.67	97.54	958.05	F					

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 14.5

INPUT

Description:

Station	Elevation	Data	num=	175					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	969.32	2.6	968.62	3.6	968.31	7.6	967.21	9.6	966.63
13.6	965.53	14.6	965.23	17.3	964.48	18.6	964.06	19.6	963.75
24.8	962.07	26.7	961.49	27.6	961.18	28.5	960.89	31.3	959.97
34.7	958.91	35.1	958.84	35.7	958.74	36.4	958.68	37.9	958.57
39.6	958.41	40.7	958.34	41.7	958.25	41.8	958.25	42.5	958.2
44.4	958.03	46.7	957.86	54.7	957.34	55.7	957.31	59.7	957.31
61.7	957.28	67.7	957.28	68.7	957.25	70.6	957.23	70.8	957.21
71	957.1	71.5	956.84	73.8	955.56	74.99	54.9379	79.9	952.11
80.2	952.01	80.8	951.9	80.9	951.87	81	951.84	81.3	951.7
81.8	951.47	81.9	951.44	83	951.42	84	951.41	86	951.41
86.9	951.38	90.2	951.37	90.8	951.35	91.1	951.35	91.2	951.34
91.3	951.34	93.6	951.32	99.1	951.16	99.3	951.16	99.5	951.15
100.3	951.1	105.5	950.94	105.6	950.95	106.2	951.02	106.5	951.05
107.5	951.25	108.5	951.42	108.8	951.46	109.6	951.62	110.4	951.85
114.7	953.12	115.5	953.26	115.7	953.32	119.7	954.15	120.5	954.31
120.8	954.36	123.9	955.01	125.2	955.26	125.6	955.33	125.9	955.4
126.4	955.5	127	955.6	127.8	955.73	128	955.76	130.9	955.7148
131.1	955.69	131.5	955.66	132.1	955.63	132.3	955.62	133.2	955.6
133.4	955.6	134	955.58	134.1	955.58	134.3	955.57	135.1	955.52
135.6	955.51	136.5	955.49	137.2	955.47	137.4	955.46	138.1	955.41
138.2	955.41	142.3	955.3	147.4	955.62	155.6	956.44	155.9	956.46
156.5	956.52	156.6	956.53	156.7	956.53	157.1	956.55	157.7	956.56
157.8	956.57	158.4	956.6	158.7	956.61	159.1	956.62	159.2	956.62
159.7	956.63	160.4	956.65	160.7	956.66	160.9	956.66	161.7	956.68
161.8	956.68	161.8	956.69	162.6	956.7	162.8	956.71	163	956.71
163.4	956.7	163.8	956.71	164.3	956.71	164.8	956.71	165.1	956.71
166	956.72	166.6	956.73	166.8	956.73	166.9	956.73	167.6	956.73
168.5	956.73	168.9	956.73	169.6	956.73	169.9	956.73	170.2	956.73
170.9	956.76	171	956.76	171.3	956.77	171.9	956.77	172	956.77
172.2	956.77	172.7	956.75	173	956.76	173.5	956.75	174	956.75
174.4	956.76	174.8	956.78	175	956.79	175.2	956.82	176	956.9
185.5	957.86	186.2	958	186.3	958.03	190.4	959.09	190.4	959.1
191.2	959.32	191.4	959.38	191.7	959.46	192	959.54	192.4	959.65
192.9	959.76	193	959.8	194.4	960.14	194.5	960.17	194.6	960.19
195	960.28	195.4	960.37	195.5	960.39	195.7	960.43	196.1	960.52

Manning's n Values			num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	70.6	.035	127.8	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	70.6	127.8		28.8	28.8		.1	.3

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach

RS: 14

INPUT

Description:

Station Elevation Data		num= 243							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-106.2	967.04	-105.2	966.75	-104.1	966.42	-99.2	965.07	-98.2	964.76
-94.2	963.65	-93.2	963.35	-88.2	961.96	-87.2	961.66	-76.1	958.62
-75.1	958.55	-70.2	958.41	-69.1	958.4	-68.1	958.34	-66.2	958.17
-65.1	958.09	-64.1	958	-63.1	957.94	-62.1	957.84	-61.8	957.82
-61.5	957.8	-61.1	957.78	-60.1	957.69	-59.1	957.62	-55.1	957.28
-53.1	957.16	-45.3	956.92	-43.4	956.91	-42.1	956.89	-41.1	956.89
-39.1	956.86	-38.1	956.86	-37.7	956.86	-37.4	956.85	-37.1	956.84
-36.8	956.84	-34.9	956.83	-34.3	956.82	-34.1	956.81	-33.9	956.81
-32.1	956.81	-31.1	956.78	-30.1	956.78	-30	956.78	-29.1	956.69
-29.1	956.68	-28.2	956.24	-26.1	955.13	-25.1	954.53	-21.1	952.02
-20.1	951.5	-19.1	951.42	-12	950.97	-9	950.88	-7	950.88
-6.8	950.88	-6.3	950.9	-6	950.91	-3.5	950.91	-2.6	950.92
-2.5	950.92	-2	950.94	0	950.94	.3	950.95	.6	950.96
1	950.97	6	951.28	12.7	951.5	13	951.51	13.3	951.57
13.6	951.63	14	951.7	15	951.83	17	951.97	21	952.13
21.3	952.18	21.8	952.21	22	952.24	22.2	952.31	23	952.52
23.2	952.58	23.9	952.84	24	952.88	24.1	952.92	25	953.24
25.1	953.26	26	953.62	26	953.63	27	953.79	27	953.8
27.1	953.81	27.9	953.91	28	953.92	28.1	953.93	29.8	953.93
30	953.94	31	953.99	31.3	954.04	31.7	954.13	32	954.19
32.3	954.26	32.7	954.33	33	954.4	33.4	954.52	33.6	954.57
34	954.7	34.5	954.88	34.6	954.92	35	955.11	35.5	955.33
36	955.55	36.5	955.73	36.6	955.78	37	955.96	37.4	956.12
37.6	956.21	38	956.37	38.4	956.53	38.7	956.67	39	956.81
39.3	956.94	39.7	957.11	40	957.23	40.3	957.33	40.8	957.55
41	957.64	41.2	957.72	41.9	958.01	42	958.08	42.2	958.14
42.9	958.45	43	958.49	43.1	958.53	44	958.88	44	958.9
44.1	958.92	45	959.34	46	959.66	46.1	959.67	46.9	959.83
47.1	959.87	49	960.23	49.3	960.28	49.8	960.39	50	960.45
50.3	960.5	50.7	960.58	51	960.64	51.4	960.7	51.7	960.76
52.4	960.9	52.6	960.94	53	961.01	53.5	961.1	54	961.2
54.6	961.3	55	961.39	55.6	961.31	56	961.23	59.1	960.53
59.3	960.51	59.8	960.44	60.1	960.42	60.9	960.34	61.1	960.33
61.2	960.41	62	960.81	62.1	960.92	63	961.44	63.1	961.47
63.1	961.49	63.9	961.92	64	962.03	64.1	962.03	65.1	962.27
65.1	962.28	65.9	962.42	66.1	962.44	67.9	962.76	68.1	962.8
68.3	962.84	68.8	962.95	69.1	963	69.4	963.05	73.6	963.8
74.1	963.88	74.5	963.97	74.6	963.99	75.1	964.07	75.5	964.14
76.1	964.26	76.4	964.32	76.8	964.38	77.1	964.44	77.4	964.49
77.8	964.57	78.1	964.62	78.3	964.66	79.9	964.99	83.1	965.65
83.1	965.66	84	965.82	84.1	965.84	84.2	965.85	85	966.03
85.1	966.05	85.2	966.07	85.9	966.22	86.1	966.25	86.3	966.28
86.9	966.36	87.1	966.39	87.3	966.42	87.8	966.48	88.1	966.51
88.8	966.59	89.1	966.64	89.4	966.67	89.7	966.69	90.1	966.73
90.5	966.76	90.7	966.77	91.1	966.8	91.6	966.82	91.6	966.83
92.1	966.84	92.6	966.86	92.6	966.87	93.1	966.89	93.5	966.91
93.7	966.92	94.1	966.94	94.5	966.96	95.1	966.98	95.8	967.02
96.1	967.04	96.8	967.07	97.3	967.09	97.9	967.11	100.1	967.23
100.2	967.23	101.1	967.26	101.19	967.26				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-106.2	.1	-29.1	.035	38.7	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
-29.1	38.7	47.6	55.7	52.5	.1	.3	

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 13

INPUT

Description:

Station Elevation Data		num= 233							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-142.8	967.05	-141.8	966.78	-138.8	965.83	-137.8	965.55	-134.8	964.6
-123.3	960.96	-122.8	960.8	-121.7	960.49	-111.7	957.3	-110.7	957.21
-90.6	956.52	-90.3	956.53	-89.9	956.53	-89.6	956.53	-87.6	956.59
-86.3	956.66	-85.8	956.68	-85.4	956.69	-81.7	956.81	-81.5	956.82
-80.5	956.88	-77.5	956.97	-71.5	956.6	-65.5	956.25	-59.8	956.07
-58.4	956.02	-50.4	955.75	-50.1	955.71	-49.7	955.67	-49.4	955.62
-48.9	955.48	-48.8	955.45	-47.9	955.15	-43.3	953.72	-42.4	953.35
-42.3	953.32	-42.2	953.26	-39.3	951.76	-38.3	951.53	-33.3	951.22
-32.9	951.15	-32.7	951.12	-32.3	951.05	-31.8	951	-31.7	951
-31.3	950.96	-28.2	951.34	-25.9	951.21	-23.8	951.1	-19.2	950.82
-19	950.81	-18.4	950.8	-18.2	950.79	-17.8	950.77	-17.5	950.75
-17.1	950.73	-16.7	950.71	-16.6	950.71	-16.1	950.69	-15.5	950.66
-14.4	950.62	-14.1	950.61	-13.9	950.61	-12.2	950.51	-11.3	950.48
-8.1	950.35	-7.1	950.3	-6.1	950.24	-5.9	950.24	-5.1	950.22
-5	950.22	-5	950.21	-4.7	950.15	-2.8	949.71	-2	949.57
-1.6	949.49	-1.4	949.45	-1	949.36	-.5	949.32	0	949.29
.3	949.41	1.2	949.72	1.9	949.93	2	949.99	3	950.31
3.9	950.6	4	950.64	4.2	950.69	4.8	950.92	5	951.01
6	951.58	6.5	951.66	6.6	951.68	7.1	951.77	7.5	951.83
7.6	951.85	8.1	951.9	8.4	951.95	8.8	952.01	9.1	952.05
9.3	952.08	10	952.17	10.2	952.19	11.1	952.31	11.1	952.32
12	952.46	12.1	952.48	12.3	952.5	12.8	952.58	13.1	952.62
13.4	952.67	13.7	952.72	14.1	952.78	14.6	952.85	14.6	952.86
15.5	952.99	16.1	953.07	19.1	953.56	19.2	953.57	19.2	953.58
20	953.76	20.9	953.94	21.4	954.03	22.1	954.15	22.2	954.17
22.7	954.27	23.2	954.37	23.3	954.39	24	954.52	24.2	954.58
25.2	955.63	25.7	956.16	25.8	956.26	28.1	958.91	29.3	960.31
30.1	961.21	30.3	961.35	35.2	965.6	35.3	965.67	35.4	965.72
35.8	966.06	36.3	966.45	36.3	966.51	37.4	966.69	46.5	967.53
46.8	967.56	47.2	967.58	47.5	967.6	47.7	967.62	48.4	967.68
48.5	967.69	53.5	967.98	53.8	968	54.4	968.05	54.6	968.07
54.7	968.07	55.4	968.12	55.6	968.12	55.6	968.13	56.4	968.17
56.6	968.18	56.8	968.19	57.3	968.22	57.6	968.24	58	968.26
58.2	968.27	58.6	968.3	59.1	968.34	59.2	968.35	59.6	968.39
64.7	968.67	65.2	968.73	65.2	968.74	65.7	968.79	66.1	968.83
66.4	968.87	66.7	968.91	66.9	968.94	67.6	969.01	67.7	969.03
67.8	969.04	68.5	969.13	68.7	969.15	68.7	969.16	68.8	969.16
69.6	969.26	69.7	969.28	70	969.3	70.4	969.34	70.8	969.38
71.2	969.43	71.3	969.45	73.1	969.66	73.6	969.72	73.8	969.75
74	969.77	74.8	969.88	75	969.9	75.7	969.96	75.8	969.97
76	969.99	76.6	970.06	76.8	970.09	77.2	970.13	77.5	970.17
77.8	970.22	78.3	970.26	78.8	970.29	79.2	970.32	79.5	970.35
79.9	970.38	80.1	970.39	80.7	970.43	80.9	970.44	81	970.45
81.6	970.5	81.8	970.53	81.9	970.53	82.7	970.58	82.9	970.59
83.1	970.61	83.6	970.65	85.5	970.79	85.9	970.82	86.2	970.84
86.7	970.89	86.9	970.91	87.1	970.92	87.9	970.97	88	970.97
88.1	970.98	88.9	971.05	88.95	971.06				

Manning's n Values	num= 3
Sta n Val	Sta n Val

-142.8 .1 -50.4 .04 24.2 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -50.4 24.2 36.4 60 69.1 .1 .3

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 12

INPUT

Description:

Station Elevation Data		num= 240							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-128.9	964.1	-127.1	963.78	-126.1	963.58	-117	962.04	-115.9	961.84
-114.9	961.53	-112	960.49	-110.9	960.09	-109.2	959.51	-106.8	958.67
-105.8	958.29	-103.9	957.63	-102.8	957.21	-99.8	956.14	-98.8	955.88
-97.7	955.69	-95.7	955.74	-93.7	955.82	-91.6	955.88	-90.8	955.93
-86.6	956.05	-85.6	956.1	-82.6	956.18	-80.6	956.26	-77.6	956.34
-77.4	956.35	-76.7	956.39	-74.1	956.47	-72.5	956.54	-69.4	956.62
-67.9	956.68	-65.4	956.75	-64.3	956.81	-63.4	956.84	-62.3	956.9
-62	956.91	-61.8	956.91	-60.3	956.98	-58.2	956.84	-56.5	956.67
-56.3	956.66	-56	956.64	-55.6	956.61	-55.3	956.58	-54.8	956.54
-54.7	956.53	-53.8	956.45	-53.6	956.44	-53.2	956.41	-53	956.38
-51.2	956.22	-50.2	956.15	-45.9	955.77	-45.1	955.71	-44.2	955.63
-44.1	955.62	-43.1	955.48	-41	954.86	-40.9	954.83	-40.2	954.62
-37.9	953.92	-35.7	953.2	-33.4	952.46	-33.3	952.41	-32.8	952.29
-32.5	952.21	-32.4	952.18	-30.2	951.97	-27.9	951.71	-24.7	951.4
-24.1	951.32	-23.7	951.28	-23.3	951.24	-19.6	950.77	-19.5	950.75
-19.4	950.75	-19.3	950.72	-18.7	950.63	-18.3	950.58	-17	950.4
-16.4	950.33	-16.2	950.29	-15.6	950.21	-15.1	950.13	-14	950
-13.8	949.98	-13.3	949.94	-11.7	949.77	-10.8	949.68	-9.7	949.58
-7.2	949.32	-1	948.47	-.3	948.38	0	948.36	.8	948.57
1.1	948.65	2	948.93	2.8	949.22	3.3	949.42	3.6	949.64
4.3	950.09	5.3	950.83	7.4	952.33	8.2	952.91	14.6	957.56
15	957.82	15.6	958.23	16	958.46	16.4	958.69	21.8	962.09
21.8	962.1	21.8	962.12	22.6	962.58	22.8	962.73	23.2	962.96
23.4	963.11	23.9	963.38	24.3	963.63	24.6	963.84	24.9	964.04
25.1	964.13	25.9	964.43	25.9	964.44	28	964.53	28.4	964.56
28.7	964.57	29	964.59	29.2	964.6	30	964.62	30.9	964.68
31.1	964.7	31.4	964.72	31.7	964.75	32.1	964.78	32.5	964.81
33.1	964.84	33.3	964.86	34.2	964.94	35	964.99	35.2	965.01
36.2	965.08	36.7	965.11	36.9	965.13	37.3	965.16	37.5	965.17
38.3	965.25	38.4	965.26	39.1	965.3	39.3	965.31	39.6	965.34
40	965.36	40.3	965.39	40.8	965.43	42.4	965.53	42.5	965.54
43.4	965.62	43.7	965.64	44.5	965.69	44.9	965.72	45.1	965.74
45.5	965.77	46.5	965.84	46.6	965.85	46.7	965.86	47.4	965.9
47.6	965.91	48.2	966	48.6	966.05	52.3	966.42	52.7	966.45
53.2	966.51	53.3	966.53	53.7	966.58	54	966.61	54.7	966.68
54.8	966.69	55.1	966.71	55.7	966.77	55.8	966.79	56	966.81
56.5	966.85	56.8	966.89	57.3	966.95	57.4	966.96	57.9	967.02
58.1	967.05	58.8	967.11	58.9	967.12	59	967.13	59.2	967.16
59.8	967.21	59.9	967.22	60.1	967.25	60.6	967.29	60.9	967.33
61.4	967.37	61.5	967.38	62	967.43	62.3	967.46	62.9	967.54
63	967.56	63.1	967.57	63.4	967.6	63.9	967.65	64	967.66
64.2	967.68	64.7	967.71	65.1	967.73	65.6	967.78	65.6	967.79
66.1	967.83	67	967.92	67.1	967.93	67.2	967.94	68.2	968.04
68.4	968.05	68.9	968.08	69.2	968.11	69.7	968.16	70.2	968.21
71.1	968.29	71.3	968.32	71.7	968.36	72.2	968.4	72.5	968.42
73	968.46	73.3	968.48	73.8	968.53	74.3	968.58	75.2	968.67
75.4	968.68	75.9	968.74	76.3	968.78	76.4	968.78	76.6	968.8
77.4	968.86	77.9	968.9	78	968.91	78.5	968.96	78.69	968.98

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-128.9	.1	-43.1	.04	14.6	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-43.1	14.6		72.6	75	71.8	.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 11

INPUT

Description:

Station Elevation Data		num=	238						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-129.5	965.17	-127.9	964.88	-123.7	964.17	-121.6	963.79	-117.4	963.08
-116.7	962.94	-115.1	962.63	-114.2	962.43	-111	961.81	-110.3	961.65
-108.9	961.38	-107.9	961.22	-105.8	960.97	-104.8	960.82	-102.6	960.56
-101.6	960.41	-98.4	960.03	-97.4	959.88	-95.3	959.62	-94.2	959.47
-92.1	959.22	-90.5	958.82	-89.7	958.61	-89	958.44	-86.9	957.86
-85.8	957.54	-84.8	957.18	-82.7	956.54	-82.5	956.49	-82	956.33
-81.7	956.22	-81.6	956.18	-79.5	955.54	-79.3	955.48	-78.8	955.29
-78.5	955.21	-78.5	955.18	-76.4	954.54	-75.3	954.19	-75.2	954.18
-74.3	954.16	-73.8	954.18	-73.7	954.18	-72.3	954.22	-69.8	954.22
-66.9	954.2	-66.6	954.2	-65.8	954.22	-62.7	954.19	-61.9	954.21
-59.6	954.19	-57.5	954.23	-56.4	954.08	-56.3	954.06	-55.5	953.88
-54.7	953.76	-48	952.89	-47.3	952.8	-45.9	952.65	-42.8	952.26
-42	952.26	-41.7	952.26	-40.6	952.3	-40.4	952.31	-39.8	952.31
-39.6	952.31	-39.5	952.32	-38.5	952.34	-37.5	952.3	-33.2	951.84
-30.1	951.47	-27	951.13	-22.8	950.64	-20.6	950.31	-19.8	950.22
-18.1	950	-18	949.99	-17.6	949.95	-14	949.71	-13.9	949.7
-13.4	949.68	-11.5	949.54	-11.4	949.53	-10.3	949.47	-9.3	949.39
-8.2	949.34	-6.6	949.22	-4.2	949.07	-4.2	949.06	-4.1	949.06
-4	949.05	-3.1	948.96	-1.1	948.73	0	948.6	.8	948.67
1	948.69	1.3	948.74	1.7	948.8	2	948.86	2.5	948.92
2.7	948.94	3.1	948.99	3.3	949.02	4.1	949.12	4.1	949.13
4.3	949.15	5	949.26	5.1	949.29	5.4	949.33	5.8	949.37
6.2	949.42	6.6	949.48	7.5	949.62	8	949.75	8.2	949.8
8.3	949.84	9.2	950.08	9.2	950.09	9.2	950.11	9.3	950.21
11.2	951.85	11.6	952.26	11.8	952.5	12.2	953	13.6	955.61
14	956.38	14.3	956.9	14.5	957.11	15.2	957.58	15.3	957.65
15.7	957.87	16.2	958.18	17.1	958.71	17.3	958.84	17.6	959.02
18.8	959.72	19.3	960.01	19.7	960.23	21.4	961.21	21.4	961.23
22	961.34	22.3	961.4	24.1	961.63	24.4	961.68	24.8	961.73
26.7	961.97	27.3	962.04	27.4	962.07	27.6	962.08	28.3	962.17
28.4	962.19	28.5	962.19	29.3	962.29	29.5	962.31	29.7	962.34
30.2	962.42	30.5	962.46	30.9	962.51	31.5	962.58	31.9	962.64
32.5	962.72	33.3	962.82	33.5	962.85	33.7	962.87	34.5	962.97
34.7	962.99	35.4	963.08	35.5	963.09	35.7	963.11	36.3	963.2
36.5	963.23	37.6	963.36	38	963.42	38.1	963.43	38.6	963.48
38.9	963.52	39.3	963.57	39.6	963.6	39.8	963.63	40.5	963.71
40.7	963.73	41	963.78	41.5	963.86	41.6	963.87	41.7	963.88
46.7	964.48	47.3	964.57	47.6	964.62	50.3	964.93	50.7	964.98
51.1	965.04	51.4	965.07	51.7	965.11	52.9	965.27	53.7	965.34
53.8	965.34	54.6	965.42	54.8	965.43	55	965.45	61.4	966.13
61.8	966.17	62.1	966.2	62.8	966.26	63.1	966.29	63.6	966.33
63.8	966.36	64	966.38	64.6	966.45	64.8	966.47	65.7	966.55
65.8	966.57	65.9	966.58	66.7	966.65	66.8	966.66	66.9	966.67
67.8	966.78	69.8	966.97	69.9	966.98	70.7	967.07	70.8	967.08
71	967.1	71.6	967.16	71.8	967.18	72	967.2	72.6	967.25
72.8	967.27	73.1	967.29	73.5	967.32	73.8	967.34	74.2	967.38
74.5	967.4	74.8	967.44	75.8	967.53	76.3	967.56	76.4	967.57

77.3	967.64	78.5	967.75	81.35	967.64
Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-129.5	.1	-57.5	.04	13.6	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-57.5	13.6		87.4 104.3	100.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 10

INPUT

Description:

Station Elevation Data		num= 182							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-113	966.49	-109.7	964.22	-109.1	963.6	-107.6	963.37	-105.5	963.02
-104.4	962.87	-103.3	962.68	-102.2	962.53	-101.2	962.35	-100.1	962.23
-99	962.08	-96.9	961.85	-95.8	961.7	-93.6	961.46	-92.6	961.31
-89.3	960.95	-88.2	960.87	-87.2	960.83	-86.1	960.75	-85	960.71
-83.9	960.63	-82.9	960.59	-81.8	960.51	-80.7	960.47	-79.6	960.4
-78.6	960.34	-77.5	960.22	-75.2	960.02	-66.1	959.12	-59.2	958.25
-59.1	958.24	-59	958.23	-58.1	958.08	-52.7	957.4	-50.7	957.11
-47.3	956.68	-45.3	956.39	-43	956.09	-41.9	955.93	-41.4	955.86
-40.9	955.79	-40.2	955.49	-39.9	955.38	-39.8	955.33	-37.6	954.29
-36.8	953.91	-36.6	953.78	-33.3	952.26	-32.4	951.78	-32.2	951.73
-29.9	950.8	-29	950.49	-27.7	950.38	-26.7	950.33	-23.5	950.11
-21.6	949.94	-19.6	949.81	-17.7	949.65	-17.3	949.62	-16.7	949.58
-15.8	949.51	-13.8	949.34	-10	949.09	-9.5	949.06	-9.1	949.03
-8.1	948.97	-8	948.97	-7.9	948.96	-3.3	948.64	-.9	948.54
0	948.53	.2	948.54	.7	948.56	1.4	948.56	1.5	948.56
4.4	948.69	6.1	948.73	12	948.98	13.1	949.06	16.6	949.22
18.8	949.36	22.5	949.59	26	949.84	26.2	949.87	26.5	949.97
26.9	950.12	27.2	950.25	27.6	950.49	28.3	950.83	28.4	950.87
28.4	950.88	28.4	950.89	29.1	951.24	29.5	951.38	30.3	951.49
30.6	951.52	30.7	951.54	31.3	951.61	31.9	951.68	32	951.7
32.2	951.72	32.5	951.74	32.8	951.77	33	951.79	33.1	951.81
33.8	951.89	34	951.91	35	952.04	35.2	952.08	35.7	952.14
36.3	952.23	36.6	952.27	37	952.31	37.4	952.37	40	952.72
40.4	952.77	40.6	952.79	41	952.84	41.3	952.88	41.6	952.93
42.3	953.03	44	953.35	44.8	953.54	45	953.57	45.1	953.6
46	953.77	46.1	953.79	46.9	953.96	47	953.96	47	953.97
47.5	954.07	48	954.16	49	954.38	49.1	954.39	49.9	954.46
50	954.47	53.3	954.69	55	954.81	60	955.12	60.3	955.14
60.8	955.17	61	955.18	61.2	955.19	61.8	955.21	62	955.22
62.2	955.23	63	955.28	63.1	955.28	64	955.31	64.6	955.35
65	955.38	65.9	955.4	66	955.41	68	955.5	68.2	955.51
68.8	955.55	69	955.56	69.3	955.6	69.7	955.65	70	955.69
70.4	955.74	70.7	955.79	71	955.84	71.4	955.92	71.6	955.95
72	956.03	77.8	957.02	78	957.06	78.2	957.1	78.9	957.22
79	957.25	79.2	957.27	79.9	957.39	80	957.41	80.1	957.42
81	957.59	81.1	957.6	81.7	957.7	82	957.75	83	957.93
122.8	958.25	124.65	958.45						

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-113	.1	-40.9	.04	49	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-40.9	49		55.8 50.4	38.7		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach

RS: 9

INPUT

Description:

Station Elevation Data		num=		270					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-128.3	970.66	-126.8	970.09	-126.6	969.8	-126.5	969.78	-125.9	969.6
-123.8	969.13	-122.7	968.86	-121.7	968.63	-117.6	967.84	-116.5	967.67
-114.3	967.24	-113.4	967.08	-109.2	966.3	-108.2	966.12	-106.1	965.71
-103	965.16	-100.9	964.77	-98.8	964.59	-97.3	964.49	-96	964.36
-91.7	963.85	-90.6	963.74	-87.5	963.38	-86.4	963.3	-82.3	962.89
-81.2	962.82	-77.3	962.44	-77.1	962.42	-77	962.4	-76	962.34
-72.9	962.03	-71.9	961.96	-67.7	961.55	-66.4	961.43	-65.7	961.38
-54.3	960.25	-53.2	960.11	-52.9	960.07	-52.6	960.03	-51.8	959.94
-51.5	959.9	-51	959.83	-50.3	959.74	-50.1	959.72	-49.1	959.6
-48	959.46	-47.2	959.37	-47	959.35	-46.9	959.34	-46.5	959.29
-46.1	959.23	-46	959.21	-45.7	959.19	-44.9	959.1	-42.8	958.81
-42	958.68	-41.8	958.64	-40.8	958.5	-39.7	958.36	-38.8	958.19
-36.6	957.9	-35.6	957.72	-33.5	957.44	-32.5	957.27	-32.3	957.24
-31.5	957.14	-31.5	957.13	-31.4	957.12	-30.6	957.02	-30.4	956.98
-29.9	956.91	-29.8	956.89	-29.4	956.81	-25.4	956.26	-24.2	956.07
-19.7	955.43	-19.6	955.4	-18.6	955.05	-17.9	954.53	-16.4	953.52
-13.2	951.27	-12.1	950.49	-9.9	949.08	-9.8	949.05	-9.7	949.01
-9.1	948.73	-8.8	948.62	-8.3	948.54	-7.7	948.45	-4.8	948.1
-.7	947.64	0	947.6	3.3	948.1	3.8	948.18	4.4	948.25
7.6	948.44	7.7	948.44	8.4	948.46	8.7	948.47	10	948.54
10.9	948.56	11.4	948.58	11.7	948.58	12	948.59	12.1	948.6
12.4	948.62	12.9	948.65	13.1	948.66	13.7	948.67	14.2	948.69
14.4	948.7	14.9	948.73	15.3	948.75	18.6	948.84	19	948.84
19.6	948.84	19.7	948.84	19.8	948.85	20.5	948.86	20.8	948.86
29.6	948.75	29.7	948.77	30.3	948.91	30.6	949	31.1	949.16
31.4	949.27	31.7	949.38	32.1	949.55	32.6	949.75	32.8	949.85
33.4	950.12	33.9	950.38	34.1	950.43	34.6	950.5	34.9	950.53
35	950.54	35.3	950.58	35.6	950.61	36.1	950.66	36.4	950.7
37	950.77	37.1	950.78	37.2	950.78	37.3	950.8	37.9	950.86
38.3	950.91	38.7	950.93	39.4	950.97	39.5	950.98	40.2	951.03
40.5	951.06	41.6	951.15	41.7	951.15	41.9	951.16	42.5	951.18
42.6	951.19	43.5	951.24	43.6	951.25	44.5	951.25	44.6	951.25
46.5	951.13	46.6	951.13	46.6	951.12	47.5	951.04	47.6	951.03
48.5	950.97	48.6	950.97	48.7	950.97	49.5	950.91	49.6	950.91
50.6	950.91	50.7	950.91	51.6	950.97	51.7	950.98	52.5	951.03
52.6	951.03	53.6	951.07	54.5	951.12	54.6	951.13	55.5	951.16
55.6	951.16	55.7	951.16	56.5	951.22	57.5	951.28	57.6	951.28
57.7	951.29	58.5	951.31	58.6	951.32	58.7	951.35	59.5	951.57
59.6	951.6	59.7	951.63	60.5	951.88	60.6	951.91	63.7	952.95
64.5	953.18	64.6	953.22	64.7	953.26	65.5	953.52	65.6	953.56
65.7	953.6	66.5	953.83	66.6	953.88	66.7	953.9	67.5	954.04
67.6	954.06	67.7	954.07	68.4	954.09	68.6	954.1	68.7	954.1
69.4	954.15	69.6	954.16	70.4	954.19	70.6	954.19	70.7	954.2
71.4	954.22	71.6	954.22	71.7	954.23	72.4	954.28	72.6	954.29
72.7	954.29	73.4	954.31	73.6	954.32	73.8	954.32	74.4	954.34
74.6	954.35	75.6	954.41	75.8	954.42	77.6	954.48	77.8	954.49
78.4	954.53	78.6	954.54	78.8	954.54	79.4	954.56	79.6	954.57
79.8	954.58	80.4	954.6	80.6	954.61	80.8	954.61	81.4	954.65
81.6	954.66	81.8	954.67	82.4	954.69	82.6	954.69	82.8	954.7
83.4	954.72	83.6	954.73	83.8	954.74	84.4	954.78	84.8	954.79
85.4	954.81	85.6	954.82	85.8	954.83	86.4	954.85	86.6	954.86
86.7	954.86	87	954.88	87.2	954.89	88.7	954.15	89.1	953.97
89.5	953.84	95.2	952.66	105.2	953.43	115	954.38	125	955.15
135	956.02	144.9	956.97	154.8	957.83	184.7	961.71	192.3	962.63

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
-128.3	.1	-18.6	.04
		67.5	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-18.6	67.5		25	25		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 8.5

INPUT

Description:

Station	Elevation	Data	num=	288	Sta	Elev	Sta	Elev	Sta	Elev
0	972.86	1	971.95	2.7	971.57	3.7	971.3	5.8	970.83	
6.8	970.56	11	969.59	12	969.32	14.1	968.85	15.1	968.58	
17.2	968.11	18.2	967.85	19.3	967.6	20.3	967.34	23.4	966.63	
24.5	966.46	26.6	966.05	27.6	965.87	28.6	965.67	29.6	965.54	
30.7	965.44	32.7	965.32	33.9	965.22	34.9	965.16	36	965.06	
36.2	965.05	37	965	38.3	964.9	40.2	964.78	41.3	964.69	
42.2	964.63	43.4	964.53	45.1	964.43	46.2	964.34	46.5	964.31	
47	964.29	47.2	964.27	47.6	964.25	51.7	963.76	51.8	963.75	
52	963.73	52.9	963.66	57.1	963.16	58.1	963	61	962.63	
62.3	962.42	64.4	962.16	65.2	962.04	67.5	961.72	76	960.54	
78.2	960.27	78.6	960.22	78.8	960.18	79.2	960.14	79.9	960.06	
80.3	960.02	83.3	959.63	83.4	959.62	83.6	959.6	84.1	959.55	
85.5	959.36	85.7	959.34	86.5	959.25	86.6	959.24	86.8	959.22	
87.3	959.15	88.1	959.05	88.3	959.02	88.7	958.98	88.9	958.95	
89.4	958.86	89.7	958.82	89.8	958.81	90.8	958.66	106.6	956.47	
107.7	956.3	110.8	955.85	111	955.81	111.8	955.51	111.9	955.48	
114.7	954.3	115	954.17	115.2	954.1	115.8	953.85	116.1	953.7	
117.9	952.95	120.3	951.92	121.3	951.42	125.6	948.72	126	948.44	
126.3	948.31	126.6	948.09	129.4	947.56	129.8	947.49	130	947.45	
130.6	947.36	130.8	947.32	130.9	947.3	131	947.27	131.6	947.16	
131.9	947.08	132.4	946.99	132.6	946.94	133	946.87	133.2	946.85	
133.7	946.82	133.9	946.81	136.3	947.15	137.1	947.27	138.2	947.42	
138.7	947.52	138.9	947.58	139.3	947.67	139.5	947.71	140	947.82	
140.5	947.91	142.6	948.25	143.2	948.27	143.4	948.28	143.5	948.28	
143.7	948.28	144.2	948.28	146.6	948.28	146.7	948.28	146.8	948.28	
149	948.26	149.5	948.25	149.8	948.25	150.9	948.24	151.3	948.24	
151.6	948.24	151.9	948.25	155.1	948.25	155.3	948.26	155.9	948.27	
156.1	948.28	156.2	948.28	156.3	948.28	157.2	948.28	157.7	948.29	
158.3	948.31	158.5	948.32	159	948.31	159.2	948.31	159.3	948.31	
159.5	948.34	160	948.38	160.4	948.46	161.4	948.96	161.6	949.05	
162.5	949.41	162.6	949.45	163.2	949.6	163.5	949.68	164	949.79	
164.2	949.85	164.6	949.95	164.8	949.99	164.9	950.02	165.5	950.12	
165.6	950.15	165.8	950.17	166.4	950.21	166.6	950.22	166.8	950.24	
167.4	950.3	167.6	950.31	167.8	950.33	168.4	950.36	168.6	950.38	
169.3	950.47	169.6	950.5	169.9	950.53	170.3	950.56	170.6	950.59	
171	950.63	171.3	950.66	171.6	950.7	172	950.74	172.2	950.77	
172.6	950.81	173.6	950.91	174.1	950.96	174.2	950.97	174.6	951.03	
175.1	951.05	175.6	951.06	182.4	950.68	182.6	950.66	182.9	950.64	
183.4	950.59	183.6	950.57	183.8	950.56	184.4	950.5	184.6	950.48	
184.8	950.47	185.5	950.43	185.6	950.42	185.8	950.42	186.5	950.35	
186.6	950.34	187.5	950.4	192.6	950.57	192.7	950.57	193.5	950.62	
193.6	950.62	193.8	950.63	194.5	950.65	194.6	950.66	194.8	950.66	
195.4	950.68	195.6	950.69	195.8	950.7	196.6	950.73	196.9	950.74	
197.4	950.77	197.6	950.79	197.9	950.8	198.3	950.81	198.6	950.82	
199	950.84	199.3	950.86	199.6	950.89	200	950.9	200.3	950.91	
200.6	950.92	201	951.03	201.6	951.2	202.1	951.34	202.2	951.38	

202.6	951.53	203.1	951.68	210.6	953.96	210.9	953.98	211.4	954.01
211.6	954.02	211.9	954.03	212.4	954.03	212.6	954.03	212.8	954.04
213.5	954.06	213.6	954.06	213.8	954.06	214.5	954.09	214.6	954.09
214.8	954.09	215.5	954.09	215.6	954.09	216.6	954.12	216.7	954.12
217.6	954.12	217.7	954.13	218.1	954.14	218.6	954.16	218.7	954.16
219.6	954.19	219.7	954.19	220.6	954.19	220.7	954.19	221.5	954.22
221.8	954.22	222.6	954.25	222.8	954.25	223.5	954.25	223.6	954.25
223.8	954.26	224.4	954.27	224.6	954.28	224.9	954.3	225.4	954.34
225.6	954.36	225.9	954.38	227.5	954.55	227.5	954.57	227.6	954.58
227.6	954.6	232.7	953.96	236.2	953.22	242.6	953.69	259.2	954.57
266.1	955.09	273.5	955.74	288.1	956.91	295.9	957.6	304.2	958.66
317.3	960.33	325.8	961.44	333.2	962.34				

Manning's n	Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	110.8	.045	210.6	.07

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	110.8	210.6		25.3	25.3	25.3		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 8

INPUT

Description:

Station Elevation Data			num=	343					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-151.51	976.92	-149.41	974.91	-148.46	974.39	-144.56	972.95	-143.61	972.6
-142.66	972.31	-140.66	971.76	-139.71	971.51	-136.76	970.72	-135.81	970.47
-133.91	969.92	-132.87	969.68	-131.91	969.4	-130.96	969.16	-130.01	968.88
-129.73	968.84	-128.97	968.63	-128.01	968.36	-127.83	968.32	-127.35	968.25
-127.06	968.18	-124.97	967.79	-124.12	967.62	-123.17	967.46	-122.21	967.27
-121.26	967.1	-120.22	966.9	-119.17	966.71	-117.36	966.36	-116.32	966.19
-115.37	966	-114.42	965.84	-113.46	965.64	-112.99	965.57	-112.42	965.48
-110.61	965.1	-109.57	964.93	-108.61	964.73	-107.57	964.57	-106.71	964.39
-106.62	964.38	-105.76	964.24	-105.67	964.21	-105.48	964.17	-105	964.08
-104.72	964.02	-102.91	963.78	-101.77	963.66	-97.87	963.19	-97.49	963.15
-97.01	963.1	-96.92	963.09	-96.73	963.07	-96.16	963	-95.87	962.96
-94.92	962.81	-90.07	962.19	-88.55	961.96	-81.32	961.03	-80.56	960.95
-78.66	960.78	-78.37	960.76	-78.08	960.72	-77.8	960.69	-77.42	960.64
-75.52	960.47	-74.66	960.36	-74.47	960.35	-71.62	960.09	-70.57	959.97
-65.82	959.54	-64.77	959.42	-60.87	959.07	-59.92	958.95	-54.02	958.42
-53.07	958.37	-52.22	958.3	-52.12	958.29	-51.93	958.28	-51.45	958.26
-51.17	958.24	-49.84	958.14	-49.46	958.12	-49.17	958.11	-49.08	958.1
-47.46	957.97	-45.08	957.83	-43.47	957.71	-43.37	957.7	-43.18	957.69
-42.61	957.66	-42.42	957.65	-41.37	957.57	-40.42	957.52	-39.47	957.44
-36.24	957.26	-35.76	957.22	-35.57	957.21	-35.48	957.21	-35.38	957.2
-34.91	957.17	-33.86	957.09	-33.67	957.08	-33.38	957.07	-31.1	956.93
-30.53	956.89	-29.77	956.83	-25.87	956.17	-25.21	955.81	-24.92	955.66
-24.07	955.22	-23.97	955.18	-23.88	955.14	-20.17	953.14	-19.79	952.97
-19.41	952.79	-19.12	952.66	-18.26	952.19	-18.17	952.15	-18.17	952.12
-17.31	951.68	-17.22	951.64	-17.12	951.57	-15.31	950.62	-14.74	950.36
-14.36	950.14	-10.47	948.1	-10.18	947.93	-9.89	947.82	-9.51	947.64
-9.04	947.55	-8.94	947.53	-8.56	947.45	-6.66	947.15	-6.57	947.15
-6.47	947.13	-5.8	947	-5.61	946.98	-5.52	946.95	-4.95	946.87
-4.66	946.82	-4.28	946.75	-4.09	946.72	-3.71	946.64	-3.33	946.57
-3.14	946.55	-2.76	946.48	-2.48	946.43	-2	946.34	-1.81	946.31
-1.62	946.31	-.86	946.31	-.76	946.32	0	946.39	.09	946.41
.28	946.43	.85	946.5	1.14	946.53	1.52	946.58	2.09	946.66
2.47	946.72	2.66	946.75	3.04	946.81	3.33	946.85	3.8	946.91
3.99	946.94	4.09	946.97	4.85	947.17	4.94	947.18	4.94	947.19

5.8	947.4	5.89	947.44	6.08	947.51	6.56	947.7	7.32	947.91
7.41	947.94	7.89	948.06	8.27	948.12	8.46	948.15	8.84	948.2
16.26	948.67	16.55	948.69	17.31	948.73	17.5	948.74	18.16	948.78
18.92	948.82	19.4	948.84	19.78	948.85	20.35	948.85	20.63	948.85
21.2	948.83	21.4	948.83	21.87	948.79	22.25	948.77	22.35	948.77
22.44	948.77	23.11	948.74	23.3	948.74	23.58	948.73	23.87	948.72
24.25	948.7	25.2	948.82	25.58	948.9	25.87	948.98	26.15	949.05
26.34	949.1	27.01	949.27	27.1	949.29	27.2	949.3	27.58	949.4
28.05	949.51	28.15	949.52	28.24	949.54	28.81	949.62	29.1	949.66
29.38	949.68	29.48	949.68	30.53	949.76	31	949.8	31.38	949.83
31.57	949.85	31.95	949.88	32.71	949.95	32.9	949.96	33.09	949.98
33.85	950.03	33.95	950.03	34.14	950.06	34.71	950.12	34.81	950.12
35.57	950.18	35.76	950.19	36.04	950.23	36.42	950.28	36.71	950.31
37.18	950.35	37.28	950.36	38.13	950.43	38.32	950.46	38.71	950.49
43.84	950.24	44.03	950.24	44.41	950.22	44.89	950.22	44.98	950.21
46.31	950.17	46.6	950.17	47.36	950.19	48.03	950.21	48.22	950.22
48.31	950.22	53.07	950.36	53.45	950.38	53.54	950.39	54.02	950.41
54.49	950.43	54.97	950.45	66.28	950.81	66.38	950.82	66.48	950.82
67.24	950.88	67.33	950.88	68.28	950.94	68.57	950.96	69.23	951
70.18	951.27	70.28	951.29	71.04	951.61	71.23	951.68	72.09	952.02
72.18	952.06	72.85	952.31	73.04	952.36	73.23	952.41	73.8	952.61
73.99	952.67	74.18	952.73	74.75	952.91	74.94	952.98	75.61	953.22
75.89	953.3	76.18	953.38	76.56	953.5	76.84	953.58	77.13	953.68
77.51	953.79	77.79	953.9	78.74	954	79.12	954.01	79.31	954.01
79.69	954.01	80.08	954.03	80.27	954.05	81.12	954.09	81.6	954.13
82.07	954.19	82.26	954.21	82.55	954.26	83.12	954.33	83.5	954.37
84.45	954.48	84.64	954.5	85.4	954.62	85.5	954.63	86.35	954.74
87.11	954.84	87.4	954.88	87.68	954.92	88.82	955.05	91.11	955.35
91.2	955.36	91.77	955.45	92.15	955.49	92.25	955.5	92.92	955.57
93.1	955.59	93.39	955.61	93.77	955.65	94.06	955.69	94.53	955.74
94.63	955.76	95.1	955.81	95.48	955.86	95.67	955.88	96.05	955.93
96.34	955.97	96.81	956.03	97	956.06	97.1	956.08	97.96	956.19
98.43	956.06	99	956.16	100.9	956.04	114.6	956.21	118.69	956.17
120.5	956.15	122.49	956.27	125.25	956.22	127.34	956.44	131.72	956.67
133.43	956.86	134.67	956.93	145.1	958.05				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-151.51	.1	-25.87	.045	77.79	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-25.87	77.79		47	47		.3	.5
Ineffective Flow	num=		2					
Sta L	Sta R	Elev	Permanent					
-151.51	-43.12	960.7	F					
43.12	145.1	955.39	F					
Skew Angle = 18								

BRIDGE

RIVER: Wallis Run
REACH: Study Reach RS: 7.5

INPUT

Description:

Distance from Upstream XS = 16.87

Deck/Roadway Width = 12.25

Weir Coefficient = 2.6

Bridge Deck/Roadway Skew = 18

Upstream Deck/Roadway Coordinates

num= 16

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-166.435		974		-142.658		973		-118.882		968.8				

-95.106	965	-71.329	961.7	-47.553	960.7	
-26.249	961.6	-26.249	961.6	958.4	26.249	958.7
26.249	962.3	47.553	961.2		71.329	957.5
95.106	955	118.882	955.8		142.658	956
166.435	956.5					

Upstream Bridge Cross Section Data

Station Elevation Data		num= 343							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-151.51	976.92	-149.41	974.91	-148.46	974.39	-144.56	972.95	-143.61	972.6
-142.66	972.31	-140.66	971.76	-139.71	971.51	-136.76	970.72	-135.81	970.47
-133.91	969.92	-132.87	969.68	-131.91	969.4	-130.96	969.16	-130.01	968.88
-129.73	968.84	-128.97	968.63	-128.01	968.36	-127.83	968.32	-127.35	968.25
-127.06	968.18	-124.97	967.79	-124.12	967.62	-123.17	967.46	-122.21	967.27
-121.26	967.1	-120.22	966.9	-119.17	966.71	-117.36	966.36	-116.32	966.19
-115.37	966	-114.42	965.84	-113.46	965.64	-112.99	965.57	-112.42	965.48
-110.61	965.1	-109.57	964.93	-108.61	964.73	-107.57	964.57	-106.71	964.39
-106.62	964.38	-105.76	964.24	-105.67	964.21	-105.48	964.17	-105	964.08
-104.72	964.02	-102.91	963.78	-101.77	963.66	-97.87	963.19	-97.49	963.15
-97.01	963.1	-96.92	963.09	-96.73	963.07	-96.16	963	-95.87	962.96
-94.92	962.81	-90.07	962.19	-88.55	961.96	-81.32	961.03	-80.56	960.95
-78.66	960.78	-78.37	960.76	-78.08	960.72	-77.8	960.69	-77.42	960.64
-75.52	960.47	-74.66	960.36	-74.47	960.35	-71.62	960.09	-70.57	959.97
-65.82	959.54	-64.77	959.42	-60.87	959.07	-59.92	958.95	-54.02	958.42
-53.07	958.37	-52.22	958.3	-52.12	958.29	-51.93	958.28	-51.45	958.26
-51.17	958.24	-49.84	958.14	-49.46	958.12	-49.17	958.11	-49.08	958.1
-47.46	957.97	-45.08	957.83	-43.47	957.71	-43.37	957.7	-43.18	957.69
-42.61	957.66	-42.42	957.65	-41.37	957.57	-40.42	957.52	-39.47	957.44
-36.24	957.26	-35.76	957.22	-35.57	957.21	-35.48	957.21	-35.38	957.2
-34.91	957.17	-33.86	957.09	-33.67	957.08	-33.38	957.07	-31.1	956.93
-30.53	956.89	-29.77	956.83	-25.87	956.17	-25.21	955.81	-24.92	955.66
-24.07	955.22	-23.97	955.18	-23.88	955.14	-20.17	953.14	-19.79	952.97
-19.41	952.79	-19.12	952.66	-18.26	952.19	-18.17	952.15	-18.17	952.12
-17.31	951.68	-17.22	951.64	-17.12	951.57	-15.31	950.62	-14.74	950.36
-14.36	950.14	-10.47	948.1	-10.18	947.93	-9.89	947.82	-9.51	947.64
-9.04	947.55	-8.94	947.53	-8.56	947.45	-6.66	947.15	-6.57	947.15
-6.47	947.13	-5.8	947	-5.61	946.98	-5.52	946.95	-4.95	946.87
-4.66	946.82	-4.28	946.75	-4.09	946.72	-3.71	946.64	-3.33	946.57
-3.14	946.55	-2.76	946.48	-2.48	946.43	-2	946.34	-1.81	946.31
-1.62	946.31	-.86	946.31	-.76	946.32	0	946.39	.09	946.41
.28	946.43	.85	946.5	1.14	946.53	1.52	946.58	2.09	946.66
2.47	946.72	2.66	946.75	3.04	946.81	3.33	946.85	3.8	946.91
3.99	946.94	4.09	946.97	4.85	947.17	4.94	947.18	4.94	947.19
5.8	947.4	5.89	947.44	6.08	947.51	6.56	947.7	7.32	947.91
7.41	947.94	7.89	948.06	8.27	948.12	8.46	948.15	8.84	948.2
16.26	948.67	16.55	948.69	17.31	948.73	17.5	948.74	18.16	948.78
18.92	948.82	19.4	948.84	19.78	948.85	20.35	948.85	20.63	948.85
21.2	948.83	21.4	948.83	21.87	948.79	22.25	948.77	22.35	948.77
22.44	948.77	23.11	948.74	23.3	948.74	23.58	948.73	23.87	948.72
24.25	948.7	25.2	948.82	25.58	948.9	25.87	948.98	26.15	949.05
26.34	949.1	27.01	949.27	27.1	949.29	27.2	949.3	27.58	949.4
28.05	949.51	28.15	949.52	28.24	949.54	28.81	949.62	29.1	949.66
29.38	949.68	29.48	949.68	30.53	949.76	31	949.8	31.38	949.83
31.57	949.85	31.95	949.88	32.71	949.95	32.9	949.96	33.09	949.98
33.85	950.03	33.95	950.03	34.14	950.06	34.71	950.12	34.81	950.12
35.57	950.18	35.76	950.19	36.04	950.23	36.42	950.28	36.71	950.31
37.18	950.35	37.28	950.36	38.13	950.43	38.32	950.46	38.71	950.49
43.84	950.24	44.03	950.24	44.41	950.22	44.89	950.22	44.98	950.21
46.31	950.17	46.6	950.17	47.36	950.19	48.03	950.21	48.22	950.22
48.31	950.22	53.07	950.36	53.45	950.38	53.54	950.39	54.02	950.41
54.49	950.43	54.97	950.45	66.28	950.81	66.38	950.82	66.48	950.82
67.24	950.88	67.33	950.88	68.28	950.94	68.57	950.96	69.23	951
70.18	951.27	70.28	951.29	71.04	951.61	71.23	951.68	72.09	952.02
72.18	952.06	72.85	952.31	73.04	952.36	73.23	952.41	73.8	952.61

73.99	952.67	74.18	952.73	74.75	952.91	74.94	952.98	75.61	953.22
75.89	953.3	76.18	953.38	76.56	953.5	76.84	953.58	77.13	953.68
77.51	953.79	77.79	953.9	78.74	954	79.12	954.01	79.31	954.01
79.69	954.01	80.08	954.03	80.27	954.05	81.12	954.09	81.6	954.13
82.07	954.19	82.26	954.21	82.55	954.26	83.12	954.33	83.5	954.37
84.45	954.48	84.64	954.5	85.4	954.62	85.5	954.63	86.35	954.74
87.11	954.84	87.4	954.88	87.68	954.92	88.82	955.05	91.11	955.35
91.2	955.36	91.77	955.45	92.15	955.49	92.25	955.5	92.92	955.57
93.1	955.59	93.39	955.61	93.77	955.65	94.06	955.69	94.53	955.74
94.63	955.76	95.1	955.81	95.48	955.86	95.67	955.88	96.05	955.93
96.34	955.97	96.81	956.03	97	956.06	97.1	956.08	97.96	956.19
98.43	956.06	99	956.16	100.9	956.04	114.6	956.21	118.69	956.17
120.5	956.15	122.49	956.27	125.25	956.22	127.34	956.44	131.72	956.67
133.43	956.86	134.67	956.93	145.1	958.05				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-151.51	.1	-25.87	.045	77.79	.07

Bank Sta: Left Right Coeff Contr. Expan.

-25.87	77.79		.3	.5
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-151.51	-43.12	960.7	F
43.12	145.1	955.39	F

Skew Angle = 18

Downstream Deck/Roadway Coordinates

num= 16

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-166.435	974		-142.658	973		-118.882	968.8	
-95.106	965		-71.329	961.7		-47.553	960.7	
-26.249	961.6		-26.249	961.6	958.4	26.249	962.3	958.7
26.249	962.3		47.553	961.2		71.329	957.5	
95.106	955		118.882	955.8		142.658	956	
166.435	956.5							

Downstream Bridge Cross Section Data

Station Elevation Data num= 356

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-131.531	971.58	-128.107	969.83	-125.254	969.6	-124.208	969.5	-116.98	968.29
-113.366	967.65	-108.801	966.88	-105.662	966.28	-104.616	966.12	-101.668	965.82
-98.815	965.55	-97.864	965.44	-94.915	965.17	-92.633	964.92	-91.016	964.7
-90.16	964.56	-88.543	964.33	-86.166	963.95	-85.12	963.8	-84.549	963.7
-82.932	963.47	-78.843	962.84	-77.511	962.65	-76.655	962.51	-75.514	962.35
-73.136	961.98	-71.615	961.77	-63.911	961.22	-62.96	961.17	-60.963	961.04
-60.868	961.04	-60.202	961.01	-60.012	961	-59.726	960.98	-59.061	960.93
-58.11	960.9	-57.063	960.83	-56.493	960.8	-56.207	960.79	-54.591	960.68
-52.118	960.57	-50.501	960.46	-48.123	960.34	-46.507	960.23	-45.461	960.19
-44.509	960.12	-43.558	960.07	-43.273	960.03	-42.798	959.97	-42.607	959.94
-37.757	959.04	-37.567	959	-36.711	958.63	-35.76	958.11	-35.474	957.95
-35.189	957.77	-34.809	957.58	-34.333	957.32	-34.238	957.28	-33.858	957.04
-33.572	956.88	-32.716	956.42	-32.051	956.03	-31.86	955.93	-31.1	955.58
-29.007	954.81	-27.2	954.18	-26.249	953.87	-22.16	952.56	-21.399	952.3
-17.404	951	-16.358	950.66	-16.168	950.59	-15.692	950.45	-15.407	950.35
-15.027	950.16	-14.932	950.14	-14.456	949.92	-14.076	949.7	-13.79	949.52
-13.505	949.33	-13.315	949.15	-12.459	948.43	-11.603	947.71	-11.413	947.66
-10.842	947.48	-10.557	947.38	-9.986	947.31	-9.225	947.2	-6.753	946.85
-1.997	946.1	-1.807	946.08	-1.522	946.02	-1.046	945.93	-.951	945.91
0	945.86	.38	945.9	1.046	945.99	1.427	946.04	1.617	946.05
2.283	946.14	2.758	946.2	2.948	946.22	3.804	946.33	3.899	946.35
4.755	946.41	5.516	946.51	5.801	946.54	6.277	946.58	6.372	946.58
6.848	946.62	7.133	946.66	7.799	946.73	7.989	946.74	8.655	946.81
8.75	946.81	9.606	946.84	9.891	946.84	10.462	946.82	10.652	946.81

11.032	946.84	11.603	946.88	12.649	946.98	12.839	947.01	13.41	947.07
14.551	947.25	15.312	947.66	15.502	947.75	15.788	947.86	16.168	948.02
16.453	948.17	17.404	948.55	17.785	948.6	18.165	948.68	18.45	948.73
18.641	948.74	19.306	948.81	19.402	948.81	20.353	948.91	20.543	948.92
21.304	949.02	21.684	949.06	22.255	949.11	22.73	949.15	22.92	949.18
23.206	949.22	23.491	949.23	25.203	949.32	26.154	949.44	26.439	949.51
26.82	949.59	27.105	949.69	31.004	950.97	31.195	951.02	31.67	951.16
31.955	951.24	32.336	951.24	32.526	951.23	32.907	951.24	33.287	951.23
34.714	951.18	34.809	951.18	34.904	951.17	35.76	951.15	35.855	951.15
36.616	951.55	36.806	951.66	37.091	951.97	37.377	952.32	37.757	952.69
38.232	952.82	38.708	952.98	38.993	953	39.469	953.03	39.659	953.05
39.849	953.06	40.61	953.11	40.705	953.11	40.8	953.12	41.466	953.17
41.846	953.19	42.988	953.28	43.083	953.29	43.558	953.33	43.939	953.36
44.224	953.38	44.509	953.41	44.795	953.42	45.365	953.47	45.461	953.47
45.556	953.48	46.031	953.51	46.412	953.54	47.172	953.63	47.458	953.66
48.884	953.94	49.36	954.03	49.645	954.09	50.121	954.18	50.311	954.22
50.501	954.25	51.262	954.4	51.357	954.4	52.118	954.41	52.498	954.41
53.259	954.4	54.876	954.4	55.161	954.41	55.351	954.41	56.017	954.44
56.112	954.44	56.207	954.45	56.588	954.45	57.063	954.46	57.824	954.46
58.014	954.47	58.395	954.47	58.68	954.48	59.061	954.49	60.012	954.48
60.297	954.44	60.773	954.4	60.963	954.37	61.058	954.36	61.914	954.28
62.77	954.21	62.865	954.19	63.15	954.17	64.291	954.05	64.387	954.05
64.862	954	65.433	953.93	65.813	953.9	66.003	953.88	66.669	953.84
66.764	953.83	66.859	953.83	67.145	953.82	67.62	953.81	67.81	953.79
68.476	953.75	69.047	953.71	69.237	953.7	69.617	953.67	70.093	953.65
70.188	953.65	70.664	953.63	70.949	953.61	71.424	953.58	71.615	953.56
71.71	953.54	72.661	953.39	73.326	953.29	73.517	953.26	73.612	953.24
74.278	953.14	74.563	953.09	75.229	953.01	75.419	952.99	75.514	952.96
76.18	952.85	76.37	952.83	76.465	952.81	77.131	952.63	77.321	952.6
77.416	952.59	78.177	952.43	78.272	952.42	78.367	952.44	79.128	952.41
79.318	952.46	80.079	952.71	80.174	952.74	80.269	952.78	81.03	953.05
82.076	953.39	82.171	953.4	82.932	953.58	83.122	953.6	83.883	953.65
83.978	953.65	85.785	953.71	85.88	953.72	86.831	953.72	87.687	953.75
87.783	953.75	88.638	953.78	88.734	953.78	89.59	953.81	89.685	953.81
90.636	953.84	91.587	953.84	92.538	953.87	92.728	953.88	93.394	953.9
93.679	953.9	94.155	953.89	94.82	953.89	95.011	953.9	95.391	953.91
95.867	953.9	96.627	953.9	97.103	953.91	97.293	953.92	98.244	953.91
98.339	953.91	99.1	953.93	99.481	953.93	99.956	953.94	101.192	953.94
101.573	953.95	101.763	953.95	102.143	953.96	102.429	953.96	102.904	953.95
103.095	953.95	104.046	953.97	105.092	953.96	105.282	953.96	105.757	953.97
106.043	953.98	107.945	954.03	108.23	954.04	108.706	954.07	108.896	954.08
108.991	954.08	109.752	954.09	109.847	954.09	110.703	954.11	110.798	954.11
111.083	954.12	111.559	954.14	111.844	954.15	112.225	954.16	112.32	954.16
112.795	954.17	113.746	954.22	114.032	954.22	114.507	954.23	114.697	954.23
114.793	954.24	115.458	954.24	115.648	954.25	116.504	954.29	116.6	954.29
117.17	954.31	123.828	954.51	137.047	954.94	137.428	954.96	138.093	955
138.379	955.03	140.091	955.07	141.517	955.17	143.134	955.21	143.61	955.25
149.316	955.76								

Manning's n Values

num=	3				
Sta	n Val	Sta	n Val	Sta	n Val
-131.531	.1	-26.249	.045	38.708	.07

Bank Sta: Left Right

Coeff	Contr.	Expan.
-26.249	38.708	.3 .5

Ineffective Flow

num=	2		
Sta L	Sta R	Elev	Permanent
-131.531	-44.13	960.3	F
44.13	149.316	955	F

Skew Angle = 18

Upstream Embankment side slope

= 0 horiz. to 1.0 vertical

Downstream Embankment side slope

= 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Energy Only

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 7

INPUT

Description:

Station Elevation Data				num=	356				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-131.531	971.58	-128.107	969.83	-125.254	969.6	-124.208	969.5	-116.98	968.29
-113.366	967.65	-108.801	966.88	-105.662	966.28	-104.616	966.12	-101.668	965.82
-98.815	965.55	-97.864	965.44	-94.915	965.17	-92.633	964.92	-91.016	964.7
-90.16	964.56	-88.543	964.33	-86.166	963.95	-85.12	963.8	-84.549	963.7
-82.932	963.47	-78.843	962.84	-77.511	962.65	-76.655	962.51	-75.514	962.35
-73.136	961.98	-71.615	961.77	-63.911	961.22	-62.96	961.17	-60.963	961.04
-60.868	961.04	-60.202	961.01	-60.012	961	-59.726	960.98	-59.061	960.93
-58.11	960.9	-57.063	960.83	-56.493	960.8	-56.207	960.79	-54.591	960.68
-52.118	960.57	-50.501	960.46	-48.123	960.34	-46.507	960.23	-45.461	960.19
-44.509	960.12	-43.558	960.07	-43.273	960.03	-42.798	959.97	-42.607	959.94
-37.757	959.04	-37.567	959	-36.711	958.63	-35.76	958.11	-35.474	957.95
-35.189	957.77	-34.809	957.58	-34.333	957.32	-34.238	957.28	-33.858	957.04
-33.572	956.88	-32.716	956.42	-32.051	956.03	-31.86	955.93	-31.1	955.58
-29.007	954.81	-27.2	954.18	-26.249	953.87	-22.16	952.56	-21.399	952.3
-17.404	951	-16.358	950.66	-16.168	950.59	-15.692	950.45	-15.407	950.35
-15.027	950.16	-14.932	950.14	-14.456	949.92	-14.076	949.7	-13.79	949.52
-13.505	949.33	-13.315	949.15	-12.459	948.43	-11.603	947.71	-11.413	947.66
-10.842	947.48	-10.557	947.38	-9.986	947.31	-9.225	947.2	-6.753	946.85
-1.997	946.1	-1.807	946.08	-1.522	946.02	-1.046	945.93	-.951	945.91
0	945.86	.38	945.9	1.046	945.99	1.427	946.04	1.617	946.05
2.283	946.14	2.758	946.2	2.948	946.22	3.804	946.33	3.899	946.35
4.755	946.41	5.516	946.51	5.801	946.54	6.277	946.58	6.372	946.58
6.848	946.62	7.133	946.66	7.799	946.73	7.989	946.74	8.655	946.81
8.75	946.81	9.606	946.84	9.891	946.84	10.462	946.82	10.652	946.81
11.032	946.84	11.603	946.88	12.649	946.98	12.839	947.01	13.41	947.07
14.551	947.25	15.312	947.66	15.502	947.75	15.788	947.86	16.168	948.02
16.453	948.17	17.404	948.55	17.785	948.6	18.165	948.68	18.45	948.73
18.641	948.74	19.306	948.81	19.402	948.81	20.353	948.91	20.543	948.92
21.304	949.02	21.684	949.06	22.255	949.11	22.73	949.15	22.92	949.18
23.206	949.22	23.491	949.23	25.203	949.32	26.154	949.44	26.439	949.51
26.82	949.59	27.105	949.69	31.004	950.97	31.195	951.02	31.67	951.16
31.955	951.24	32.336	951.24	32.526	951.23	32.907	951.24	33.287	951.23
34.714	951.18	34.809	951.18	34.904	951.17	35.76	951.15	35.855	951.15

36.616	951.55	36.806	951.66	37.091	951.97	37.377	952.32	37.757	952.69
38.232	952.82	38.708	952.98	38.993	953	39.469	953.03	39.659	953.05
39.849	953.06	40.61	953.11	40.705	953.11	40.8	953.12	41.466	953.17
41.846	953.19	42.988	953.28	43.083	953.29	43.558	953.33	43.939	953.36
44.224	953.38	44.509	953.41	44.795	953.42	45.365	953.47	45.461	953.47
45.556	953.48	46.031	953.51	46.412	953.54	47.172	953.63	47.458	953.66
48.884	953.94	49.36	954.03	49.645	954.09	50.121	954.18	50.311	954.22
50.501	954.25	51.262	954.4	51.357	954.4	52.118	954.41	52.498	954.41
53.259	954.4	54.876	954.4	55.161	954.41	55.351	954.41	56.017	954.44
56.112	954.44	56.207	954.45	56.588	954.45	57.063	954.46	57.824	954.46
58.014	954.47	58.395	954.47	58.68	954.48	59.061	954.49	60.012	954.48
60.297	954.44	60.773	954.4	60.963	954.37	61.058	954.36	61.914	954.28
62.77	954.21	62.865	954.19	63.15	954.17	64.291	954.05	64.387	954.05
64.862	954	65.433	953.93	65.813	953.9	66.003	953.88	66.669	953.84
66.764	953.83	66.859	953.83	67.145	953.82	67.62	953.81	67.81	953.79
68.476	953.75	69.047	953.71	69.237	953.7	69.617	953.67	70.093	953.65
70.188	953.65	70.664	953.63	70.949	953.61	71.424	953.58	71.615	953.56
71.71	953.54	72.661	953.39	73.326	953.29	73.517	953.26	73.612	953.24
74.278	953.14	74.563	953.09	75.229	953.01	75.419	952.99	75.514	952.96
76.18	952.85	76.37	952.83	76.465	952.81	77.131	952.63	77.321	952.6
77.416	952.59	78.177	952.43	78.272	952.42	78.367	952.44	79.128	952.41
79.318	952.46	80.079	952.71	80.174	952.74	80.269	952.78	81.03	953.05
82.076	953.39	82.171	953.4	82.932	953.58	83.122	953.6	83.883	953.65
83.978	953.65	85.785	953.71	85.88	953.72	86.831	953.72	87.687	953.75
87.783	953.75	88.638	953.78	88.734	953.78	89.59	953.81	89.685	953.81
90.636	953.84	91.587	953.84	92.538	953.87	92.728	953.88	93.394	953.9
93.679	953.9	94.155	953.89	94.82	953.89	95.011	953.9	95.391	953.91
95.867	953.9	96.627	953.9	97.103	953.91	97.293	953.92	98.244	953.91
98.339	953.91	99.1	953.93	99.481	953.93	99.956	953.94	101.192	953.94
101.573	953.95	101.763	953.95	102.143	953.96	102.429	953.96	102.904	953.95
103.095	953.95	104.046	953.97	105.092	953.96	105.282	953.96	105.757	953.97
106.043	953.98	107.945	954.03	108.23	954.04	108.706	954.07	108.896	954.08
108.991	954.08	109.752	954.09	109.847	954.09	110.703	954.11	110.798	954.11
111.083	954.12	111.559	954.14	111.844	954.15	112.225	954.16	112.32	954.16
112.795	954.17	113.746	954.22	114.032	954.22	114.507	954.23	114.697	954.23
114.793	954.24	115.458	954.24	115.648	954.25	116.504	954.29	116.6	954.29
117.17	954.31	123.828	954.51	137.047	954.94	137.428	954.96	138.093	955
138.379	955.03	140.091	955.07	141.517	955.17	143.134	955.21	143.61	955.25
149.316	955.76								

Manning's n Values			num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-131.531	.1	-26.249	.045	38.708	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
-26.249	38.708	39.3	50.19	73.89		.3	.5
Ineffective Flow		num=	2				
Sta L	Sta R	Elev	Permanent				
-131.531	-44.13	960.3	F				
44.13	149.316	955	F				
Skew Angle	= 18						

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 6

INPUT									
Description:									
Station	Elevation	Data	num=	148					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.6	965.63	-91.3	965.27	-84.1	964.24	-82.1	963.92	-74.9	962.88
-73.7	962.71	-72.8	962.55	-64.7	961.39	-63.6	961.21	-59.6	960.7

-56.3	960.31	-51.5	959.81	-47.2	959.38	-46.1	959.24	-42	958.83
-41.7	958.79	-41.3	958.73	-41	958.69	-39.9	958.58	-39.7	958.55
-38.9	958.44	-37.6	958.29	-33.9	957.77	-33	957.68	-32.2	957.56
-31.7	957.49	-31.4	957.45	-30.7	957.37	-27.2	956.9	-26.6	956.81
-25.5	956.62	-24.5	956.06	-18.7	952.72	-18.3	952.5	-15.6	950.99
-10.2	947.87	-9.2	947.31	-8.8	947.11	-8.5	947	-8.2	946.83
-.2	945.31	0	945.29	.2	945.33	2	945.64	4.1	946.04
4.3	946.08	5	946.17	5.1	946.19	10.1	946.81	10.2	946.82
11	946.89	15.2	947.41	16.3	947.56	17.3	947.69	19.3	948
19.5	948.03	20.2	948.11	20.4	948.13	20.7	948.19	21.3	948.28
21.5	948.3	22.4	948.41	22.7	948.4	23.8	948.4	25.4	948.38
25.5	948.38	26.2	948.4	26.5	948.4	30.5	948.39	31.5	948.41
34.6	948.39	36.7	948.41	40.7	948.4	41.7	948.29	42.6	948.14
42.7	948.13	43.5	948.15	43.7	948.18	45.2	948.78	45.8	948.99
46.1	949.14	46.8	949.42	47	949.48	47.8	949.79	48.7	950.04
48.8	950.08	49	950.14	49.5	950.32	49.8	950.42	50.8	950.67
51.5	950.69	53.5	950.74	53.8	950.75	54.7	950.75	60	950.87
60.9	950.87	61	950.88	70	951.09	71.1	951.09	71.9	951.12
73	951.12	73.3	951.13	73.7	951.14	74	951.15	74.6	951.15
77.1	951.2	77.7	951.21	78.1	951.22	79.1	951.22	79.2	951.23
80	951.25	80.1	951.25	81.1	951.28	83.8	951.31	85.1	951.34
85.5	951.35	85.7	951.36	86.1	951.36	86.6	951.37	88.1	951.39
88.4	951.39	88.8	951.4	89.1	951.41	89.4	951.41	89.9	951.43
90.1	951.44	91	951.44	92.1	951.47	93.2	951.47	94	951.49
94.1	951.49	94.3	951.5	96.1	951.5	96.5	951.51	96.7	951.51
97.1	951.52	97.7	951.52	98.1	951.53	99.1	951.53	99.5	951.54
100.2	951.54	129.3	951.5	131.9	951.63	161.8	953.52	168	954.36
184.2	956.48	191.8	957.54	195.21	958.26				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.6	.1	-15.6	.045	50.8	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-15.6	50.8		42.6	50.2		.1	.3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 5

INPUT

Description:

Station Elevation Data		num= 207							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.4	966.28	-83.8	966.23	-81.9	965.69	-80.9	965.44	-78.9	964.98
-77.8	964.73	-75	964.1	-73.8	963.8	-71.8	963.35	-70.7	963.08
-67.7	962.42	-65.7	961.95	-63.7	961.51	-62.6	961.24	-59.6	960.57
-58.6	960.32	-55.5	959.63	-54.5	959.42	-53.5	959.26	-51.5	959
-50.5	958.84	-48.4	958.58	-47.4	958.41	-45.3	958.14	-44.4	957.99
-42.4	957.73	-41.4	957.57	-39.4	957.32	-38.5	957.18	-37.3	957.02
-35.9	956.8	-35.6	956.77	-35.3	956.72	-35	956.68	-33.2	956.4
-31.2	956.11	-30.8	956.05	-30.2	955.98	-29.2	955.82	-28.1	955.67
-26.1	955.37	-25.1	955.24	-24.1	955.08	-23.7	955.02	-23.1	954.95
-22.1	954.79	-21.1	954.14	-14	949.12	-13	948.38	-12.1	947.71
-12	947.66	-12	947.62	-11.5	947.23	-11.1	946.93	-11	946.9
-10	946.59	-3	945.94	-3	945.93	-2.1	945.79	-2	945.78
-1.1	945.58	-1	945.56	-.9	945.56	-.1	945.48	0	945.47
.9	945.61	1	945.62	1.1	945.63	2	945.75	2.9	945.78
6.9	946.02	8	946.06	10.1	946.2	10.9	946.3	12	946.41
12.9	946.57	13	946.59	13.1	946.62	13.9	946.82	15	947.09
15.1	947.12	15.9	947.26	16	947.28	17	947.44	17.1	947.44
17.9	947.49	22	947.37	22.1	947.37	22.8	947.37	23	947.37

25	947.31	25.1	947.31	25.8	947.31	26	947.31	26.1	947.31
27	947.31	27.1	947.3	27.8	947.28	28	947.28	28.1	947.28
28.8	947.28	29.1	947.27	30	947.25	30.1	947.25	30.8	947.25
31	947.25	31.1	947.24	32	947.22	32.1	947.22	32.8	947.22
33.8	947.19	34	947.19	34.1	947.23	35	947.45	35.1	947.49
35.8	947.74	36	947.79	36.1	947.83	36.8	948.05	37	948.1
38	948.44	38.1	948.49	39.1	948.81	39.8	949.05	40	949.1
40.8	949.37	42.1	949.81	42.8	950.05	44	950.38	51	950.59
51.1	950.6	51.8	950.6	52	950.6	54	950.66	63	950.94
63.2	950.94	63.8	950.94	64	950.94	64.2	950.94	64.8	950.96
65	950.97	65.8	950.99	66	951	66.2	951	66.8	951
67	951.01	67.2	951.01	69.2	951.07	69.8	951.07	70	951.07
70.2	951.07	70.8	951.07	71	951.06	71.2	951.06	71.8	951.04
72	951.03	72.2	951.03	72.8	951.03	73	951.02	73.2	951.02
79	950.84	79.2	950.84	79.7	950.84	80	950.84	85	950.69
85.2	950.69	86	950.69	86.2	950.69	88	950.74	88.2	950.75
88.7	950.75	89	950.75	89.2	950.75	89.7	950.77	90	950.77
90.2	950.78	90.7	950.78	91	950.78	91.2	950.79	91.7	950.8
92	950.8	92.2	950.81	92.6	950.82	92.7	950.83	93	950.84
93.2	950.84	93.7	950.84	94	950.84	94.1	950.86	99	950.28
103.7	950.04	109.9	950.25	126.8	951.02	133.6	951.25	163.4	953.26
171.9	954.57	184.3	956.39	193.3	957.78	202.9	959.87	213.1	962.13
223.2	964.3	234	965.69	241.9	966.89	253	968.29	265	968.85
270.7	969.08	275.2	969.29						

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-84.4 .1 -21.1 .04 44 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-21.1 44 108.6 100.1 95.4 .1 .3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 4

INPUT
Description:
Station Elevation Data num= 151

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-94.7	969.74	-92.3	968.97	-91.4	969.05	-88.3	969.42	-87.1	969.55
-86	969.69	-84.5	969.84	-83.4	969.92	-82.8	969.93	-82.2	969.78
-81.7	969.61	-80.6	969.18	-79.3	968.59	-59.4	959.09	-58.4	958.59
-55.3	957.13	-54.3	956.62	-53.3	956.14	-52.3	955.75	-48.5	955.28
-47.3	955.09	-38.2	953.97	-37.2	953.81	-28.1	952.69	-27.1	952.43
-26.2	952.07	-24.1	951.2	-22.1	950.07	-19.7	948.73	-18.8	948.22
-16.1	946.66	-16	946.65	-16	946.64	-14	945.56	-13	945.47
-11.5	945.37	-11	945.34	-9	945.19	-8.8	945.17	-7	945.06
-6.9	945.06	-6	944.97	-5.1	944.83	-2	944.41	-1	944.26
0	944.18	2	944.37	7.1	944.7	8.1	944.73	13.1	945.06
14	945.07	14.1	945.07	14.2	945.07	15.1	945.1	15.4	945.17
15.8	945.33	16.1	945.42	17.1	946.12	18.1	946.72	18.6	946.99
19.1	947.35	19.5	947.56	19.8	947.77	20.1	947.95	21	948.46
21.1	948.58	23.2	949.8	24	950.28	24.2	950.34	25.2	950.41
26.8	950.57	27.7	950.65	28.2	950.69	28.6	950.71	28.8	950.72
29.2	950.74	29.5	950.75	30.4	950.79	31.2	950.84	32.2	950.9
33.2	950.94	35	951.05	35.2	951.06	35.5	951.08	35.9	951.09
39.5	951.29	40	951.3	40.2	951.31	40.4	951.32	42.3	951.44
43.2	951.47	44.1	951.47	44.3	951.47	44.5	951.46	45	951.45
45.3	951.44	45.6	951.43	49.3	951.28	49.6	951.27	51.3	951.22
51.4	951.21	52.1	951.17	52.3	951.16	53.3	951.12	53.5	951.12
54.1	951.1	54.3	951.09	54.6	951.08	55	951.05	55.3	951.04

55.7	951.03	55.9	951.02	56.3	951	56.8	950.97	56.9	950.97
57.8	950.9	60.4	950.71	60.5	950.7	61.3	950.63	61.4	950.62
61.9	950.58	62.3	950.54	62.4	950.53	63.2	950.48	63.4	950.47
63.5	950.46	64.1	950.4	64.4	950.38	64.7	950.36	65.4	950.29
65.8	950.27	66	950.26	66.4	950.23	66.9	950.2	66.9	950.19
70.1	949.95	70.2	949.94	79.9	949.99	92.2	949.93	122.3	950.1
152.3	951.64	178.9	955.46	182.3	955.98	212.3	962.7	219.9	963.82
233.2	965.99	242.3	967.27	253.5	967.61	260.4	967.78	272.3	968.15
291.3	967.98								

Manning's	n Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-94.7	.1	-27.1	.04	24.2	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-27.1	24.2		95 100.8	97.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 3

INPUT

Description:

Station	Elevation	Data	num=	119					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-79.6	956.95	-79.5	956.89	-70.4	954.96	-70.1	954.92	-68.4	954.78
-67.4	954.68	-63.3	954.39	-62.3	954.29	-58.3	954	-56.2	953.83
-53.2	953.61	-52.2	953.29	-51.2	952.85	-50.2	952.62	-48.2	952.38
-43.7	951.96	-41.1	951.75	-36.1	951.28	-35.1	950.97	-34.1	950.5
-33.1	950	-31.1	949.08	-30.1	948.56	-29.1	948.09	-28.3	947.67
-28.1	947.59	-26.3	946.77	-24.8	946.01	-24.1	945.69	-23.1	944.9
-22.1	944.86	-18.1	944.84	-17.1	944.78	-16	944.68	-11.1	944.53
-10.1	944.47	-2	944.22	-1.6	944.2	0	944.12	.4	944.16
.6	944.18	1.3	944.23	2.8	944.33	3	944.34	4	944.43
4.1	944.44	5	944.5	5.5	944.53	5.9	944.56	6	944.56
7	944.66	8	944.66	9	945.02	10	945.5	10.7	945.72
11	945.83	15.1	946	15.6	946.02	16.5	946.07	24.2	946.62
35.3	947.36	35.4	947.37	35.5	947.38	36	947.43	36.3	947.47
36.4	947.47	36.5	947.5	37.2	947.75	37.4	947.82	37.7	947.91
38.1	948.03	38.4	948.14	38.9	948.31	39.4	948.49	39.8	948.62
40.2	948.75	40.5	948.86	40.7	948.96	41.5	949.31	43.5	949.32
43.8	949.31	44.1	949.31	44.5	949.3	46.3	949.3	46.6	949.3
47.5	949.28	48.5	949.29	48.6	949.29	49.6	949.27	51.6	949.39
54.7	949.65	54.9	949.61	55.7	949.48	56.1	949.29	56.2	949.24
56.7	949.05	57.7	948.56	61.1	946.52	64.4	946.75	73.7	947.34
83.6	947.62	96.9	947.92	104.1	948.11	108.9	948.28	134.6	949.08
159.5	951.59	165.1	952.23	173.5	954.07	184.8	956.41	195.5	958.82
210.1	962.47	211.7	962.85	226	966.35	235.4	966.62	250	966.76
256.4	966.9	286	965.03	286.9	964.99	296.5	965.31		

Manning's	n Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-79.6	.1	-36.1	.04	41.5	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-36.1	41.5		100.3 100.7	106.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 2

INPUT

Description:

Station Elevation Data		num= 138							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-80.1	963.24	-79.3	962.69	-77.6	961.49	-76.4	960.49	-71.9	956.52
-70	955.98	-68	955.39	-60	953.14	-59	952.84	-55	951.7
-40	947.48	-39.6	947.39	-39.4	947.35	-39	947.26	-37	947.04
-34.4	946.8	-34	946.76	-33.6	946.76	-33.4	946.76	-33	946.75
-32	946.64	-30	945.46	-29	944.89	-28.6	944.8	-28.4	944.78
-28	944.69	-24	944.44	-21	944.28	-17	944.03	-16	943.99
-15	943.91	-13	943.78	-12.5	943.74	-12.5	943.73	-12	943.69
-9.5	943.52	-9	943.48	-8.5	943.45	-8.5	943.44	-8	943.41
-6	943.28	-5	943.19	-3	943.06	-1	942.91	-.5	942.88
-.5	942.87	0	942.84	.5	942.85	1	942.86	1.5	942.89
2	942.92	6	943.7	6.5	943.76	7	943.81	7.5	943.84
8	943.88	8.5	944.03	8.5	944.04	9	944.19	12	945.69
13	946.16	13.5	946.39	18	948.66	18.5	948.74	19	948.81
19.5	948.87	20	948.91	20.5	948.94	21	948.97	22	948.97
22.5	948.96	23	948.95	23.4	948.94	23.5	948.93	24	948.92
24.4	948.92	24.5	948.92	25	948.92	27	948.86	27.5	948.86
28	948.86	29	948.83	29.4	948.82	29.6	948.82	30.4	948.81
30.6	948.8	32	948.76	32.4	948.76	32.6	948.76	33	948.75
33.4	948.74	35	948.7	36	948.7	38	948.64	38.4	948.64
38.6	948.64	39	948.64	39.4	948.62	39.6	948.62	40	948.61
44.4	948.52	49	948.52	49.4	948.51	49.6	948.51	50.4	948.49
50.6	948.49	51	948.49	56	948.49	56.4	948.48	58	948.48
59	948.46	65	948.45	65.4	948.44	65.6	948.43	66	948.43
68.6	948.42	69	948.41	71	948.43	71.3	948.42	71.5	948.41
79.3	948.4	82.6	948.38	91.3	948.3	99.4	948.29	126.5	948.42
156.4	948.84	186.3	950.15	216.2	953.61	221.3	954.4	239.9	957.47
246.1	958.43	253.3	959.45	267.9	961.74	276.1	962.87	285.3	964.12
296	965.64	306	966.97	316.8	969.11				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-80.1	.1	-33	.04	18	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	-33	18		100	100.4	100	.1	.3

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 1

INPUT

Description:

Station Elevation Data		num= 30							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-134	964.88	-119.4	964.28	-89.5	960.46	-59.7	953.09	-29.8	946.15
0	942.14	29.9	946.86	59.7	947.84	89.6	946.97	94.32	946.8707
102.9	946.69	106.1	946.64	119.4	946.37	132.5	946.87	136.2	947.07
149.2	947.58	162	948.95	166.4	949.46	179.1	950.83	191.5	953.03
196.5	953.89	208.9	956.08	221.1	958.76	226.7	959.9	238.8	962.56
250.6	965.67	256.8	967.17	268.6	970.27	280.2	973.24	288.6	975.36

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-134	.1	-29.8	.04	29.9	.1

Bank Sta:	Left	Right	Coeff Contr.	Expan.
	-29.8	29.9	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Wallis Run

Reach	River Sta.	n1	n2	n3
Study Reach	17	.1	.035	.07
Study Reach	16	.1	.035	.07
Study Reach	15.5	Bridge		
Study Reach	15	.1	.035	.07
Study Reach	14.5	.1	.035	.07
Study Reach	14	.1	.035	.07
Study Reach	13	.1	.04	.1
Study Reach	12	.1	.04	.1
Study Reach	11	.1	.04	.1
Study Reach	10	.1	.04	.1
Study Reach	9	.1	.04	.07
Study Reach	8.5	.1	.045	.07
Study Reach	8	.1	.045	.07
Study Reach	7.5	Bridge		
Study Reach	7	.1	.045	.07
Study Reach	6	.1	.045	.07
Study Reach	5	.1	.04	.1
Study Reach	4	.1	.04	.1
Study Reach	3	.1	.04	.1
Study Reach	2	.1	.04	.1
Study Reach	1	.1	.04	.1

SUMMARY OF REACH LENGTHS

River: Wallis Run

Reach	River Sta.	Left	Channel	Right
Study Reach	17	55	52.7	49.8
Study Reach	16	40.1	42.2	40
Study Reach	15.5	Bridge		
Study Reach	15	28.1	28.1	28.1
Study Reach	14.5	28.8	28.8	28.8
Study Reach	14	47.6	55.7	52.5
Study Reach	13	36.4	60	69.1
Study Reach	12	72.6	75	71.8
Study Reach	11	87.4	104.3	100.6
Study Reach	10	55.8	50.4	38.7
Study Reach	9	25	25	25
Study Reach	8.5	25.3	25.3	25.3
Study Reach	8	47	47	47
Study Reach	7.5	Bridge		
Study Reach	7	39.3	50.19	73.89
Study Reach	6	42.6	50.2	41.6
Study Reach	5	108.6	100.1	95.4
Study Reach	4	95	100.8	97.6
Study Reach	3	100.3	100.7	106.6
Study Reach	2	100	100.4	100
Study Reach	1			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Wallis Run

Reach	River Sta.	Contr.	Expan.
Study Reach	17	.1	.3
Study Reach	16	.3	.5
Study Reach	15.5	Bridge	
Study Reach	15		
Study Reach	14.5	.1	.3
Study Reach	14	.1	.3
Study Reach	13	.1	.3
Study Reach	12	.1	.3
Study Reach	11	.1	.3
Study Reach	10	.1	.3
Study Reach	9	.1	.3
Study Reach	8.5	.1	.3
Study Reach	8	.3	.5
Study Reach	7.5	Bridge	
Study Reach	7		
Study Reach	6	.1	.3
Study Reach	5	.1	.3
Study Reach	4	.1	.3
Study Reach	3	.1	.3
Study Reach	2	.1	.3
Study Reach	1	.1	.3

Existing - Standard Table 1

HEC-RAS Plan: EX River: Wallis Run Reach: Study Reach

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Study Reach	17	2 YR (50%)	452.00	951.10	954.67	954.02	955.09	0.006875	5.18	87.28	48.09	0.68
Study Reach	17	5 YR (20%)	812.00	951.10	955.97	954.94	956.40	0.004007	5.26	154.51	55.14	0.55
Study Reach	17	10 YR (10%)	1120.00	951.10	956.93	955.44	957.37	0.003067	5.35	209.79	61.99	0.50
Study Reach	17	25 YR (4%)	1590.00	951.10	958.80	956.14	959.17	0.001522	4.87	343.01	79.79	0.38
Study Reach	17	50 YR (2%)	2000.00	951.10	959.35	956.64	959.81	0.001709	5.51	387.87	84.59	0.40
Study Reach	17	100 YR (1%)	2460.00	951.10	959.99	957.18	960.54	0.001796	6.06	443.56	90.37	0.42
Study Reach	17	500 YR (0.2%)	3760.00	951.10	961.63	958.49	962.40	0.001866	7.19	603.09	102.73	0.45
Study Reach	16	2 YR (50%)	452.00	950.32	954.56	953.16	954.84	0.002520	4.23	106.94	36.41	0.43
Study Reach	16	5 YR (20%)	812.00	950.32	955.80	954.07	956.23	0.002790	5.27	154.11	40.13	0.47
Study Reach	16	10 YR (10%)	1120.00	950.32	956.66	954.72	957.20	0.002914	5.90	189.99	42.89	0.49
Study Reach	16	25 YR (4%)	1590.00	950.32	958.55	955.59	959.06	0.002041	5.74	276.88	49.25	0.43
Study Reach	16	50 YR (2%)	2000.00	950.32	958.98	956.26	959.68	0.002567	6.70	298.82	52.28	0.48
Study Reach	16	100 YR (1%)	2460.00	950.32	959.50	956.94	960.39	0.002946	7.58	327.37	59.02	0.52
Study Reach	16	500 YR (0.2%)	3760.00	950.32	960.77	958.59	962.20	0.003729	9.61	414.84	81.64	0.61
Study Reach	15.5		Bridge									
Study Reach	15	2 YR (50%)	452.00	951.25	953.61	953.55	954.46	0.013728	7.39	61.14	32.32	0.95
Study Reach	15	5 YR (20%)	812.00	951.25	954.44	954.44	955.74	0.014099	9.16	88.63	34.03	1.00
Study Reach	15	10 YR (10%)	1120.00	951.25	955.09	955.09	956.67	0.013407	10.06	111.38	35.35	1.00
Study Reach	15	25 YR (4%)	1590.00	951.25	955.96	955.96	957.89	0.012838	11.13	142.80	37.06	1.00
Study Reach	15	50 YR (2%)	2000.00	951.25	956.65	956.65	958.83	0.012423	11.86	168.67	38.43	1.00
Study Reach	15	100 YR (1%)	2460.00	951.25	957.34	957.34	959.79	0.012129	12.55	195.95	39.83	1.00
Study Reach	15	500 YR (0.2%)	3760.00	951.25	959.13	959.13	962.11	0.010924	13.86	279.08	58.56	0.98
Study Reach	14.5	2 YR (50%)	452.00	950.94	953.28	953.19	954.03	0.013441	6.97	64.82	37.72	0.94
Study Reach	14.5	5 YR (20%)	812.00	950.94	953.72	954.03	955.24	0.021750	9.88	82.19	40.58	1.22
Study Reach	14.5	10 YR (10%)	1120.00	950.94	954.11	954.63	956.12	0.024693	11.38	98.41	43.13	1.33
Study Reach	14.5	25 YR (4%)	1590.00	950.94	954.61	955.41	957.30	0.027830	13.16	120.84	46.50	1.44
Study Reach	14.5	50 YR (2%)	2000.00	950.94	954.98	956.04	958.21	0.029783	14.41	138.79	48.96	1.51
Study Reach	14.5	100 YR (1%)	2460.00	950.94	955.36	956.53	959.14	0.031546	15.59	157.90	54.93	1.57
Study Reach	14.5	500 YR (0.2%)	3760.00	950.94	956.19	957.99	961.39	0.034540	18.39	217.08	80.41	1.69
Study Reach	14	2 YR (50%)	452.00	950.88	953.20		953.65	0.007732	5.38	84.03	47.88	0.72
Study Reach	14	5 YR (20%)	812.00	950.88	954.17	953.53	954.74	0.006716	6.09	133.28	56.40	0.70
Study Reach	14	10 YR (10%)	1120.00	950.88	954.83	954.10	955.49	0.005962	6.52	171.91	59.95	0.68
Study Reach	14	25 YR (4%)	1590.00	950.88	955.70	954.75	956.47	0.005291	7.05	225.53	63.58	0.66
Study Reach	14	50 YR (2%)	2000.00	950.88	956.36	955.24	957.22	0.004962	7.44	268.87	66.44	0.65
Study Reach	14	100 YR (1%)	2460.00	950.88	957.05	955.75	958.00	0.004543	7.80	318.98	89.11	0.64
Study Reach	14	500 YR (0.2%)	3760.00	950.88	958.71	956.99	959.85	0.003696	8.63	492.80	120.01	0.61
Study Reach	13	2 YR (50%)	452.00	949.29	953.01		953.26	0.004849	4.01	112.73	57.33	0.50
Study Reach	13	5 YR (20%)	812.00	949.29	954.05		954.37	0.004204	4.59	176.91	65.85	0.49
Study Reach	13	10 YR (10%)	1120.00	949.29	954.76		955.14	0.003923	4.96	225.61	71.00	0.49
Study Reach	13	25 YR (4%)	1590.00	949.29	955.68		956.14	0.003539	5.44	292.80	75.02	0.48
Study Reach	13	50 YR (2%)	2000.00	949.29	956.38		956.90	0.003258	5.79	351.98	93.63	0.48
Study Reach	13	100 YR (1%)	2460.00	949.29	957.11		957.68	0.002991	6.12	434.22	134.18	0.47
Study Reach	13	500 YR (0.2%)	3760.00	949.29	958.87		959.54	0.002478	6.74	683.15	144.69	0.45
Study Reach	12	2 YR (50%)	452.00	948.36	952.49		952.89	0.006991	5.08	88.99	41.13	0.61
Study Reach	12	5 YR (20%)	812.00	948.36	953.37		954.01	0.007921	6.41	126.64	45.04	0.67
Study Reach	12	10 YR (10%)	1120.00	948.36	953.90		954.75	0.008985	7.41	151.12	47.39	0.73
Study Reach	12	25 YR (4%)	1590.00	948.36	954.57		955.73	0.010239	8.63	184.24	50.53	0.80
Study Reach	12	50 YR (2%)	2000.00	948.36	955.08		956.48	0.011090	9.50	210.48	52.93	0.84
Study Reach	12	100 YR (1%)	2460.00	948.36	955.66	955.18	957.27	0.011131	10.16	242.24	56.57	0.85
Study Reach	12	500 YR (0.2%)	3760.00	948.36	957.55	956.76	959.20	0.007807	10.47	423.25	118.28	0.75
Study Reach	11	2 YR (50%)	452.00	948.60	951.82		952.28	0.009479	5.43	83.22	44.22	0.70
Study Reach	11	5 YR (20%)	812.00	948.60	952.67		953.31	0.010925	6.42	126.46	58.04	0.77
Study Reach	11	10 YR (10%)	1120.00	948.60	953.25		954.00	0.010320	6.93	161.55	63.11	0.76
Study Reach	11	25 YR (4%)	1590.00	948.60	954.09		954.92	0.008836	7.32	217.22	69.24	0.73
Study Reach	11	50 YR (2%)	2000.00	948.60	954.80		955.66	0.007152	7.44	278.84	90.43	0.67
Study Reach	11	100 YR (1%)	2460.00	948.60	955.61		956.46	0.005647	7.46	353.08	93.33	0.62
Study Reach	11	500 YR (0.2%)	3760.00	948.60	957.72		958.59	0.003552	7.62	558.15	101.83	0.52
Study Reach	10	2 YR (50%)	452.00	948.53	951.07		951.38	0.007165	4.46	101.23	59.33	0.60
Study Reach	10	5 YR (20%)	812.00	948.53	952.05		952.43	0.005728	4.99	162.64	67.92	0.57
Study Reach	10	10 YR (10%)	1120.00	948.53	952.73		953.17	0.005156	5.30	211.26	74.39	0.55
Study Reach	10	25 YR (4%)	1590.00	948.53	953.74		954.20	0.004122	5.47	290.63	82.34	0.51
Study Reach	10	50 YR (2%)	2000.00	948.53	954.57		955.05	0.003406	5.53	361.90	89.74	0.48
Study Reach	10	100 YR (1%)	2460.00	948.53	955.48		955.96	0.002732	5.56	450.35	107.62	0.44
Study Reach	10	500 YR (0.2%)	3760.00	948.53	957.72		958.22	0.001771	5.73	725.04	137.10	0.38
Study Reach	9	2 YR (50%)	452.00	947.60	950.65		951.01	0.007198	4.83	93.60	48.33	0.61
Study Reach	9	5 YR (20%)	812.00	947.60	951.74		952.12	0.006518	5.00	162.35	73.90	0.59
Study Reach	9	10 YR (10%)	1120.00	947.60	952.50		952.90	0.004780	5.08	220.37	77.32	0.53
Study Reach	9	25 YR (4%)	1590.00	947.60	953.58		954.00	0.003471	5.17	314.18	98.21	0.47
Study Reach	9	50 YR (2%)	2000.00	947.60	954.46		954.87	0.002754	5.18	409.67	122.97	0.43

HEC-RAS Plan: EX River: Wallis Run Reach: Study Reach (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Study Reach	9	100 YR (1%)	2460.00	947.60	955.42		955.81	0.002113	5.12	541.46	147.73	0.39
Study Reach	9	500 YR (0.2%)	3760.00	947.60	957.74		958.11	0.001283	5.07	933.88	189.56	0.32
Study Reach	8.5	2 YR (50%)	452.00	946.81	950.48		950.81	0.008496	4.59	98.52	51.96	0.59
Study Reach	8.5	5 YR (20%)	812.00	946.81	951.63		951.94	0.006351	4.43	183.23	82.08	0.52
Study Reach	8.5	10 YR (10%)	1120.00	946.81	952.45		952.76	0.004478	4.44	252.36	86.59	0.46
Study Reach	8.5	25 YR (4%)	1590.00	946.81	953.57		953.88	0.003269	4.51	353.41	99.29	0.41
Study Reach	8.5	50 YR (2%)	2000.00	946.81	954.46		954.78	0.002613	4.54	457.98	140.81	0.38
Study Reach	8.5	100 YR (1%)	2460.00	946.81	955.43		955.73	0.002026	4.48	603.73	157.93	0.34
Study Reach	8.5	500 YR (0.2%)	3760.00	946.81	957.77		958.05	0.001240	4.43	1022.16	200.03	0.28
Study Reach	8	2 YR (50%)	452.00	946.31	950.28	949.48	950.60	0.007797	4.50	100.43	58.57	0.57
Study Reach	8	5 YR (20%)	812.00	946.31	951.41	950.33	951.78	0.005842	4.90	165.83	87.36	0.52
Study Reach	8	10 YR (10%)	1120.00	946.31	952.21	950.82	952.63	0.004897	5.22	214.38	90.86	0.49
Study Reach	8	25 YR (4%)	1590.00	946.31	953.28	951.43	953.77	0.004197	5.65	281.21	96.23	0.47
Study Reach	8	50 YR (2%)	2000.00	946.31	954.13	951.90	954.68	0.003806	5.95	335.95	103.57	0.46
Study Reach	8	100 YR (1%)	2460.00	946.31	955.04	952.41	955.64	0.003458	6.21	395.89	112.38	0.45
Study Reach	8	500 YR (0.2%)	3760.00	946.31	957.71	953.65	958.02	0.001226	4.47	935.37	185.51	0.28
Study Reach	7.5		Bridge									
Study Reach	7	2 YR (50%)	452.00	945.86	949.57	948.76	949.98	0.009018	5.14	87.88	40.56	0.62
Study Reach	7	5 YR (20%)	812.00	945.86	950.33	949.73	951.04	0.011596	6.75	120.30	44.42	0.72
Study Reach	7	10 YR (10%)	1120.00	945.86	950.90	950.33	951.81	0.012600	7.63	146.75	47.90	0.77
Study Reach	7	25 YR (4%)	1590.00	945.86	951.69	951.12	952.80	0.013780	8.45	188.12	56.34	0.82
Study Reach	7	50 YR (2%)	2000.00	945.86	952.28	951.75	953.54	0.013244	8.99	222.48	58.70	0.81
Study Reach	7	100 YR (1%)	2460.00	945.86	952.79	952.29	954.26	0.013835	9.73	252.75	64.76	0.84
Study Reach	7	500 YR (0.2%)	3760.00	945.86	953.79	953.66	955.98	0.016568	11.88	319.31	95.41	0.95
Study Reach	6	2 YR (50%)	452.00	945.29	949.09		949.44	0.011347	4.79	94.41	58.30	0.66
Study Reach	6	5 YR (20%)	812.00	945.29	949.89		950.39	0.010111	5.70	142.47	61.84	0.66
Study Reach	6	10 YR (10%)	1120.00	945.29	950.54		951.12	0.008820	6.09	183.98	65.11	0.64
Study Reach	6	25 YR (4%)	1590.00	945.29	951.43		952.08	0.007137	6.50	257.16	106.29	0.60
Study Reach	6	50 YR (2%)	2000.00	945.29	952.19		952.81	0.005506	6.47	368.82	158.46	0.54
Study Reach	6	100 YR (1%)	2460.00	945.29	952.83		953.44	0.004773	6.59	474.36	169.78	0.52
Study Reach	6	500 YR (0.2%)	3760.00	945.29	954.16		954.83	0.004166	7.20	714.28	187.74	0.50
Study Reach	5	2 YR (50%)	452.00	945.47	948.35		948.83	0.012396	5.58	80.99	50.70	0.78
Study Reach	5	5 YR (20%)	812.00	945.47	949.35		949.92	0.008481	6.07	133.69	55.06	0.69
Study Reach	5	10 YR (10%)	1120.00	945.47	950.08		950.72	0.007116	6.40	175.17	60.20	0.65
Study Reach	5	25 YR (4%)	1590.00	945.47	951.08	949.89	951.76	0.005584	6.68	269.20	145.27	0.60
Study Reach	5	50 YR (2%)	2000.00	945.47	951.95	950.44	952.57	0.004174	6.52	403.58	161.93	0.53
Study Reach	5	100 YR (1%)	2460.00	945.47	952.58		953.23	0.003907	6.79	508.89	172.17	0.52
Study Reach	5	500 YR (0.2%)	3760.00	945.47	953.82		954.62	0.004025	7.79	733.81	187.67	0.55
Study Reach	4	2 YR (50%)	452.00	944.18	947.61		947.99	0.005735	4.97	90.86	37.31	0.56
Study Reach	4	5 YR (20%)	812.00	944.18	948.41		949.10	0.007698	6.65	122.03	40.06	0.67
Study Reach	4	10 YR (10%)	1120.00	944.18	948.88		949.86	0.009537	7.93	141.16	41.59	0.76
Study Reach	4	25 YR (4%)	1590.00	944.18	949.39	949.07	950.87	0.012701	9.77	162.81	43.38	0.89
Study Reach	4	50 YR (2%)	2000.00	944.18	949.70	949.70	951.70	0.015968	11.34	176.32	44.46	1.00
Study Reach	4	100 YR (1%)	2460.00	944.18	950.69	950.69	952.49	0.011774	10.85	266.47	124.73	0.88
Study Reach	4	500 YR (0.2%)	3760.00	944.18	952.22	952.22	953.95	0.009323	11.18	516.10	182.95	0.81
Study Reach	3	2 YR (50%)	452.00	944.12	946.94		947.30	0.008208	4.75	96.45	62.83	0.64
Study Reach	3	5 YR (20%)	812.00	944.12	947.93		948.32	0.006107	5.08	177.55	105.14	0.58
Study Reach	3	10 YR (10%)	1120.00	944.12	948.60		949.01	0.005048	5.28	256.25	131.28	0.55
Study Reach	3	25 YR (4%)	1590.00	944.12	949.46		949.89	0.004058	5.47	384.96	167.10	0.51
Study Reach	3	50 YR (2%)	2000.00	944.12	950.08	948.68	950.53	0.003635	5.69	491.93	177.78	0.49
Study Reach	3	100 YR (1%)	2460.00	944.12	950.66	949.13	951.13	0.003411	5.94	596.52	184.68	0.49
Study Reach	3	500 YR (0.2%)	3760.00	944.12	951.79	950.11	952.41	0.003572	6.94	814.44	202.82	0.51
Study Reach	2	2 YR (50%)	452.00	942.84	946.48		946.73	0.003710	4.05	111.60	45.40	0.46
Study Reach	2	5 YR (20%)	812.00	942.84	947.36		947.79	0.004543	5.29	155.64	54.86	0.52
Study Reach	2	10 YR (10%)	1120.00	942.84	947.85		948.46	0.005436	6.29	183.36	57.71	0.58
Study Reach	2	25 YR (4%)	1590.00	942.84	948.41	947.43	949.32	0.006851	7.66	220.21	115.39	0.67
Study Reach	2	50 YR (2%)	2000.00	942.84	948.77	948.00	949.93	0.008048	8.73	276.37	183.44	0.73
Study Reach	2	100 YR (1%)	2460.00	942.84	949.12	949.04	950.51	0.008957	9.69	345.99	208.67	0.79
Study Reach	2	500 YR (0.2%)	3760.00	942.84	950.21	950.21	951.78	0.008483	10.83	589.15	236.55	0.79
Study Reach	1	2 YR (50%)	452.00	942.14	945.88	945.20	946.22	0.007001	4.69	96.43	51.53	0.60
Study Reach	1	5 YR (20%)	812.00	942.14	946.74	946.00	947.23	0.007002	5.61	150.32	90.05	0.63
Study Reach	1	10 YR (10%)	1120.00	942.14	947.24	946.50	947.84	0.007010	6.30	206.39	135.93	0.65
Study Reach	1	25 YR (4%)	1590.00	942.14	947.83	947.24	948.58	0.007002	7.13	303.48	188.12	0.67
Study Reach	1	50 YR (2%)	2000.00	942.14	948.25	947.81	949.08	0.007012	7.69	383.32	194.30	0.68
Study Reach	1	100 YR (1%)	2460.00	942.14	948.66	948.25	949.58	0.007008	8.22	465.02	199.96	0.70
Study Reach	1	500 YR (0.2%)	3760.00	942.14	949.66	949.13	950.77	0.007003	9.42	669.82	213.11	0.72

Existing - Standard Table 2

HEC-RAS Plan: EX River: Wallis Run Reach: Study Reach

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Study Reach	17	2 YR (50%)	955.09	954.67	0.42	0.21	0.04		452.00		48.09
Study Reach	17	5 YR (20%)	956.40	955.97	0.43	0.17	0.00		812.00		55.14
Study Reach	17	10 YR (10%)	957.37	956.93	0.44	0.16	0.01		1119.83	0.17	61.99
Study Reach	17	25 YR (4%)	959.17	958.80	0.36	0.09	0.01	0.00	1572.43	17.57	79.79
Study Reach	17	50 YR (2%)	959.81	959.35	0.46	0.11	0.02	0.06	1966.39	33.54	84.59
Study Reach	17	100 YR (1%)	960.54	959.99	0.56	0.12	0.03	0.43	2400.25	59.32	90.37
Study Reach	17	500 YR (0.2%)	962.40	961.63	0.77	0.13	0.07	4.15	3581.10	174.74	102.73
Study Reach	16	2 YR (50%)	954.84	954.56	0.28	0.04	0.01		452.00		36.41
Study Reach	16	5 YR (20%)	956.23	955.80	0.43	0.05	0.02		812.00		40.13
Study Reach	16	10 YR (10%)	957.20	956.66	0.54	0.05	0.04		1120.00		42.89
Study Reach	16	25 YR (4%)	959.06	958.55	0.51				1590.00		49.25
Study Reach	16	50 YR (2%)	959.68	958.98	0.70			0.00	1999.94	0.06	52.28
Study Reach	16	100 YR (1%)	960.39	959.50	0.89			0.10	2458.31	1.59	59.02
Study Reach	16	500 YR (0.2%)	962.20	960.77	1.43			2.28	3730.26	27.46	81.64
Study Reach	15.5		Bridge								
Study Reach	15	2 YR (50%)	954.46	953.61	0.85	0.38	0.05		452.00		32.32
Study Reach	15	5 YR (20%)	955.74	954.44	1.30	0.49	0.02		812.00		34.03
Study Reach	15	10 YR (10%)	956.67	955.09	1.57	0.50	0.04		1120.00		35.35
Study Reach	15	25 YR (4%)	957.89	955.96	1.93	0.51	0.08		1590.00		37.06
Study Reach	15	50 YR (2%)	958.83	956.65	2.18	0.52	0.10		2000.00		38.43
Study Reach	15	100 YR (1%)	959.79	957.34	2.45	0.52	0.13		2460.00		39.83
Study Reach	15	500 YR (0.2%)	962.11	959.13	2.98	0.50	0.22	8.78	3751.22		58.56
Study Reach	14.5	2 YR (50%)	954.03	953.28	0.76	0.29	0.09		452.00		37.72
Study Reach	14.5	5 YR (20%)	955.24	953.72	1.52	0.27	0.15		812.00		40.58
Study Reach	14.5	10 YR (10%)	956.12	954.11	2.01	0.25	0.19		1120.00		43.13
Study Reach	14.5	25 YR (4%)	957.30	954.61	2.69	0.22	0.23		1590.00		46.50
Study Reach	14.5	50 YR (2%)	958.21	954.98	3.23	0.20	0.22		2000.00		48.96
Study Reach	14.5	100 YR (1%)	959.14	955.36	3.78	0.18	0.20		2459.96	0.04	54.93
Study Reach	14.5	500 YR (0.2%)	961.39	956.19	5.20	0.12	0.06		3719.17	40.83	80.41
Study Reach	14	2 YR (50%)	953.65	953.20	0.45	0.34	0.06		452.00		47.88
Study Reach	14	5 YR (20%)	954.74	954.17	0.58	0.29	0.07		812.00		56.40
Study Reach	14	10 YR (10%)	955.49	954.83	0.66	0.27	0.08		1120.00		59.95
Study Reach	14	25 YR (4%)	956.47	955.70	0.77	0.24	0.09		1590.00		63.58
Study Reach	14	50 YR (2%)	957.22	956.36	0.86	0.22	0.10		2000.00		66.44
Study Reach	14	100 YR (1%)	958.00	957.05	0.95	0.20	0.11	1.14	2458.79	0.07	89.11
Study Reach	14	500 YR (0.2%)	959.85	958.71	1.14	0.17	0.14	63.38	3690.54	6.09	120.01
Study Reach	13	2 YR (50%)	953.26	953.01	0.25	0.35	0.02		452.00		57.33
Study Reach	13	5 YR (20%)	954.37	954.05	0.33	0.34	0.03		812.00		65.85
Study Reach	13	10 YR (10%)	955.14	954.76	0.38	0.34	0.05		1120.00	0.00	71.00
Study Reach	13	25 YR (4%)	956.14	955.68	0.46	0.34	0.07		1589.74	0.27	75.02
Study Reach	13	50 YR (2%)	956.90	956.38	0.52	0.33	0.09	2.39	1996.66	0.95	93.63
Study Reach	13	100 YR (1%)	957.68	957.11	0.58	0.31	0.10	18.07	2439.70	2.23	134.18
Study Reach	13	500 YR (0.2%)	959.54	958.87	0.67	0.24	0.10	178.75	3573.16	8.10	144.69
Study Reach	12	2 YR (50%)	952.89	952.49	0.40	0.61	0.01		452.00		41.13
Study Reach	12	5 YR (20%)	954.01	953.37	0.64	0.69	0.00		812.00		45.04
Study Reach	12	10 YR (10%)	954.75	953.90	0.85	0.72	0.03		1120.00		47.39
Study Reach	12	25 YR (4%)	955.73	954.57	1.16	0.71	0.10		1590.00		50.53
Study Reach	12	50 YR (2%)	956.48	955.08	1.40	0.66	0.16		2000.00		52.93
Study Reach	12	100 YR (1%)	957.27	955.66	1.60	0.58	0.23	0.04	2459.96		56.57
Study Reach	12	500 YR (0.2%)	959.20	957.55	1.65	0.38	0.24	112.27	3647.73		118.28
Study Reach	11	2 YR (50%)	952.28	951.82	0.46	0.86	0.04		452.00		44.22
Study Reach	11	5 YR (20%)	953.31	952.67	0.64	0.80	0.08		812.00		58.04
Study Reach	11	10 YR (10%)	954.00	953.25	0.75	0.74	0.09		1120.00		63.11
Study Reach	11	25 YR (4%)	954.92	954.09	0.83	0.61	0.11		1590.00		69.24
Study Reach	11	50 YR (2%)	955.66	954.80	0.86	0.50	0.11	9.69	1990.31		90.43
Study Reach	11	100 YR (1%)	956.46	955.61	0.85	0.40	0.11	36.71	2423.29		93.33
Study Reach	11	500 YR (0.2%)	958.59	957.72	0.87	0.25	0.11	144.06	3615.14	0.80	101.83
Study Reach	10	2 YR (50%)	951.38	951.07	0.31	0.36	0.01		452.00		59.33
Study Reach	10	5 YR (20%)	952.43	952.05	0.39	0.31	0.00		812.00		67.92
Study Reach	10	10 YR (10%)	953.17	952.73	0.44	0.25	0.01		1120.00		74.39
Study Reach	10	25 YR (4%)	954.20	953.74	0.47	0.19	0.02		1590.00		82.34
Study Reach	10	50 YR (2%)	955.05	954.57	0.48	0.15	0.02		1999.96	0.04	89.74
Study Reach	10	100 YR (1%)	955.96	955.48	0.48	0.12	0.03		2455.62	4.38	107.62
Study Reach	10	500 YR (0.2%)	958.22	957.72	0.50	0.07	0.04	8.25	3682.75	69.00	137.10
Study Reach	9	2 YR (50%)	951.01	950.65	0.36	0.20	0.01		452.00		48.33

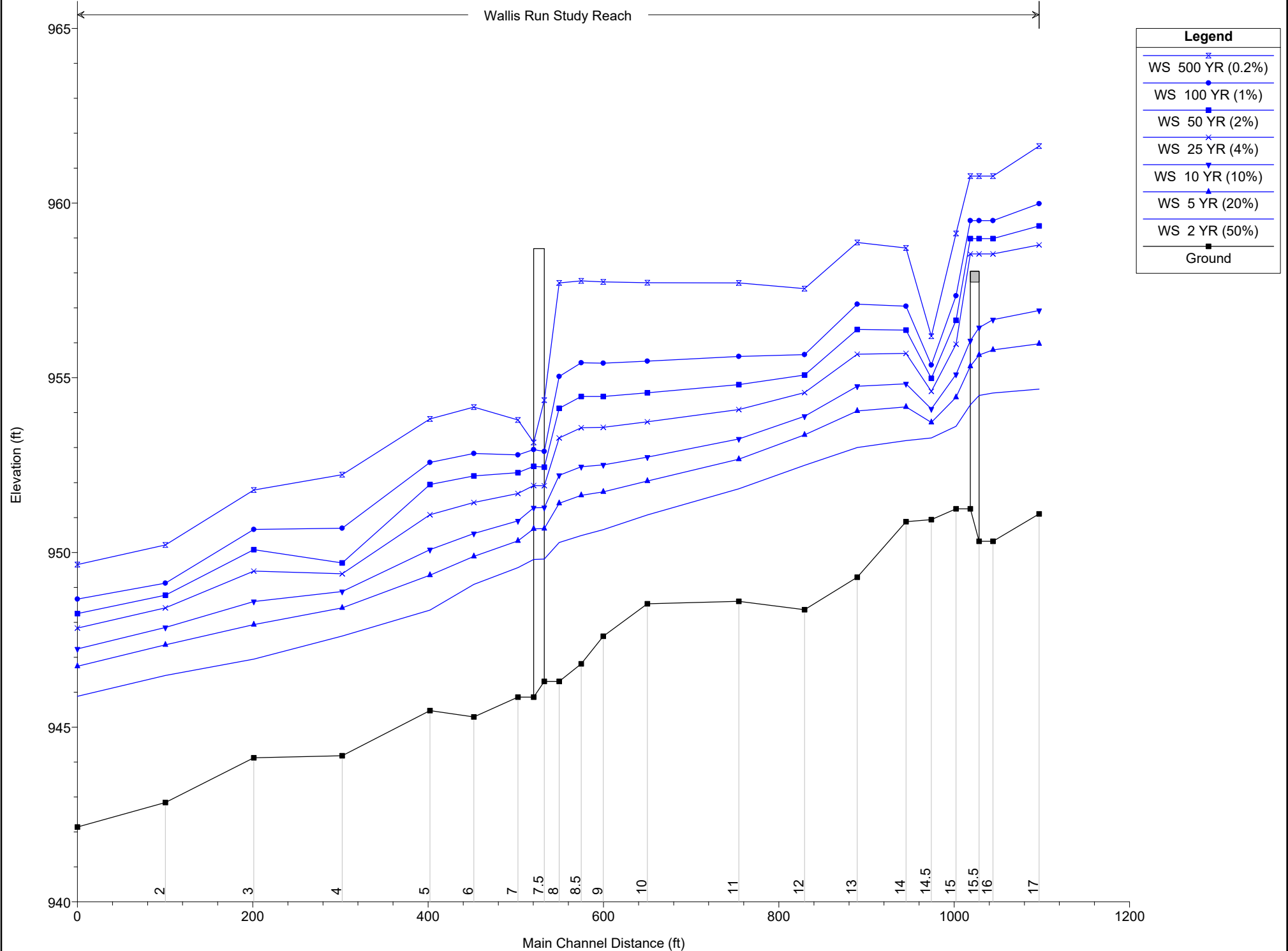
HEC-RAS Plan: EX River: Wallis Run Reach: Study Reach (Continued)

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Study Reach	9	5 YR (20%)	952.12	951.74	0.39	0.16	0.03		812.00		73.90
Study Reach	9	10 YR (10%)	952.90	952.50	0.40	0.12	0.03		1120.00		77.32
Study Reach	9	25 YR (4%)	954.00	953.58	0.41	0.08	0.03		1584.28	5.72	98.21
Study Reach	9	50 YR (2%)	954.87	954.46	0.41	0.07	0.03		1969.93	30.07	122.97
Study Reach	9	100 YR (1%)	955.81	955.42	0.39	0.05	0.03	0.04	2368.70	91.26	147.73
Study Reach	9	500 YR (0.2%)	958.11	957.74	0.36	0.03	0.02	13.02	3363.30	383.68	189.56
Study Reach	8.5	2 YR (50%)	950.81	950.48	0.33	0.21	0.00		452.00		51.96
Study Reach	8.5	5 YR (20%)	951.94	951.63	0.31	0.15	0.01		812.00		82.08
Study Reach	8.5	10 YR (10%)	952.76	952.45	0.31	0.12	0.01		1120.00		86.59
Study Reach	8.5	25 YR (4%)	953.88	953.57	0.32	0.09	0.02		1589.58	0.42	99.29
Study Reach	8.5	50 YR (2%)	954.78	954.46	0.32	0.08	0.02		1985.78	14.22	140.81
Study Reach	8.5	100 YR (1%)	955.73	955.43	0.30	0.07	0.03		2381.23	78.77	157.93
Study Reach	8.5	500 YR (0.2%)	958.05	957.77	0.28	0.03	0.00	6.47	3389.69	363.84	200.03
Study Reach	8	2 YR (50%)	950.60	950.28	0.31	0.17	0.07		452.00		58.57
Study Reach	8	5 YR (20%)	951.78	951.41	0.37	0.15	0.13		812.00		87.36
Study Reach	8	10 YR (10%)	952.63	952.21	0.42	0.13	0.18		1120.00		90.86
Study Reach	8	25 YR (4%)	953.77	953.28	0.50	0.13	0.29		1590.00		96.23
Study Reach	8	50 YR (2%)	954.68	954.13	0.55	0.12	0.36		2000.00		103.57
Study Reach	8	100 YR (1%)	955.64	955.04	0.60	0.12	0.47		2460.00		112.38
Study Reach	8	500 YR (0.2%)	958.02	957.71	0.30	0.05	0.76	4.08	3635.83	120.09	185.51
Study Reach	7.5		Bridge								
Study Reach	7	2 YR (50%)	949.98	949.57	0.41	0.51	0.03		452.00		40.56
Study Reach	7	5 YR (20%)	951.04	950.33	0.71	0.54	0.10		812.00		44.42
Study Reach	7	10 YR (10%)	951.81	950.90	0.91	0.52	0.16		1120.00		47.90
Study Reach	7	25 YR (4%)	952.80	951.69	1.11	0.49	0.23		1590.00		56.34
Study Reach	7	50 YR (2%)	953.54	952.28	1.26	0.41	0.32		2000.00		58.70
Study Reach	7	100 YR (1%)	954.26	952.79	1.47	0.39	0.43		2460.00		64.76
Study Reach	7	500 YR (0.2%)	955.98	953.79	2.19	0.39	0.76		3753.29	6.71	95.41
Study Reach	6	2 YR (50%)	949.44	949.09	0.36	0.60	0.01		452.00		58.30
Study Reach	6	5 YR (20%)	950.39	949.89	0.50	0.46	0.01		812.00		61.84
Study Reach	6	10 YR (10%)	951.12	950.54	0.58	0.40	0.01		1120.00		65.11
Study Reach	6	25 YR (4%)	952.08	951.43	0.65	0.32	0.00	0.07	1576.94	12.99	106.29
Study Reach	6	50 YR (2%)	952.81	952.19	0.62	0.24	0.00	0.92	1895.64	103.44	158.46
Study Reach	6	100 YR (1%)	953.44	952.83	0.61	0.21	0.00	2.69	2214.00	243.31	169.78
Study Reach	6	500 YR (0.2%)	954.83	954.16	0.67	0.20	0.01	10.70	3053.74	695.56	187.74
Study Reach	5	2 YR (50%)	948.83	948.35	0.48	0.81	0.03		452.00		50.70
Study Reach	5	5 YR (20%)	949.92	949.35	0.57	0.81	0.01		812.00		55.06
Study Reach	5	10 YR (10%)	950.72	950.08	0.64	0.82	0.03		1120.00	0.00	60.20
Study Reach	5	25 YR (4%)	951.76	951.08	0.68	0.81	0.08		1569.16	20.84	145.27
Study Reach	5	50 YR (2%)	952.57	951.95	0.62	0.73	0.14		1878.31	121.69	161.93
Study Reach	5	100 YR (1%)	953.23	952.58	0.65	0.63	0.11		2224.30	235.70	172.17
Study Reach	5	500 YR (0.2%)	954.62	953.82	0.80	0.58	0.09		3169.08	590.92	187.67
Study Reach	4	2 YR (50%)	947.99	947.61	0.38	0.69	0.01		452.00		37.31
Study Reach	4	5 YR (20%)	949.10	948.41	0.69	0.69	0.09		812.00		40.06
Study Reach	4	10 YR (10%)	949.86	948.88	0.98	0.68	0.17		1120.00		41.59
Study Reach	4	25 YR (4%)	950.87	949.39	1.48	0.67	0.32		1590.00		43.38
Study Reach	4	50 YR (2%)	951.70	949.70	2.00	0.67	0.47		2000.00		44.46
Study Reach	4	100 YR (1%)	952.49	950.69	1.79	0.58	0.40		2409.91	50.09	124.73
Study Reach	4	500 YR (0.2%)	953.95	952.22	1.72	0.55	0.33		3320.55	439.45	182.95
Study Reach	3	2 YR (50%)	947.30	946.94	0.35	0.53	0.03		451.31	0.69	62.83
Study Reach	3	5 YR (20%)	948.32	947.93	0.39	0.53	0.00		796.13	15.87	105.14
Study Reach	3	10 YR (10%)	949.01	948.60	0.41	0.53	0.02		1067.73	52.27	131.28
Study Reach	3	25 YR (4%)	949.89	949.46	0.43	0.52	0.05		1447.28	142.72	167.10
Study Reach	3	50 YR (2%)	950.53	950.08	0.45	0.53	0.07		1763.60	236.40	177.78
Study Reach	3	100 YR (1%)	951.13	950.66	0.47	0.53	0.09		2101.92	358.08	184.68
Study Reach	3	500 YR (0.2%)	952.41	951.79	0.62	0.53	0.09	0.49	3059.32	700.19	202.82
Study Reach	2	2 YR (50%)	946.73	946.48	0.25	0.50	0.01		452.00		45.40
Study Reach	2	5 YR (20%)	947.79	947.36	0.43	0.56	0.01	1.25	810.75		54.86
Study Reach	2	10 YR (10%)	948.46	947.85	0.61	0.62	0.00	5.33	1114.67		57.71
Study Reach	2	25 YR (4%)	949.32	948.41	0.90	0.70	0.05	14.64	1574.70	0.66	115.39
Study Reach	2	50 YR (2%)	949.93	948.77	1.16	0.75	0.10	24.09	1953.06	22.85	183.44
Study Reach	2	100 YR (1%)	950.51	949.12	1.39	0.79	0.14	35.77	2340.53	83.70	208.67
Study Reach	2	500 YR (0.2%)	951.78	950.21	1.57	0.77	0.14	79.39	3217.11	463.50	236.55
Study Reach	1	2 YR (50%)	946.22	945.88	0.34				452.00		51.53
Study Reach	1	5 YR (20%)	947.23	946.74	0.49			0.41	809.51	2.09	90.05

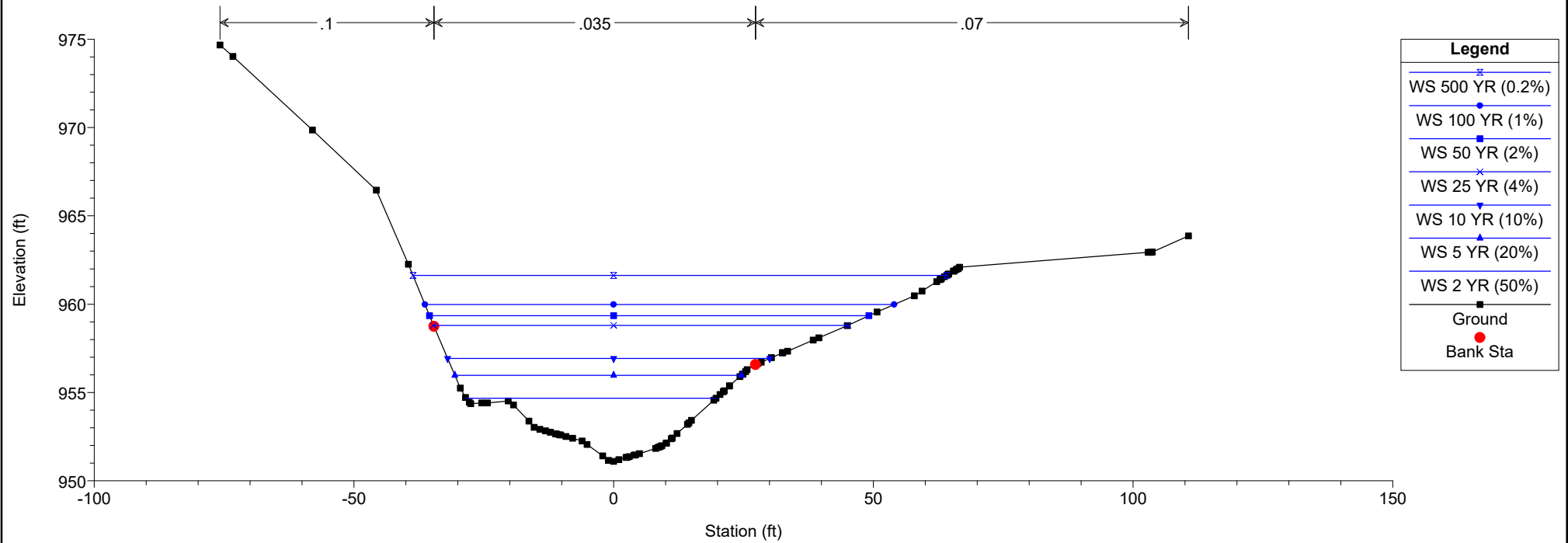
HEC-RAS Plan: EX River: Wallis Run Reach: Study Reach (Continued)

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Study Reach	1	10 YR (10%)	947.84	947.24	0.60			2.08	1096.52	21.40	135.93
Study Reach	1	25 YR (4%)	948.58	947.83	0.74			6.64	1493.48	89.88	188.12
Study Reach	1	50 YR (2%)	949.08	948.25	0.83			11.99	1802.13	185.88	194.30
Study Reach	1	100 YR (1%)	949.58	948.66	0.91			19.38	2129.53	311.09	199.96
Study Reach	1	500 YR (0.2%)	950.77	949.66	1.12			47.02	2999.35	713.64	213.11

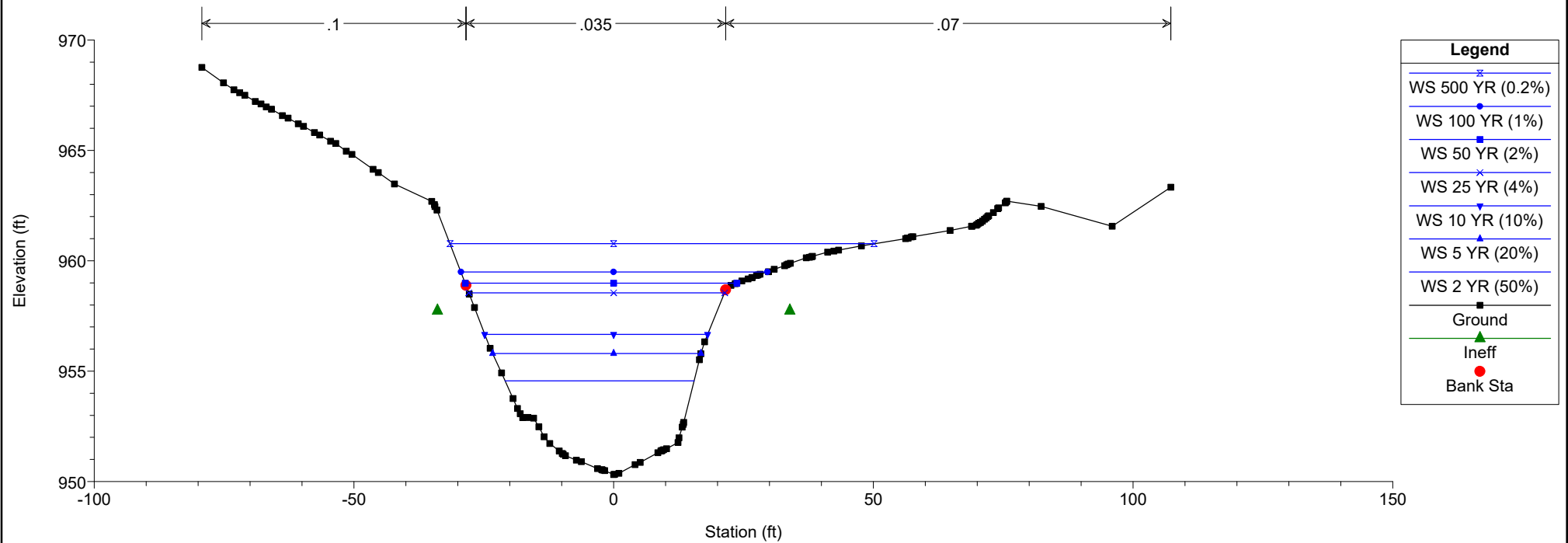
Wallis Run Study Reach



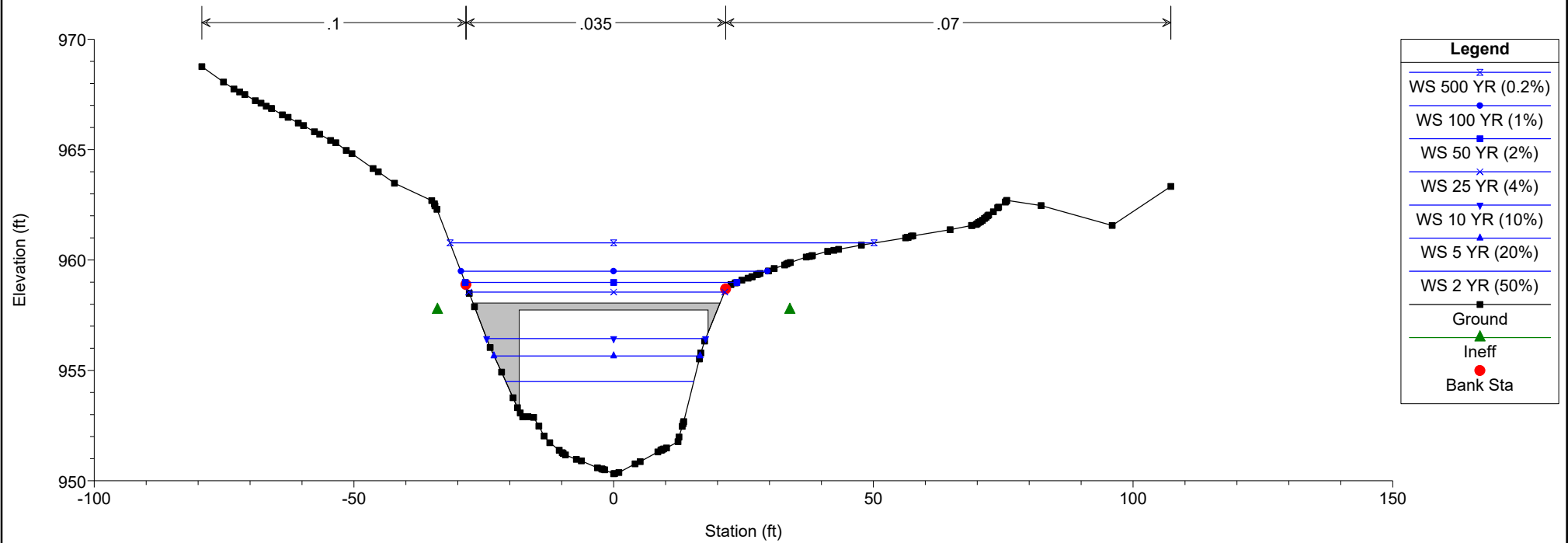
334659-Saluda Access Plan: Existing 9/8/2025



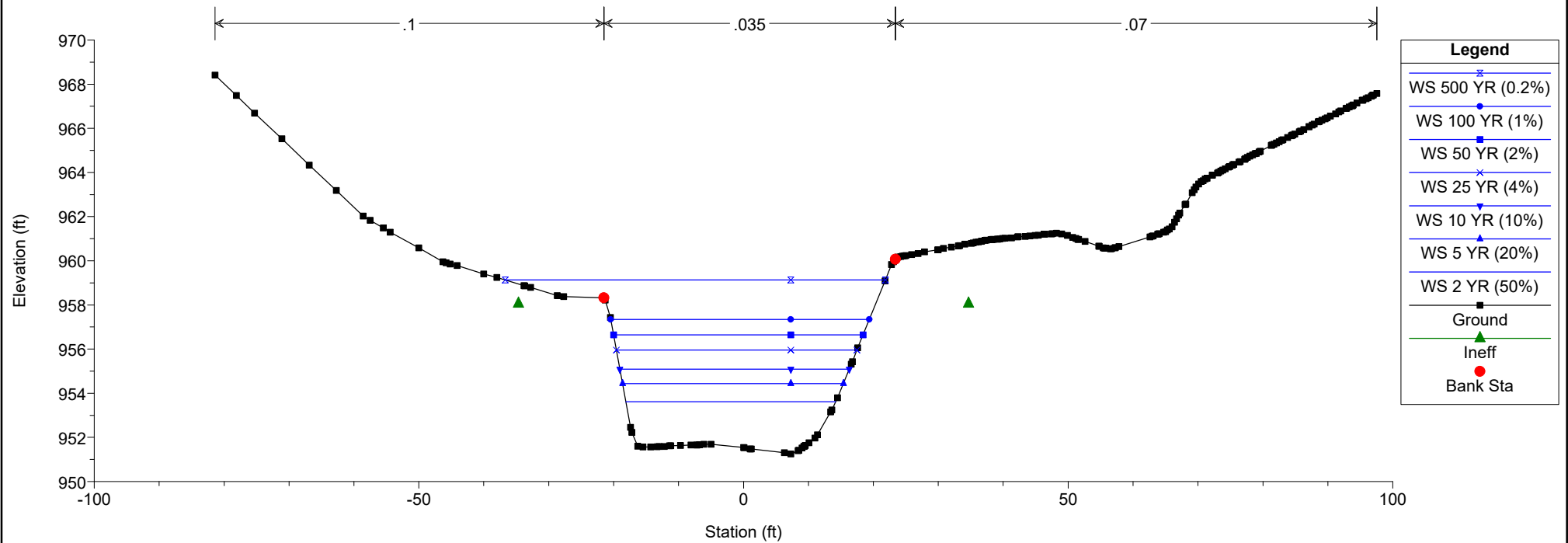
334659-Saluda Access Plan: Existing 9/8/2025



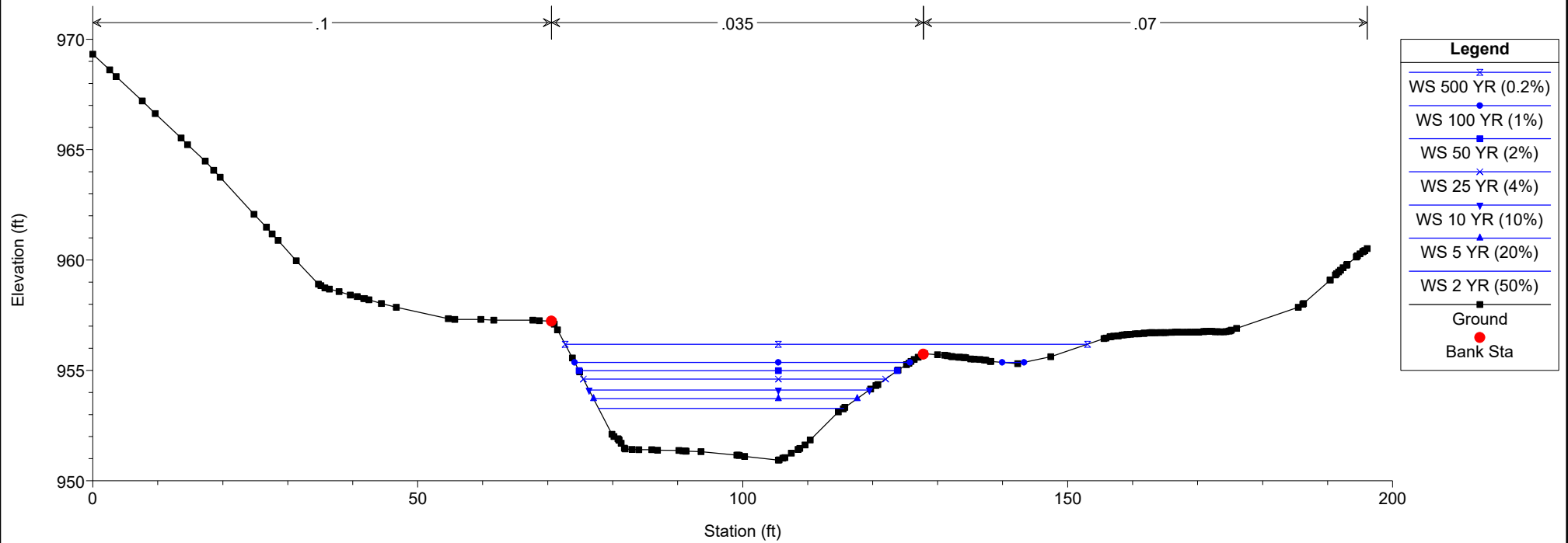
334659-Saluda Access Plan: Existing 9/8/2025



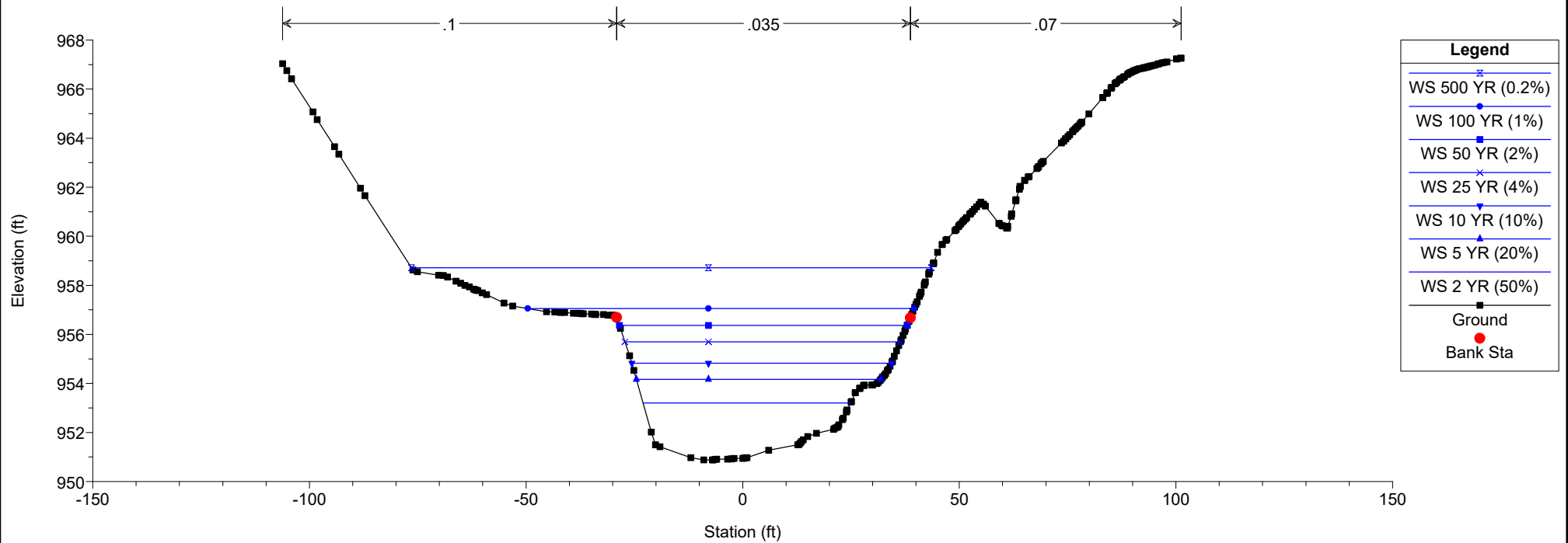
334659-Saluda Access Plan: Existing 9/8/2025



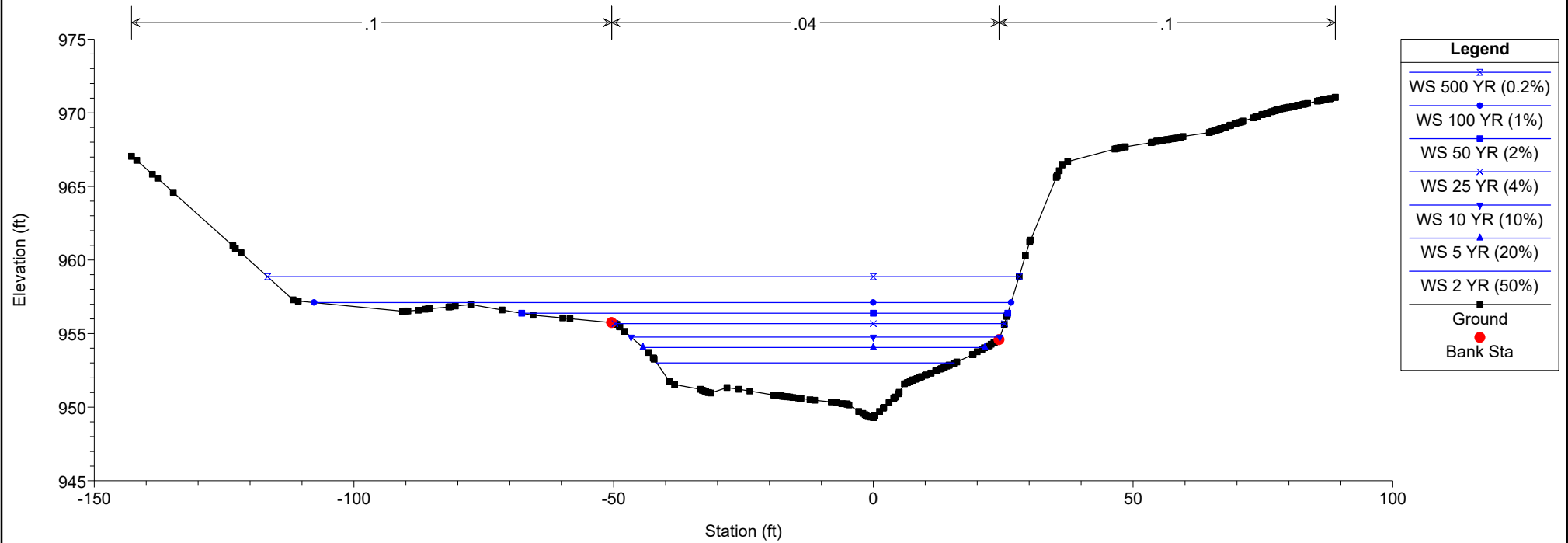
9/8/2025



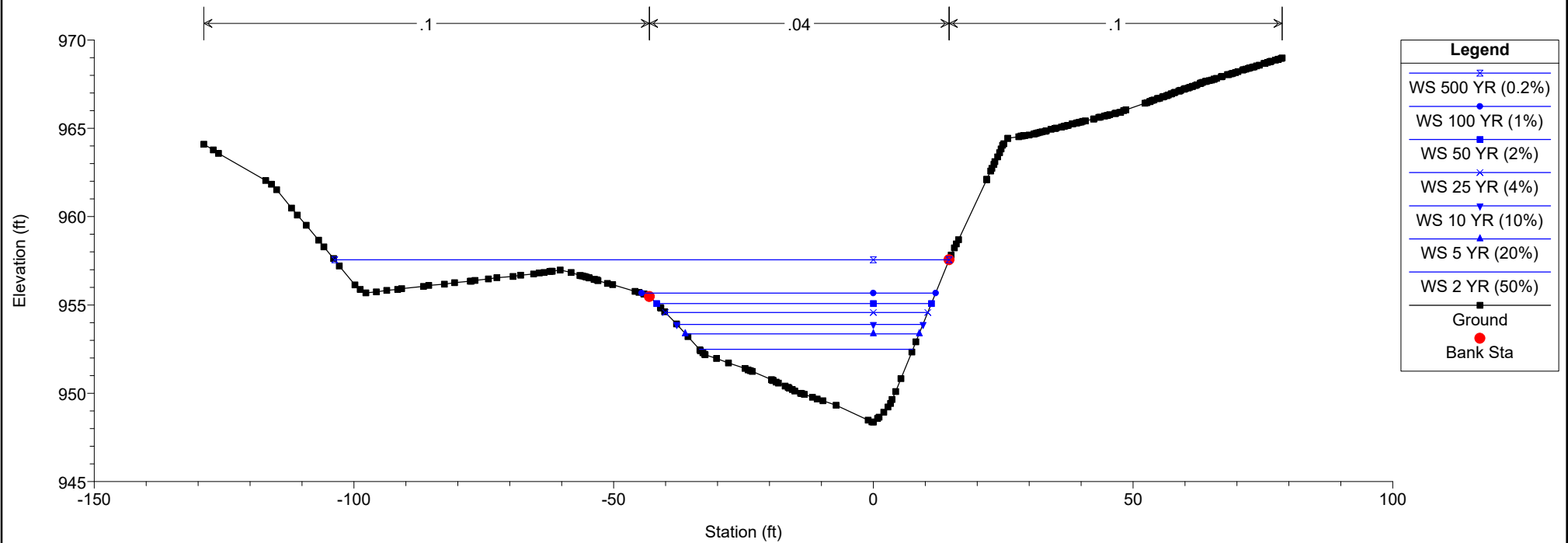
9/8/2025



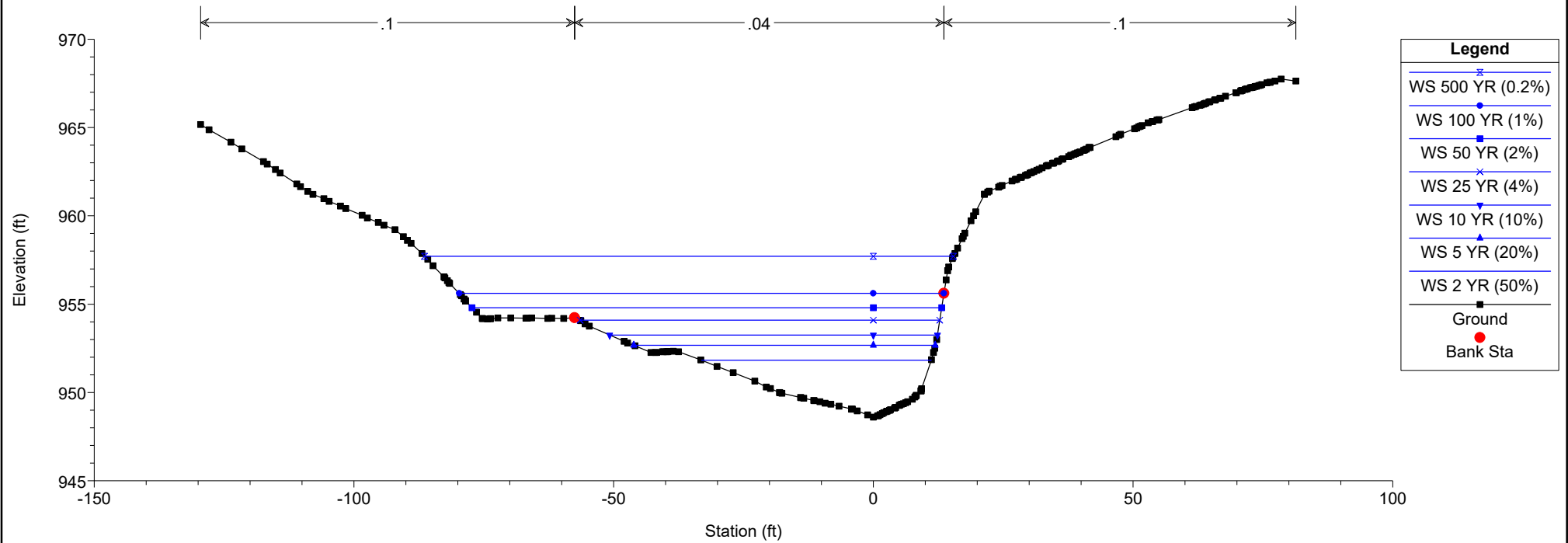
334659-Saluda Access Plan: Existing 9/8/2025



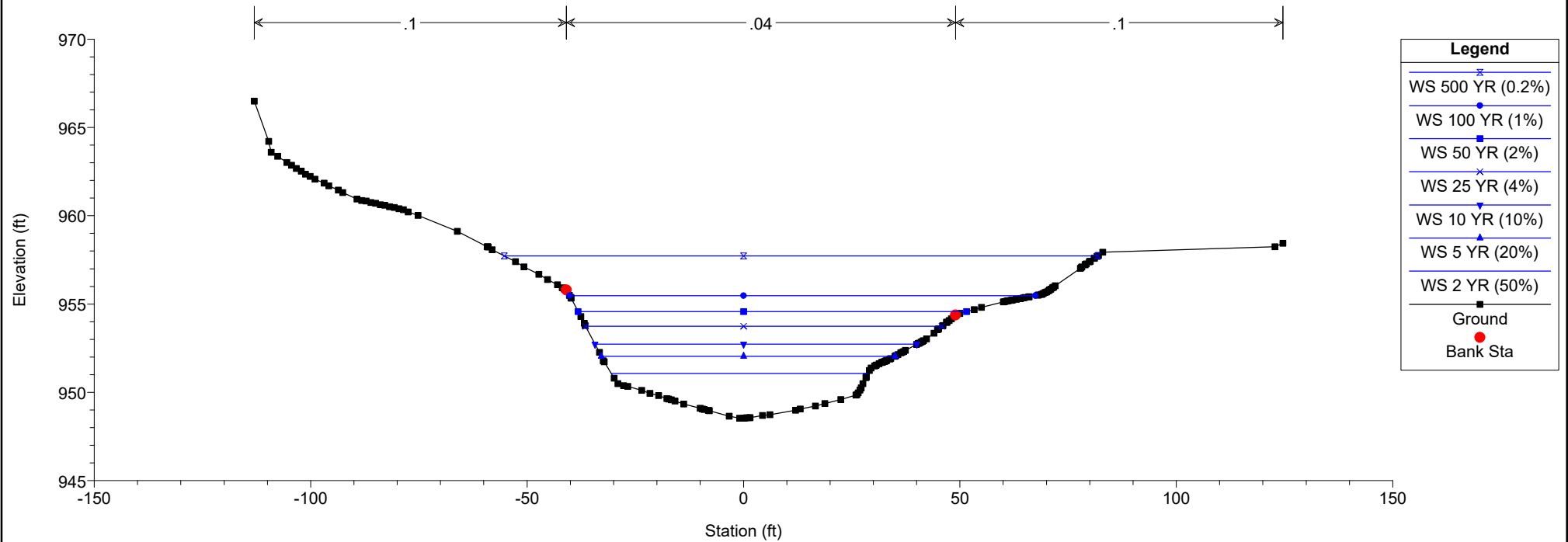
334659-Saluda Access Plan: Existing 9/8/2025



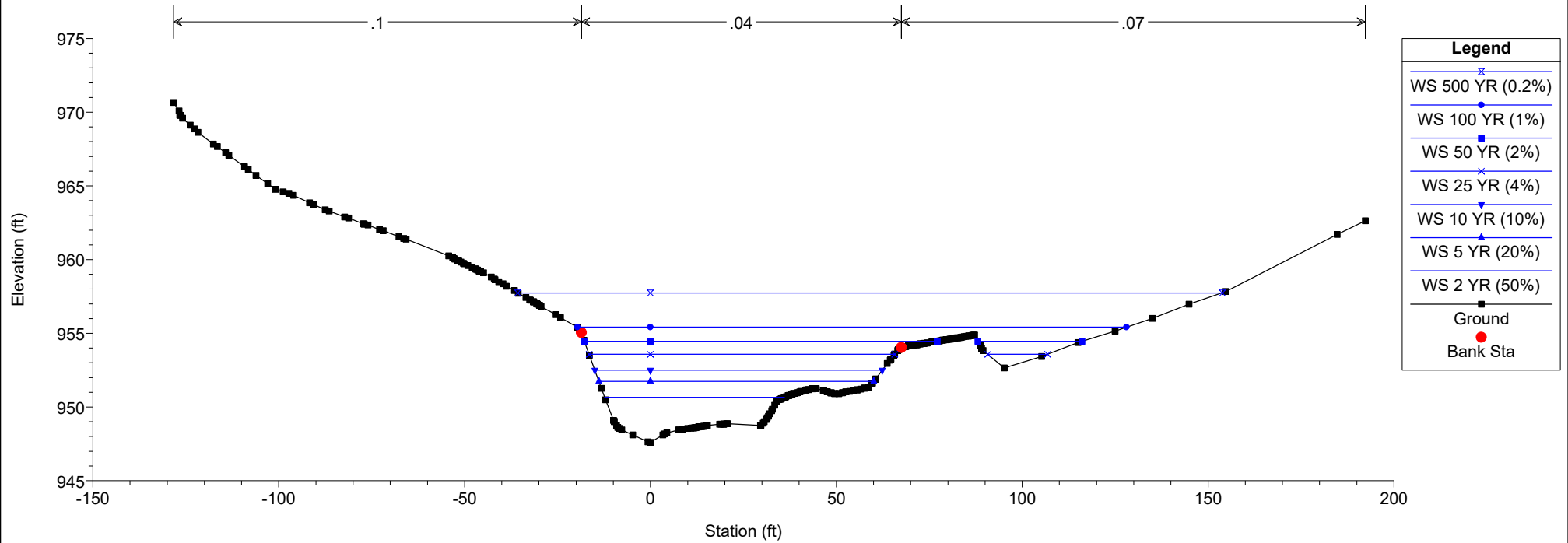
334659-Saluda Access Plan: Existing 9/8/2025



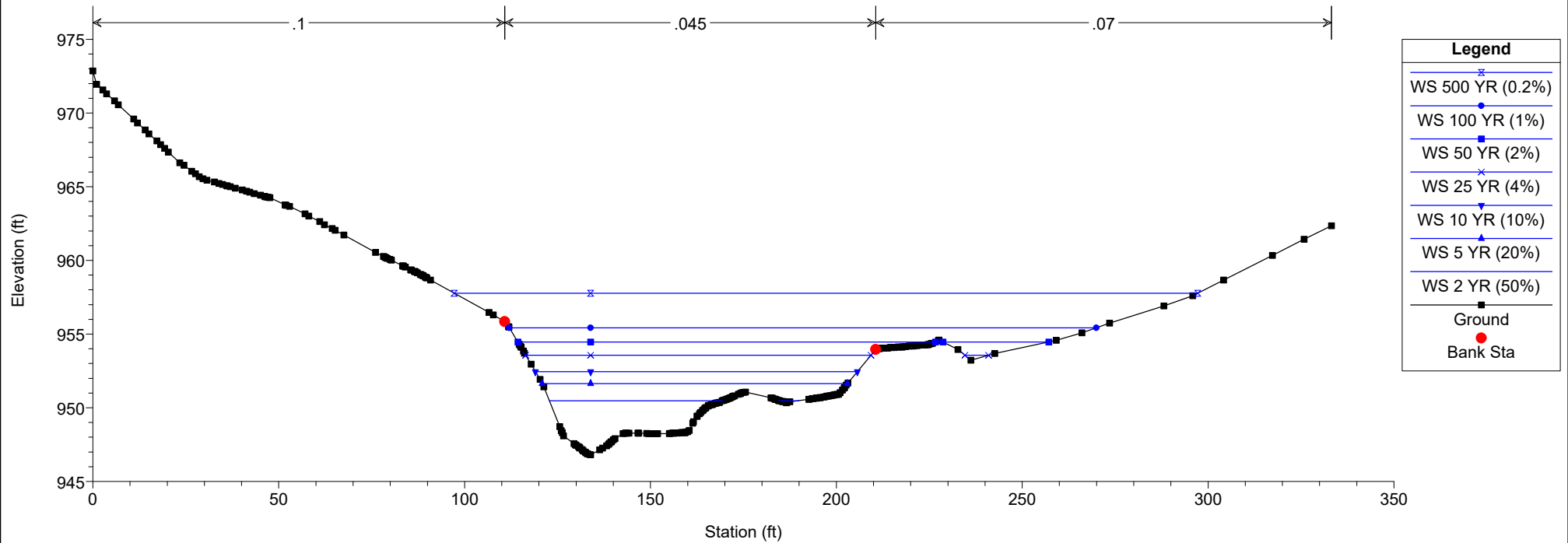
334659-Saluda Access Plan: Existing 9/8/2025



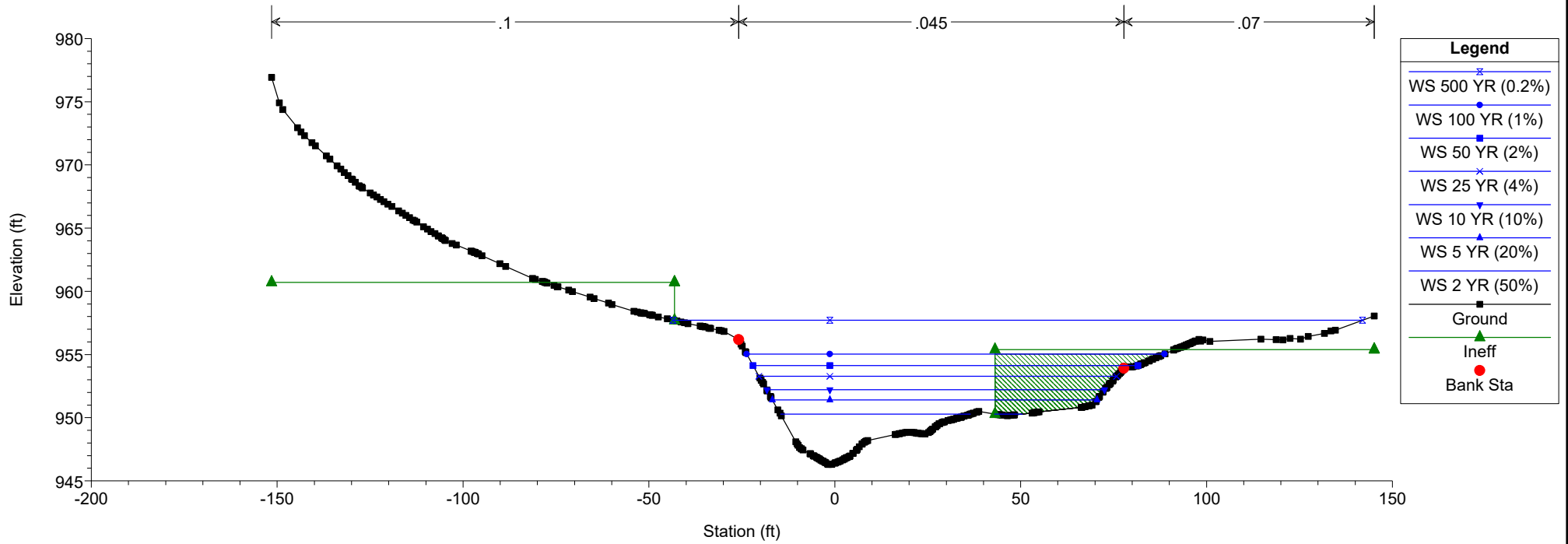
334659-Saluda Access Plan: Existing 9/8/2025



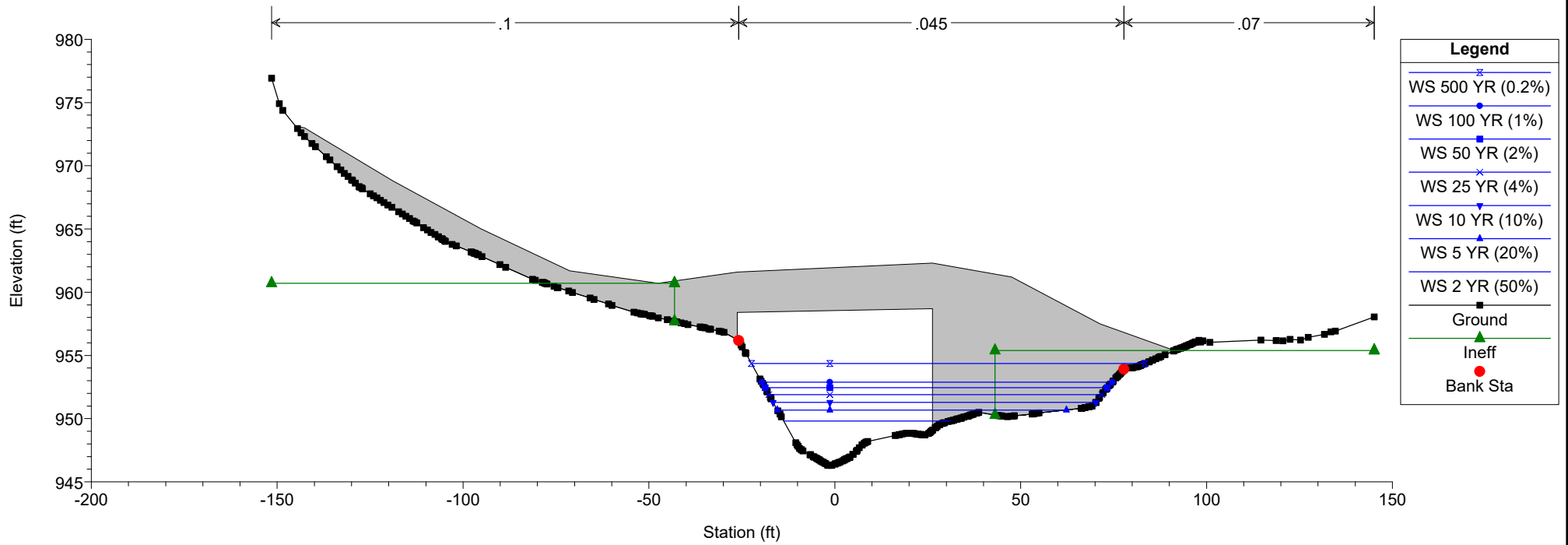
334659-Saluda Access Plan: Existing 9/8/2025



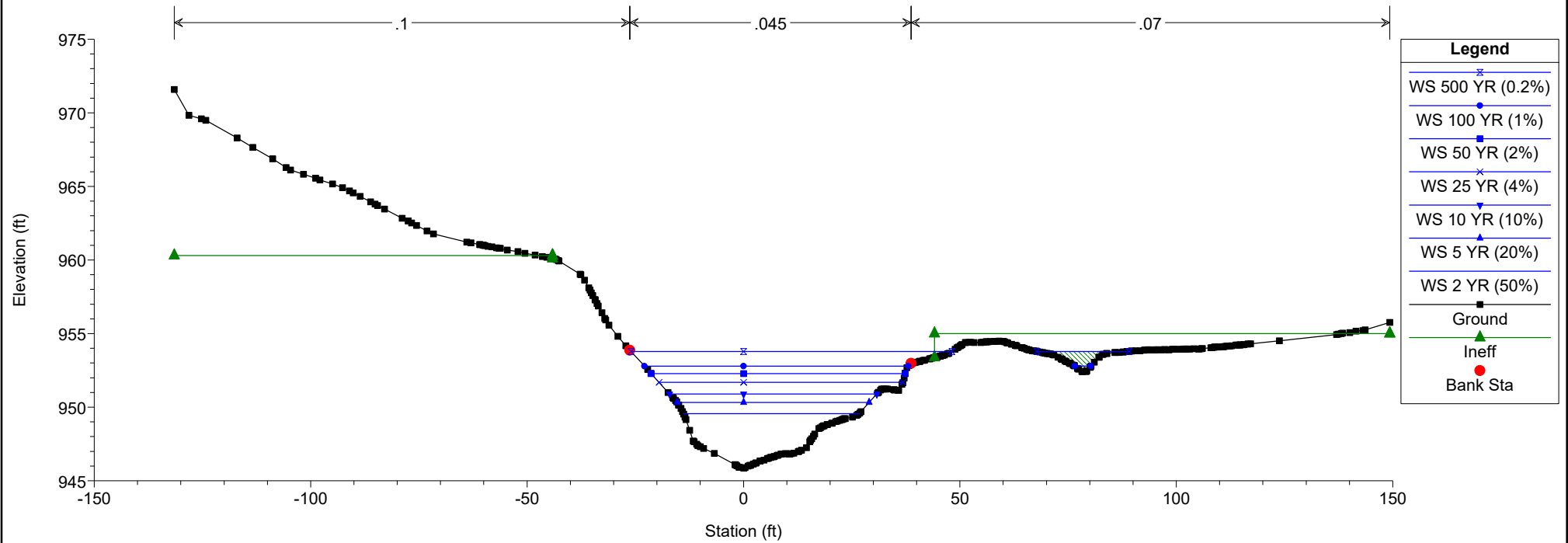
334659-Saluda Access Plan: Existing 9/8/2025



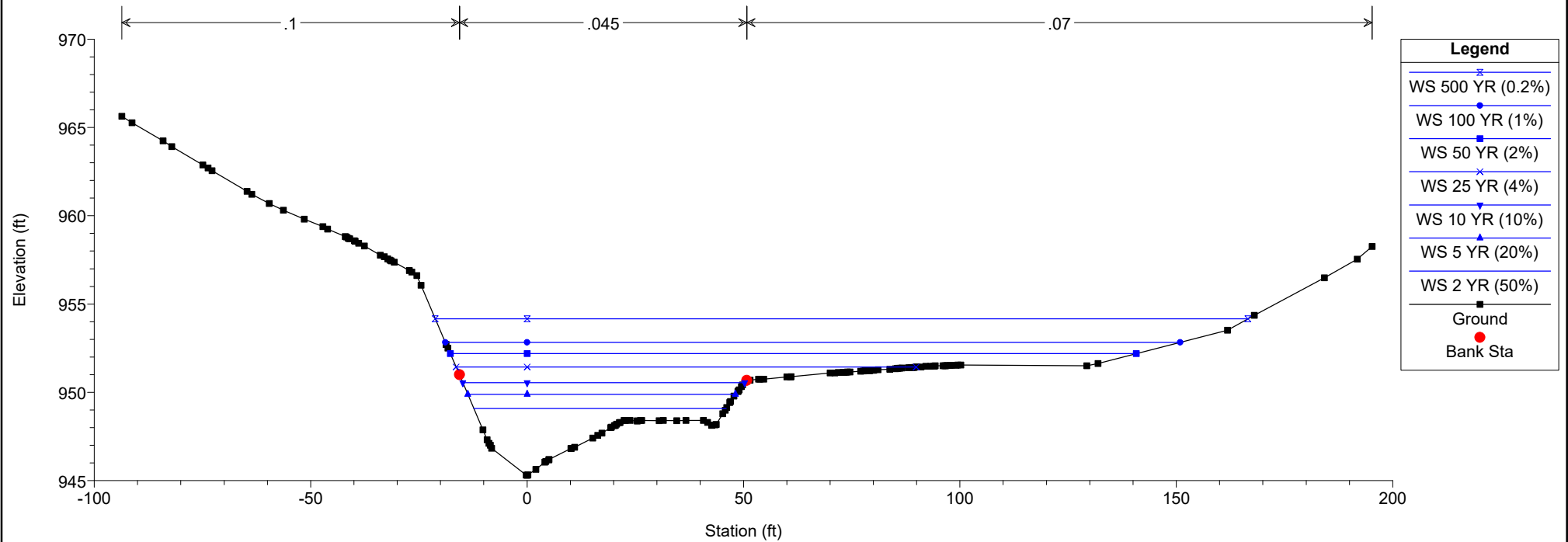
334659-Saluda Access Plan: Existing 9/8/2025



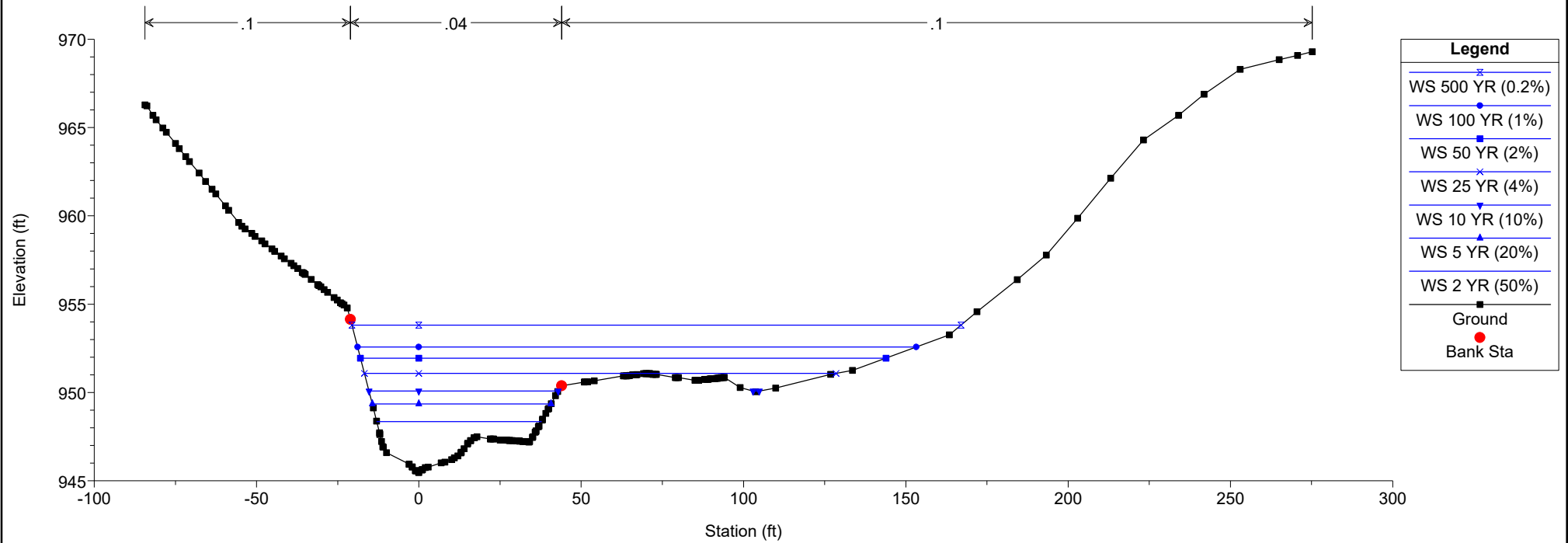
334659-Saluda Access Plan: Existing 9/8/2025



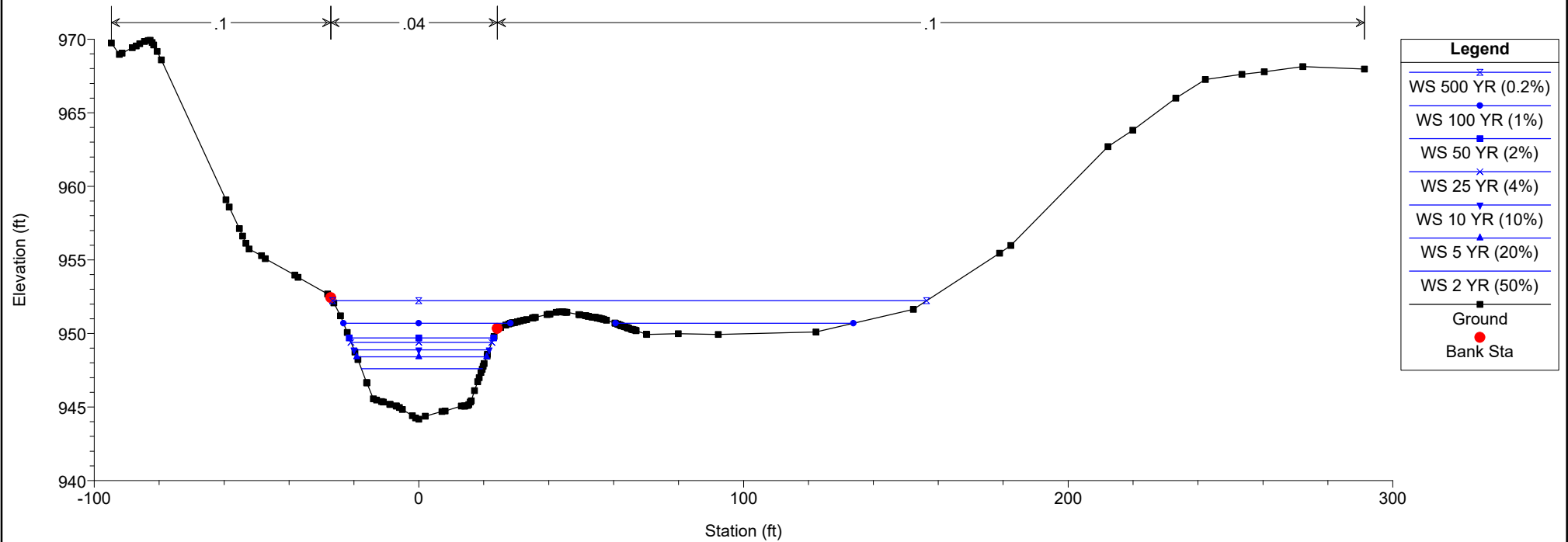
334659-Saluda Access Plan: Existing 9/8/2025



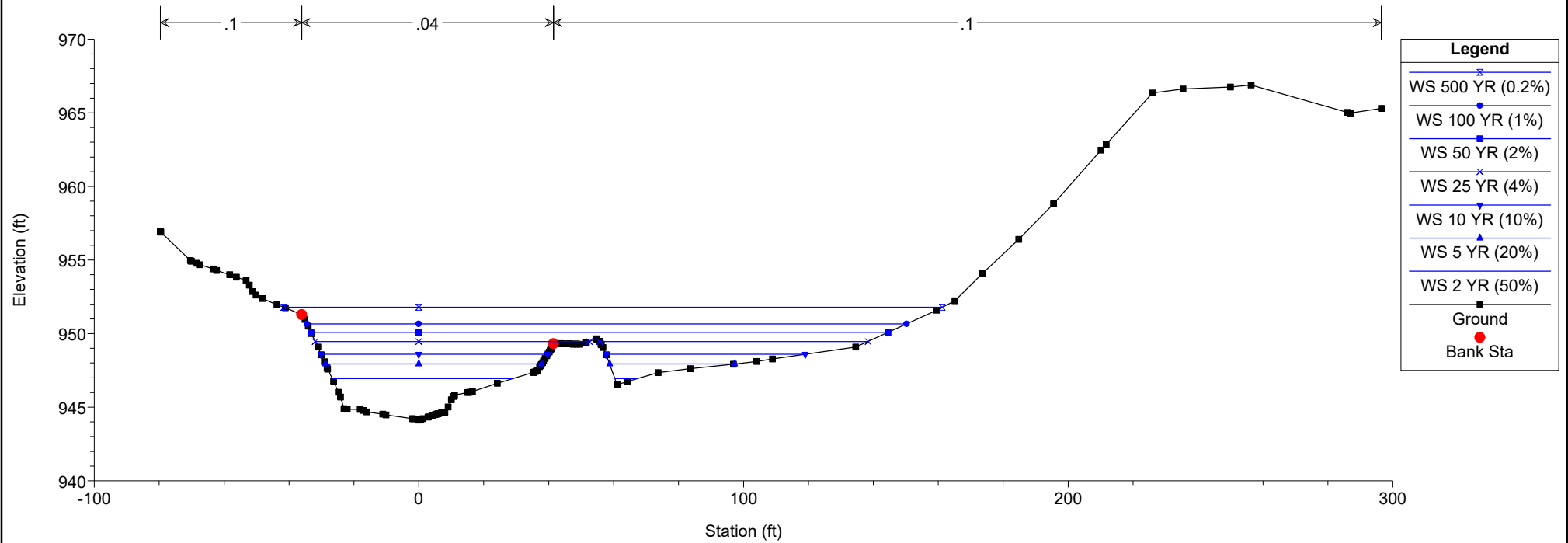
334659-Saluda Access Plan: Existing 9/8/2025



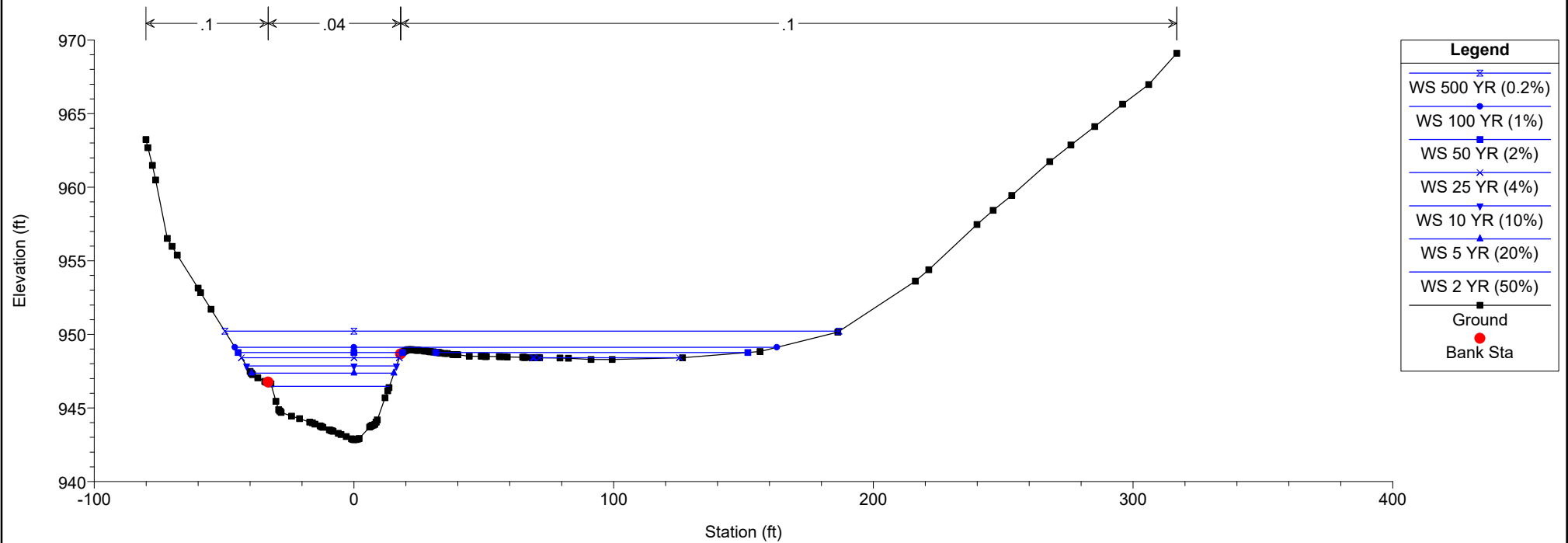
334659-Saluda Access Plan: Existing 9/8/2025

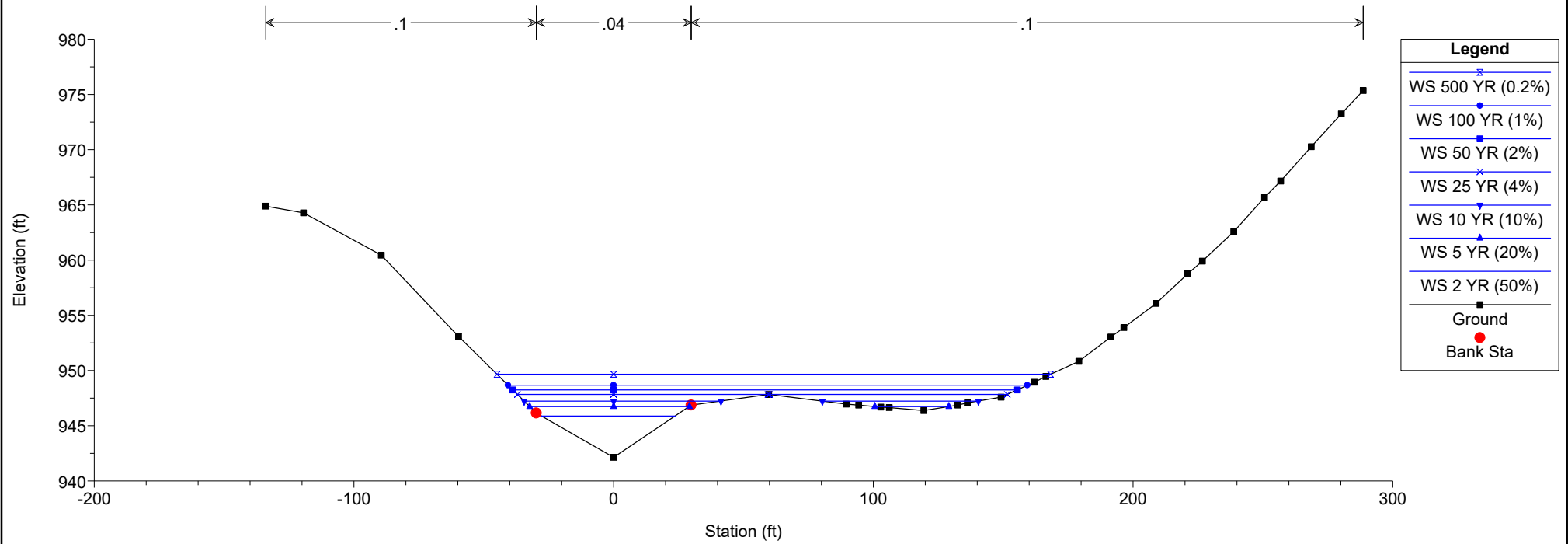


334659-Saluda Access Plan: Existing 9/8/2025



334659-Saluda Access Plan: Existing 9/8/2025





ATTACHMENT 4
Wallis Run
Proposed HEC-RAS Output

HEC-RAS HEC-RAS 6.5 February 2024
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X        X  X      X  X      X  X      X
X      X  X        X        X  X      X  X      X
XXXXXXX XXXX      X        XXX XXXX      XXXXXX   XXXX
X      X  X        X        X  X      X  X        X
X      X  X        X  X      X  X      X  X      X
X      X  XXXXXX   XXXX      X  X      X  X      XXXXX

```

PROJECT DATA

Project Title: 334659-Saluda Access
Project File : 334659SaludaAccess.prj
Run Date and Time: 9/10/2025 11:02:10 AM

Project in English units

PLAN DATA

Plan Title: Proposed
Plan File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.p02

Geometry Title: Proposed
Geometry File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.g02

Flow Title : StreamStats Wallis Run
Flow File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.f01

Plan Summary Information:

Number of: Cross Sections	=	19	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	0
Bridges	=	2	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: StreamStats Wallis Run
Flow File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.f01

Flow Data (cfs)

River (4%)	50 YR (2%)	Reach Study Reach	RS (1%)	2 YR (50%) 500 YR (0.2%)	5 YR (20%)	10 YR (10%)	25 YR
Wallis Run	1590	2000	17	2460	452	812	1120
				3760			

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Wallis Run	Study Reach	2 YR (50%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	5 YR (20%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	10 YR (10%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	25 YR (4%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	50 YR (2%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	100 YR (1%)	Normal S = 0.009	Normal S = 0.007
Wallis Run	Study Reach	500 YR (0.2%)	Normal S = 0.009	Normal S = 0.007

GEOMETRY DATA

Geometry Title: Proposed

Geometry File : c:\Users\dsmulski\Documents\Saluda\HECRAS\334659SaludaAccess.g02

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 17

INPUT

Description:

Station Elevation Data				num=	92				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-75.8	974.68	-73.3	974.03	-58	969.86	-45.7	966.45	-39.5	962.26
-34.6	958.74	-29.5	955.25	-28.5	954.72	-27.8	954.45	-27.5	954.36
-25.4	954.4	-24.3	954.41	-20.3	954.52	-19.3	954.3	-16.3	953.38
-15.3	953.03	-14.2	952.91	-13.1	952.83	-12.2	952.75	-11.2	952.66
-11	952.64	-10.5	952.61	-10.2	952.59	-9.2	952.5	-7.9	952.41
-6.1	952.25	-5.1	952.06	-2.1	951.41	-1	951.15	0	951.1
1	951.2	2.4	951.32	2.6	951.33	3	951.37	3.9	951.45
4.2	951.47	5	951.53	8.1	951.83	8.5	951.88	8.8	951.92
9.1	951.96	9.3	951.99	10.1	952.12	10.2	952.14	11.1	952.38
11.3	952.42	12.2	952.67	14.2	953.2	14.5	953.28	15	953.42
19.3	954.56	19.7	954.67	20.5	954.89	21.1	955.04	21.3	955.09
22.3	955.37	22.3	955.38	24.3	955.9	24.8	956.03	24.9	956.04
25.4	956.18	25.7	956.29	27.3	956.58	27.4	956.59	27.8	956.64
28.4	956.72	30.4	956.97	32.5	957.24	32.6	957.26	33.5	957.34
38.4	957.97	39.5	958.09	45	958.79	50.7	959.56	57.9	960.48
59.4	960.74	62.2	961.27	62.8	961.39	62.9	961.41	63.1	961.44
63.7	961.55	64.3	961.67	64.5	961.71	65.4	961.86	65.6	961.88
66	961.96	66.3	962.01	66.6	962.09	102.9	962.93	103.4	962.94
103.7	962.95	110.67	963.86						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
-75.8	.1	-34.6	.035	27.3	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-34.6	27.3		55 52.7	49.8		.1	.3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 16

INPUT

Description:

Station	Elevation	Data	num=	122
Sta	Elev	Sta	Elev	Sta Elev Sta Elev
-79.3	968.76	-75.1	968.06	-73.1 967.75 -72 967.61 -71 967.5
-69	967.22	-67.9	967.11	-66.9 966.97 -65.9 966.87 -63.8 966.58
-62.7	966.46	-60.7	966.2	-59.7 966.09 -57.6 965.81 -56.6 965.7
-54.5	965.42	-53.5	965.31	-51.5 964.97 -50.4 964.82 -46.3 964.14
-45.3	964	-42.2	963.48	-35 962.69 -34.5 962.54 -34.4 962.46
-34	962.3	-28.4	958.89	-27.8 958.49 -26.8 957.88 -23.8 956.04
-21.6	954.92	-19.4	953.76	-18.5 953.31 -18 953.07 -17.5 952.89
-16.7	952.9	-16.5	952.9	-15.4 952.87 -14.4 952.48 -13.4 952.03
-12.3	951.72	-10.5	951.38	-9.9 951.27 -9.7 951.24 -9.3 951.17
-7.2	950.97	-6.2	950.9	-3.1 950.59 -2.3 950.54 -2.1 950.52
-1.7	950.49	0	950.32	.2 950.33 1 950.37 4.1 950.77
5.1	950.87	8.5	951.31	9.1 951.39 9.3 951.4 9.3 951.41
9.6	951.44	10.2	951.49	12.4 951.77 12.6 951.98 13.2 952.47
13.4	952.59	13.5	952.68	16.5 955.52 16.8 955.79 17.5 956.33
21.6	958.68	22.6	958.89	23.4 958.96 23.7 958.98 24.7 959.09
25.9	959.18	26.6	959.23	26.7 959.24 27.5 959.33 27.8 959.36
28.2	959.39	29.8	959.51	30.9 959.62 32.9 959.78 33.3 959.82
33.6	959.85	34	959.89	37.1 960.13 37.7 960.16 38.1 960.18
38.3	960.2	41.2	960.39	42.4 960.44 43.3 960.48 47.7 960.68
56.2	961	56.5	961.02	56.6 961.02 56.7 961.03 57.3 961.08
57.6	961.09	64.8	961.37	68.9 961.56 69 961.56 69.8 961.61
70	961.64	70.3	961.7	70.6 961.73 71 961.8 71.4 961.88
71.7	961.94	72	962.01	72.2 962.04 73.1 962.19 73.9 962.36
74.1	962.4	75.4	962.62	75.6 962.67 75.7 962.7 82.3 962.47
96	961.56	107.27	963.33	

Manning's	n Values	num=	3
Sta	n Val	Sta	n Val
-79.3	.1	-28.4	.035
		21.6	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-28.4	21.6		40.1 42.2	40		.3	.5

Ineffective Flow	num=	2
Sta L	Sta R	Elev
-79.3	-33.9	957.74
33.9	107.27	957.74
		F
		F

BRIDGE

RIVER: Wallis Run
REACH: Study Reach RS: 15.5

INPUT

Description:

Distance from Upstream XS = 15.7
Deck/Roadway Width = 10
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-100	958.05		-18.17	958.05		-18.17	958.05	957.74
18.17	958.05	957.74	18.17	958.05		100	958.05	

Upstream Bridge Cross Section Data

Station Elevation Data		num=		122					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-79.3	968.76	-75.1	968.06	-73.1	967.75	-72	967.61	-71	967.5
-69	967.22	-67.9	967.11	-66.9	966.97	-65.9	966.87	-63.8	966.58
-62.7	966.46	-60.7	966.2	-59.7	966.09	-57.6	965.81	-56.6	965.7
-54.5	965.42	-53.5	965.31	-51.5	964.97	-50.4	964.82	-46.3	964.14
-45.3	964	-42.2	963.48	-35	962.69	-34.5	962.54	-34.4	962.46
-34	962.3	-28.4	958.89	-27.8	958.49	-26.8	957.88	-23.8	956.04
-21.6	954.92	-19.4	953.76	-18.5	953.31	-18	953.07	-17.5	952.89
-16.7	952.9	-16.5	952.9	-15.4	952.87	-14.4	952.48	-13.4	952.03
-12.3	951.72	-10.5	951.38	-9.9	951.27	-9.7	951.24	-9.3	951.17
-7.2	950.97	-6.2	950.9	-3.1	950.59	-2.3	950.54	-2.1	950.52
-1.7	950.49	0	950.32	.2	950.33	1	950.37	4.1	950.77
5.1	950.87	8.5	951.31	9.1	951.39	9.3	951.4	9.3	951.41
9.6	951.44	10.2	951.49	12.4	951.77	12.6	951.98	13.2	952.47
13.4	952.59	13.5	952.68	16.5	955.52	16.8	955.79	17.5	956.33
21.6	958.68	22.6	958.89	23.4	958.96	23.7	958.98	24.7	959.09
25.9	959.18	26.6	959.23	26.7	959.24	27.5	959.33	27.8	959.36
28.2	959.39	29.8	959.51	30.9	959.62	32.9	959.78	33.3	959.82
33.6	959.85	34	959.89	37.1	960.13	37.7	960.16	38.1	960.18
38.3	960.2	41.2	960.39	42.4	960.44	43.3	960.48	47.7	960.68
56.2	961	56.5	961.02	56.6	961.02	56.7	961.03	57.3	961.08
57.6	961.09	64.8	961.37	68.9	961.56	69	961.56	69.8	961.61
70	961.64	70.3	961.7	70.6	961.73	71	961.8	71.4	961.88
71.7	961.94	72	962.01	72.2	962.04	73.1	962.19	73.9	962.36
74.1	962.4	75.4	962.62	75.6	962.67	75.7	962.7	82.3	962.47
96	961.56	107.27	963.33						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-79.3	.1	-28.4	.035	21.6	.07

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	-28.4	21.6		.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
-79.3	-33.9	957.74	F		
33.9	107.27	957.74	F		

Downstream Deck/Roadway Coordinates

num=		6							
Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	
-100	958.05		-18.17	958.05		-18.17	958.05	957.74	
18.17	958.05	957.74	18.17	958.05		100	958.05		

Downstream Bridge Cross Section Data

Station Elevation Data		num=		221					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-81.4	968.41	-78.1	967.49	-75.3	966.69	-71.1	965.53	-66.9	964.34
-62.7	963.19	-58.6	962.03	-57.5	961.83	-55.5	961.49	-54.4	961.3
-50	960.58	-46.3	959.96	-45.8	959.91	-45.2	959.85	-44.1	959.79
-40	959.4	-38	959.25	-33.8	958.87	-33.7	958.86	-32.8	958.8
-28.7	958.42	-27.7	958.38	-21.5	958.32	-21.3	958.22	-20.5	957.43
-17.4	952.45	-17.2	952.23	-16.3	951.6	-15.5	951.57	-14.3	951.56
-13.3	951.58	-13	951.59	-12.2	951.59	-11.4	951.62	-11.2	951.62
-9.7	951.63	-8.1	951.66	-7.2	951.66	-7.1	951.66	-6.8	951.67
-6.1	951.69	-5	951.69	0	951.54	.1	951.53	1	951.48
1.2	951.47	6.3	951.31	7.3	951.25	8.4	951.4	8.5	951.42
9	951.52	9.3	951.59	9.4	951.6	9.5	951.63	10.1	951.76

11	951.97	11.4	952.12	13.4	953.15	13.6	953.24	14.5	953.8
16.6	955.31	16.8	955.43	17.6	956.06	21.8	959.09	22.8	959.83
23.1	959.95	23.4	960.07	23.8	960.17	24.2	960.19	24.5	960.21
24.8	960.23	25	960.24	25.9	960.28	26.9	960.33	27.9	960.41
29.9	960.5	30	960.5	30.8	960.56	32	960.62	33.1	960.68
33.3	960.69	34.1	960.75	35.1	960.79	35.4	960.81	35.8	960.84
36.2	960.86	36.6	960.88	36.7	960.89	37.2	960.92	37.4	960.93
38.1	960.96	38.2	960.96	38.3	960.97	38.5	960.97	39.1	960.98
39.2	960.98	39.5	960.99	39.9	961.01	40.3	961.03	41.3	961.04
42.2	961.08	42.3	961.09	43.4	961.1	44.1	961.13	44.9	961.15
45.4	961.16	46.3	961.2	46.4	961.21	47.4	961.22	47.6	961.23
48.2	961.25	49	961.22	49.9	961.15	50.7	961.06	51.2	961.01
51.5	960.97	51.6	960.97	52.6	960.88	54.7	960.67	54.8	960.65
55.4	960.59	55.6	960.57	55.7	960.57	55.8	960.57	56.5	960.54
56.7	960.55	57.2	960.59	57.3	960.6	57.8	960.64	62.6	961.08
62.9	961.11	63.1	961.13	63.8	961.21	63.9	961.22	64	961.23
64.7	961.29	65	961.32	65.3	961.4	65.6	961.44	66	961.54
66.4	961.74	66.7	961.9	67	962.07	67.2	962.16	68	962.55
68.1	962.56	68.1	962.57	69.1	963.09	69.4	963.22	69.7	963.35
70.1	963.48	70.5	963.59	70.8	963.63	71.1	963.71	71.4	963.74
72.2	963.87	72.2	963.88	73	963.98	73.2	964.01	73.5	964.06
73.8	964.11	74.2	964.17	74.7	964.24	74.9	964.27	75.3	964.33
75.5	964.37	76.3	964.47	76.5	964.49	77.2	964.6	77.3	964.63
77.6	964.68	78	964.74	78.4	964.8	78.8	964.85	79	964.87
79.4	964.93	79.6	964.97	81.3	965.23	81.4	965.25	81.7	965.28
82.1	965.34	82.5	965.39	82.9	965.46	83.1	965.48	83.8	965.59
84.4	965.67	84.5	965.69	84.6	965.7	84.9	965.74	85.6	965.85
85.8	965.88	86.3	965.95	87.1	966.07	87.1	966.08	87.6	966.15
87.9	966.19	88.5	966.29	88.6	966.31	88.7	966.32	89.1	966.37
89.6	966.43	89.9	966.47	90.4	966.55	91.2	966.66	91.7	966.74
92	966.79	92.8	966.9	92.9	966.92	93.3	966.97	93.7	967.02
93.8	967.03	93.9	967.06	94.5	967.15	95.3	967.27	95.4	967.28
95.9	967.34	96.2	967.39	96.7	967.46	96.9	967.5	97	967.51
97.54	967.58								

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-81.4 .1 -21.5 .035 23.4 .07

Bank Sta: Left Right Coeff Contr. Expan.
 -21.5 23.4 .3 .5

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
-81.4 -34.67 958.05 F
34.67 97.54 958.05 F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8

Max Low Cord

=

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach

RS: 15

INPUT

Description:

Station Elevation Data		num= 221							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-81.4	968.41	-78.1	967.49	-75.3	966.69	-71.1	965.53	-66.9	964.34
-62.7	963.19	-58.6	962.03	-57.5	961.83	-55.5	961.49	-54.4	961.3
-50	960.58	-46.3	959.96	-45.8	959.91	-45.2	959.85	-44.1	959.79
-40	959.4	-38	959.25	-33.8	958.87	-33.7	958.86	-32.8	958.8
-28.7	958.42	-27.7	958.38	-21.5	958.32	-21.3	958.22	-20.5	957.43
-17.4	952.45	-17.2	952.23	-16.3	951.6	-15.5	951.57	-14.3	951.56
-13.3	951.58	-13	951.59	-12.2	951.59	-11.4	951.62	-11.2	951.62
-9.7	951.63	-8.1	951.66	-7.2	951.66	-7.1	951.66	-6.8	951.67
-6.1	951.69	-5	951.69	0	951.54	.1	951.53	1	951.48
1.2	951.47	6.3	951.31	7.3	951.25	8.4	951.4	8.5	951.42
9	951.52	9.3	951.59	9.4	951.6	9.5	951.63	10.1	951.76
11	951.97	11.4	952.12	13.4	953.15	13.6	953.24	14.5	953.8
16.6	955.31	16.8	955.43	17.6	956.06	21.8	959.09	22.8	959.83
23.1	959.95	23.4	960.07	23.8	960.17	24.2	960.19	24.5	960.21
24.8	960.23	25	960.24	25.9	960.28	26.9	960.33	27.9	960.41
29.9	960.5	30	960.5	30.8	960.56	32	960.62	33.1	960.68
33.3	960.69	34.1	960.75	35.1	960.79	35.4	960.81	35.8	960.84
36.2	960.86	36.6	960.88	36.7	960.89	37.2	960.92	37.4	960.93
38.1	960.96	38.2	960.96	38.3	960.97	38.5	960.97	39.1	960.98
39.2	960.98	39.5	960.99	39.9	961.01	40.3	961.03	41.3	961.04
42.2	961.08	42.3	961.09	43.4	961.1	44.1	961.13	44.9	961.15
45.4	961.16	46.3	961.2	46.4	961.21	47.4	961.22	47.6	961.23
48.2	961.25	49	961.22	49.9	961.15	50.7	961.06	51.2	961.01
51.5	960.97	51.6	960.97	52.6	960.88	54.7	960.67	54.8	960.65
55.4	960.59	55.6	960.57	55.7	960.57	55.8	960.57	56.5	960.54
56.7	960.55	57.2	960.59	57.3	960.6	57.8	960.64	62.6	961.08
62.9	961.11	63.1	961.13	63.8	961.21	63.9	961.22	64	961.23
64.7	961.29	65	961.32	65.3	961.4	65.6	961.44	66	961.54
66.4	961.74	66.7	961.9	67	962.07	67.2	962.16	68	962.55
68.1	962.56	68.1	962.57	69.1	963.09	69.4	963.22	69.7	963.35
70.1	963.48	70.5	963.59	70.8	963.63	71.1	963.71	71.4	963.74
72.2	963.87	72.2	963.88	73	963.98	73.2	964.01	73.5	964.06
73.8	964.11	74.2	964.17	74.7	964.24	74.9	964.27	75.3	964.33
75.5	964.37	76.3	964.47	76.5	964.49	77.2	964.6	77.3	964.63
77.6	964.68	78	964.74	78.4	964.8	78.8	964.85	79	964.87
79.4	964.93	79.6	964.97	81.3	965.23	81.4	965.25	81.7	965.28
82.1	965.34	82.5	965.39	82.9	965.46	83.1	965.48	83.8	965.59
84.4	965.67	84.5	965.69	84.6	965.7	84.9	965.74	85.6	965.85
85.8	965.88	86.3	965.95	87.1	966.07	87.1	966.08	87.6	966.15
87.9	966.19	88.5	966.29	88.6	966.31	88.7	966.32	89.1	966.37
89.6	966.43	89.9	966.47	90.4	966.55	91.2	966.66	91.7	966.74
92	966.79	92.8	966.9	92.9	966.92	93.3	966.97	93.7	967.02
93.8	967.03	93.9	967.06	94.5	967.15	95.3	967.27	95.4	967.28
95.9	967.34	96.2	967.39	96.7	967.46	96.9	967.5	97	967.51
97.54	967.58								

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
-81.4 .1 -21.5 .035 23.4 .07		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff	Contr.	Expan.
-21.5	23.4	28.1 28.1	28.1		.3	.5

Ineffective Flow num= 2

Sta L Sta R Elev	Permanent
-81.4 -34.67 958.05	F
34.67 97.54 958.05	F

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 14.5

INPUT

Description:

Station Elevation Data	num=	175
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 969.32 2.6 968.62 3.6 968.31 7.6 967.21 9.6 966.63		
13.6 965.53 14.6 965.23 17.3 964.48 18.6 964.06 19.6 963.75		
24.8 962.07 26.7 961.49 27.6 961.18 28.5 960.89 31.3 959.97		
34.7 958.91 35.1 958.84 35.7 958.74 36.4 958.68 37.9 958.57		
39.6 958.41 40.7 958.34 41.7 958.25 41.8 958.25 42.5 958.2		
44.4 958.03 46.7 957.86 54.7 957.34 55.7 957.31 59.7 957.31		
61.7 957.28 67.7 957.28 68.7 957.25 70.6 957.23 70.8 957.21		
71 957.1 71.5 956.84 73.8 955.56 74.9954.9379 79.9 952.11		
80.2 952.01 80.8 951.9 80.9 951.87 81 951.84 81.3 951.7		
81.8 951.47 81.9 951.44 83 951.42 84 951.41 86 951.41		
86.9 951.38 90.2 951.37 90.8 951.35 91.1 951.35 91.2 951.34		
91.3 951.34 93.6 951.32 99.1 951.16 99.3 951.16 99.5 951.15		
100.3 951.1 105.5 950.94 105.6 950.95 106.2 951.02 106.5 951.05		
107.5 951.25 108.5 951.42 108.8 951.46 109.6 951.62 110.4 951.85		
114.7 953.12 115.5 953.26 115.7 953.32 119.7 954.15 120.5 954.31		
120.8 954.36 123.9 955.01 125.2 955.26 125.6 955.33 125.9 955.4		
126.4 955.5 127 955.6 127.8 955.73 128 955.76 130955.7148		
131.1 955.69 131.5 955.66 132.1 955.63 132.3 955.62 133.2 955.6		
133.4 955.6 134 955.58 134.1 955.58 134.3 955.57 135.1 955.52		
135.6 955.51 136.5 955.49 137.2 955.47 137.4 955.46 138.1 955.41		
138.2 955.41 142.3 955.3 147.4 955.62 155.6 956.44 155.9 956.46		
156.5 956.52 156.6 956.53 156.7 956.53 157.1 956.55 157.7 956.56		
157.8 956.57 158.4 956.6 158.7 956.61 159.1 956.62 159.2 956.62		
159.7 956.63 160.4 956.65 160.7 956.66 160.9 956.66 161.7 956.68		
161.8 956.68 161.8 956.69 162.6 956.7 162.8 956.71 163 956.71		
163.4 956.7 163.8 956.71 164.3 956.71 164.8 956.71 165.1 956.71		
166 956.72 166.6 956.73 166.8 956.73 166.9 956.73 167.6 956.73		
168.5 956.73 168.9 956.73 169.6 956.73 169.9 956.73 170.2 956.73		
170.9 956.76 171 956.76 171.3 956.77 171.9 956.77 172 956.77		
172.2 956.77 172.7 956.75 173 956.76 173.5 956.75 174 956.75		
174.4 956.76 174.8 956.78 175 956.79 175.2 956.82 176 956.9		
185.5 957.86 186.2 958 186.3 958.03 190.4 959.09 190.4 959.1		
191.2 959.32 191.4 959.38 191.7 959.46 192 959.54 192.4 959.65		
192.9 959.76 193 959.8 194.4 960.14 194.5 960.17 194.6 960.19		
195 960.28 195.4 960.37 195.5 960.39 195.7 960.43 196.1 960.52		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .1 70.6 .035 127.8 .07		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff	Contr.	Expan.
70.6	127.8	28.8 28.8	28.8		.1	.3

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach

RS: 14

INPUT

Description:

Station Elevation Data		num= 243							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-106.2	967.04	-105.2	966.75	-104.1	966.42	-99.2	965.07	-98.2	964.76
-94.2	963.65	-93.2	963.35	-88.2	961.96	-87.2	961.66	-76.1	958.62
-75.1	958.55	-70.2	958.41	-69.1	958.4	-68.1	958.34	-66.2	958.17
-65.1	958.09	-64.1	958	-63.1	957.94	-62.1	957.84	-61.8	957.82
-61.5	957.8	-61.1	957.78	-60.1	957.69	-59.1	957.62	-55.1	957.28
-53.1	957.16	-45.3	956.92	-43.4	956.91	-42.1	956.89	-41.1	956.89
-39.1	956.86	-38.1	956.86	-37.7	956.86	-37.4	956.85	-37.1	956.84
-36.8	956.84	-34.9	956.83	-34.3	956.82	-34.1	956.81	-33.9	956.81
-32.1	956.81	-31.1	956.78	-30.1	956.78	-30	956.78	-29.1	956.69
-29.1	956.68	-28.2	956.24	-26.1	955.13	-25.1	954.53	-21.1	952.02
-20.1	951.5	-19.1	951.42	-12	950.97	-9	950.88	-7	950.88
-6.8	950.88	-6.3	950.9	-6	950.91	-3.5	950.91	-2.6	950.92
-2.5	950.92	-2	950.94	0	950.94	.3	950.95	.6	950.96
1	950.97	6	951.28	12.7	951.5	13	951.51	13.3	951.57
13.6	951.63	14	951.7	15	951.83	17	951.97	21	952.13
21.3	952.18	21.8	952.21	22	952.24	22.2	952.31	23	952.52
23.2	952.58	23.9	952.84	24	952.88	24.1	952.92	25	953.24
25.1	953.26	26	953.62	26	953.63	27	953.79	27	953.8
27.1	953.81	27.9	953.91	28	953.92	28.1	953.93	29.8	953.93
30	953.94	31	953.99	31.3	954.04	31.7	954.13	32	954.19
32.3	954.26	32.7	954.33	33	954.4	33.4	954.52	33.6	954.57
34	954.7	34.5	954.88	34.6	954.92	35	955.11	35.5	955.33
36	955.55	36.5	955.73	36.6	955.78	37	955.96	37.4	956.12
37.6	956.21	38	956.37	38.4	956.53	38.7	956.67	39	956.81
39.3	956.94	39.7	957.11	40	957.23	40.3	957.33	40.8	957.55
41	957.64	41.2	957.72	41.9	958.01	42	958.08	42.2	958.14
42.9	958.45	43	958.49	43.1	958.53	44	958.88	44	958.9
44.1	958.92	45	959.34	46	959.66	46.1	959.67	46.9	959.83
47.1	959.87	49	960.23	49.3	960.28	49.8	960.39	50	960.45
50.3	960.5	50.7	960.58	51	960.64	51.4	960.7	51.7	960.76
52.4	960.9	52.6	960.94	53	961.01	53.5	961.1	54	961.2
54.6	961.3	55	961.39	55.6	961.31	56	961.23	59.1	960.53
59.3	960.51	59.8	960.44	60.1	960.42	60.9	960.34	61.1	960.33
61.2	960.41	62	960.81	62.1	960.92	63	961.44	63.1	961.47
63.1	961.49	63.9	961.92	64	962.03	64.1	962.03	65.1	962.27
65.1	962.28	65.9	962.42	66.1	962.44	67.9	962.76	68.1	962.8
68.3	962.84	68.8	962.95	69.1	963	69.4	963.05	73.6	963.8
74.1	963.88	74.5	963.97	74.6	963.99	75.1	964.07	75.5	964.14
76.1	964.26	76.4	964.32	76.8	964.38	77.1	964.44	77.4	964.49
77.8	964.57	78.1	964.62	78.3	964.66	79.9	964.99	83.1	965.65
83.1	965.66	84	965.82	84.1	965.84	84.2	965.85	85	966.03
85.1	966.05	85.2	966.07	85.9	966.22	86.1	966.25	86.3	966.28
86.9	966.36	87.1	966.39	87.3	966.42	87.8	966.48	88.1	966.51
88.8	966.59	89.1	966.64	89.4	966.67	89.7	966.69	90.1	966.73
90.5	966.76	90.7	966.77	91.1	966.8	91.6	966.82	91.6	966.83
92.1	966.84	92.6	966.86	92.6	966.87	93.1	966.89	93.5	966.91
93.7	966.92	94.1	966.94	94.5	966.96	95.1	966.98	95.8	967.02
96.1	967.04	96.8	967.07	97.3	967.09	97.9	967.11	100.1	967.23
100.2	967.23	101.1	967.26	101.19	967.26				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-106.2	.1	-29.1	.035	38.7	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-29.1	38.7	47.6 55.7	52.5	.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 13

INPUT

Description:

Station Elevation Data		num= 233							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-142.8	967.05	-141.8	966.78	-138.8	965.83	-137.8	965.55	-134.8	964.6
-123.3	960.96	-122.8	960.8	-121.7	960.49	-111.7	957.3	-110.7	957.21
-90.6	956.52	-90.3	956.53	-89.9	956.53	-89.6	956.53	-87.6	956.59
-86.3	956.66	-85.8	956.68	-85.4	956.69	-81.7	956.81	-81.5	956.82
-80.5	956.88	-77.5	956.97	-71.5	956.6	-65.5	956.25	-59.8	956.07
-58.4	956.02	-50.4	955.75	-50.1	955.71	-49.7	955.67	-49.4	955.62
-48.9	955.48	-48.8	955.45	-47.9	955.15	-43.3	953.72	-42.4	953.35
-42.3	953.32	-42.2	953.26	-39.3	951.76	-38.3	951.53	-33.3	951.22
-32.9	951.15	-32.7	951.12	-32.3	951.05	-31.8	951	-31.7	951
-31.3	950.96	-28.2	951.34	-25.9	951.21	-23.8	951.1	-19.2	950.82
-19	950.81	-18.4	950.8	-18.2	950.79	-17.8	950.77	-17.5	950.75
-17.1	950.73	-16.7	950.71	-16.6	950.71	-16.1	950.69	-15.5	950.66
-14.4	950.62	-14.1	950.61	-13.9	950.61	-12.2	950.51	-11.3	950.48
-8.1	950.35	-7.1	950.3	-6.1	950.24	-5.9	950.24	-5.1	950.22
-5	950.22	-5	950.21	-4.7	950.15	-2.8	949.71	-2	949.57
-1.6	949.49	-1.4	949.45	-1	949.36	-.5	949.32	0	949.29
.3	949.41	1.2	949.72	1.9	949.93	2	949.99	3	950.31
3.9	950.6	4	950.64	4.2	950.69	4.8	950.92	5	951.01
6	951.58	6.5	951.66	6.6	951.68	7.1	951.77	7.5	951.83
7.6	951.85	8.1	951.9	8.4	951.95	8.8	952.01	9.1	952.05
9.3	952.08	10	952.17	10.2	952.19	11.1	952.31	11.1	952.32
12	952.46	12.1	952.48	12.3	952.5	12.8	952.58	13.1	952.62
13.4	952.67	13.7	952.72	14.1	952.78	14.6	952.85	14.6	952.86
15.5	952.99	16.1	953.07	19.1	953.56	19.2	953.57	19.2	953.58
20	953.76	20.9	953.94	21.4	954.03	22.1	954.15	22.2	954.17
22.7	954.27	23.2	954.37	23.3	954.39	24	954.52	24.2	954.58
25.2	955.63	25.7	956.16	25.8	956.26	28.1	958.91	29.3	960.31
30.1	961.21	30.3	961.35	35.2	965.6	35.3	965.67	35.4	965.72
35.8	966.06	36.3	966.45	36.3	966.51	37.4	966.69	46.5	967.53
46.8	967.56	47.2	967.58	47.5	967.6	47.7	967.62	48.4	967.68
48.5	967.69	53.5	967.98	53.8	968	54.4	968.05	54.6	968.07
54.7	968.07	55.4	968.12	55.6	968.12	55.6	968.13	56.4	968.17
56.6	968.18	56.8	968.19	57.3	968.22	57.6	968.24	58	968.26
58.2	968.27	58.6	968.3	59.1	968.34	59.2	968.35	59.6	968.39
64.7	968.67	65.2	968.73	65.2	968.74	65.7	968.79	66.1	968.83
66.4	968.87	66.7	968.91	66.9	968.94	67.6	969.01	67.7	969.03
67.8	969.04	68.5	969.13	68.7	969.15	68.7	969.16	68.8	969.16
69.6	969.26	69.7	969.28	70	969.3	70.4	969.34	70.8	969.38
71.2	969.43	71.3	969.45	73.1	969.66	73.6	969.72	73.8	969.75
74	969.77	74.8	969.88	75	969.9	75.7	969.96	75.8	969.97
76	969.99	76.6	970.06	76.8	970.09	77.2	970.13	77.5	970.17
77.8	970.22	78.3	970.26	78.8	970.29	79.2	970.32	79.5	970.35
79.9	970.38	80.1	970.39	80.7	970.43	80.9	970.44	81	970.45
81.6	970.5	81.8	970.53	81.9	970.53	82.7	970.58	82.9	970.59
83.1	970.61	83.6	970.65	85.5	970.79	85.9	970.82	86.2	970.84
86.7	970.89	86.9	970.91	87.1	970.92	87.9	970.97	88	970.97
88.1	970.98	88.9	971.05	88.95	971.06				

Manning's n Values	num= 3
Sta n Val	Sta n Val

-142.8 .1 -50.4 .04 24.2 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -50.4 24.2 36.4 60 69.1 .1 .3

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach RS: 12

INPUT

Description:

Station Elevation Data		num= 240							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-128.9	964.1	-127.1	963.78	-126.1	963.58	-117	962.04	-115.9	961.84
-114.9	961.53	-112	960.49	-110.9	960.09	-109.2	959.51	-106.8	958.67
-105.8	958.29	-103.9	957.63	-102.8	957.21	-99.8	956.14	-98.8	955.88
-97.7	955.69	-95.7	955.74	-93.7	955.82	-91.6	955.88	-90.8	955.93
-86.6	956.05	-85.6	956.1	-82.6	956.18	-80.6	956.26	-77.6	956.34
-77.4	956.35	-76.7	956.39	-74.1	956.47	-72.5	956.54	-69.4	956.62
-67.9	956.68	-65.4	956.75	-64.3	956.81	-63.4	956.84	-62.3	956.9
-62	956.91	-61.8	956.91	-60.3	956.98	-58.2	956.84	-56.5	956.67
-56.3	956.66	-56	956.64	-55.6	956.61	-55.3	956.58	-54.8	956.54
-54.7	956.53	-53.8	956.45	-53.6	956.44	-53.2	956.41	-53	956.38
-51.2	956.22	-50.2	956.15	-45.9	955.77	-45.1	955.71	-44.2	955.63
-44.1	955.62	-43.1	955.48	-41	954.86	-40.9	954.83	-40.2	954.62
-37.9	953.92	-35.7	953.2	-33.4	952.46	-33.3	952.41	-32.8	952.29
-32.5	952.21	-32.4	952.18	-30.2	951.97	-27.9	951.71	-24.7	951.4
-24.1	951.32	-23.7	951.28	-23.3	951.24	-19.6	950.77	-19.5	950.75
-19.4	950.75	-19.3	950.72	-18.7	950.63	-18.3	950.58	-17	950.4
-16.4	950.33	-16.2	950.29	-15.6	950.21	-15.1	950.13	-14	950
-13.8	949.98	-13.3	949.94	-11.7	949.77	-10.8	949.68	-9.7	949.58
-7.2	949.32	-1	948.47	-.3	948.38	0	948.36	.8	948.57
1.1	948.65	2	948.93	2.8	949.22	3.3	949.42	3.6	949.64
4.3	950.09	5.3	950.83	7.4	952.33	8.2	952.91	14.6	957.56
15	957.82	15.6	958.23	16	958.46	16.4	958.69	21.8	962.09
21.8	962.1	21.8	962.12	22.6	962.58	22.8	962.73	23.2	962.96
23.4	963.11	23.9	963.38	24.3	963.63	24.6	963.84	24.9	964.04
25.1	964.13	25.9	964.43	25.9	964.44	28	964.53	28.4	964.56
28.7	964.57	29	964.59	29.2	964.6	30	964.62	30.9	964.68
31.1	964.7	31.4	964.72	31.7	964.75	32.1	964.78	32.5	964.81
33.1	964.84	33.3	964.86	34.2	964.94	35	964.99	35.2	965.01
36.2	965.08	36.7	965.11	36.9	965.13	37.3	965.16	37.5	965.17
38.3	965.25	38.4	965.26	39.1	965.3	39.3	965.31	39.6	965.34
40	965.36	40.3	965.39	40.8	965.43	42.4	965.53	42.5	965.54
43.4	965.62	43.7	965.64	44.5	965.69	44.9	965.72	45.1	965.74
45.5	965.77	46.5	965.84	46.6	965.85	46.7	965.86	47.4	965.9
47.6	965.91	48.2	966	48.6	966.05	52.3	966.42	52.7	966.45
53.2	966.51	53.3	966.53	53.7	966.58	54	966.61	54.7	966.68
54.8	966.69	55.1	966.71	55.7	966.77	55.8	966.79	56	966.81
56.5	966.85	56.8	966.89	57.3	966.95	57.4	966.96	57.9	967.02
58.1	967.05	58.8	967.11	58.9	967.12	59	967.13	59.2	967.16
59.8	967.21	59.9	967.22	60.1	967.25	60.6	967.29	60.9	967.33
61.4	967.37	61.5	967.38	62	967.43	62.3	967.46	62.9	967.54
63	967.56	63.1	967.57	63.4	967.6	63.9	967.65	64	967.66
64.2	967.68	64.7	967.71	65.1	967.73	65.6	967.78	65.6	967.79
66.1	967.83	67	967.92	67.1	967.93	67.2	967.94	68.2	968.04
68.4	968.05	68.9	968.08	69.2	968.11	69.7	968.16	70.2	968.21
71.1	968.29	71.3	968.32	71.7	968.36	72.2	968.4	72.5	968.42
73	968.46	73.3	968.48	73.8	968.53	74.3	968.58	75.2	968.67
75.4	968.68	75.9	968.74	76.3	968.78	76.4	968.78	76.6	968.8
77.4	968.86	77.9	968.9	78	968.91	78.5	968.96	78.69	968.98

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-128.9	.1	-43.1	.04	14.6	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-43.1	14.6		72.6	75	71.8	.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 11

INPUT

Description:

Station Elevation Data		num=		238					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-129.5	965.17	-127.9	964.88	-123.7	964.17	-121.6	963.79	-117.4	963.08
-116.7	962.94	-115.1	962.63	-114.2	962.43	-111	961.81	-110.3	961.65
-108.9	961.38	-107.9	961.22	-105.8	960.97	-104.8	960.82	-102.6	960.56
-101.6	960.41	-98.4	960.03	-97.4	959.88	-95.3	959.62	-94.2	959.47
-92.1	959.22	-90.5	958.82	-89.7	958.61	-89	958.44	-86.9	957.86
-85.8	957.54	-84.8	957.18	-82.7	956.54	-82.5	956.49	-82	956.33
-81.7	956.22	-81.6	956.18	-79.5	955.54	-79.3	955.48	-78.8	955.29
-78.5	955.21	-78.5	955.18	-76.4	954.54	-75.3	954.19	-75.2	954.18
-74.3	954.16	-73.8	954.18	-73.7	954.18	-72.3	954.22	-69.8	954.22
-66.9	954.2	-66.6	954.2	-65.8	954.22	-62.7	954.19	-61.9	954.21
-59.6	954.19	-57.5	954.23	-56.4	954.08	-56.3	954.06	-55.5	953.88
-54.7	953.76	-48	952.89	-47.3	952.8	-45.9	952.65	-42.8	952.26
-42	952.26	-41.7	952.26	-40.6	952.3	-40.4	952.31	-39.8	952.31
-39.6	952.31	-39.5	952.32	-38.5	952.34	-37.5	952.3	-33.2	951.84
-30.1	951.47	-27	951.13	-22.8	950.64	-20.6	950.31	-19.8	950.22
-18.1	950	-18	949.99	-17.6	949.95	-14	949.71	-13.9	949.7
-13.4	949.68	-11.5	949.54	-11.4	949.53	-10.3	949.47	-9.3	949.39
-8.2	949.34	-6.6	949.22	-4.2	949.07	-4.2	949.06	-4.1	949.06
-4	949.05	-3.1	948.96	-1.1	948.73	0	948.6	.8	948.67
1	948.69	1.3	948.74	1.7	948.8	2	948.86	2.5	948.92
2.7	948.94	3.1	948.99	3.3	949.02	4.1	949.12	4.1	949.13
4.3	949.15	5	949.26	5.1	949.29	5.4	949.33	5.8	949.37
6.2	949.42	6.6	949.48	7.5	949.62	8	949.75	8.2	949.8
8.3	949.84	9.2	950.08	9.2	950.09	9.2	950.11	9.3	950.21
11.2	951.85	11.6	952.26	11.8	952.5	12.2	953	13.6	955.61
14	956.38	14.3	956.9	14.5	957.11	15.2	957.58	15.3	957.65
15.7	957.87	16.2	958.18	17.1	958.71	17.3	958.84	17.6	959.02
18.8	959.72	19.3	960.01	19.7	960.23	21.4	961.21	21.4	961.23
22	961.34	22.3	961.4	24.1	961.63	24.4	961.68	24.8	961.73
26.7	961.97	27.3	962.04	27.4	962.07	27.6	962.08	28.3	962.17
28.4	962.19	28.5	962.19	29.3	962.29	29.5	962.31	29.7	962.34
30.2	962.42	30.5	962.46	30.9	962.51	31.5	962.58	31.9	962.64
32.5	962.72	33.3	962.82	33.5	962.85	33.7	962.87	34.5	962.97
34.7	962.99	35.4	963.08	35.5	963.09	35.7	963.11	36.3	963.2
36.5	963.23	37.6	963.36	38	963.42	38.1	963.43	38.6	963.48
38.9	963.52	39.3	963.57	39.6	963.6	39.8	963.63	40.5	963.71
40.7	963.73	41	963.78	41.5	963.86	41.6	963.87	41.7	963.88
46.7	964.48	47.3	964.57	47.6	964.62	50.3	964.93	50.7	964.98
51.1	965.04	51.4	965.07	51.7	965.11	52.9	965.27	53.7	965.34
53.8	965.34	54.6	965.42	54.8	965.43	55	965.45	61.4	966.13
61.8	966.17	62.1	966.2	62.8	966.26	63.1	966.29	63.6	966.33
63.8	966.36	64	966.38	64.6	966.45	64.8	966.47	65.7	966.55
65.8	966.57	65.9	966.58	66.7	966.65	66.8	966.66	66.9	966.67
67.8	966.78	69.8	966.97	69.9	966.98	70.7	967.07	70.8	967.08
71	967.1	71.6	967.16	71.8	967.18	72	967.2	72.6	967.25
72.8	967.27	73.1	967.29	73.5	967.32	73.8	967.34	74.2	967.38
74.5	967.4	74.8	967.44	75.8	967.53	76.3	967.56	76.4	967.57

77.3	967.64	78.5	967.75	81.35	967.64
Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-129.5	.1	-57.5	.04	13.6	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-57.5	13.6		87.4 104.3	100.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 10

INPUT

Description:

Station Elevation Data		num= 182							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-113	966.49	-109.7	964.22	-109.1	963.6	-107.6	963.37	-105.5	963.02
-104.4	962.87	-103.3	962.68	-102.2	962.53	-101.2	962.35	-100.1	962.23
-99	962.08	-96.9	961.85	-95.8	961.7	-93.6	961.46	-92.6	961.31
-89.3	960.95	-88.2	960.87	-87.2	960.83	-86.1	960.75	-85	960.71
-83.9	960.63	-82.9	960.59	-81.8	960.51	-80.7	960.47	-79.6	960.4
-78.6	960.34	-77.5	960.22	-75.2	960.02	-66.1	959.12	-59.2	958.25
-59.1	958.24	-59	958.23	-58.1	958.08	-52.7	957.4	-50.7	957.11
-47.3	956.68	-45.3	956.39	-43	956.09	-41.9	955.93	-41.4	955.86
-40.9	955.79	-40.2	955.49	-39.9	955.38	-39.8	955.33	-37.6	954.29
-36.8	953.91	-36.6	953.78	-33.3	952.26	-32.4	951.78	-32.2	951.73
-29.9	950.8	-29	950.49	-27.7	950.38	-26.7	950.33	-23.5	950.11
-21.6	949.94	-19.6	949.81	-17.7	949.65	-17.3	949.62	-16.7	949.58
-15.8	949.51	-13.8	949.34	-10	949.09	-9.5	949.06	-9.1	949.03
-8.1	948.97	-8	948.97	-7.9	948.96	-3.3	948.64	-.9	948.54
0	948.53	.2	948.54	.7	948.56	1.4	948.56	1.5	948.56
4.4	948.69	6.1	948.73	12	948.98	13.1	949.06	16.6	949.22
18.8	949.36	22.5	949.59	26	949.84	26.2	949.87	26.5	949.97
26.9	950.12	27.2	950.25	27.6	950.49	28.3	950.83	28.4	950.87
28.4	950.88	28.4	950.89	29.1	951.24	29.5	951.38	30.3	951.49
30.6	951.52	30.7	951.54	31.3	951.61	31.9	951.68	32	951.7
32.2	951.72	32.5	951.74	32.8	951.77	33	951.79	33.1	951.81
33.8	951.89	34	951.91	35	952.04	35.2	952.08	35.7	952.14
36.3	952.23	36.6	952.27	37	952.31	37.4	952.37	40	952.72
40.4	952.77	40.6	952.79	41	952.84	41.3	952.88	41.6	952.93
42.3	953.03	44	953.35	44.8	953.54	45	953.57	45.1	953.6
46	953.77	46.1	953.79	46.9	953.96	47	953.96	47	953.97
47.5	954.07	48	954.16	49	954.38	49.1	954.39	49.9	954.46
50	954.47	53.3	954.69	55	954.81	60	955.12	60.3	955.14
60.8	955.17	61	955.18	61.2	955.19	61.8	955.21	62	955.22
62.2	955.23	63	955.28	63.1	955.28	64	955.31	64.6	955.35
65	955.38	65.9	955.4	66	955.41	68	955.5	68.2	955.51
68.8	955.55	69	955.56	69.3	955.6	69.7	955.65	70	955.69
70.4	955.74	70.7	955.79	71	955.84	71.4	955.92	71.6	955.95
72	956.03	77.8	957.02	78	957.06	78.2	957.1	78.9	957.22
79	957.25	79.2	957.27	79.9	957.39	80	957.41	80.1	957.42
81	957.59	81.1	957.6	81.7	957.7	82	957.75	83	957.93
122.8	958.25	124.65	958.45						

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-113	.1	-40.9	.04	49	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-40.9	49		55.8 50.4	38.7		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach

RS: 9

INPUT

Description:

Station Elevation Data		num=		270					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-128.3	970.66	-126.8	970.09	-126.6	969.8	-126.5	969.78	-125.9	969.6
-123.8	969.13	-122.7	968.86	-121.7	968.63	-117.6	967.84	-116.5	967.67
-114.3	967.24	-113.4	967.08	-109.2	966.3	-108.2	966.12	-106.1	965.71
-103	965.16	-100.9	964.77	-98.8	964.59	-97.3	964.49	-96	964.36
-91.7	963.85	-90.6	963.74	-87.5	963.38	-86.4	963.3	-82.3	962.89
-81.2	962.82	-77.3	962.44	-77.1	962.42	-77	962.4	-76	962.34
-72.9	962.03	-71.9	961.96	-67.7	961.55	-66.4	961.43	-65.7	961.38
-54.3	960.25	-53.2	960.11	-52.9	960.07	-52.6	960.03	-51.8	959.94
-51.5	959.9	-51	959.83	-50.3	959.74	-50.1	959.72	-49.1	959.6
-48	959.46	-47.2	959.37	-47	959.35	-46.9	959.34	-46.5	959.29
-46.1	959.23	-46	959.21	-45.7	959.19	-44.9	959.1	-42.8	958.81
-42	958.68	-41.8	958.64	-40.8	958.5	-39.7	958.36	-38.8	958.19
-36.6	957.9	-35.6	957.72	-33.5	957.44	-32.5	957.27	-32.3	957.24
-31.5	957.14	-31.5	957.13	-31.4	957.12	-30.6	957.02	-30.4	956.98
-29.9	956.91	-29.8	956.89	-29.4	956.81	-25.4	956.26	-24.2	956.07
-19.7	955.43	-19.6	955.4	-18.6	955.05	-17.9	954.53	-16.4	953.52
-13.2	951.27	-12.1	950.49	-9.9	949.08	-9.8	949.05	-9.7	949.01
-9.1	948.73	-8.8	948.62	-8.3	948.54	-7.7	948.45	-4.8	948.1
-.7	947.64	0	947.6	3.3	948.1	3.8	948.18	4.4	948.25
7.6	948.44	7.7	948.44	8.4	948.46	8.7	948.47	10	948.54
10.9	948.56	11.4	948.58	11.7	948.58	12	948.59	12.1	948.6
12.4	948.62	12.9	948.65	13.1	948.66	13.7	948.67	14.2	948.69
14.4	948.7	14.9	948.73	15.3	948.75	18.6	948.84	19	948.84
19.6	948.84	19.7	948.84	19.8	948.85	20.5	948.86	20.8	948.86
29.6	948.75	29.7	948.77	30.3	948.91	30.6	949	31.1	949.16
31.4	949.27	31.7	949.38	32.1	949.55	32.6	949.75	32.8	949.85
33.4	950.12	33.9	950.38	34.1	950.43	34.6	950.5	34.9	950.53
35	950.54	35.3	950.58	35.6	950.61	36.1	950.66	36.4	950.7
37	950.77	37.1	950.78	37.2	950.78	37.3	950.8	37.9	950.86
38.3	950.91	38.7	950.93	39.4	950.97	39.5	950.98	40.2	951.03
40.5	951.06	41.6	951.15	41.7	951.15	41.9	951.16	42.5	951.18
42.6	951.19	43.5	951.24	43.6	951.25	44.5	951.25	44.6	951.25
46.5	951.13	46.6	951.13	46.6	951.12	47.5	951.04	47.6	951.03
48.5	950.97	48.6	950.97	48.7	950.97	49.5	950.91	49.6	950.91
50.6	950.91	50.7	950.91	51.6	950.97	51.7	950.98	52.5	951.03
52.6	951.03	53.6	951.07	54.5	951.12	54.6	951.13	55.5	951.16
55.6	951.16	55.7	951.16	56.5	951.22	57.5	951.28	57.6	951.28
57.7	951.29	58.5	951.31	58.6	951.32	58.7	951.35	59.5	951.57
59.6	951.6	59.7	951.63	60.5	951.88	60.6	951.91	63.7	952.95
64.5	953.18	64.6	953.22	64.7	953.26	65.5	953.52	65.6	953.56
65.7	953.6	66.5	953.83	66.6	953.88	66.7	953.9	67.5	954.04
67.6	954.06	67.7	954.07	68.4	954.09	68.6	954.1	68.7	954.1
69.4	954.15	69.6	954.16	70.4	954.19	70.6	954.19	70.7	954.2
71.4	954.22	71.6	954.22	71.7	954.23	72.4	954.28	72.6	954.29
72.7	954.29	73.4	954.31	73.6	954.32	73.8	954.32	74.4	954.34
74.6	954.35	75.6	954.41	75.8	954.42	77.6	954.48	77.8	954.49
78.4	954.53	78.6	954.54	78.8	954.54	79.4	954.56	79.6	954.57
79.8	954.58	80.4	954.6	80.6	954.61	80.8	954.61	81.4	954.65
81.6	954.66	81.8	954.67	82.4	954.69	82.6	954.69	82.8	954.7
83.4	954.72	83.6	954.73	83.8	954.74	84.4	954.78	84.8	954.79
85.4	954.81	85.6	954.82	85.8	954.83	86.4	954.85	86.6	954.86
86.7	954.86	87	954.88	87.2	954.89	88.7	954.15	89.1	953.97
89.5	953.84	95.2	952.66	105.2	953.43	115	954.38	125	955.15
135	956.02	144.9	956.97	154.8	957.83	184.7	961.71	192.3	962.63

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
-128.3	.1	-18.6	.04
		67.5	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-18.6	67.5		25	25		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 8.5

INPUT

Description:

Station	Elevation	Data	num=	288
Sta	Elev	Sta	Elev	Sta Elev Sta Elev
0	972.86	1	971.95	2.7 971.57 3.7 971.3 5.8 970.83
6.8	970.56	11	969.59	12 969.32 14.1 968.85 15.1 968.58
17.2	968.11	18.2	967.85	19.3 967.6 20.3 967.34 23.4 966.63
24.5	966.46	26.6	966.05	27.6 965.87 28.6 965.67 29.6 965.54
30.7	965.44	32.7	965.32	33.9 965.22 34.9 965.16 36 965.06
36.2	965.05	37	965	38.3 964.9 40.2 964.78 41.3 964.69
42.2	964.63	43.4	964.53	45.1 964.43 46.2 964.34 46.5 964.31
47	964.29	47.2	964.27	47.6 964.25 51.7 963.76 51.8 963.75
52	963.73	52.9	963.66	57.1 963.16 58.1 963 61 962.63
62.3	962.42	64.4	962.16	65.2 962.04 67.5 961.72 76 960.54
78.2	960.27	78.6	960.22	78.8 960.18 79.2 960.14 79.9 960.06
80.3	960.02	83.3	959.63	83.4 959.62 83.6 959.6 84.1 959.55
85.5	959.36	85.7	959.34	86.5 959.25 86.6 959.24 86.8 959.22
87.3	959.15	88.1	959.05	88.3 959.02 88.7 958.98 88.9 958.95
89.4	958.86	89.7	958.82	89.8 958.81 90.8 958.66 106.6 956.47
107.7	956.3	110.8	955.85	111 955.81 111.8 955.51 111.9 955.48
114.7	954.3	115	954.17	115.2 954.1 115.8 953.85 116.1 953.7
117.9	952.95	120.3	951.92	121.3 951.42 125.6 948.72 126 948.44
126.3	948.31	126.6	948.09	129.4 947.56 129.8 947.49 130 947.45
130.6	947.36	130.8	947.32	130.9 947.3 131 947.27 131.6 947.16
131.9	947.08	132.4	946.99	132.6 946.94 133 946.87 133.2 946.85
133.7	946.82	133.9	946.81	136.3 947.15 137.1 947.27 138.2 947.42
138.7	947.52	138.9	947.58	139.3 947.67 139.5 947.71 140 947.82
140.5	947.91	142.6	948.25	143.2 948.27 143.4 948.28 143.5 948.28
143.7	948.28	144.2	948.28	146.6 948.28 146.7 948.28 146.8 948.28
149	948.26	149.5	948.25	149.8 948.25 150.9 948.24 151.3 948.24
151.6	948.24	151.9	948.25	155.1 948.25 155.3 948.26 155.9 948.27
156.1	948.28	156.2	948.28	156.3 948.28 157.2 948.28 157.7 948.29
158.3	948.31	158.5	948.32	159 948.31 159.2 948.31 159.3 948.31
159.5	948.34	160	948.38	160.4 948.46 161.4 948.96 161.6 949.05
162.5	949.41	162.6	949.45	163.2 949.6 163.5 949.68 164 949.79
164.2	949.85	164.6	949.95	164.8 949.99 164.9 950.02 165.5 950.12
165.6	950.15	165.8	950.17	166.4 950.21 166.6 950.22 166.8 950.24
167.4	950.3	167.6	950.31	167.8 950.33 168.4 950.36 168.6 950.38
169.3	950.47	169.6	950.5	169.9 950.53 170.3 950.56 170.6 950.59
171	950.63	171.3	950.66	171.6 950.7 172 950.74 172.2 950.77
172.6	950.81	173.6	950.91	174.1 950.96 174.2 950.97 174.6 951.03
175.1	951.05	175.6	951.06	182.4 950.68 182.6 950.66 182.9 950.64
183.4	950.59	183.6	950.57	183.8 950.56 184.4 950.5 184.6 950.48
184.8	950.47	185.5	950.43	185.6 950.42 185.8 950.42 186.5 950.35
186.6	950.34	187.5	950.4	192.6 950.57 192.7 950.57 193.5 950.62
193.6	950.62	193.8	950.63	194.5 950.65 194.6 950.66 194.8 950.66
195.4	950.68	195.6	950.69	195.8 950.7 196.6 950.73 196.9 950.74
197.4	950.77	197.6	950.79	197.9 950.8 198.3 950.81 198.6 950.82
199	950.84	199.3	950.86	199.6 950.89 200 950.9 200.3 950.91
200.6	950.92	201	951.03	201.6 951.2 202.1 951.34 202.2 951.38

202.6	951.53	203.1	951.68	210.6	953.96	210.9	953.98	211.4	954.01
211.6	954.02	211.9	954.03	212.4	954.03	212.6	954.03	212.8	954.04
213.5	954.06	213.6	954.06	213.8	954.06	214.5	954.09	214.6	954.09
214.8	954.09	215.5	954.09	215.6	954.09	216.6	954.12	216.7	954.12
217.6	954.12	217.7	954.13	218.1	954.14	218.6	954.16	218.7	954.16
219.6	954.19	219.7	954.19	220.6	954.19	220.7	954.19	221.5	954.22
221.8	954.22	222.6	954.25	222.8	954.25	223.5	954.25	223.6	954.25
223.8	954.26	224.4	954.27	224.6	954.28	224.9	954.3	225.4	954.34
225.6	954.36	225.9	954.38	227.5	954.55	227.5	954.57	227.6	954.58
227.6	954.6	232.7	953.96	236.2	953.22	242.6	953.69	259.2	954.57
266.1	955.09	273.5	955.74	288.1	956.91	295.9	957.6	304.2	958.66
317.3	960.33	325.8	961.44	333.2	962.34				

Manning's n	Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	110.8	.045	210.6	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	110.8	210.6		25.3	25.3		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 8

INPUT

Description:

Station Elevation Data			num=	343					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-151.51	976.92	-149.41	974.91	-148.46	974.39	-144.56	972.95	-143.61	972.6
-142.66	972.31	-140.66	971.76	-139.71	971.51	-136.76	970.72	-135.81	970.47
-133.91	969.92	-132.87	969.68	-131.91	969.4	-130.96	969.16	-130.01	968.88
-129.73	968.84	-128.97	968.63	-128.01	968.36	-127.83	968.32	-127.35	968.25
-127.06	968.18	-124.97	967.79	-124.12	967.62	-123.17	967.46	-122.21	967.27
-121.26	967.1	-120.22	966.9	-119.17	966.71	-117.36	966.36	-116.32	966.19
-115.37	966	-114.42	965.84	-113.46	965.64	-112.99	965.57	-112.42	965.48
-110.61	965.1	-109.57	964.93	-108.61	964.73	-107.57	964.57	-106.71	964.39
-106.62	964.38	-105.76	964.24	-105.67	964.21	-105.48	964.17	-105	964.08
-104.72	964.02	-102.91	963.78	-101.77	963.66	-97.87	963.19	-97.49	963.15
-97.01	963.1	-96.92	963.09	-96.73	963.07	-96.16	963	-95.87	962.96
-94.92	962.81	-90.07	962.19	-88.55	961.96	-81.32	961.03	-80.56	960.95
-78.66	960.78	-78.37	960.76	-78.08	960.72	-77.8	960.69	-77.42	960.64
-75.52	960.47	-74.66	960.36	-74.47	960.35	-71.62	960.09	-70.57	959.97
-65.82	959.54	-64.77	959.42	-60.87	959.07	-59.92	958.95	-54.02	958.42
-53.07	958.37	-52.22	958.3	-52.12	958.29	-51.93	958.28	-51.45	958.26
-51.17	958.24	-49.84	958.14	-49.46	958.12	-49.17	958.11	-49.08	958.1
-47.46	957.97	-45.08	957.83	-43.47	957.71	-43.37	957.7	-43.18	957.69
-42.61	957.66	-42.42	957.65	-41.37	957.57	-40.42	957.52	-39.47	957.44
-36.24	957.26	-35.76	957.22	-35.57	957.21	-35.48	957.21	-35.38	957.2
-34.91	957.17	-33.86	957.09	-33.67	957.08	-33.38	957.07	-31.1	956.93
-30.53	956.89	-29.77	956.83	-25.87	956.17	-25.21	955.81	-24.92	955.66
-24.07	955.22	-23.97	955.18	-23.88	955.14	-20.17	953.14	-19.79	952.97
-19.41	952.79	-19.12	952.66	-18.26	952.19	-18.17	952.15	-18.17	952.12
-17.31	951.68	-17.22	951.64	-17.12	951.57	-15.31	950.62	-14.74	950.36
-14.36	950.14	-10.47	948.1	-10.18	947.93	-9.89	947.82	-9.51	947.64
-9.04	947.55	-8.94	947.53	-8.56	947.45	-6.66	947.15	-6.57	947.15
-6.47	947.13	-5.8	947	-5.61	946.98	-5.52	946.95	-4.95	946.87
-4.66	946.82	-4.28	946.75	-4.09	946.72	-3.71	946.64	-3.33	946.57
-3.14	946.55	-2.76	946.48	-2.48	946.43	-2	946.34	-1.81	946.31
-1.62	946.31	-.86	946.31	-.76	946.32	0	946.39	.09	946.41
.28	946.43	.85	946.5	1.14	946.53	1.52	946.58	2.09	946.66
2.47	946.72	2.66	946.75	3.04	946.81	3.33	946.85	3.8	946.91
3.99	946.94	4.09	946.97	4.85	947.17	4.94	947.18	4.94	947.19

5.8	947.4	5.89	947.44	6.08	947.51	6.56	947.7	7.32	947.91
7.41	947.94	7.89	948.06	8.27	948.12	8.46	948.15	8.84	948.2
16.26	948.67	16.55	948.69	17.31	948.73	17.5	948.74	18.16	948.78
18.92	948.82	19.4	948.84	19.78	948.85	20.35	948.85	20.63	948.85
21.2	948.83	21.4	948.83	21.87	948.79	22.25	948.77	22.35	948.77
22.44	948.77	23.11	948.74	23.3	948.74	23.58	948.73	23.87	948.72
24.25	948.7	25.2	948.82	25.58	948.9	25.87	948.98	26.15	949.05
26.34	949.1	27.01	949.27	27.1	949.29	27.2	949.3	27.58	949.4
28.05	949.51	28.15	949.52	28.24	949.54	28.81	949.62	29.1	949.66
29.38	949.68	29.48	949.68	30.53	949.76	31	949.8	31.38	949.83
31.57	949.85	31.95	949.88	32.71	949.95	32.9	949.96	33.09	949.98
33.85	950.03	33.95	950.03	34.14	950.06	34.71	950.12	34.81	950.12
35.57	950.18	35.76	950.19	36.04	950.23	36.42	950.28	36.71	950.31
37.18	950.35	37.28	950.36	38.13	950.43	38.32	950.46	38.71	950.49
43.84	950.24	44.03	950.24	44.41	950.22	44.89	950.22	44.98	950.21
46.31	950.17	46.6	950.17	47.36	950.19	48.03	950.21	48.22	950.22
48.31	950.22	53.07	950.36	53.45	950.38	53.54	950.39	54.02	950.41
54.49	950.43	54.97	950.45	66.28	950.81	66.38	950.82	66.48	950.82
67.24	950.88	67.33	950.88	68.28	950.94	68.57	950.96	69.23	951
70.18	951.27	70.28	951.29	71.04	951.61	71.23	951.68	72.09	952.02
72.18	952.06	72.85	952.31	73.04	952.36	73.23	952.41	73.8	952.61
73.99	952.67	74.18	952.73	74.75	952.91	74.94	952.98	75.61	953.22
75.89	953.3	76.18	953.38	76.56	953.5	76.84	953.58	77.13	953.68
77.51	953.79	77.79	953.9	78.74	954	79.12	954.01	79.31	954.01
79.69	954.01	80.08	954.03	80.27	954.05	81.12	954.09	81.6	954.13
82.07	954.19	82.26	954.21	82.55	954.26	83.12	954.33	83.5	954.37
84.45	954.48	84.64	954.5	85.4	954.62	85.5	954.63	86.35	954.74
87.11	954.84	87.4	954.88	87.68	954.92	88.82	955.05	91.11	955.35
91.2	955.36	91.77	955.45	92.15	955.49	92.25	955.5	92.92	955.57
93.1	955.59	93.39	955.61	93.77	955.65	94.06	955.69	94.53	955.74
94.63	955.76	95.1	955.81	95.48	955.86	95.67	955.88	96.05	955.93
96.34	955.97	96.81	956.03	97	956.06	97.1	956.08	97.96	956.19
98.43	956.06	99	956.16	100.9	956.04	114.6	956.21	118.69	956.17
120.5	956.15	122.49	956.27	125.25	956.22	127.34	956.44	131.72	956.67
133.43	956.86	134.67	956.93	145.1	958.05				

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-151.51	.1	-25.87	.045	77.79	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-25.87	77.79		47	47		.3	.5
Ineffective Flow	num=		2					
Sta L	Sta R	Elev	Permanent					
-151.51	-43.12	960.7	F					
43.12	145.1	955.39	F					
Skew Angle = 18								

BRIDGE

RIVER: Wallis Run
REACH: Study Reach RS: 7.5

INPUT

Description:

Distance from Upstream XS = 16.87

Deck/Roadway Width = 17.67

Weir Coefficient = 2.6

Bridge Deck/Roadway Skew = 18

Upstream Deck/Roadway Coordinates

num= 13

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-166.435		974		-142.658		973		-118.882		968.8				

-95.106	965		-71.25	961.77		-26.25	960
-26.25	960	956.75	26.25	958.2	954.95	26.25	958.2
76.25	956.58		116.25	956.76		141.25	958.1
166.25	960.41						

Upstream Bridge Cross Section Data

Station Elevation Data		num= 343							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-151.51	976.92	-149.41	974.91	-148.46	974.39	-144.56	972.95	-143.61	972.6
-142.66	972.31	-140.66	971.76	-139.71	971.51	-136.76	970.72	-135.81	970.47
-133.91	969.92	-132.87	969.68	-131.91	969.4	-130.96	969.16	-130.01	968.88
-129.73	968.84	-128.97	968.63	-128.01	968.36	-127.83	968.32	-127.35	968.25
-127.06	968.18	-124.97	967.79	-124.12	967.62	-123.17	967.46	-122.21	967.27
-121.26	967.1	-120.22	966.9	-119.17	966.71	-117.36	966.36	-116.32	966.19
-115.37	966	-114.42	965.84	-113.46	965.64	-112.99	965.57	-112.42	965.48
-110.61	965.1	-109.57	964.93	-108.61	964.73	-107.57	964.57	-106.71	964.39
-106.62	964.38	-105.76	964.24	-105.67	964.21	-105.48	964.17	-105	964.08
-104.72	964.02	-102.91	963.78	-101.77	963.66	-97.87	963.19	-97.49	963.15
-97.01	963.1	-96.92	963.09	-96.73	963.07	-96.16	963	-95.87	962.96
-94.92	962.81	-90.07	962.19	-88.55	961.96	-81.32	961.03	-80.56	960.95
-78.66	960.78	-78.37	960.76	-78.08	960.72	-77.8	960.69	-77.42	960.64
-75.52	960.47	-74.66	960.36	-74.47	960.35	-71.62	960.09	-70.57	959.97
-65.82	959.54	-64.77	959.42	-60.87	959.07	-59.92	958.95	-54.02	958.42
-53.07	958.37	-52.22	958.3	-52.12	958.29	-51.93	958.28	-51.45	958.26
-51.17	958.24	-49.84	958.14	-49.46	958.12	-49.17	958.11	-49.08	958.1
-47.46	957.97	-45.08	957.83	-43.47	957.71	-43.37	957.7	-43.18	957.69
-42.61	957.66	-42.42	957.65	-41.37	957.57	-40.42	957.52	-39.47	957.44
-36.24	957.26	-35.76	957.22	-35.57	957.21	-35.48	957.21	-35.38	957.2
-34.91	957.17	-33.86	957.09	-33.67	957.08	-33.38	957.07	-31.1	956.93
-30.53	956.89	-29.77	956.83	-25.87	956.17	-25.21	955.81	-24.92	955.66
-24.07	955.22	-23.97	955.18	-23.88	955.14	-20.17	953.14	-19.79	952.97
-19.41	952.79	-19.12	952.66	-18.26	952.19	-18.17	952.15	-18.17	952.12
-17.31	951.68	-17.22	951.64	-17.12	951.57	-15.31	950.62	-14.74	950.36
-14.36	950.14	-10.47	948.1	-10.18	947.93	-9.89	947.82	-9.51	947.64
-9.04	947.55	-8.94	947.53	-8.56	947.45	-6.66	947.15	-6.57	947.15
-6.47	947.13	-5.8	947	-5.61	946.98	-5.52	946.95	-4.95	946.87
-4.66	946.82	-4.28	946.75	-4.09	946.72	-3.71	946.64	-3.33	946.57
-3.14	946.55	-2.76	946.48	-2.48	946.43	-2	946.34	-1.81	946.31
-1.62	946.31	-.86	946.31	-.76	946.32	0	946.39	.09	946.41
.28	946.43	.85	946.5	1.14	946.53	1.52	946.58	2.09	946.66
2.47	946.72	2.66	946.75	3.04	946.81	3.33	946.85	3.8	946.91
3.99	946.94	4.09	946.97	4.85	947.17	4.94	947.18	4.94	947.19
5.8	947.4	5.89	947.44	6.08	947.51	6.56	947.7	7.32	947.91
7.41	947.94	7.89	948.06	8.27	948.12	8.46	948.15	8.84	948.2
16.26	948.67	16.55	948.69	17.31	948.73	17.5	948.74	18.16	948.78
18.92	948.82	19.4	948.84	19.78	948.85	20.35	948.85	20.63	948.85
21.2	948.83	21.4	948.83	21.87	948.79	22.25	948.77	22.35	948.77
22.44	948.77	23.11	948.74	23.3	948.74	23.58	948.73	23.87	948.72
24.25	948.7	25.2	948.82	25.58	948.9	25.87	948.98	26.15	949.05
26.34	949.1	27.01	949.27	27.1	949.29	27.2	949.3	27.58	949.4
28.05	949.51	28.15	949.52	28.24	949.54	28.81	949.62	29.1	949.66
29.38	949.68	29.48	949.68	30.53	949.76	31	949.8	31.38	949.83
31.57	949.85	31.95	949.88	32.71	949.95	32.9	949.96	33.09	949.98
33.85	950.03	33.95	950.03	34.14	950.06	34.71	950.12	34.81	950.12
35.57	950.18	35.76	950.19	36.04	950.23	36.42	950.28	36.71	950.31
37.18	950.35	37.28	950.36	38.13	950.43	38.32	950.46	38.71	950.49
43.84	950.24	44.03	950.24	44.41	950.22	44.89	950.22	44.98	950.21
46.31	950.17	46.6	950.17	47.36	950.19	48.03	950.21	48.22	950.22
48.31	950.22	53.07	950.36	53.45	950.38	53.54	950.39	54.02	950.41
54.49	950.43	54.97	950.45	66.28	950.81	66.38	950.82	66.48	950.82
67.24	950.88	67.33	950.88	68.28	950.94	68.57	950.96	69.23	951
70.18	951.27	70.28	951.29	71.04	951.61	71.23	951.68	72.09	952.02
72.18	952.06	72.85	952.31	73.04	952.36	73.23	952.41	73.8	952.61
73.99	952.67	74.18	952.73	74.75	952.91	74.94	952.98	75.61	953.22

75.89	953.3	76.18	953.38	76.56	953.5	76.84	953.58	77.13	953.68
77.51	953.79	77.79	953.9	78.74	954	79.12	954.01	79.31	954.01
79.69	954.01	80.08	954.03	80.27	954.05	81.12	954.09	81.6	954.13
82.07	954.19	82.26	954.21	82.55	954.26	83.12	954.33	83.5	954.37
84.45	954.48	84.64	954.5	85.4	954.62	85.5	954.63	86.35	954.74
87.11	954.84	87.4	954.88	87.68	954.92	88.82	955.05	91.11	955.35
91.2	955.36	91.77	955.45	92.15	955.49	92.25	955.5	92.92	955.57
93.1	955.59	93.39	955.61	93.77	955.65	94.06	955.69	94.53	955.74
94.63	955.76	95.1	955.81	95.48	955.86	95.67	955.88	96.05	955.93
96.34	955.97	96.81	956.03	97	956.06	97.1	956.08	97.96	956.19
98.43	956.06	99	956.16	100.9	956.04	114.6	956.21	118.69	956.17
120.5	956.15	122.49	956.27	125.25	956.22	127.34	956.44	131.72	956.67
133.43	956.86	134.67	956.93	145.1	958.05				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-151.51	.1	-25.87	.045	77.79	.07

Bank Sta: Left Right Coeff Contr. Expan.

-25.87	77.79		.3	.5
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-151.51	-43.12	960.7	F
43.12	145.1	955.39	F

Skew Angle = 18

Downstream Deck/Roadway Coordinates

num= 13

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-166.435	974		-142.658	973		-118.882	968.8	
-95.106	965		-71.25	961.77		-26.25	960	
-26.25	960	956.75	26.25	958.2	954.95	26.25	958.2	
76.25	956.58		116.25	956.76		141.25	958.1	
166.25	960.41							

Downstream Bridge Cross Section Data

Station Elevation Data num= 356

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-131.531	971.58	-128.107	969.83	-125.254	969.6	-124.208	969.5	-116.98	968.29
-113.366	967.65	-108.801	966.88	-105.662	966.28	-104.616	966.12	-101.668	965.82
-98.815	965.55	-97.864	965.44	-94.915	965.17	-92.633	964.92	-91.016	964.7
-90.16	964.56	-88.543	964.33	-86.166	963.95	-85.12	963.8	-84.549	963.7
-82.932	963.47	-78.843	962.84	-77.511	962.65	-76.655	962.51	-75.514	962.35
-73.136	961.98	-71.615	961.77	-63.911	961.22	-62.96	961.17	-60.963	961.04
-60.868	961.04	-60.202	961.01	-60.012	961	-59.726	960.98	-59.061	960.93
-58.11	960.9	-57.063	960.83	-56.493	960.8	-56.207	960.79	-54.591	960.68
-52.118	960.57	-50.501	960.46	-48.123	960.34	-46.507	960.23	-45.461	960.19
-44.509	960.12	-43.558	960.07	-43.273	960.03	-42.798	959.97	-42.607	959.94
-37.757	959.04	-37.567	959	-36.711	958.63	-35.76	958.11	-35.474	957.95
-35.189	957.77	-34.809	957.58	-34.333	957.32	-34.238	957.28	-33.858	957.04
-33.572	956.88	-32.716	956.42	-32.051	956.03	-31.86	955.93	-31.1	955.58
-29.007	954.81	-27.2	954.18	-26.249	953.87	-22.16	952.56	-21.399	952.3
-17.404	951	-16.358	950.66	-16.168	950.59	-15.692	950.45	-15.407	950.35
-15.027	950.16	-14.932	950.14	-14.456	949.92	-14.076	949.7	-13.79	949.52
-13.505	949.33	-13.315	949.15	-12.459	948.43	-11.603	947.71	-11.413	947.66
-10.842	947.48	-10.557	947.38	-9.986	947.31	-9.225	947.2	-6.753	946.85
-1.997	946.1	-1.807	946.08	-1.522	946.02	-1.046	945.93	-.951	945.91
0	945.86	.38	945.9	1.046	945.99	1.427	946.04	1.617	946.05
2.283	946.14	2.758	946.2	2.948	946.22	3.804	946.33	3.899	946.35
4.755	946.41	5.516	946.51	5.801	946.54	6.277	946.58	6.372	946.58
6.848	946.62	7.133	946.66	7.799	946.73	7.989	946.74	8.655	946.81
8.75	946.81	9.606	946.84	9.891	946.84	10.462	946.82	10.652	946.81
11.032	946.84	11.603	946.88	12.649	946.98	12.839	947.01	13.41	947.07
14.551	947.25	15.312	947.66	15.502	947.75	15.788	947.86	16.168	948.02

16.453	948.17	17.404	948.55	17.785	948.6	18.165	948.68	18.45	948.73
18.641	948.74	19.306	948.81	19.402	948.81	20.353	948.91	20.543	948.92
21.304	949.02	21.684	949.06	22.255	949.11	22.73	949.15	22.92	949.18
23.206	949.22	23.491	949.23	25.203	949.32	26.154	949.44	26.439	949.51
26.82	949.59	27.105	949.69	31.004	950.97	31.195	951.02	31.67	951.16
31.955	951.24	32.336	951.24	32.526	951.23	32.907	951.24	33.287	951.23
34.714	951.18	34.809	951.18	34.904	951.17	35.76	951.15	35.855	951.15
36.616	951.55	36.806	951.66	37.091	951.97	37.377	952.32	37.757	952.69
38.232	952.82	38.708	952.98	38.993	953	39.469	953.03	39.659	953.05
39.849	953.06	40.61	953.11	40.705	953.11	40.8	953.12	41.466	953.17
41.846	953.19	42.988	953.28	43.083	953.29	43.558	953.33	43.939	953.36
44.224	953.38	44.509	953.41	44.795	953.42	45.365	953.47	45.461	953.47
45.556	953.48	46.031	953.51	46.412	953.54	47.172	953.63	47.458	953.66
48.884	953.94	49.36	954.03	49.645	954.09	50.121	954.18	50.311	954.22
50.501	954.25	51.262	954.4	51.357	954.4	52.118	954.41	52.498	954.41
53.259	954.4	54.876	954.4	55.161	954.41	55.351	954.41	56.017	954.44
56.112	954.44	56.207	954.45	56.588	954.45	57.063	954.46	57.824	954.46
58.014	954.47	58.395	954.47	58.68	954.48	59.061	954.49	60.012	954.48
60.297	954.44	60.773	954.4	60.963	954.37	61.058	954.36	61.914	954.28
62.77	954.21	62.865	954.19	63.15	954.17	64.291	954.05	64.387	954.05
64.862	954	65.433	953.93	65.813	953.9	66.003	953.88	66.669	953.84
66.764	953.83	66.859	953.83	67.145	953.82	67.62	953.81	67.81	953.79
68.476	953.75	69.047	953.71	69.237	953.7	69.617	953.67	70.093	953.65
70.188	953.65	70.664	953.63	70.949	953.61	71.424	953.58	71.615	953.56
71.71	953.54	72.661	953.39	73.326	953.29	73.517	953.26	73.612	953.24
74.278	953.14	74.563	953.09	75.229	953.01	75.419	952.99	75.514	952.96
76.18	952.85	76.37	952.83	76.465	952.81	77.131	952.63	77.321	952.6
77.416	952.59	78.177	952.43	78.272	952.42	78.367	952.44	79.128	952.41
79.318	952.46	80.079	952.71	80.174	952.74	80.269	952.78	81.03	953.05
82.076	953.39	82.171	953.4	82.932	953.58	83.122	953.6	83.883	953.65
83.978	953.65	85.785	953.71	85.88	953.72	86.831	953.72	87.687	953.75
87.783	953.75	88.638	953.78	88.734	953.78	89.59	953.81	89.685	953.81
90.636	953.84	91.587	953.84	92.538	953.87	92.728	953.88	93.394	953.9
93.679	953.9	94.155	953.89	94.82	953.89	95.011	953.9	95.391	953.91
95.867	953.9	96.627	953.9	97.103	953.91	97.293	953.92	98.244	953.91
98.339	953.91	99.1	953.93	99.481	953.93	99.956	953.94	101.192	953.94
101.573	953.95	101.763	953.95	102.143	953.96	102.429	953.96	102.904	953.95
103.095	953.95	104.046	953.97	105.092	953.96	105.282	953.96	105.757	953.97
106.043	953.98	107.945	954.03	108.23	954.04	108.706	954.07	108.896	954.08
108.991	954.08	109.752	954.09	109.847	954.09	110.703	954.11	110.798	954.11
111.083	954.12	111.559	954.14	111.844	954.15	112.225	954.16	112.32	954.16
112.795	954.17	113.746	954.22	114.032	954.22	114.507	954.23	114.697	954.23
114.793	954.24	115.458	954.24	115.648	954.25	116.504	954.29	116.6	954.29
117.17	954.31	123.828	954.51	137.047	954.94	137.428	954.96	138.093	955
138.379	955.03	140.091	955.07	141.517	955.17	143.134	955.21	143.61	955.25
149.316	955.76								

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
-131.531	.1	-26.249	.045
		38.708	.07

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	-26.249	38.708		.3	.5

Ineffective Flow		num= 2	
Sta L	Sta R	Elev	Permanent
-131.531	-44.13	960.3	F
44.13	149.316	955	F

Skew Angle = 18

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	

Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 7

INPUT

Description:

Station Elevation Data				num=	356						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-131.531	971.58	-128.107	969.83	-125.254	969.6	-124.208	969.5	-116.98	968.29		
-113.366	967.65	-108.801	966.88	-105.662	966.28	-104.616	966.12	-101.668	965.82		
-98.815	965.55	-97.864	965.44	-94.915	965.17	-92.633	964.92	-91.016	964.7		
-90.16	964.56	-88.543	964.33	-86.166	963.95	-85.12	963.8	-84.549	963.7		
-82.932	963.47	-78.843	962.84	-77.511	962.65	-76.655	962.51	-75.514	962.35		
-73.136	961.98	-71.615	961.77	-63.911	961.22	-62.96	961.17	-60.963	961.04		
-60.868	961.04	-60.202	961.01	-60.012	961	-59.726	960.98	-59.061	960.93		
-58.11	960.9	-57.063	960.83	-56.493	960.8	-56.207	960.79	-54.591	960.68		
-52.118	960.57	-50.501	960.46	-48.123	960.34	-46.507	960.23	-45.461	960.19		
-44.509	960.12	-43.558	960.07	-43.273	960.03	-42.798	959.97	-42.607	959.94		
-37.757	959.04	-37.567	959	-36.711	958.63	-35.76	958.11	-35.474	957.95		
-35.189	957.77	-34.809	957.58	-34.333	957.32	-34.238	957.28	-33.858	957.04		
-33.572	956.88	-32.716	956.42	-32.051	956.03	-31.86	955.93	-31.1	955.58		
-29.007	954.81	-27.2	954.18	-26.249	953.87	-22.16	952.56	-21.399	952.3		
-17.404	951	-16.358	950.66	-16.168	950.59	-15.692	950.45	-15.407	950.35		
-15.027	950.16	-14.932	950.14	-14.456	949.92	-14.076	949.7	-13.79	949.52		
-13.505	949.33	-13.315	949.15	-12.459	948.43	-11.603	947.71	-11.413	947.66		
-10.842	947.48	-10.557	947.38	-9.986	947.31	-9.225	947.2	-6.753	946.85		
-1.997	946.1	-1.807	946.08	-1.522	946.02	-1.046	945.93	-.951	945.91		
0	945.86	.38	945.9	1.046	945.99	1.427	946.04	1.617	946.05		
2.283	946.14	2.758	946.2	2.948	946.22	3.804	946.33	3.899	946.35		
4.755	946.41	5.516	946.51	5.801	946.54	6.277	946.58	6.372	946.58		
6.848	946.62	7.133	946.66	7.799	946.73	7.989	946.74	8.655	946.81		
8.75	946.81	9.606	946.84	9.891	946.84	10.462	946.82	10.652	946.81		
11.032	946.84	11.603	946.88	12.649	946.98	12.839	947.01	13.41	947.07		
14.551	947.25	15.312	947.66	15.502	947.75	15.788	947.86	16.168	948.02		
16.453	948.17	17.404	948.55	17.785	948.6	18.165	948.68	18.45	948.73		
18.641	948.74	19.306	948.81	19.402	948.81	20.353	948.91	20.543	948.92		
21.304	949.02	21.684	949.06	22.255	949.11	22.73	949.15	22.92	949.18		
23.206	949.22	23.491	949.23	25.203	949.32	26.154	949.44	26.439	949.51		
26.82	949.59	27.105	949.69	31.004	950.97	31.195	951.02	31.67	951.16		
31.955	951.24	32.336	951.24	32.526	951.23	32.907	951.24	33.287	951.23		
34.714	951.18	34.809	951.18	34.904	951.17	35.76	951.15	35.855	951.15		
36.616	951.55	36.806	951.66	37.091	951.97	37.377	952.32	37.757	952.69		
38.232	952.82	38.708	952.98	38.993	953	39.469	953.03	39.659	953.05		

39.849	953.06	40.61	953.11	40.705	953.11	40.8	953.12	41.466	953.17
41.846	953.19	42.988	953.28	43.083	953.29	43.558	953.33	43.939	953.36
44.224	953.38	44.509	953.41	44.795	953.42	45.365	953.47	45.461	953.47
45.556	953.48	46.031	953.51	46.412	953.54	47.172	953.63	47.458	953.66
48.884	953.94	49.36	954.03	49.645	954.09	50.121	954.18	50.311	954.22
50.501	954.25	51.262	954.4	51.357	954.4	52.118	954.41	52.498	954.41
53.259	954.4	54.876	954.4	55.161	954.41	55.351	954.41	56.017	954.44
56.112	954.44	56.207	954.45	56.588	954.45	57.063	954.46	57.824	954.46
58.014	954.47	58.395	954.47	58.68	954.48	59.061	954.49	60.012	954.48
60.297	954.44	60.773	954.4	60.963	954.37	61.058	954.36	61.914	954.28
62.77	954.21	62.865	954.19	63.15	954.17	64.291	954.05	64.387	954.05
64.862	954	65.433	953.93	65.813	953.9	66.003	953.88	66.669	953.84
66.764	953.83	66.859	953.83	67.145	953.82	67.62	953.81	67.81	953.79
68.476	953.75	69.047	953.71	69.237	953.7	69.617	953.67	70.093	953.65
70.188	953.65	70.664	953.63	70.949	953.61	71.424	953.58	71.615	953.56
71.71	953.54	72.661	953.39	73.326	953.29	73.517	953.26	73.612	953.24
74.278	953.14	74.563	953.09	75.229	953.01	75.419	952.99	75.514	952.96
76.18	952.85	76.37	952.83	76.465	952.81	77.131	952.63	77.321	952.6
77.416	952.59	78.177	952.43	78.272	952.42	78.367	952.44	79.128	952.41
79.318	952.46	80.079	952.71	80.174	952.74	80.269	952.78	81.03	953.05
82.076	953.39	82.171	953.4	82.932	953.58	83.122	953.6	83.883	953.65
83.978	953.65	85.785	953.71	85.88	953.72	86.831	953.72	87.687	953.75
87.783	953.75	88.638	953.78	88.734	953.78	89.59	953.81	89.685	953.81
90.636	953.84	91.587	953.84	92.538	953.87	92.728	953.88	93.394	953.9
93.679	953.9	94.155	953.89	94.82	953.89	95.011	953.9	95.391	953.91
95.867	953.9	96.627	953.9	97.103	953.91	97.293	953.92	98.244	953.91
98.339	953.91	99.1	953.93	99.481	953.93	99.956	953.94	101.192	953.94
101.573	953.95	101.763	953.95	102.143	953.96	102.429	953.96	102.904	953.95
103.095	953.95	104.046	953.97	105.092	953.96	105.282	953.96	105.757	953.97
106.043	953.98	107.945	954.03	108.23	954.04	108.706	954.07	108.896	954.08
108.991	954.08	109.752	954.09	109.847	954.09	110.703	954.11	110.798	954.11
111.083	954.12	111.559	954.14	111.844	954.15	112.225	954.16	112.32	954.16
112.795	954.17	113.746	954.22	114.032	954.22	114.507	954.23	114.697	954.23
114.793	954.24	115.458	954.24	115.648	954.25	116.504	954.29	116.6	954.29
117.17	954.31	123.828	954.51	137.047	954.94	137.428	954.96	138.093	955
138.379	955.03	140.091	955.07	141.517	955.17	143.134	955.21	143.61	955.25
149.316	955.76								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
-131.531	.1	-26.249	.045	38.708	.07

ank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan
-26.249	38.708	39.3	50.19	73.89	.3	.5
neffective Flow		num=	2			
Sta L	Sta R	Elev	Permanent			
131.531	-44.13	960.3	F			
44.13	149.316	955	F			
kew Angle = 18						

CROSS SECTION

RIVER: Wallis Run

REACH: Study Reach

RS: 6

INPUT									
Description:									
Station		Elevation		Data		num= 148			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-93.6	965.63	-91.3	965.27	-84.1	964.24	-82.1	963.92	-74.9	962.88
-73.7	962.71	-72.8	962.55	-64.7	961.39	-63.6	961.21	-59.6	960.7
-56.3	960.31	-51.5	959.81	-47.2	959.38	-46.1	959.24	-42	958.83
-41.7	958.79	-41.3	958.73	-41	958.69	-39.9	958.58	-39.7	958.55

-38.9	958.44	-37.6	958.29	-33.9	957.77	-33	957.68	-32.2	957.56
-31.7	957.49	-31.4	957.45	-30.7	957.37	-27.2	956.9	-26.6	956.81
-25.5	956.62	-24.5	956.06	-18.7	952.72	-18.3	952.5	-15.6	950.99
-10.2	947.87	-9.2	947.31	-8.8	947.11	-8.5	947	-8.2	946.83
-.2	945.31	0	945.29	.2	945.33	2	945.64	4.1	946.04
4.3	946.08	5	946.17	5.1	946.19	10.1	946.81	10.2	946.82
11	946.89	15.2	947.41	16.3	947.56	17.3	947.69	19.3	948
19.5	948.03	20.2	948.11	20.4	948.13	20.7	948.19	21.3	948.28
21.5	948.3	22.4	948.41	22.7	948.4	23.8	948.4	25.4	948.38
25.5	948.38	26.2	948.4	26.5	948.4	30.5	948.39	31.5	948.41
34.6	948.39	36.7	948.41	40.7	948.4	41.7	948.29	42.6	948.14
42.7	948.13	43.5	948.15	43.7	948.18	45.2	948.78	45.8	948.99
46.1	949.14	46.8	949.42	47	949.48	47.8	949.79	48.7	950.04
48.8	950.08	49	950.14	49.5	950.32	49.8	950.42	50.8	950.67
51.5	950.69	53.5	950.74	53.8	950.75	54.7	950.75	60	950.87
60.9	950.87	61	950.88	70	951.09	71.1	951.09	71.9	951.12
73	951.12	73.3	951.13	73.7	951.14	74	951.15	74.6	951.15
77.1	951.2	77.7	951.21	78.1	951.22	79.1	951.22	79.2	951.23
80	951.25	80.1	951.25	81.1	951.28	83.8	951.31	85.1	951.34
85.5	951.35	85.7	951.36	86.1	951.36	86.6	951.37	88.1	951.39
88.4	951.39	88.8	951.4	89.1	951.41	89.4	951.41	89.9	951.43
90.1	951.44	91	951.44	92.1	951.47	93.2	951.47	94	951.49
94.1	951.49	94.3	951.5	96.1	951.5	96.5	951.51	96.7	951.51
97.1	951.52	97.7	951.52	98.1	951.53	99.1	951.53	99.5	951.54
100.2	951.54	129.3	951.5	131.9	951.63	161.8	953.52	168	954.36
184.2	956.48	191.8	957.54	195.21	958.26				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-93.6	.1	-15.6	.045	50.8	.07

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-15.6	50.8		42.6	50.2		.1	.3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 5

INPUT

Description:

Station Elevation Data		num= 207							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-84.4	966.28	-83.8	966.23	-81.9	965.69	-80.9	965.44	-78.9	964.98
-77.8	964.73	-75	964.1	-73.8	963.8	-71.8	963.35	-70.7	963.08
-67.7	962.42	-65.7	961.95	-63.7	961.51	-62.6	961.24	-59.6	960.57
-58.6	960.32	-55.5	959.63	-54.5	959.42	-53.5	959.26	-51.5	959
-50.5	958.84	-48.4	958.58	-47.4	958.41	-45.3	958.14	-44.4	957.99
-42.4	957.73	-41.4	957.57	-39.4	957.32	-38.5	957.18	-37.3	957.02
-35.9	956.8	-35.6	956.77	-35.3	956.72	-35	956.68	-33.2	956.4
-31.2	956.11	-30.8	956.05	-30.2	955.98	-29.2	955.82	-28.1	955.67
-26.1	955.37	-25.1	955.24	-24.1	955.08	-23.7	955.02	-23.1	954.95
-22.1	954.79	-21.1	954.14	-14	949.12	-13	948.38	-12.1	947.71
-12	947.66	-12	947.62	-11.5	947.23	-11.1	946.93	-11	946.9
-10	946.59	-3	945.94	-3	945.93	-2.1	945.79	-2	945.78
-1.1	945.58	-1	945.56	-.9	945.56	-.1	945.48	0	945.47
.9	945.61	1	945.62	1.1	945.63	2	945.75	2.9	945.78
6.9	946.02	8	946.06	10.1	946.2	10.9	946.3	12	946.41
12.9	946.57	13	946.59	13.1	946.62	13.9	946.82	15	947.09
15.1	947.12	15.9	947.26	16	947.28	17	947.44	17.1	947.44
17.9	947.49	22	947.37	22.1	947.37	22.8	947.37	23	947.37
25	947.31	25.1	947.31	25.8	947.31	26	947.31	26.1	947.31
27	947.31	27.1	947.3	27.8	947.28	28	947.28	28.1	947.28

28.8	947.28	29.1	947.27	30	947.25	30.1	947.25	30.8	947.25
31	947.25	31.1	947.24	32	947.22	32.1	947.22	32.8	947.22
33.8	947.19	34	947.19	34.1	947.23	35	947.45	35.1	947.49
35.8	947.74	36	947.79	36.1	947.83	36.8	948.05	37	948.1
38	948.44	38.1	948.49	39.1	948.81	39.8	949.05	40	949.1
40.8	949.37	42.1	949.81	42.8	950.05	44	950.38	51	950.59
51.1	950.6	51.8	950.6	52	950.6	54	950.66	63	950.94
63.2	950.94	63.8	950.94	64	950.94	64.2	950.94	64.8	950.96
65	950.97	65.8	950.99	66	951	66.2	951	66.8	951
67	951.01	67.2	951.01	69.2	951.07	69.8	951.07	70	951.07
70.2	951.07	70.8	951.07	71	951.06	71.2	951.06	71.8	951.04
72	951.03	72.2	951.03	72.8	951.03	73	951.02	73.2	951.02
79	950.84	79.2	950.84	79.7	950.84	80	950.84	85	950.69
85.2	950.69	86	950.69	86.2	950.69	88	950.74	88.2	950.75
88.7	950.75	89	950.75	89.2	950.75	89.7	950.77	90	950.77
90.2	950.78	90.7	950.78	91	950.78	91.2	950.79	91.7	950.8
92	950.8	92.2	950.81	92.6	950.82	92.7	950.83	93	950.84
93.2	950.84	93.7	950.84	94	950.84	94.1	950.86	99	950.28
103.7	950.04	109.9	950.25	126.8	951.02	133.6	951.25	163.4	953.26
171.9	954.57	184.3	956.39	193.3	957.78	202.9	959.87	213.1	962.13
223.2	964.3	234	965.69	241.9	966.89	253	968.29	265	968.85
270.7	969.08	275.2	969.29						

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-84.4 .1 -21.1 .04 44 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-21.1 44 108.6 100.1 95.4 .1 .3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 4

INPUT

Description:

Station Elevation Data				num=	151				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-94.7	969.74	-92.3	968.97	-91.4	969.05	-88.3	969.42	-87.1	969.55
-86	969.69	-84.5	969.84	-83.4	969.92	-82.8	969.93	-82.2	969.78
-81.7	969.61	-80.6	969.18	-79.3	968.59	-59.4	959.09	-58.4	958.59
-55.3	957.13	-54.3	956.62	-53.3	956.14	-52.3	955.75	-48.5	955.28
-47.3	955.09	-38.2	953.97	-37.2	953.81	-28.1	952.69	-27.1	952.43
-26.2	952.07	-24.1	951.2	-22.1	950.07	-19.7	948.73	-18.8	948.22
-16.1	946.66	-16	946.65	-16	946.64	-14	945.56	-13	945.47
-11.5	945.37	-11	945.34	-9	945.19	-8.8	945.17	-7	945.06
-6.9	945.06	-6	944.97	-5.1	944.83	-2	944.41	-1	944.26
0	944.18	2	944.37	7.1	944.7	8.1	944.73	13.1	945.06
14	945.07	14.1	945.07	14.2	945.07	15.1	945.1	15.4	945.17
15.8	945.33	16.1	945.42	17.1	946.12	18.1	946.72	18.6	946.99
19.1	947.35	19.5	947.56	19.8	947.77	20.1	947.95	21	948.46
21.1	948.58	23.2	949.8	24	950.28	24.2	950.34	25.2	950.41
26.8	950.57	27.7	950.65	28.2	950.69	28.6	950.71	28.8	950.72
29.2	950.74	29.5	950.75	30.4	950.79	31.2	950.84	32.2	950.9
33.2	950.94	35	951.05	35.2	951.06	35.5	951.08	35.9	951.09
39.5	951.29	40	951.3	40.2	951.31	40.4	951.32	42.3	951.44
43.2	951.47	44.1	951.47	44.3	951.47	44.5	951.46	45	951.45
45.3	951.44	45.6	951.43	49.3	951.28	49.6	951.27	51.3	951.22
51.4	951.21	52.1	951.17	52.3	951.16	53.3	951.12	53.5	951.12
54.1	951.1	54.3	951.09	54.6	951.08	55	951.05	55.3	951.04
55.7	951.03	55.9	951.02	56.3	951	56.8	950.97	56.9	950.97
57.8	950.9	60.4	950.71	60.5	950.7	61.3	950.63	61.4	950.62

61.9	950.58	62.3	950.54	62.4	950.53	63.2	950.48	63.4	950.47
63.5	950.46	64.1	950.4	64.4	950.38	64.7	950.36	65.4	950.29
65.8	950.27	66	950.26	66.4	950.23	66.9	950.2	66.9	950.19
70.1	949.95	70.2	949.94	79.9	949.99	92.2	949.93	122.3	950.1
152.3	951.64	178.9	955.46	182.3	955.98	212.3	962.7	219.9	963.82
233.2	965.99	242.3	967.27	253.5	967.61	260.4	967.78	272.3	968.15
291.3	967.98								

Manning's	n Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-94.7	.1	-27.1	.04	24.2	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-27.1	24.2		95 100.8	97.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 3

INPUT
 Description:

Station Elevation Data	num=	119							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
-79.6 956.95	-79.5 956.89	-70.4 954.96	-70.1 954.92	-68.4 954.78					
-67.4 954.68	-63.3 954.39	-62.3 954.29	-58.3 954	-56.2 953.83					
-53.2 953.61	-52.2 953.29	-51.2 952.85	-50.2 952.62	-48.2 952.38					
-43.7 951.96	-41.1 951.75	-36.1 951.28	-35.1 950.97	-34.1 950.5					
-33.1 950	-31.1 949.08	-30.1 948.56	-29.1 948.09	-28.3 947.67					
-28.1 947.59	-26.3 946.77	-24.8 946.01	-24.1 945.69	-23.1 944.9					
-22.1 944.86	-18.1 944.84	-17.1 944.78	-16 944.68	-11.1 944.53					
-10.1 944.47	-2 944.22	-1.6 944.2	0 944.12	.4 944.16					
.6 944.18	1.3 944.23	2.8 944.33	3 944.34	4 944.43					
4.1 944.44	5 944.5	5.5 944.53	5.9 944.56	6 944.56					
7 944.66	8 944.66	9 945.02	10 945.5	10.7 945.72					
11 945.83	15.1 946	15.6 946.02	16.5 946.07	24.2 946.62					
35.3 947.36	35.4 947.37	35.5 947.38	36 947.43	36.3 947.47					
36.4 947.47	36.5 947.5	37.2 947.75	37.4 947.82	37.7 947.91					
38.1 948.03	38.4 948.14	38.9 948.31	39.4 948.49	39.8 948.62					
40.2 948.75	40.5 948.86	40.7 948.96	41.5 949.31	43.5 949.32					
43.8 949.31	44.1 949.31	44.5 949.3	46.3 949.3	46.6 949.3					
47.5 949.28	48.5 949.29	48.6 949.29	49.6 949.27	51.6 949.39					
54.7 949.65	54.9 949.61	55.7 949.48	56.1 949.29	56.2 949.24					
56.7 949.05	57.7 948.56	61.1 946.52	64.4 946.75	73.7 947.34					
83.6 947.62	96.9 947.92	104.1 948.11	108.9 948.28	134.6 949.08					
159.5 951.59	165.1 952.23	173.5 954.07	184.8 956.41	195.5 958.82					
210.1 962.47	211.7 962.85	226 966.35	235.4 966.62	250 966.76					
256.4 966.9	286 965.03	286.9 964.99	296.5 965.31						

Manning's	n Values		num=	3	
Sta	n Val	Sta	n Val	Sta	n Val
-79.6	.1	-36.1	.04	41.5	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	-36.1	41.5		100.3 100.7	106.6		.1	.3

CROSS SECTION

RIVER: Wallis Run
 REACH: Study Reach RS: 2

INPUT

Description:

Station Elevation Data		num=		138					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-80.1	963.24	-79.3	962.69	-77.6	961.49	-76.4	960.49	-71.9	956.52
-70	955.98	-68	955.39	-60	953.14	-59	952.84	-55	951.7
-40	947.48	-39.6	947.39	-39.4	947.35	-39	947.26	-37	947.04
-34.4	946.8	-34	946.76	-33.6	946.76	-33.4	946.76	-33	946.75
-32	946.64	-30	945.46	-29	944.89	-28.6	944.8	-28.4	944.78
-28	944.69	-24	944.44	-21	944.28	-17	944.03	-16	943.99
-15	943.91	-13	943.78	-12.5	943.74	-12.5	943.73	-12	943.69
-9.5	943.52	-9	943.48	-8.5	943.45	-8.5	943.44	-8	943.41
-6	943.28	-5	943.19	-3	943.06	-1	942.91	-.5	942.88
-.5	942.87	0	942.84	.5	942.85	1	942.86	1.5	942.89
2	942.92	6	943.7	6.5	943.76	7	943.81	7.5	943.84
8	943.88	8.5	944.03	8.5	944.04	9	944.19	12	945.69
13	946.16	13.5	946.39	18	948.66	18.5	948.74	19	948.81
19.5	948.87	20	948.91	20.5	948.94	21	948.97	22	948.97
22.5	948.96	23	948.95	23.4	948.94	23.5	948.93	24	948.92
24.4	948.92	24.5	948.92	25	948.92	27	948.86	27.5	948.86
28	948.86	29	948.83	29.4	948.82	29.6	948.82	30.4	948.81
30.6	948.8	32	948.76	32.4	948.76	32.6	948.76	33	948.75
33.4	948.74	35	948.7	36	948.7	38	948.64	38.4	948.64
38.6	948.64	39	948.64	39.4	948.62	39.6	948.62	40	948.61
44.4	948.52	49	948.52	49.4	948.51	49.6	948.51	50.4	948.49
50.6	948.49	51	948.49	56	948.49	56.4	948.48	58	948.48
59	948.46	65	948.45	65.4	948.44	65.6	948.43	66	948.43
68.6	948.42	69	948.41	71	948.43	71.3	948.42	71.5	948.41
79.3	948.4	82.6	948.38	91.3	948.3	99.4	948.29	126.5	948.42
156.4	948.84	186.3	950.15	216.2	953.61	221.3	954.4	239.9	957.47
246.1	958.43	253.3	959.45	267.9	961.74	276.1	962.87	285.3	964.12
296	965.64	306	966.97	316.8	969.11				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-80.1	.1	-33	.04	18	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	-33	18		100	100.4	100	.1 .3

CROSS SECTION

RIVER: Wallis Run
REACH: Study Reach RS: 1

Station Elevation Data		num=		30					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-134	964.88	-119.4	964.28	-89.5	960.46	-59.7	953.09	-29.8	946.15
0	942.14	29.9	946.86	59.7	947.84	89.6	946.97	94.32946.8707	
102.9	946.69	106.1	946.64	119.4	946.37	132.5	946.87	136.2	947.07
149.2	947.58	162	948.95	166.4	949.46	179.1	950.83	191.5	953.03
196.5	953.89	208.9	956.08	221.1	958.76	226.7	959.9	238.8	962.56
250.6	965.67	256.8	967.17	268.6	970.27	280.2	973.24	288.6	975.36

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-134	.1	-29.8	.04	29.9	.1

Bank Sta:	Left	Right	Coeff Contr.	Expan.
	-29.8	29.9	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Wallis Run

Reach	River Sta.	n1	n2	n3
Study Reach	17	.1	.035	.07
Study Reach	16	.1	.035	.07
Study Reach	15.5	Bridge		
Study Reach	15	.1	.035	.07
Study Reach	14.5	.1	.035	.07
Study Reach	14	.1	.035	.07
Study Reach	13	.1	.04	.1
Study Reach	12	.1	.04	.1
Study Reach	11	.1	.04	.1
Study Reach	10	.1	.04	.1
Study Reach	9	.1	.04	.07
Study Reach	8.5	.1	.045	.07
Study Reach	8	.1	.045	.07
Study Reach	7.5	Bridge		
Study Reach	7	.1	.045	.07
Study Reach	6	.1	.045	.07
Study Reach	5	.1	.04	.1
Study Reach	4	.1	.04	.1
Study Reach	3	.1	.04	.1
Study Reach	2	.1	.04	.1
Study Reach	1	.1	.04	.1

SUMMARY OF REACH LENGTHS

River: Wallis Run

Reach	River Sta.	Left	Channel	Right
Study Reach	17	55	52.7	49.8
Study Reach	16	40.1	42.2	40
Study Reach	15.5	Bridge		
Study Reach	15	28.1	28.1	28.1
Study Reach	14.5	28.8	28.8	28.8
Study Reach	14	47.6	55.7	52.5
Study Reach	13	36.4	60	69.1
Study Reach	12	72.6	75	71.8
Study Reach	11	87.4	104.3	100.6
Study Reach	10	55.8	50.4	38.7
Study Reach	9	25	25	25
Study Reach	8.5	25.3	25.3	25.3
Study Reach	8	47	47	47
Study Reach	7.5	Bridge		
Study Reach	7	39.3	50.19	73.89
Study Reach	6	42.6	50.2	41.6
Study Reach	5	108.6	100.1	95.4
Study Reach	4	95	100.8	97.6
Study Reach	3	100.3	100.7	106.6
Study Reach	2	100	100.4	100
Study Reach	1			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Wallis Run

Reach	River Sta.	Contr.	Expan.
Study Reach	17	.1	.3
Study Reach	16	.3	.5
Study Reach	15.5	Bridge	
Study Reach	15	.3	.5
Study Reach	14.5	.1	.3
Study Reach	14	.1	.3
Study Reach	13	.1	.3
Study Reach	12	.1	.3
Study Reach	11	.1	.3
Study Reach	10	.1	.3
Study Reach	9	.1	.3
Study Reach	8.5	.1	.3
Study Reach	8	.3	.5
Study Reach	7.5	Bridge	
Study Reach	7	.3	.5
Study Reach	6	.1	.3
Study Reach	5	.1	.3
Study Reach	4	.1	.3
Study Reach	3	.1	.3
Study Reach	2	.1	.3
Study Reach	1	.1	.3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Study Reach	17	2 YR (50%)	452.00	951.10	954.67	954.02	955.09	0.006875	5.18	87.28	48.09	0.68
Study Reach	17	5 YR (20%)	812.00	951.10	955.97	954.94	956.40	0.004007	5.26	154.51	55.14	0.55
Study Reach	17	10 YR (10%)	1120.00	951.10	956.93	955.44	957.37	0.003067	5.35	209.79	61.99	0.50
Study Reach	17	25 YR (4%)	1590.00	951.10	958.80	956.14	959.17	0.001522	4.87	343.01	79.79	0.38
Study Reach	17	50 YR (2%)	2000.00	951.10	959.35	956.64	959.81	0.001709	5.51	387.87	84.59	0.40
Study Reach	17	100 YR (1%)	2460.00	951.10	959.99	957.18	960.54	0.001796	6.06	443.56	90.37	0.42
Study Reach	17	500 YR (0.2%)	3760.00	951.10	961.63	958.49	962.40	0.001866	7.19	603.09	102.73	0.45
Study Reach	16	2 YR (50%)	452.00	950.32	954.56	953.16	954.84	0.002520	4.23	106.94	36.41	0.43
Study Reach	16	5 YR (20%)	812.00	950.32	955.80	954.07	956.23	0.002790	5.27	154.11	40.13	0.47
Study Reach	16	10 YR (10%)	1120.00	950.32	956.66	954.72	957.20	0.002914	5.90	189.99	42.89	0.49
Study Reach	16	25 YR (4%)	1590.00	950.32	958.55	955.59	959.06	0.002041	5.74	276.88	49.25	0.43
Study Reach	16	50 YR (2%)	2000.00	950.32	958.98	956.26	959.68	0.002567	6.70	298.82	52.28	0.48
Study Reach	16	100 YR (1%)	2460.00	950.32	959.50	956.94	960.39	0.002946	7.58	327.37	59.02	0.52
Study Reach	16	500 YR (0.2%)	3760.00	950.32	960.77	958.59	962.20	0.003729	9.61	414.84	81.64	0.61
Study Reach	15.5		Bridge									
Study Reach	15	2 YR (50%)	452.00	951.25	953.61	953.55	954.46	0.013728	7.39	61.14	32.32	0.95
Study Reach	15	5 YR (20%)	812.00	951.25	954.44	954.44	955.74	0.014099	9.16	88.63	34.03	1.00
Study Reach	15	10 YR (10%)	1120.00	951.25	955.09	955.09	956.67	0.013407	10.06	111.38	35.35	1.00
Study Reach	15	25 YR (4%)	1590.00	951.25	955.96	955.96	957.89	0.012838	11.13	142.80	37.06	1.00
Study Reach	15	50 YR (2%)	2000.00	951.25	956.65	956.65	958.83	0.012423	11.86	168.67	38.43	1.00
Study Reach	15	100 YR (1%)	2460.00	951.25	957.34	957.34	959.79	0.012129	12.55	195.95	39.83	1.00
Study Reach	15	500 YR (0.2%)	3760.00	951.25	959.13	959.13	962.11	0.010924	13.86	279.08	58.56	0.98
Study Reach	14.5	2 YR (50%)	452.00	950.94	953.28	953.19	954.03	0.013441	6.97	64.82	37.72	0.94
Study Reach	14.5	5 YR (20%)	812.00	950.94	953.72	954.03	955.24	0.021750	9.88	82.19	40.58	1.22
Study Reach	14.5	10 YR (10%)	1120.00	950.94	954.11	954.63	956.12	0.024693	11.38	98.41	43.13	1.33
Study Reach	14.5	25 YR (4%)	1590.00	950.94	954.61	955.41	957.30	0.027830	13.16	120.84	46.50	1.44
Study Reach	14.5	50 YR (2%)	2000.00	950.94	954.98	956.04	958.21	0.029783	14.41	138.79	48.96	1.51
Study Reach	14.5	100 YR (1%)	2460.00	950.94	955.36	956.53	959.14	0.031546	15.59	157.90	54.93	1.57
Study Reach	14.5	500 YR (0.2%)	3760.00	950.94	956.19	957.99	961.39	0.034540	18.39	217.08	80.41	1.69
Study Reach	14	2 YR (50%)	452.00	950.88	953.20		953.65	0.007732	5.38	84.03	47.88	0.72
Study Reach	14	5 YR (20%)	812.00	950.88	954.17	953.53	954.74	0.006716	6.09	133.28	56.40	0.70
Study Reach	14	10 YR (10%)	1120.00	950.88	954.83	954.10	955.49	0.005963	6.52	171.90	59.95	0.68
Study Reach	14	25 YR (4%)	1590.00	950.88	955.70	954.75	956.47	0.005291	7.05	225.52	63.58	0.66
Study Reach	14	50 YR (2%)	2000.00	950.88	956.36	955.24	957.22	0.004963	7.44	268.85	66.44	0.65
Study Reach	14	100 YR (1%)	2460.00	950.88	957.05	955.75	958.00	0.004547	7.80	318.88	89.08	0.64
Study Reach	14	500 YR (0.2%)	3760.00	950.88	959.08	956.99	960.07	0.003024	8.10	536.89	122.20	0.55
Study Reach	13	2 YR (50%)	452.00	949.29	953.01		953.26	0.004849	4.01	112.73	57.33	0.50
Study Reach	13	5 YR (20%)	812.00	949.29	954.05		954.37	0.004204	4.59	176.90	65.85	0.49
Study Reach	13	10 YR (10%)	1120.00	949.29	954.76		955.14	0.003924	4.96	225.60	71.00	0.49
Study Reach	13	25 YR (4%)	1590.00	949.29	955.68		956.14	0.003539	5.44	292.80	75.02	0.48
Study Reach	13	50 YR (2%)	2000.00	949.29	956.38		956.90	0.003258	5.79	351.97	93.63	0.48
Study Reach	13	100 YR (1%)	2460.00	949.29	957.10		957.68	0.002993	6.12	434.06	134.15	0.47
Study Reach	13	500 YR (0.2%)	3760.00	949.29	959.22		959.81	0.002079	6.37	733.63	146.08	0.41
Study Reach	12	2 YR (50%)	452.00	948.36	952.49		952.89	0.006991	5.08	88.99	41.13	0.61
Study Reach	12	5 YR (20%)	812.00	948.36	953.37		954.01	0.007922	6.41	126.64	45.04	0.67
Study Reach	12	10 YR (10%)	1120.00	948.36	953.90		954.75	0.008987	7.41	151.12	47.39	0.73
Study Reach	12	25 YR (4%)	1590.00	948.36	954.57		955.73	0.010241	8.63	184.23	50.53	0.80
Study Reach	12	50 YR (2%)	2000.00	948.36	955.08		956.48	0.011101	9.51	210.41	52.93	0.84
Study Reach	12	100 YR (1%)	2460.00	948.36	955.66	955.18	957.27	0.011194	10.18	241.79	56.47	0.86
Study Reach	12	500 YR (0.2%)	3760.00	948.36	958.41		959.58	0.004759	8.92	526.09	122.02	0.60
Study Reach	11	2 YR (50%)	452.00	948.60	951.82		952.28	0.009478	5.43	83.22	44.22	0.70
Study Reach	11	5 YR (20%)	812.00	948.60	952.67		953.31	0.010926	6.42	126.45	58.04	0.77
Study Reach	11	10 YR (10%)	1120.00	948.60	953.25		954.00	0.010330	6.94	161.49	63.10	0.76
Study Reach	11	25 YR (4%)	1590.00	948.60	954.09		954.92	0.008841	7.32	217.18	69.24	0.73
Study Reach	11	50 YR (2%)	2000.00	948.60	954.80		955.66	0.007170	7.44	278.57	90.42	0.67
Study Reach	11	100 YR (1%)	2460.00	948.60	955.60		956.46	0.005693	7.48	352.04	93.29	0.62
Study Reach	11	500 YR (0.2%)	3760.00	948.60	958.50		959.18	0.002412	6.76	639.94	106.02	0.44
Study Reach	10	2 YR (50%)	452.00	948.53	951.07		951.38	0.007161	4.46	101.25	59.33	0.60
Study Reach	10	5 YR (20%)	812.00	948.53	952.04		952.43	0.005732	4.99	162.60	67.92	0.57
Study Reach	10	10 YR (10%)	1120.00	948.53	952.73		953.16	0.005168	5.31	211.08	74.36	0.56
Study Reach	10	25 YR (4%)	1590.00	948.53	953.74		954.20	0.004125	5.47	290.56	82.33	0.51
Study Reach	10	50 YR (2%)	2000.00	948.53	954.57		955.04	0.003417	5.54	361.53	89.67	0.48
Study Reach	10	100 YR (1%)	2460.00	948.53	955.46		955.95	0.002755	5.58	448.94	107.29	0.44
Study Reach	10	500 YR (0.2%)	3760.00	948.53	958.53		958.93	0.001229	5.12	856.48	186.06	0.32
Study Reach	9	2 YR (50%)	452.00	947.60	950.65		951.01	0.007188	4.83	93.64	48.34	0.61

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Study Reach	9	5 YR (20%)	812.00	947.60	951.73		952.12	0.006529	5.00	162.26	73.90	0.60
Study Reach	9	10 YR (10%)	1120.00	947.60	952.50		952.90	0.004797	5.09	220.12	77.31	0.53
Study Reach	9	25 YR (4%)	1590.00	947.60	953.58		954.00	0.003475	5.17	314.07	98.19	0.47
Study Reach	9	50 YR (2%)	2000.00	947.60	954.46		954.87	0.002764	5.18	409.09	122.75	0.43
Study Reach	9	100 YR (1%)	2460.00	947.60	955.40		955.80	0.002133	5.14	539.37	147.52	0.39
Study Reach	9	500 YR (0.2%)	3760.00	947.60	958.56		958.84	0.000868	4.47	1094.11	201.70	0.27
Study Reach	8.5	2 YR (50%)	452.00	946.81	950.48		950.81	0.008491	4.58	98.59	52.03	0.59
Study Reach	8.5	5 YR (20%)	812.00	946.81	951.63		951.94	0.006364	4.43	183.11	82.07	0.52
Study Reach	8.5	10 YR (10%)	1120.00	946.81	952.45		952.76	0.004495	4.44	252.05	86.57	0.46
Study Reach	8.5	25 YR (4%)	1590.00	946.81	953.57		953.88	0.003272	4.51	353.30	99.26	0.41
Study Reach	8.5	50 YR (2%)	2000.00	946.81	954.46		954.78	0.002622	4.55	457.31	140.63	0.38
Study Reach	8.5	100 YR (1%)	2460.00	946.81	955.41		955.72	0.002045	4.50	601.49	157.74	0.34
Study Reach	8.5	500 YR (0.2%)	3760.00	946.81	958.59		958.80	0.000841	3.91	1190.03	212.28	0.24
Study Reach	8	2 YR (50%)	452.00	946.31	950.28	949.48	950.60	0.007787	4.50	100.51	58.67	0.57
Study Reach	8	5 YR (20%)	812.00	946.31	951.40	950.33	951.78	0.005856	4.90	165.70	87.35	0.52
Study Reach	8	10 YR (10%)	1120.00	946.31	952.20	950.82	952.63	0.004917	5.23	214.11	90.84	0.49
Study Reach	8	25 YR (4%)	1590.00	946.31	953.28	951.43	953.77	0.004201	5.66	281.14	96.22	0.47
Study Reach	8	50 YR (2%)	2000.00	946.31	954.12	951.90	954.67	0.003818	5.96	335.59	103.49	0.46
Study Reach	8	100 YR (1%)	2460.00	946.31	955.02	952.41	955.62	0.003488	6.23	394.80	112.21	0.45
Study Reach	8	500 YR (0.2%)	3760.00	946.31	958.54	953.65	958.77	0.000841	3.96	1090.59	200.48	0.24
Study Reach	7.5		Bridge									
Study Reach	7	2 YR (50%)	452.00	945.86	949.57	948.76	949.98	0.009018	5.14	87.88	40.56	0.62
Study Reach	7	5 YR (20%)	812.00	945.86	950.33	949.73	951.04	0.011596	6.75	120.30	44.42	0.72
Study Reach	7	10 YR (10%)	1120.00	945.86	950.90	950.33	951.81	0.012600	7.63	146.75	47.90	0.77
Study Reach	7	25 YR (4%)	1590.00	945.86	951.69	951.12	952.80	0.013780	8.45	188.12	56.34	0.82
Study Reach	7	50 YR (2%)	2000.00	945.86	952.28	951.75	953.54	0.013244	8.99	222.48	58.70	0.81
Study Reach	7	100 YR (1%)	2460.00	945.86	952.79	952.29	954.26	0.013835	9.73	252.75	64.76	0.84
Study Reach	7	500 YR (0.2%)	3760.00	945.86	953.79	953.66	955.98	0.016568	11.88	319.31	95.41	0.95
Study Reach	6	2 YR (50%)	452.00	945.29	949.09		949.44	0.011347	4.79	94.41	58.30	0.66
Study Reach	6	5 YR (20%)	812.00	945.29	949.89		950.39	0.010111	5.70	142.47	61.84	0.66
Study Reach	6	10 YR (10%)	1120.00	945.29	950.54		951.12	0.008820	6.09	183.98	65.11	0.64
Study Reach	6	25 YR (4%)	1590.00	945.29	951.43		952.08	0.007137	6.50	257.16	106.29	0.60
Study Reach	6	50 YR (2%)	2000.00	945.29	952.19		952.81	0.005506	6.47	368.82	158.46	0.54
Study Reach	6	100 YR (1%)	2460.00	945.29	952.83		953.44	0.004773	6.59	474.36	169.78	0.52
Study Reach	6	500 YR (0.2%)	3760.00	945.29	954.16		954.83	0.004166	7.20	714.28	187.74	0.50
Study Reach	5	2 YR (50%)	452.00	945.47	948.35		948.83	0.012396	5.58	80.99	50.70	0.78
Study Reach	5	5 YR (20%)	812.00	945.47	949.35		949.92	0.008481	6.07	133.69	55.06	0.69
Study Reach	5	10 YR (10%)	1120.00	945.47	950.08		950.72	0.007116	6.40	175.17	60.20	0.65
Study Reach	5	25 YR (4%)	1590.00	945.47	951.08	949.89	951.76	0.005584	6.68	269.20	145.27	0.60
Study Reach	5	50 YR (2%)	2000.00	945.47	951.95	950.44	952.57	0.004174	6.52	403.58	161.93	0.53
Study Reach	5	100 YR (1%)	2460.00	945.47	952.58		953.23	0.003907	6.79	508.89	172.17	0.52
Study Reach	5	500 YR (0.2%)	3760.00	945.47	953.82		954.62	0.004025	7.79	733.81	187.67	0.55
Study Reach	4	2 YR (50%)	452.00	944.18	947.61		947.99	0.005735	4.97	90.86	37.31	0.56
Study Reach	4	5 YR (20%)	812.00	944.18	948.41		949.10	0.007698	6.65	122.03	40.06	0.67
Study Reach	4	10 YR (10%)	1120.00	944.18	948.88		949.86	0.009537	7.93	141.16	41.59	0.76
Study Reach	4	25 YR (4%)	1590.00	944.18	949.39	949.07	950.87	0.012701	9.77	162.81	43.38	0.89
Study Reach	4	50 YR (2%)	2000.00	944.18	949.70	949.70	951.70	0.015968	11.34	176.32	44.46	1.00
Study Reach	4	100 YR (1%)	2460.00	944.18	950.69	950.69	952.49	0.011774	10.85	266.47	124.73	0.88
Study Reach	4	500 YR (0.2%)	3760.00	944.18	952.22	952.22	953.95	0.009323	11.18	516.10	182.95	0.81
Study Reach	3	2 YR (50%)	452.00	944.12	946.94		947.30	0.008208	4.75	96.45	62.83	0.64
Study Reach	3	5 YR (20%)	812.00	944.12	947.93		948.32	0.006107	5.08	177.55	105.14	0.58
Study Reach	3	10 YR (10%)	1120.00	944.12	948.60		949.01	0.005048	5.28	256.25	131.28	0.55
Study Reach	3	25 YR (4%)	1590.00	944.12	949.46		949.89	0.004058	5.47	384.96	167.10	0.51
Study Reach	3	50 YR (2%)	2000.00	944.12	950.08	948.68	950.53	0.003635	5.69	491.93	177.78	0.49
Study Reach	3	100 YR (1%)	2460.00	944.12	950.66	949.13	951.13	0.003411	5.94	596.52	184.68	0.49
Study Reach	3	500 YR (0.2%)	3760.00	944.12	951.79	950.11	952.41	0.003572	6.94	814.44	202.82	0.51
Study Reach	2	2 YR (50%)	452.00	942.84	946.48		946.73	0.003710	4.05	111.60	45.40	0.46
Study Reach	2	5 YR (20%)	812.00	942.84	947.36		947.79	0.004543	5.29	155.64	54.86	0.52
Study Reach	2	10 YR (10%)	1120.00	942.84	947.85		948.46	0.005436	6.29	183.36	57.71	0.58
Study Reach	2	25 YR (4%)	1590.00	942.84	948.41	947.43	949.32	0.006851	7.66	220.21	115.39	0.67
Study Reach	2	50 YR (2%)	2000.00	942.84	948.77	948.00	949.93	0.008048	8.73	276.37	183.44	0.73
Study Reach	2	100 YR (1%)	2460.00	942.84	949.12	949.04	950.51	0.008957	9.69	345.99	208.67	0.79
Study Reach	2	500 YR (0.2%)	3760.00	942.84	950.21	950.21	951.78	0.008483	10.83	589.15	236.55	0.79
Study Reach	1	2 YR (50%)	452.00	942.14	945.88	945.20	946.22	0.007001	4.69	96.43	51.53	0.60
Study Reach	1	5 YR (20%)	812.00	942.14	946.74	946.00	947.23	0.007002	5.61	150.32	90.05	0.63

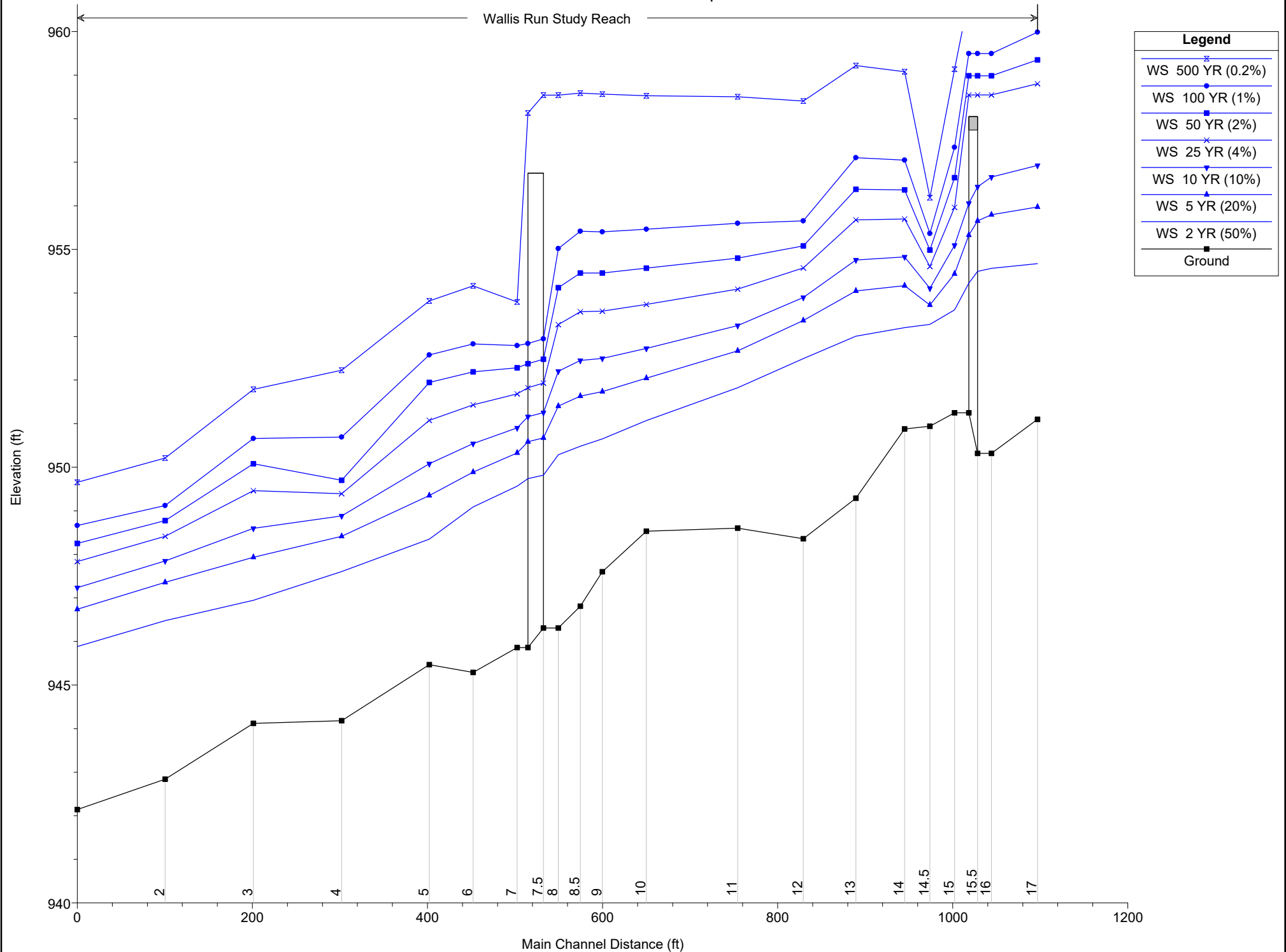
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Study Reach	1	10 YR (10%)	1120.00	942.14	947.24	946.50	947.84	0.007010	6.30	206.39	135.93	0.65
Study Reach	1	25 YR (4%)	1590.00	942.14	947.83	947.24	948.58	0.007002	7.13	303.48	188.12	0.67
Study Reach	1	50 YR (2%)	2000.00	942.14	948.25	947.81	949.08	0.007012	7.69	383.32	194.30	0.68
Study Reach	1	100 YR (1%)	2460.00	942.14	948.66	948.25	949.58	0.007008	8.22	465.02	199.96	0.70
Study Reach	1	500 YR (0.2%)	3760.00	942.14	949.66	949.13	950.77	0.007003	9.42	669.82	213.11	0.72

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Study Reach	17	2 YR (50%)	955.09	954.67	0.42	0.21	0.04		452.00		48.09
Study Reach	17	5 YR (20%)	956.40	955.97	0.43	0.17	0.00		812.00		55.14
Study Reach	17	10 YR (10%)	957.37	956.93	0.44	0.16	0.01		1119.83	0.17	61.99
Study Reach	17	25 YR (4%)	959.17	958.80	0.36	0.09	0.01	0.00	1572.43	17.57	79.79
Study Reach	17	50 YR (2%)	959.81	959.35	0.46	0.11	0.02	0.06	1966.39	33.54	84.59
Study Reach	17	100 YR (1%)	960.54	959.99	0.56	0.12	0.03	0.43	2400.25	59.32	90.37
Study Reach	17	500 YR (0.2%)	962.40	961.63	0.77	0.13	0.07	4.15	3581.10	174.74	102.73
Study Reach	16	2 YR (50%)	954.84	954.56	0.28	0.04	0.01		452.00		36.41
Study Reach	16	5 YR (20%)	956.23	955.80	0.43	0.05	0.02		812.00		40.13
Study Reach	16	10 YR (10%)	957.20	956.66	0.54	0.05	0.04		1120.00		42.89
Study Reach	16	25 YR (4%)	959.06	958.55	0.51				1590.00		49.25
Study Reach	16	50 YR (2%)	959.68	958.98	0.70			0.00	1999.94	0.06	52.28
Study Reach	16	100 YR (1%)	960.39	959.50	0.89			0.10	2458.31	1.59	59.02
Study Reach	16	500 YR (0.2%)	962.20	960.77	1.43			2.28	3730.26	27.46	81.64
Study Reach	15.5		Bridge								
Study Reach	15	2 YR (50%)	954.46	953.61	0.85	0.38	0.05		452.00		32.32
Study Reach	15	5 YR (20%)	955.74	954.44	1.30	0.49	0.02		812.00		34.03
Study Reach	15	10 YR (10%)	956.67	955.09	1.57	0.50	0.04		1120.00		35.35
Study Reach	15	25 YR (4%)	957.89	955.96	1.93	0.51	0.08		1590.00		37.06
Study Reach	15	50 YR (2%)	958.83	956.65	2.18	0.52	0.10		2000.00		38.43
Study Reach	15	100 YR (1%)	959.79	957.34	2.45	0.52	0.13		2460.00		39.83
Study Reach	15	500 YR (0.2%)	962.11	959.13	2.98	0.50	0.22	8.78	3751.22		58.56
Study Reach	14.5	2 YR (50%)	954.03	953.28	0.76	0.29	0.09		452.00		37.72
Study Reach	14.5	5 YR (20%)	955.24	953.72	1.52	0.27	0.15		812.00		40.58
Study Reach	14.5	10 YR (10%)	956.12	954.11	2.01	0.25	0.19		1120.00		43.13
Study Reach	14.5	25 YR (4%)	957.30	954.61	2.69	0.22	0.23		1590.00		46.50
Study Reach	14.5	50 YR (2%)	958.21	954.98	3.23	0.20	0.22		2000.00		48.96
Study Reach	14.5	100 YR (1%)	959.14	955.36	3.78	0.18	0.20		2459.96	0.04	54.93
Study Reach	14.5	500 YR (0.2%)	961.39	956.19	5.20	0.10	0.03		3719.17	40.83	80.41
Study Reach	14	2 YR (50%)	953.65	953.20	0.45	0.34	0.06		452.00		47.88
Study Reach	14	5 YR (20%)	954.74	954.17	0.58	0.29	0.07		812.00		56.40
Study Reach	14	10 YR (10%)	955.49	954.83	0.66	0.27	0.08		1120.00		59.95
Study Reach	14	25 YR (4%)	956.47	955.70	0.77	0.24	0.09		1590.00		63.58
Study Reach	14	50 YR (2%)	957.22	956.36	0.86	0.22	0.10		2000.00		66.44
Study Reach	14	100 YR (1%)	958.00	957.05	0.95	0.20	0.11	1.13	2458.80	0.07	89.08
Study Reach	14	500 YR (0.2%)	960.07	959.08	0.99	0.14	0.12	86.13	3665.32	8.56	122.20
Study Reach	13	2 YR (50%)	953.26	953.01	0.25	0.35	0.02		452.00		57.33
Study Reach	13	5 YR (20%)	954.37	954.05	0.33	0.34	0.03		812.00		65.85
Study Reach	13	10 YR (10%)	955.14	954.76	0.38	0.34	0.05		1120.00	0.00	71.00
Study Reach	13	25 YR (4%)	956.14	955.68	0.46	0.34	0.07		1589.74	0.27	75.02
Study Reach	13	50 YR (2%)	956.90	956.38	0.52	0.33	0.09	2.39	1996.66	0.95	93.63
Study Reach	13	100 YR (1%)	957.68	957.10	0.58	0.31	0.10	18.03	2439.75	2.23	134.15
Study Reach	13	500 YR (0.2%)	959.81	959.22	0.60	0.18	0.06	207.51	3543.40	9.08	146.08
Study Reach	12	2 YR (50%)	952.89	952.49	0.40	0.61	0.01		452.00		41.13
Study Reach	12	5 YR (20%)	954.01	953.37	0.64	0.69	0.00		812.00		45.04
Study Reach	12	10 YR (10%)	954.75	953.90	0.85	0.72	0.03		1120.00		47.39
Study Reach	12	25 YR (4%)	955.73	954.57	1.16	0.71	0.10		1590.00		50.53
Study Reach	12	50 YR (2%)	956.48	955.08	1.40	0.66	0.16		2000.00		52.93
Study Reach	12	100 YR (1%)	957.27	955.66	1.61	0.58	0.23	0.03	2459.97		56.47
Study Reach	12	500 YR (0.2%)	959.58	958.41	1.17	0.25	0.15	208.20	3551.53	0.28	122.02
Study Reach	11	2 YR (50%)	952.28	951.82	0.46	0.86	0.04		452.00		44.22
Study Reach	11	5 YR (20%)	953.31	952.67	0.64	0.80	0.08		812.00		58.04
Study Reach	11	10 YR (10%)	954.00	953.25	0.75	0.74	0.09		1120.00		63.10
Study Reach	11	25 YR (4%)	954.92	954.09	0.83	0.61	0.11		1590.00		69.24
Study Reach	11	50 YR (2%)	955.66	954.80	0.86	0.50	0.11	9.62	1990.38		90.42
Study Reach	11	100 YR (1%)	956.46	955.60	0.86	0.40	0.11	36.37	2423.63		93.29
Study Reach	11	500 YR (0.2%)	959.18	958.50	0.68	0.17	0.08	170.37	3587.56	2.08	106.02
Study Reach	10	2 YR (50%)	951.38	951.07	0.31	0.36	0.01		452.00		59.33
Study Reach	10	5 YR (20%)	952.43	952.04	0.39	0.31	0.00		812.00		67.92
Study Reach	10	10 YR (10%)	953.16	952.73	0.44	0.25	0.01		1120.00		74.36
Study Reach	10	25 YR (4%)	954.20	953.74	0.47	0.19	0.02		1590.00		82.33
Study Reach	10	50 YR (2%)	955.04	954.57	0.48	0.15	0.02		1999.96	0.04	89.67
Study Reach	10	100 YR (1%)	955.95	955.46	0.48	0.12	0.03		2455.75	4.25	107.29

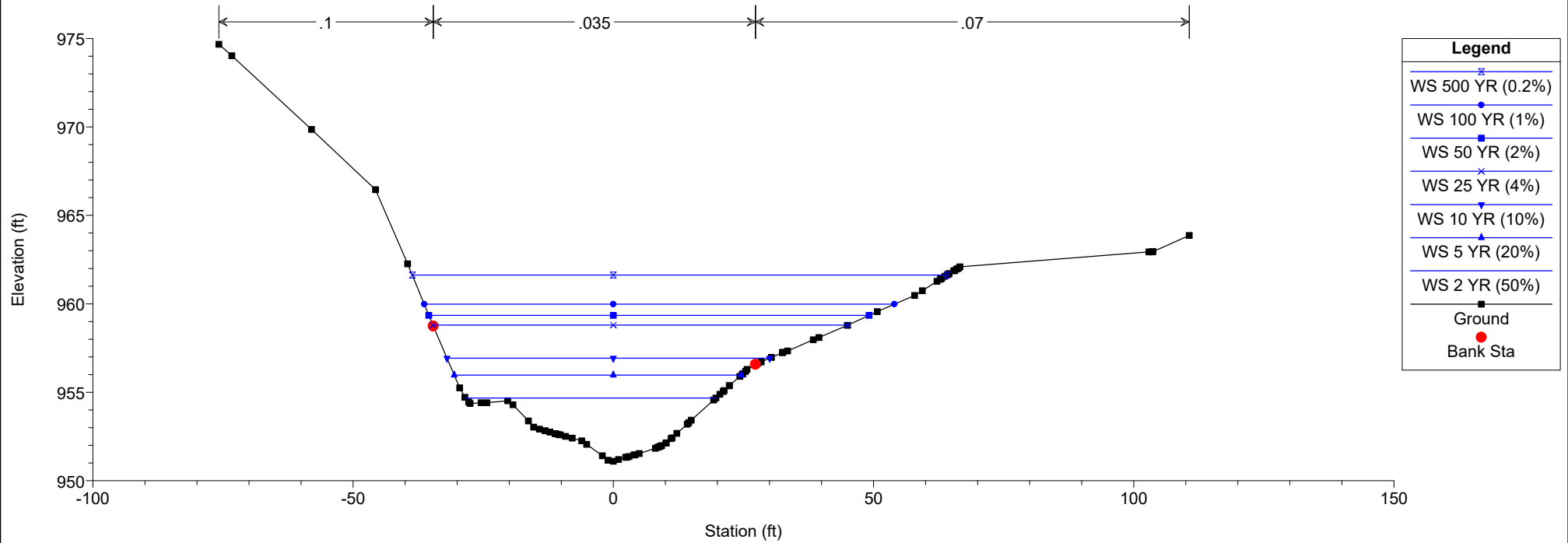
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Study Reach	10	500 YR (0.2%)	958.93	958.53	0.40	0.05	0.04	17.57	3665.54	76.89	186.06
Study Reach	9	2 YR (50%)	951.01	950.65	0.36	0.19	0.01		452.00		48.34
Study Reach	9	5 YR (20%)	952.12	951.73	0.39	0.16	0.03		812.00		73.90
Study Reach	9	10 YR (10%)	952.90	952.50	0.40	0.12	0.03		1120.00		77.31
Study Reach	9	25 YR (4%)	954.00	953.58	0.41	0.08	0.03		1584.30	5.70	98.19
Study Reach	9	50 YR (2%)	954.87	954.46	0.41	0.07	0.03		1970.08	29.92	122.75
Study Reach	9	100 YR (1%)	955.80	955.40	0.40	0.05	0.03	0.04	2369.76	90.21	147.52
Study Reach	9	500 YR (0.2%)	958.84	958.56	0.27	0.02	0.02	22.84	3275.22	461.94	201.70
Study Reach	8.5	2 YR (50%)	950.81	950.48	0.33	0.21	0.00		452.00		52.03
Study Reach	8.5	5 YR (20%)	951.94	951.63	0.31	0.15	0.01		812.00		82.07
Study Reach	8.5	10 YR (10%)	952.76	952.45	0.31	0.12	0.01		1120.00		86.57
Study Reach	8.5	25 YR (4%)	953.88	953.57	0.32	0.09	0.02		1589.58	0.42	99.26
Study Reach	8.5	50 YR (2%)	954.78	954.46	0.32	0.08	0.02		1985.95	14.05	140.63
Study Reach	8.5	100 YR (1%)	955.72	955.41	0.30	0.07	0.03		2382.25	77.75	157.74
Study Reach	8.5	500 YR (0.2%)	958.80	958.59	0.21	0.02	0.00	13.81	3304.07	442.12	212.28
Study Reach	8	2 YR (50%)	950.60	950.28	0.31	0.17	0.07		452.00		58.67
Study Reach	8	5 YR (20%)	951.78	951.40	0.37	0.15	0.14		812.00		87.35
Study Reach	8	10 YR (10%)	952.63	952.20	0.43	0.13	0.19		1120.00		90.84
Study Reach	8	25 YR (4%)	953.77	953.28	0.50	0.13	0.28		1590.00		96.22
Study Reach	8	50 YR (2%)	954.67	954.12	0.55	0.12	0.35		2000.00		103.49
Study Reach	8	100 YR (1%)	955.62	955.02	0.60	0.12	0.45		2460.00		112.21
Study Reach	8	500 YR (0.2%)	958.77	958.54	0.23			13.79	3559.15	187.06	200.48
Study Reach	7.5		Bridge								
Study Reach	7	2 YR (50%)	949.98	949.57	0.41	0.51	0.03		452.00		40.56
Study Reach	7	5 YR (20%)	951.04	950.33	0.71	0.54	0.10		812.00		44.42
Study Reach	7	10 YR (10%)	951.81	950.90	0.91	0.52	0.16		1120.00		47.90
Study Reach	7	25 YR (4%)	952.80	951.69	1.11	0.49	0.23		1590.00		56.34
Study Reach	7	50 YR (2%)	953.54	952.28	1.26	0.41	0.32		2000.00		58.70
Study Reach	7	100 YR (1%)	954.26	952.79	1.47	0.39	0.43		2460.00		64.76
Study Reach	7	500 YR (0.2%)	955.98	953.79	2.19	0.39	0.76		3753.29	6.71	95.41
Study Reach	6	2 YR (50%)	949.44	949.09	0.36	0.60	0.01		452.00		58.30
Study Reach	6	5 YR (20%)	950.39	949.89	0.50	0.46	0.01		812.00		61.84
Study Reach	6	10 YR (10%)	951.12	950.54	0.58	0.40	0.01		1120.00		65.11
Study Reach	6	25 YR (4%)	952.08	951.43	0.65	0.32	0.00	0.07	1576.94	12.99	106.29
Study Reach	6	50 YR (2%)	952.81	952.19	0.62	0.24	0.00	0.92	1895.64	103.44	158.46
Study Reach	6	100 YR (1%)	953.44	952.83	0.61	0.21	0.00	2.69	2214.00	243.31	169.78
Study Reach	6	500 YR (0.2%)	954.83	954.16	0.67	0.20	0.01	10.70	3053.74	695.56	187.74
Study Reach	5	2 YR (50%)	948.83	948.35	0.48	0.81	0.03		452.00		50.70
Study Reach	5	5 YR (20%)	949.92	949.35	0.57	0.81	0.01		812.00		55.06
Study Reach	5	10 YR (10%)	950.72	950.08	0.64	0.82	0.03		1120.00		60.20
Study Reach	5	25 YR (4%)	951.76	951.08	0.68	0.81	0.08		1569.16	20.84	145.27
Study Reach	5	50 YR (2%)	952.57	951.95	0.62	0.73	0.14		1878.31	121.69	161.93
Study Reach	5	100 YR (1%)	953.23	952.58	0.65	0.63	0.11		2224.30	235.70	172.17
Study Reach	5	500 YR (0.2%)	954.62	953.82	0.80	0.58	0.09		3169.08	590.92	187.67
Study Reach	4	2 YR (50%)	947.99	947.61	0.38	0.69	0.01		452.00		37.31
Study Reach	4	5 YR (20%)	949.10	948.41	0.69	0.69	0.09		812.00		40.06
Study Reach	4	10 YR (10%)	949.86	948.88	0.98	0.68	0.17		1120.00		41.59
Study Reach	4	25 YR (4%)	950.87	949.39	1.48	0.67	0.32		1590.00		43.38
Study Reach	4	50 YR (2%)	951.70	949.70	2.00	0.67	0.47		2000.00		44.46
Study Reach	4	100 YR (1%)	952.49	950.69	1.79	0.58	0.40		2409.91	50.09	124.73
Study Reach	4	500 YR (0.2%)	953.95	952.22	1.72	0.55	0.33		3320.55	439.45	182.95
Study Reach	3	2 YR (50%)	947.30	946.94	0.35	0.53	0.03		451.31	0.69	62.83
Study Reach	3	5 YR (20%)	948.32	947.93	0.39	0.53	0.00		796.13	15.87	105.14
Study Reach	3	10 YR (10%)	949.01	948.60	0.41	0.53	0.02		1067.73	52.27	131.28
Study Reach	3	25 YR (4%)	949.89	949.46	0.43	0.52	0.05		1447.28	142.72	167.10
Study Reach	3	50 YR (2%)	950.53	950.08	0.45	0.53	0.07		1763.60	236.40	177.78
Study Reach	3	100 YR (1%)	951.13	950.66	0.47	0.53	0.09		2101.92	358.08	184.68
Study Reach	3	500 YR (0.2%)	952.41	951.79	0.62	0.53	0.09	0.49	3059.32	700.19	202.82
Study Reach	2	2 YR (50%)	946.73	946.48	0.25	0.50	0.01		452.00		45.40
Study Reach	2	5 YR (20%)	947.79	947.36	0.43	0.56	0.01	1.25	810.75		54.86
Study Reach	2	10 YR (10%)	948.46	947.85	0.61	0.62	0.00	5.33	1114.67		57.71
Study Reach	2	25 YR (4%)	949.32	948.41	0.90	0.70	0.05	14.64	1574.70	0.66	115.39

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Study Reach	2	50 YR (2%)	949.93	948.77	1.16	0.75	0.10	24.09	1953.06	22.85	183.44
Study Reach	2	100 YR (1%)	950.51	949.12	1.39	0.79	0.14	35.77	2340.53	83.70	208.67
Study Reach	2	500 YR (0.2%)	951.78	950.21	1.57	0.77	0.14	79.39	3217.11	463.50	236.55
Study Reach	1	2 YR (50%)	946.22	945.88	0.34				452.00		51.53
Study Reach	1	5 YR (20%)	947.23	946.74	0.49			0.41	809.51	2.09	90.05
Study Reach	1	10 YR (10%)	947.84	947.24	0.60			2.08	1096.52	21.40	135.93
Study Reach	1	25 YR (4%)	948.58	947.83	0.74			6.64	1493.48	89.88	188.12
Study Reach	1	50 YR (2%)	949.08	948.25	0.83			11.99	1802.13	185.88	194.30
Study Reach	1	100 YR (1%)	949.58	948.66	0.91			19.38	2129.53	311.09	199.96
Study Reach	1	500 YR (0.2%)	950.77	949.66	1.12			47.02	2999.35	713.64	213.11

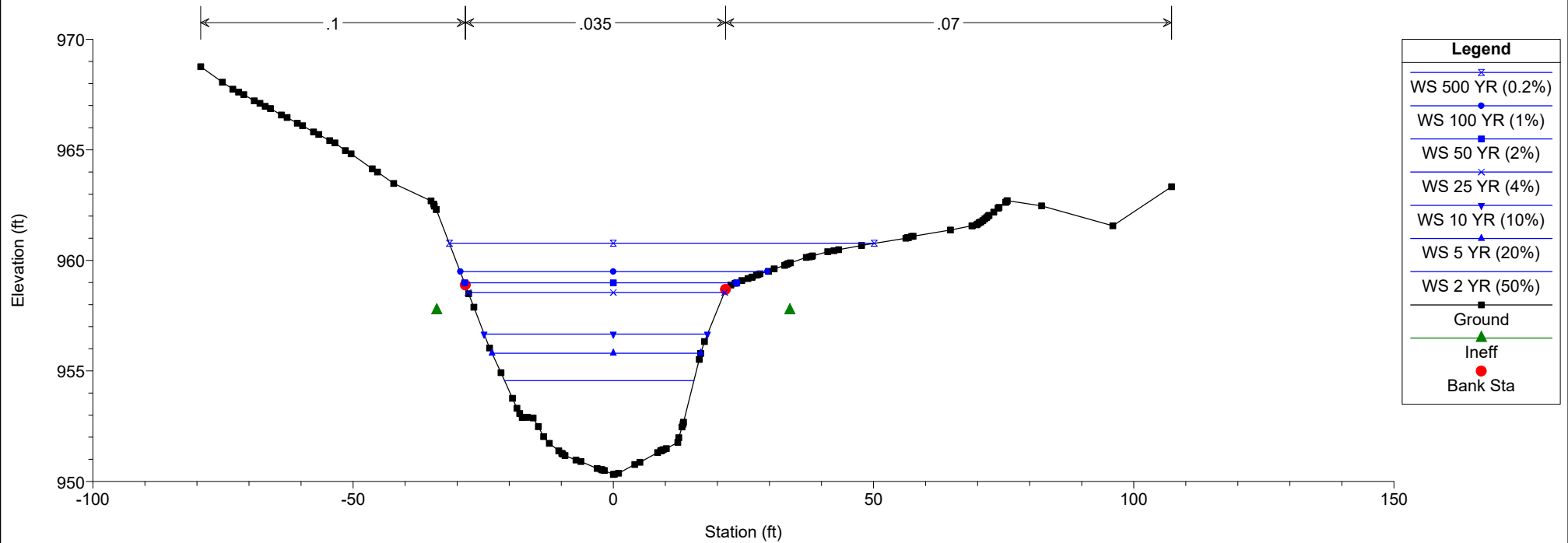
Wallis Run Study Reach



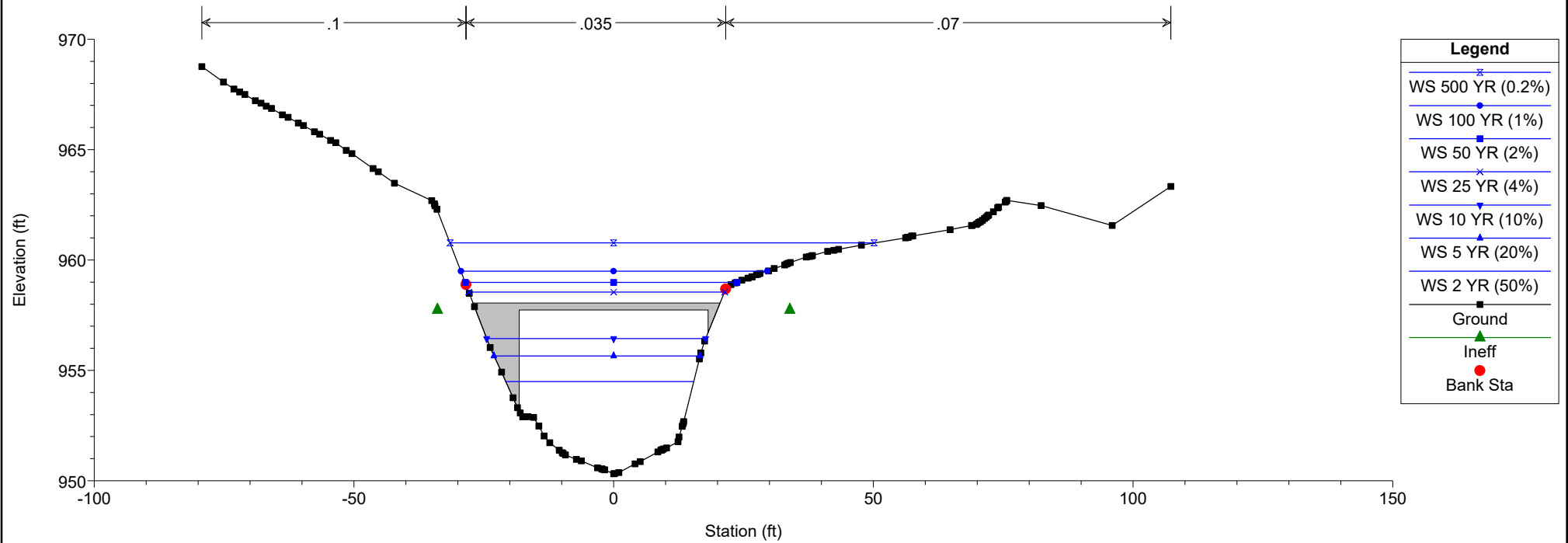
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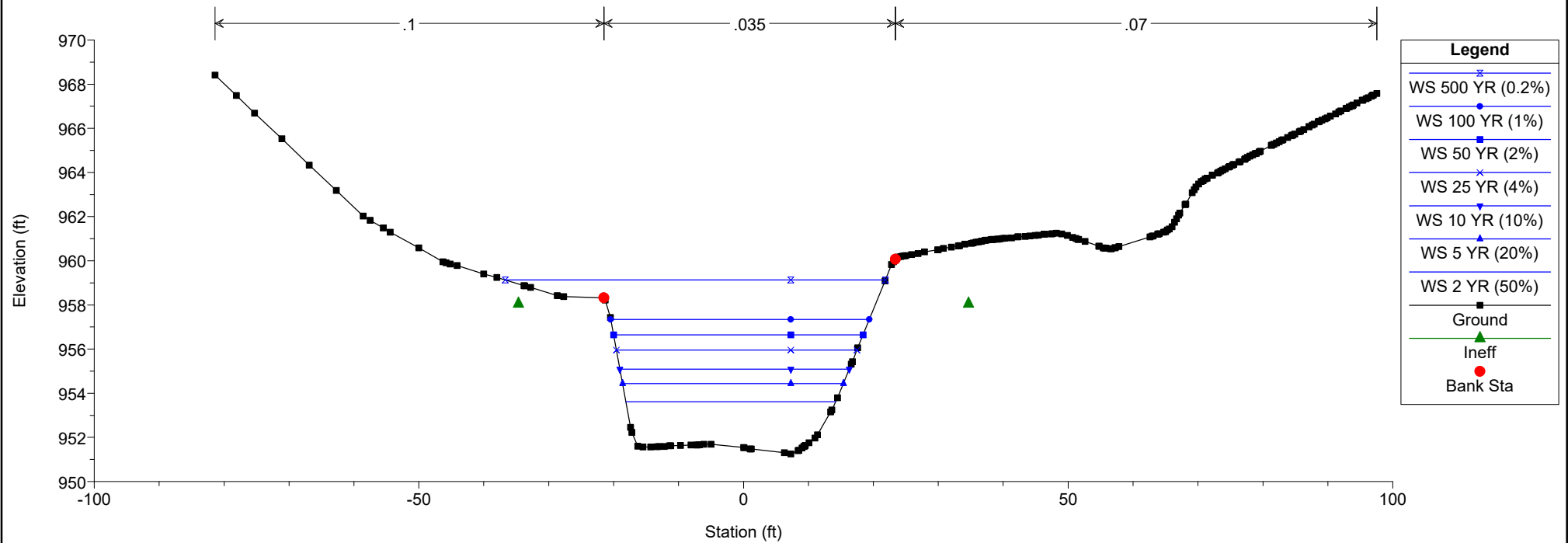
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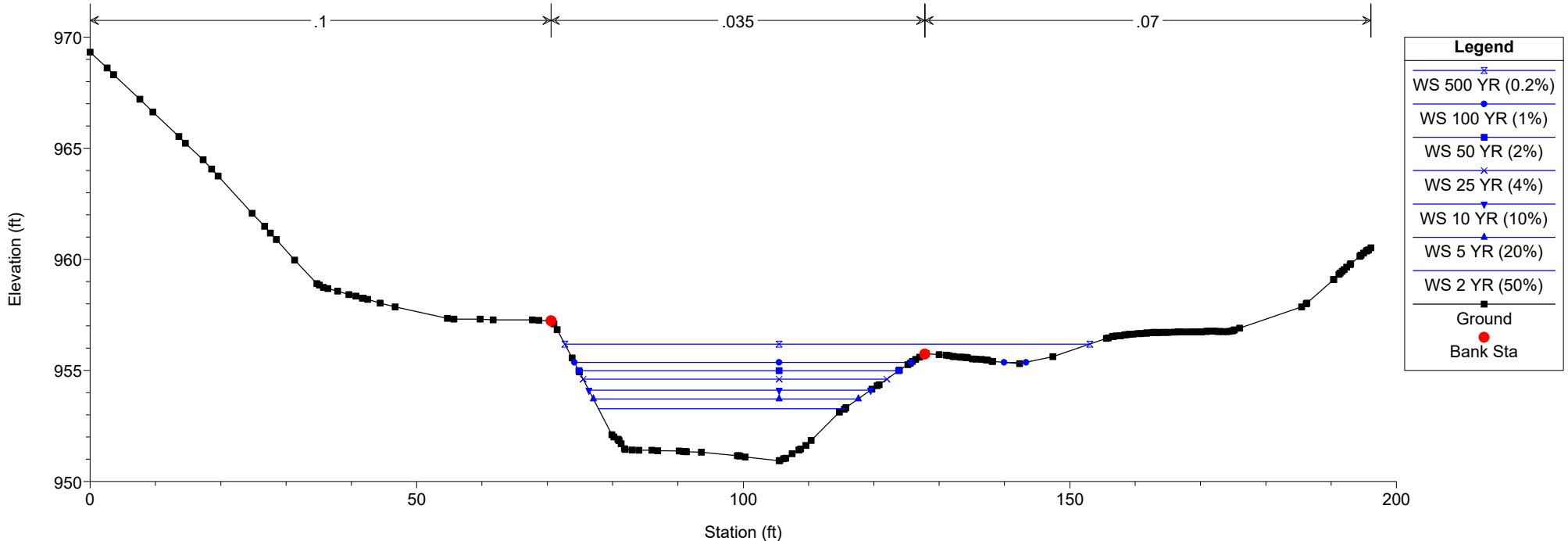
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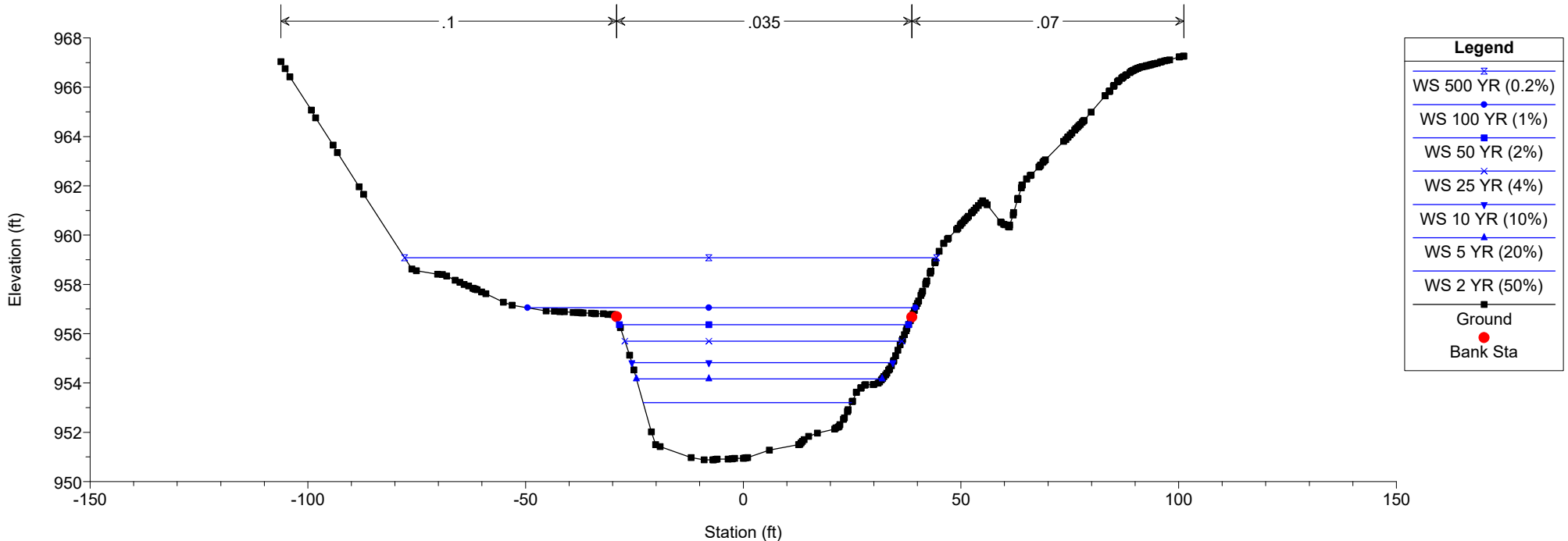
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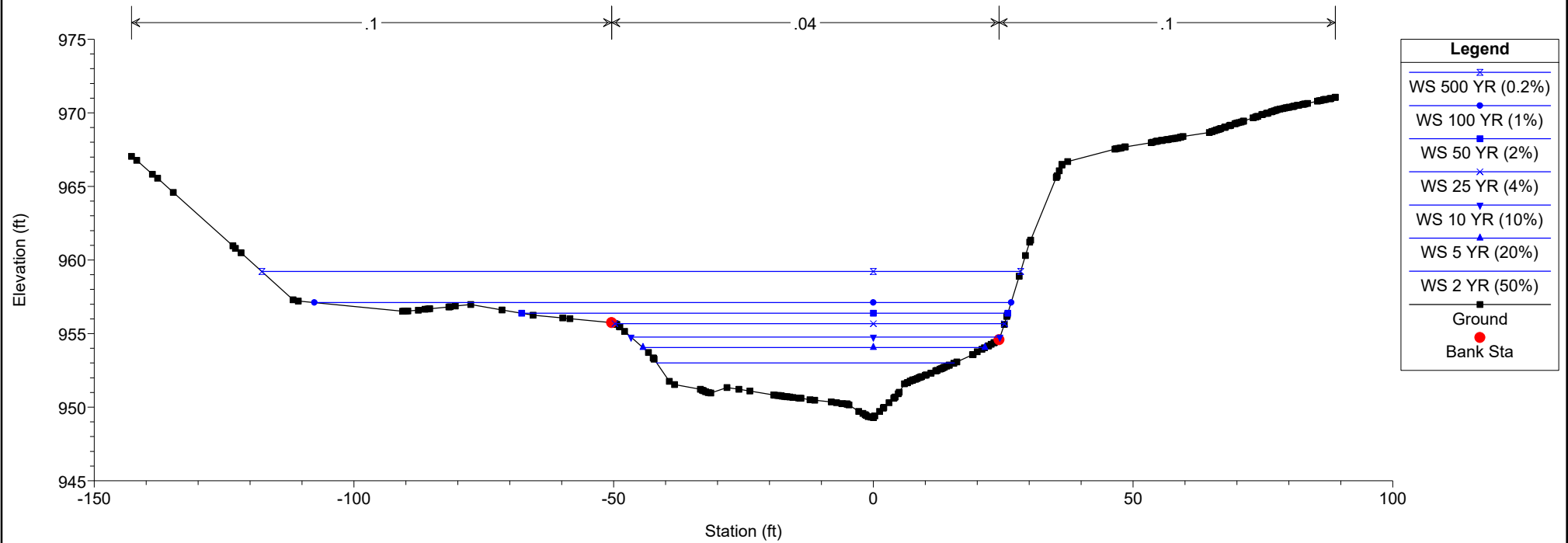
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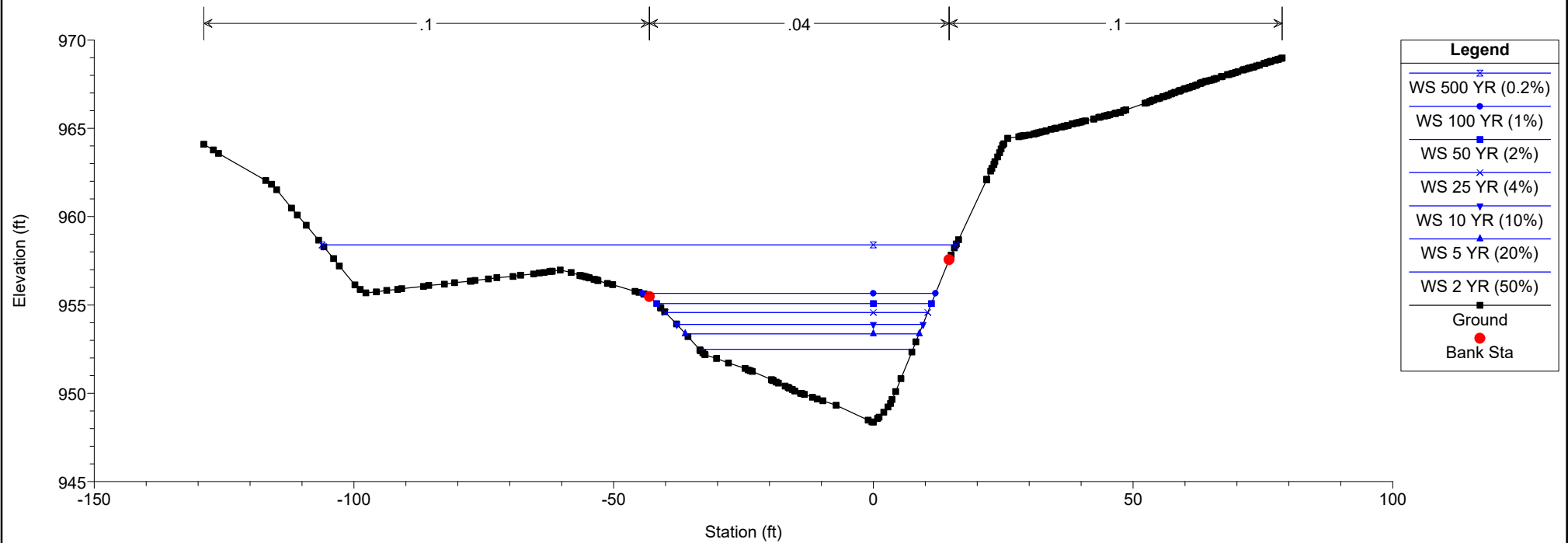
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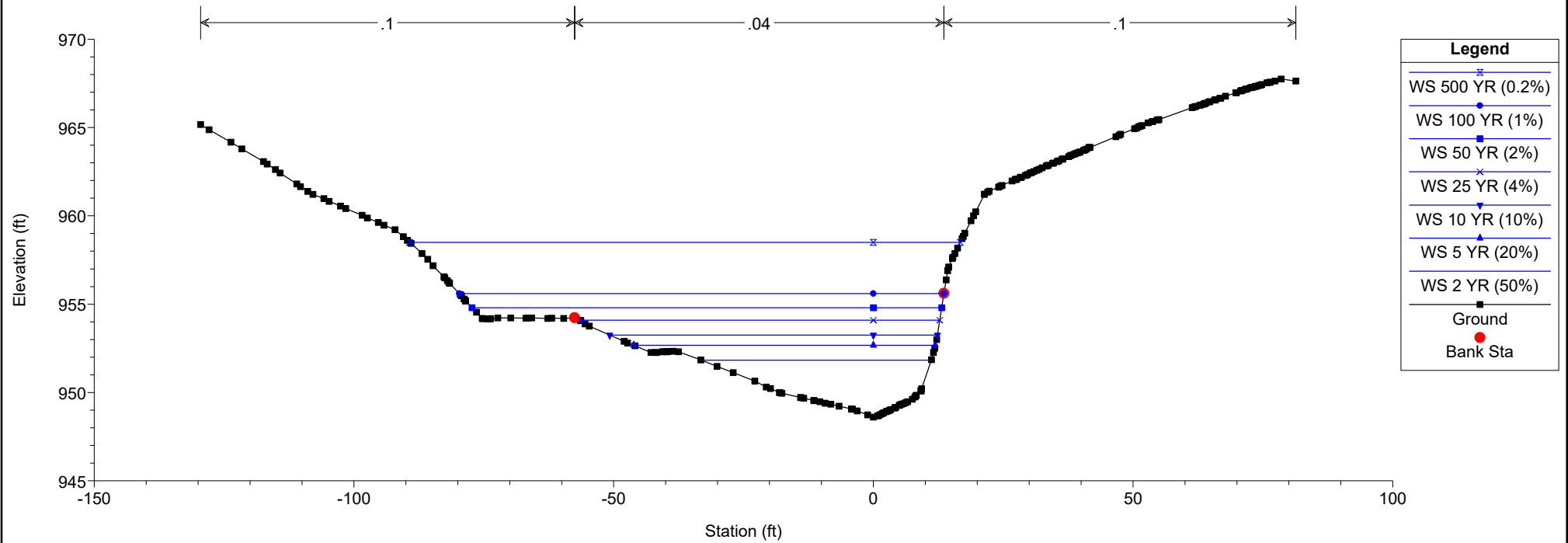
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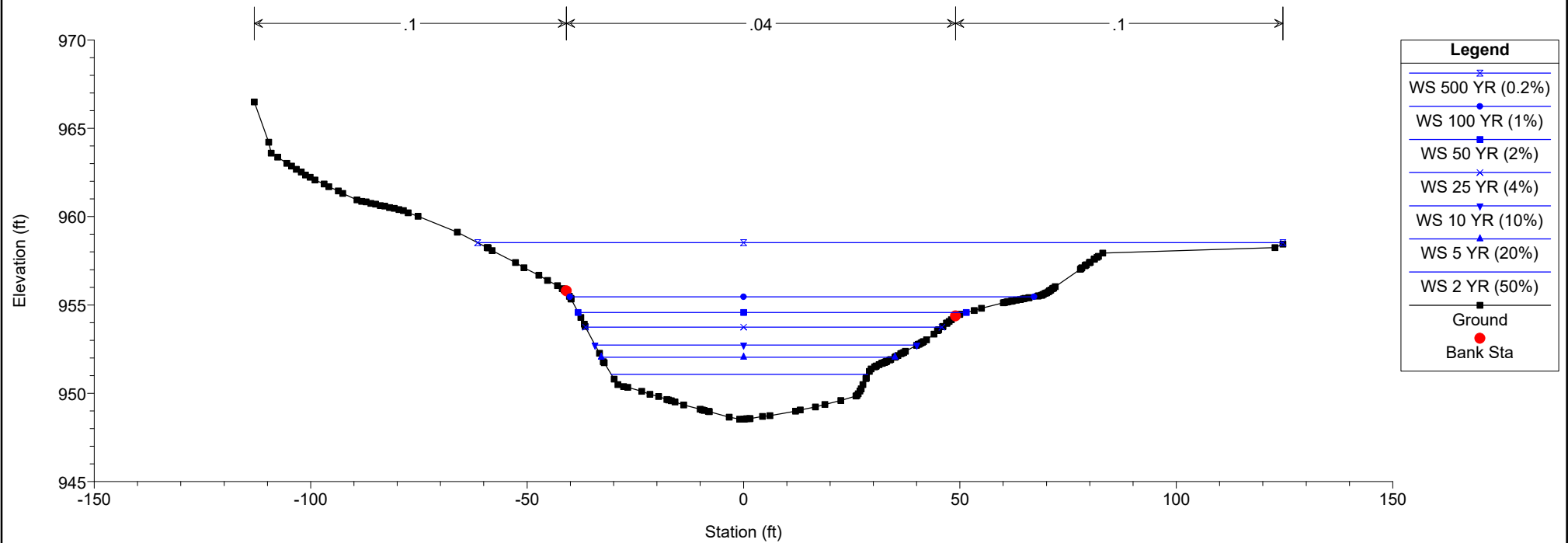
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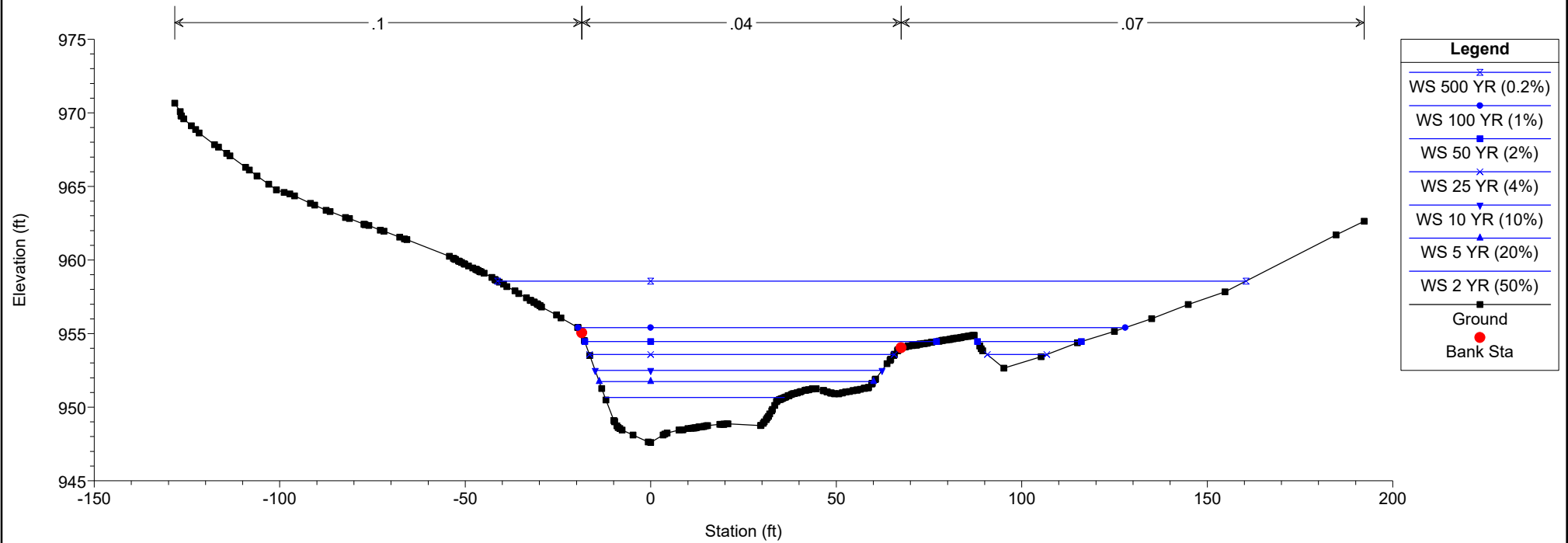
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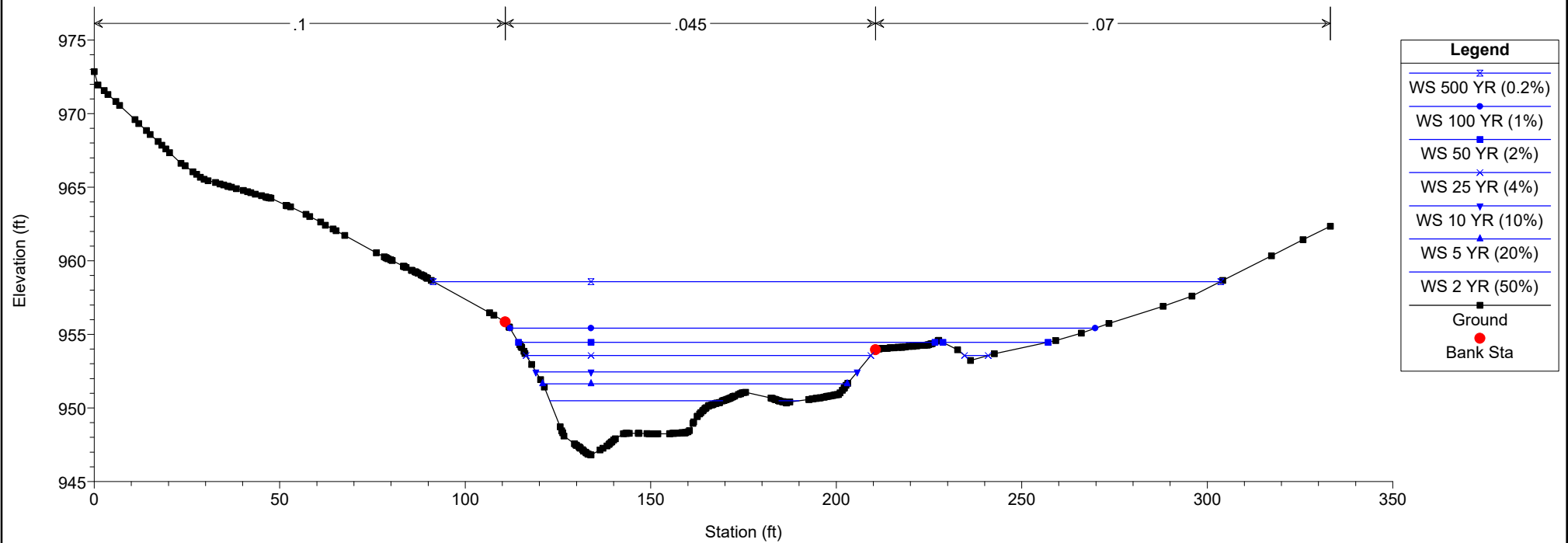
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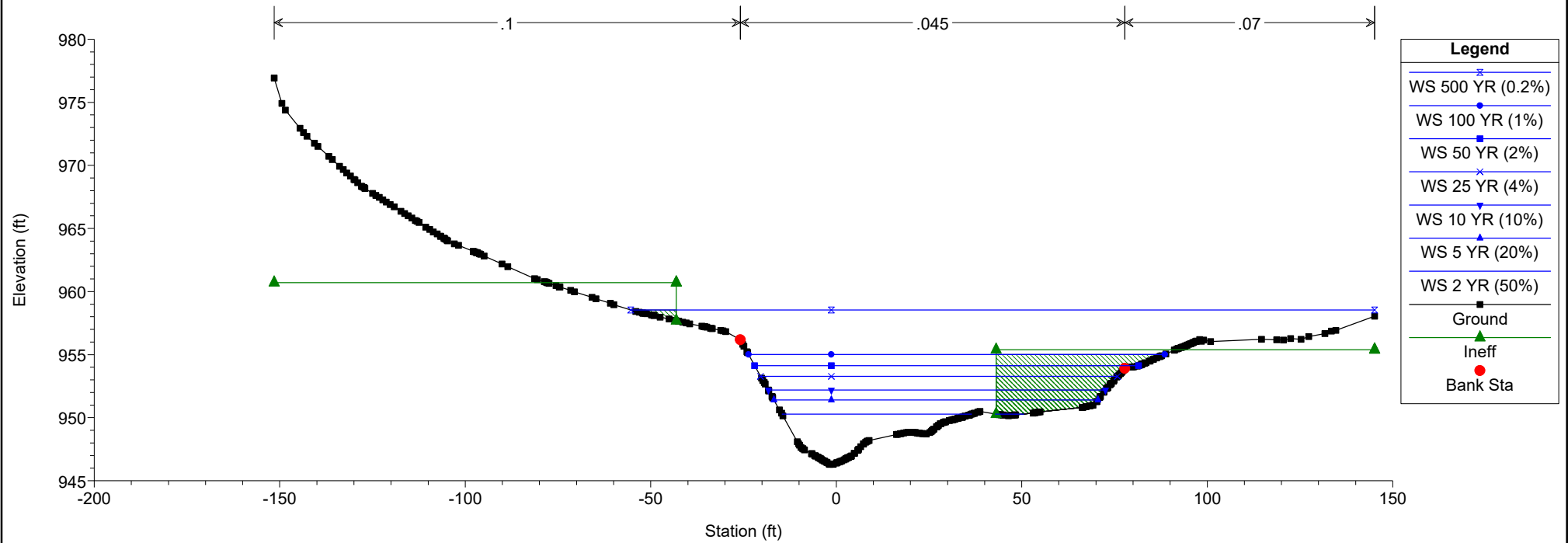
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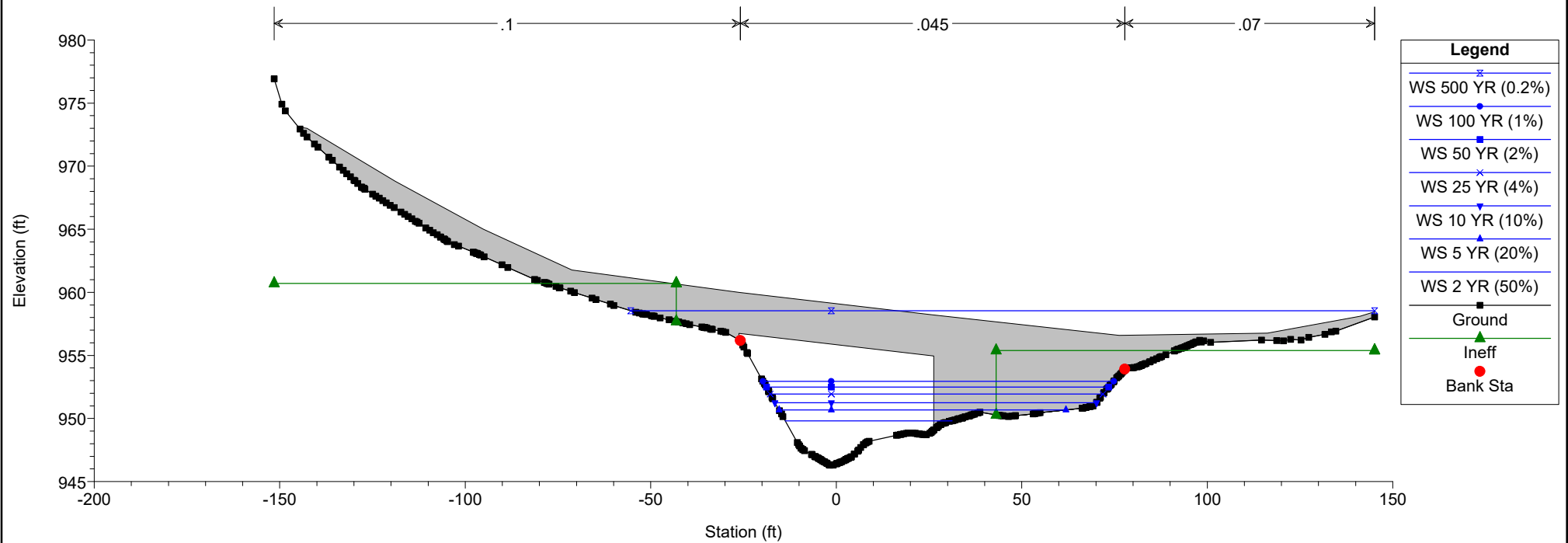
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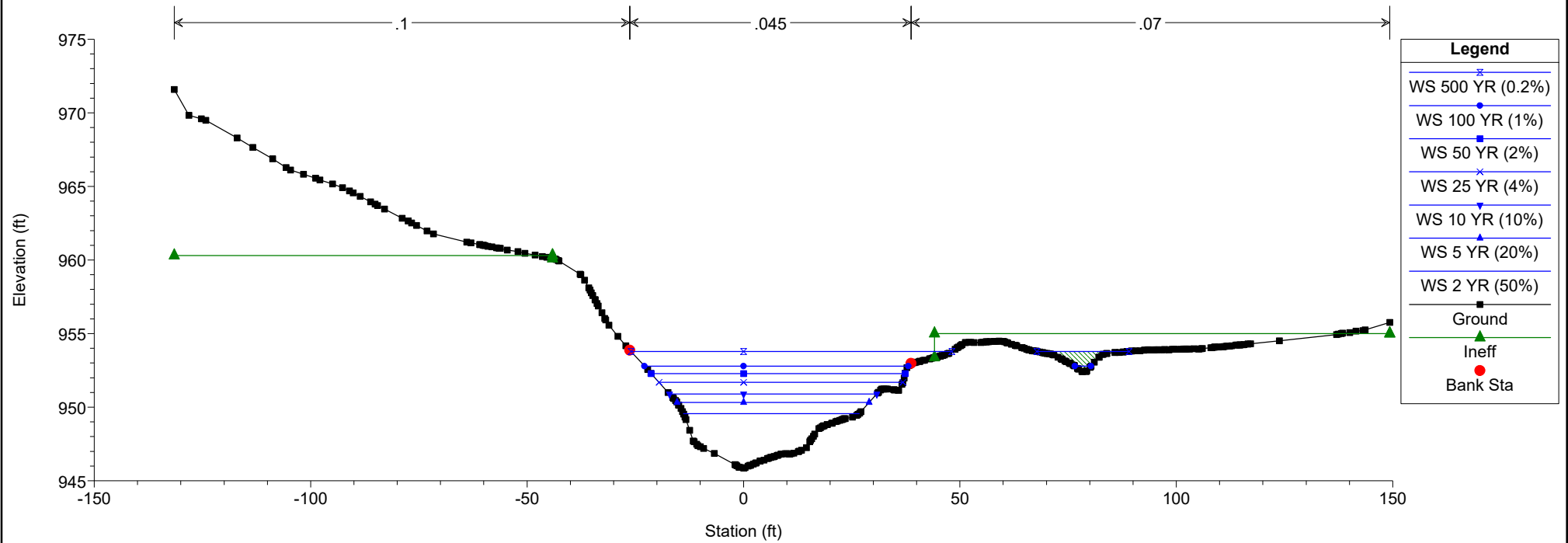
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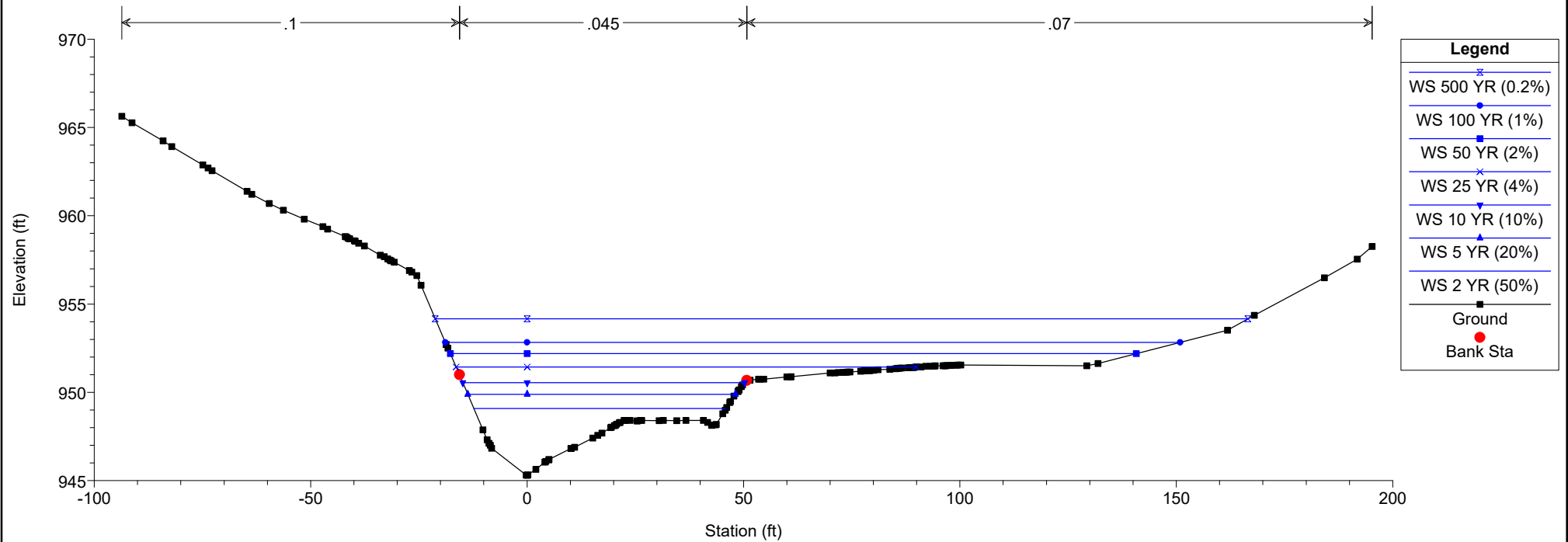
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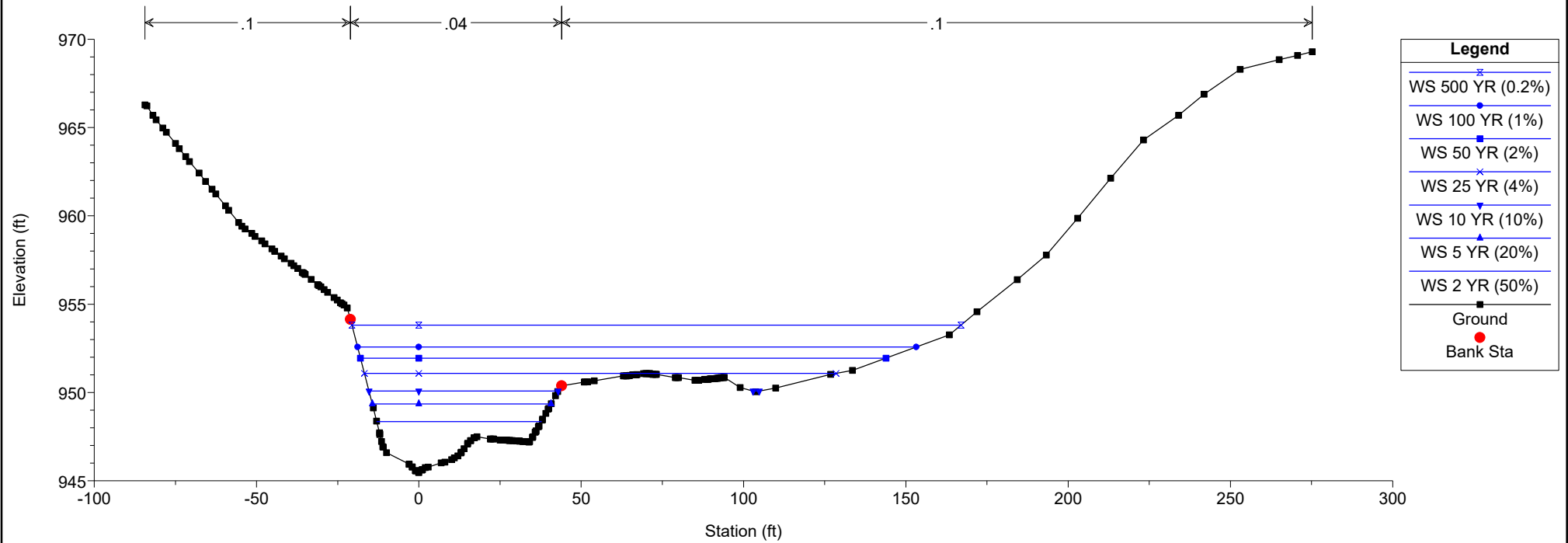
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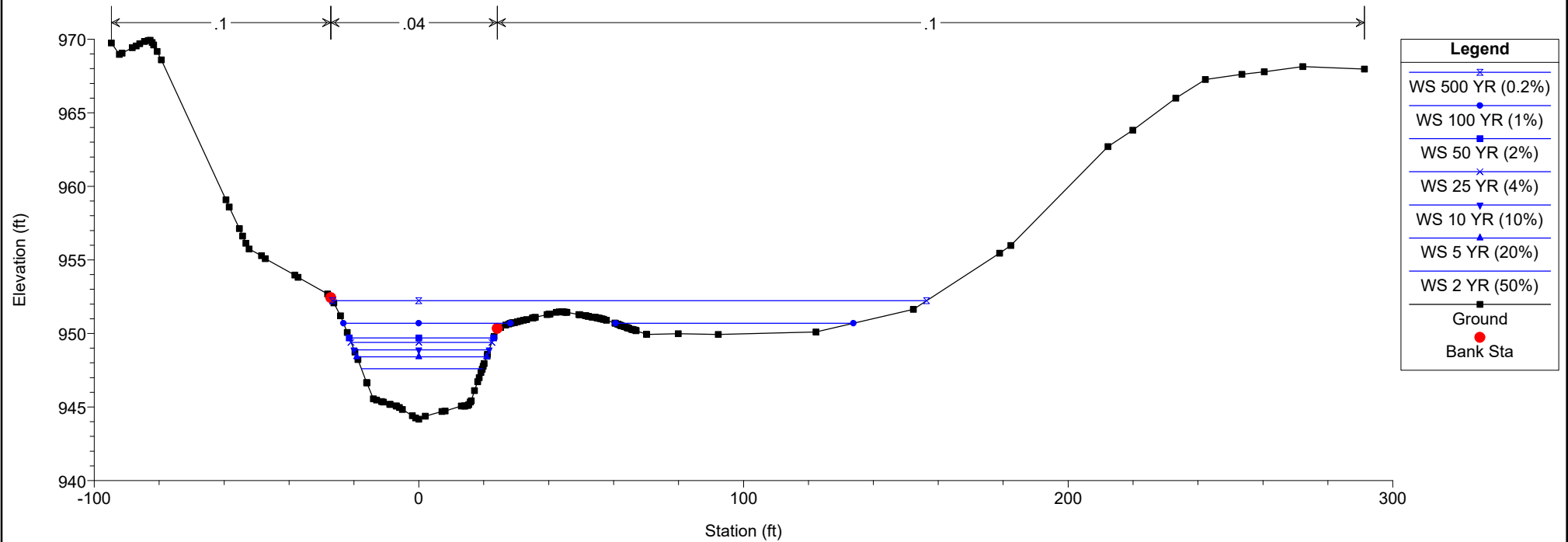
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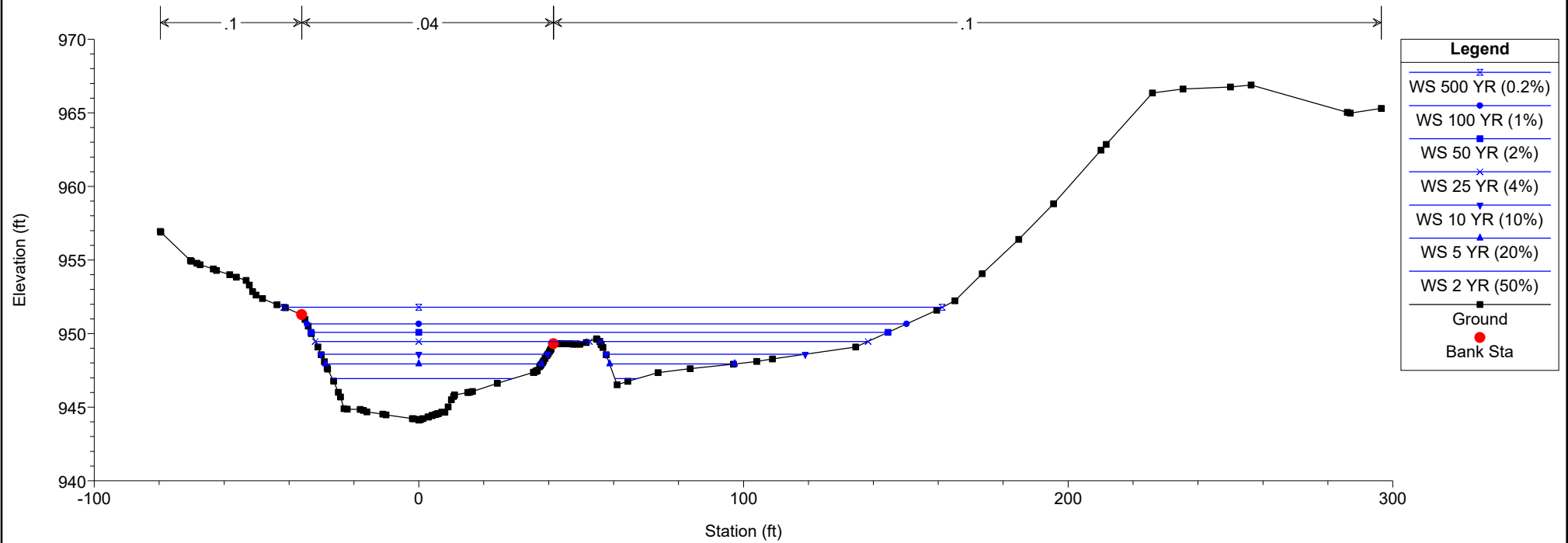
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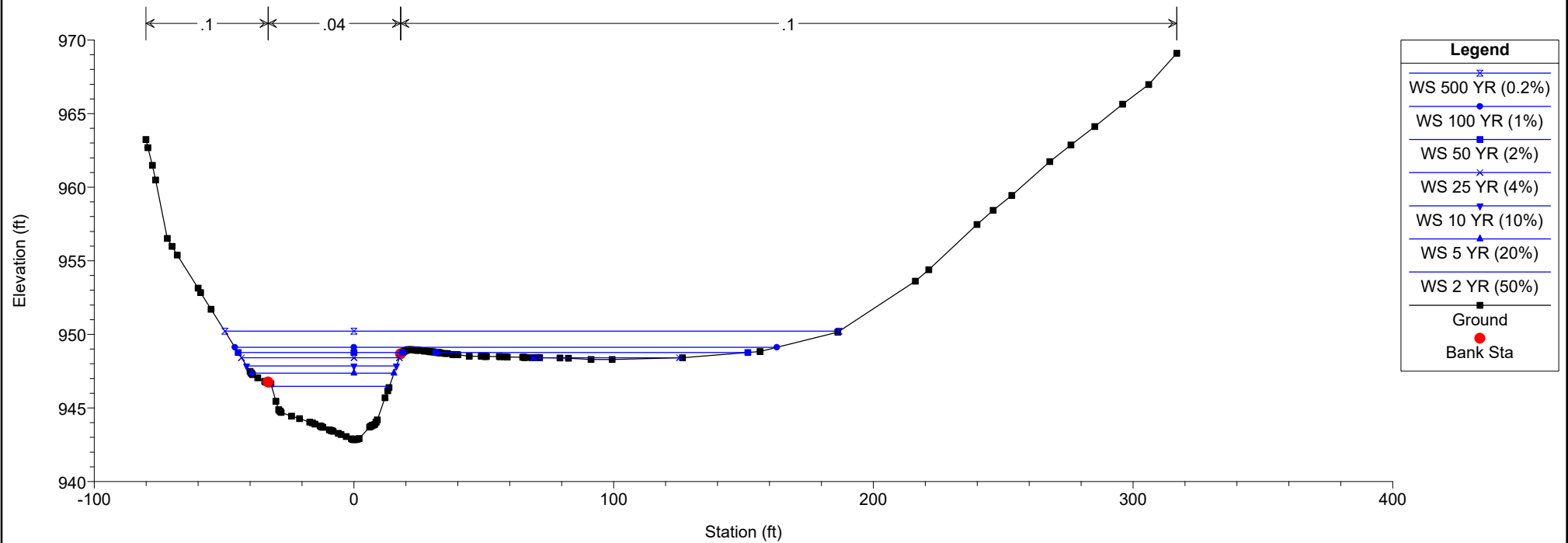
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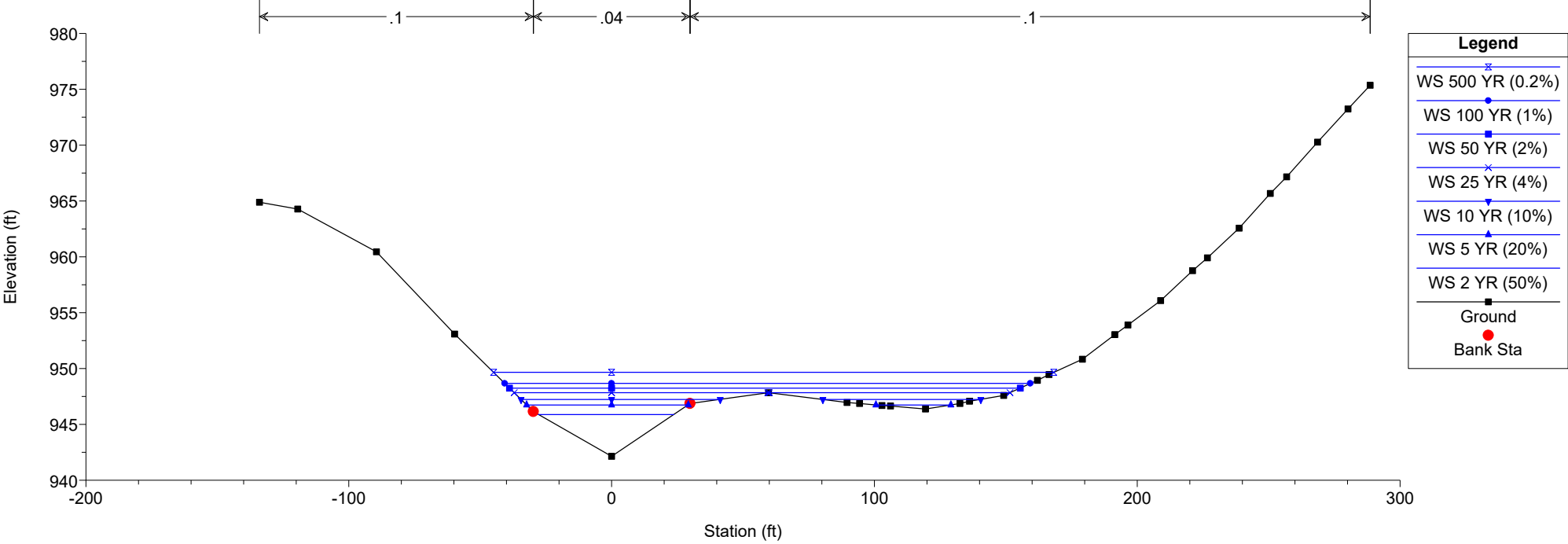


334659-Saluda Access Plan: Proposed 9/10/2025



334659-Saluda Access Plan: Proposed 9/10/2025





ATTACHMENT 5
Ephemeral Stream Analysis
HEC-RAS Output Tables

HEC-RAS River: Stream 1 Reach: S-20230821-1402-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230821-1402-	214	25 Year	Exist	16.89	990.00	990.26	990.26	990.36	0.030007	2.58	6.53	31.35	1.00
S-20230821-1402-	214	25 Year	Proposed	16.89	990.00	990.26	990.26	990.36	0.030007	2.58	6.53	31.35	1.00
S-20230821-1402-	214	100 Year	Exist	20.43	990.00	990.29	990.29	990.40	0.029156	2.72	7.52	32.72	1.00
S-20230821-1402-	214	100 Year	Proposed	20.43	990.00	990.29	990.29	990.40	0.029156	2.72	7.52	32.72	1.00
S-20230821-1402-	162	25 Year	Exist	16.89	987.57	989.67	988.47	989.68	0.000252	0.73	24.51	28.00	0.12
S-20230821-1402-	162	25 Year	Proposed	16.89	987.57	988.85	988.47	988.93	0.006343	2.20	7.69	14.17	0.53
S-20230821-1402-	162	100 Year	Exist	20.43	987.57	989.73	988.55	989.74	0.000309	0.83	26.19	29.25	0.13
S-20230821-1402-	162	100 Year	Proposed	20.43	987.57	988.96	988.55	989.03	0.005977	2.21	9.25	16.25	0.52
S-20230821-1402-	140			Culvert									
S-20230821-1402-	117	25 Year	Exist	16.89	985.20	986.21	985.92	986.32	0.006458	2.73	6.19	8.18	0.55
S-20230821-1402-	117	25 Year	Proposed	16.89	985.20	986.21	985.92	986.32	0.006458	2.73	6.19	8.18	0.55
S-20230821-1402-	117	100 Year	Exist	20.43	985.20	986.28		986.42	0.007228	3.01	6.80	8.44	0.59
S-20230821-1402-	117	100 Year	Proposed	20.43	985.20	986.28		986.42	0.007228	3.01	6.80	8.44	0.59
S-20230821-1402-	51.9	25 Year	Exist	16.89	985.06	985.43	985.43	985.53	0.029994	2.56	6.60	32.17	1.00
S-20230821-1402-	51.9	25 Year	Proposed	16.89	985.06	985.43	985.43	985.53	0.029994	2.56	6.60	32.17	1.00
S-20230821-1402-	51.9	100 Year	Exist	20.43	985.06	985.46	985.46	985.57	0.028878	2.69	7.59	33.26	0.99
S-20230821-1402-	51.9	100 Year	Proposed	20.43	985.06	985.46	985.46	985.57	0.028878	2.69	7.59	33.26	0.99

HEC-RAS River: Stream 2 Reach: S-20230822-1015-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230822-1015-	155	25 Year	Existing	2.91	1052.54	1052.67	1052.70	1052.77	0.088489	2.43	1.20	14.17	1.47
S-20230822-1015-	155	25 Year	Proposed	2.91	1052.54	1052.67	1052.70	1052.77	0.088489	2.43	1.20	14.17	1.47
S-20230822-1015-	155	100 Year	Existing	4.02	1052.54	1052.69	1052.73	1052.81	0.088657	2.71	1.48	14.93	1.52
S-20230822-1015-	155	100 Year	Proposed	4.02	1052.54	1052.69	1052.73	1052.81	0.088657	2.71	1.48	14.93	1.52
S-20230822-1015-	145	25 Year	Existing	2.91	1051.44	1051.64	1051.69	1051.78	0.105677	2.99	0.97	9.65	1.66
S-20230822-1015-	145	25 Year	Proposed	2.91	1051.44	1051.64	1051.69	1051.78	0.105677	2.99	0.97	9.65	1.66
S-20230822-1015-	145	100 Year	Existing	4.02	1051.44	1051.67	1051.72	1051.83	0.103639	3.22	1.25	10.95	1.68
S-20230822-1015-	145	100 Year	Proposed	4.02	1051.44	1051.67	1051.72	1051.83	0.103639	3.22	1.25	10.95	1.68
S-20230822-1015-	120			Culvert									
S-20230822-1015-	106	25 Year	Existing	2.91	1047.35	1047.71	1047.71	1047.83	0.029327	2.79	1.04	4.27	1.00
S-20230822-1015-	106	25 Year	Proposed	2.91	1047.35	1047.71	1047.71	1047.83	0.029319	2.79	1.04	4.27	1.00
S-20230822-1015-	106	100 Year	Existing	4.02	1047.35	1047.77	1047.77	1047.91	0.028631	3.07	1.31	4.55	1.01
S-20230822-1015-	106	100 Year	Proposed	4.02	1047.35	1047.77	1047.77	1047.91	0.028625	3.07	1.31	4.55	1.01
S-20230822-1015-	61	25 Year	Existing	2.91	1041.92	1042.05	1042.29	1043.78	1.084784	10.55	0.28	2.26	5.32
S-20230822-1015-	61	25 Year	Proposed	2.91	1041.92	1042.05	1042.29	1043.78	1.084784	10.55	0.28	2.26	5.32
S-20230822-1015-	61	100 Year	Existing	4.02	1041.92	1042.09	1042.38	1044.02	0.900728	11.16	0.36	2.33	5.01
S-20230822-1015-	61	100 Year	Proposed	4.02	1041.92	1042.09	1042.38	1044.02	0.900728	11.16	0.36	2.33	5.01

HEC-RAS River: Stream 3 Reach: S-20230822-1218-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230822-1218-	239	25 Year	Existing	2.53	1106.02	1106.12	1106.17	1106.26	0.180560	3.05	0.83	11.96	2.04
S-20230822-1218-	239	25 Year	Proposed	2.53	1106.02	1106.12	1106.17	1106.26	0.180560	3.05	0.83	11.96	2.04
S-20230822-1218-	239	100 Year	Existing	3.65	1106.02	1106.14	1106.19	1106.31	0.180365	3.31	1.10	14.02	2.08
S-20230822-1218-	239	100 Year	Proposed	3.65	1106.02	1106.14	1106.19	1106.31	0.180365	3.31	1.10	14.02	2.08
S-20230822-1218-	208	25 Year	Existing	2.53	1096.69	1097.79	1097.10	1097.79	0.000130	0.31	8.08	15.27	0.08
S-20230822-1218-	208	25 Year	Proposed	2.53	1096.69	1097.49	1097.10	1097.49	0.000743	0.60	4.19	10.96	0.17
S-20230822-1218-	208	100 Year	Existing	3.65	1096.69	1097.95	1097.16	1097.95	0.000125	0.34	10.79	17.66	0.08
S-20230822-1218-	208	100 Year	Proposed	3.65	1096.69	1097.62	1097.16	1097.63	0.000664	0.63	5.76	12.87	0.17
S-20230822-1218-	185			Culvert									
S-20230822-1218-	174	25 Year	Existing	2.53	1093.89	1094.24	1094.24	1094.39	0.029839	3.09	0.82	2.70	0.99
S-20230822-1218-	174	25 Year	Proposed	2.53	1093.89	1094.24	1094.24	1094.39	0.029839	3.09	0.82	2.70	0.99
S-20230822-1218-	174	100 Year	Existing	3.65	1093.89	1094.33	1094.33	1094.51	0.028408	3.42	1.07	2.88	0.99
S-20230822-1218-	174	100 Year	Proposed	3.65	1093.89	1094.33	1094.33	1094.51	0.028408	3.42	1.07	2.88	0.99
S-20230822-1218-	119	25 Year	Existing	2.53	1086.01	1086.24	1086.24	1086.30	0.036037	2.03	1.25	9.88	1.01
S-20230822-1218-	119	25 Year	Proposed	2.53	1086.01	1086.24	1086.24	1086.30	0.036037	2.03	1.25	9.88	1.01
S-20230822-1218-	119	100 Year	Existing	3.65	1086.01	1086.27	1086.27	1086.35	0.036718	2.25	1.62	11.13	1.04
S-20230822-1218-	119	100 Year	Proposed	3.65	1086.01	1086.27	1086.27	1086.35	0.036718	2.25	1.62	11.13	1.04

HEC-RAS River: Stream 4 Reach: S-20230822-1243-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230822-1243-	302	25 Year	Existing	5.35	1113.05	1113.28	1113.48	1114.00	0.215057	6.78	0.79	3.78	2.61
S-20230822-1243-	302	25 Year	Proposed	5.35	1113.05	1113.28	1113.48	1114.00	0.215057	6.78	0.79	3.78	2.61
S-20230822-1243-	302	100 Year	Existing	7.96	1113.05	1113.34	1113.59	1114.28	0.215126	7.76	1.03	3.98	2.70
S-20230822-1243-	302	100 Year	Proposed	7.96	1113.05	1113.34	1113.59	1114.28	0.215126	7.76	1.03	3.98	2.70
S-20230822-1243-	267	25 Year	Existing	5.35	1106.50	1108.07	1106.90	1108.07	0.000075	0.35	15.35	16.16	0.06
S-20230822-1243-	267	25 Year	Proposed	5.35	1106.50	1107.17	1106.90	1107.20	0.003061	1.34	3.98	9.04	0.36
S-20230822-1243-	267	100 Year	Existing	7.96	1106.50	1108.26	1106.99	1108.26	0.000103	0.43	18.64	18.29	0.07
S-20230822-1243-	267	100 Year	Proposed	7.96	1106.50	1107.30	1106.99	1107.33	0.003253	1.53	5.19	10.10	0.38
S-20230822-1243-	250			Culvert									
S-20230822-1243-	227	25 Year	Existing	5.35	1101.39	1101.98	1101.98	1102.17	0.027205	3.55	1.51	3.92	1.01
S-20230822-1243-	227	25 Year	Proposed	5.35	1101.39	1101.98	1101.98	1102.17	0.027205	3.55	1.51	3.92	1.01
S-20230822-1243-	227	100 Year	Existing	7.96	1101.39	1102.11	1102.11	1102.34	0.025440	3.86	2.06	4.49	1.00
S-20230822-1243-	227	100 Year	Proposed	7.96	1101.39	1102.11	1102.11	1102.34	0.025440	3.86	2.06	4.49	1.00
S-20230822-1243-	172	25 Year	Existing	5.35	1093.85	1093.95	1094.11	1096.71	5.031567	13.32	0.40	7.67	10.27
S-20230822-1243-	172	25 Year	Proposed	5.35	1093.85	1093.95	1094.11	1096.71	5.031567	13.32	0.40	7.67	10.27
S-20230822-1243-	172	100 Year	Existing	7.96	1093.85	1093.97	1094.16	1097.18	4.696945	14.37	0.55	8.97	10.20
S-20230822-1243-	172	100 Year	Proposed	7.96	1093.85	1093.97	1094.16	1097.18	4.696945	14.37	0.55	8.97	10.20

HEC-RAS River: Stream 5 Reach: S-20230823-1130-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1130-	464	25 Year	Existing	2.19	1130.53	1130.89	1130.93	1131.05	0.055861	3.27	0.67	3.34	1.29
S-20230823-1130-	464	25 Year	Proposed	2.19	1130.53	1130.89	1130.93	1131.05	0.055861	3.27	0.67	3.34	1.29
S-20230823-1130-	464	100 Year	Existing	2.79	1130.53	1130.92	1130.97	1131.11	0.055842	3.47	0.80	3.64	1.30
S-20230823-1130-	464	100 Year	Proposed	2.79	1130.53	1130.92	1130.97	1131.11	0.055842	3.47	0.80	3.64	1.30
S-20230823-1130-	427	25 Year	Existing	2.19	1128.26	1129.13	1128.53	1129.13	0.000258	0.42	5.26	10.69	0.10
S-20230823-1130-	427	25 Year	Proposed	2.19	1128.26	1128.47	1128.53	1128.66	0.075673	3.41	0.64	3.98	1.50
S-20230823-1130-	427	100 Year	Existing	2.79	1128.26	1129.25	1128.57	1129.25	0.000227	0.42	6.69	12.32	0.10
S-20230823-1130-	427	100 Year	Proposed	2.79	1128.26	1128.50	1128.57	1128.71	0.075763	3.67	0.76	4.23	1.53
S-20230823-1130-	400			Culvert									
S-20230823-1130-	366	25 Year	Existing	2.19	1122.15	1122.42	1122.63	1123.58	0.607850	8.64	0.25	1.80	4.06
S-20230823-1130-	366	25 Year	Proposed	2.19	1122.15	1122.63	1122.63	1122.76	0.031193	2.82	0.78	3.17	1.01
S-20230823-1130-	366	100 Year	Existing	2.79	1122.15	1122.45	1122.69	1123.66	0.546652	8.82	0.32	2.01	3.92
S-20230823-1130-	366	100 Year	Proposed	2.79	1122.15	1122.69	1122.69	1122.82	0.029647	2.91	0.96	3.62	1.00
S-20230823-1130-	313	25 Year	Existing	2.19	1115.46	1115.64	1115.64	1115.69	0.043986	1.74	1.26	14.58	1.04
S-20230823-1130-	313	25 Year	Proposed	2.19	1115.46	1115.64	1115.64	1115.69	0.043986	1.74	1.26	14.58	1.04
S-20230823-1130-	313	100 Year	Existing	2.79	1115.46	1115.67	1115.67	1115.71	0.034129	1.72	1.62	15.81	0.95
S-20230823-1130-	313	100 Year	Proposed	2.79	1115.46	1115.67	1115.67	1115.71	0.034129	1.72	1.62	15.81	0.95

HEC-RAS River: Stream 6 Reach: S-20230823-1225-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1225-	325	25 Year	Existing	1.85	1152.97	1153.15	1153.23	1153.42	0.201518	4.24	0.44	4.14	2.30
S-20230823-1225-	325	25 Year	Proposed	1.85	1152.97	1153.15	1153.23	1153.42	0.201518	4.24	0.44	4.14	2.30
S-20230823-1225-	325	100 Year	Existing	2.28	1152.97	1153.16	1153.25	1153.48	0.201486	4.49	0.51	4.41	2.34
S-20230823-1225-	325	100 Year	Proposed	2.28	1152.97	1153.16	1153.25	1153.48	0.201486	4.49	0.51	4.41	2.34
S-20230823-1225-	267	25 Year	Existing	1.85	1140.65	1141.04	1141.04	1141.18	0.032400	2.94	0.63	2.43	1.02
S-20230823-1225-	267	25 Year	Proposed	1.85	1140.65	1141.04	1141.04	1141.18	0.032400	2.94	0.63	2.43	1.02
S-20230823-1225-	267	100 Year	Existing	2.28	1140.65	1141.10	1141.10	1141.24	0.028992	3.00	0.76	2.61	0.98
S-20230823-1225-	267	100 Year	Proposed	2.28	1140.65	1141.10	1141.10	1141.24	0.028992	3.00	0.76	2.61	0.98
S-20230823-1225-	200			Culvert									
S-20230823-1225-	182	25 Year	Existing	1.85	1127.12	1127.31	1127.31	1127.35	0.041635	1.64	1.13	13.65	1.01
S-20230823-1225-	182	25 Year	Proposed	1.85	1127.12	1127.31	1127.31	1127.35	0.041618	1.64	1.13	13.65	1.01
S-20230823-1225-	182	100 Year	Existing	2.28	1127.12	1127.33	1127.33	1127.37	0.040829	1.71	1.33	14.96	1.01
S-20230823-1225-	182	100 Year	Proposed	2.28	1127.12	1127.33	1127.33	1127.37	0.040814	1.71	1.33	14.96	1.01
S-20230823-1225-	115	25 Year	Existing	1.85	1119.07	1119.18	1119.26	1119.69	0.938387	5.72	0.32	6.23	4.43
S-20230823-1225-	115	25 Year	Proposed	1.85	1119.07	1119.18	1119.26	1119.69	0.938387	5.72	0.32	6.23	4.43
S-20230823-1225-	115	100 Year	Existing	2.28	1119.07	1119.19	1119.28	1119.77	0.981432	6.12	0.37	6.69	4.58
S-20230823-1225-	115	100 Year	Proposed	2.28	1119.07	1119.19	1119.28	1119.77	0.981432	6.12	0.37	6.69	4.58

HEC-RAS River: Stream 7 Reach: S-20230823-1240-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1240-	425	25 Year	Existing	4.55	1186.36	1186.61	1186.75	1187.14	0.256429	5.87	0.78	5.41	2.73
S-20230823-1240-	425	25 Year	Proposed	4.55	1186.36	1186.61	1186.75	1187.14	0.256429	5.87	0.78	5.41	2.73
S-20230823-1240-	425	100 Year	Existing	6.62	1186.36	1186.65	1186.82	1187.30	0.256457	6.46	1.02	6.18	2.80
S-20230823-1240-	425	100 Year	Proposed	6.62	1186.36	1186.65	1186.82	1187.30	0.256457	6.46	1.02	6.18	2.80
S-20230823-1240-	367	25 Year	Existing	4.55	1170.73	1171.86	1171.50	1171.90	0.003724	1.57	2.90	5.70	0.39
S-20230823-1240-	367	25 Year	Proposed	4.55	1170.73	1171.25	1171.50	1172.24	0.252979	7.98	0.57	2.26	2.80
S-20230823-1240-	367	100 Year	Existing	6.62	1170.73	1172.14	1171.63	1172.17	0.002217	1.38	4.79	7.76	0.31
S-20230823-1240-	367	100 Year	Proposed	6.62	1170.73	1171.33	1171.63	1172.49	0.249043	8.67	0.76	2.65	2.85
S-20230823-1240-	300			Culvert									
S-20230823-1240-	295	25 Year	Existing	4.55	1154.74	1155.14	1155.14	1155.27	0.029129	2.91	1.57	6.06	1.01
S-20230823-1240-	295	25 Year	Proposed	4.55	1154.74	1155.14	1155.14	1155.27	0.029133	2.91	1.57	6.06	1.01
S-20230823-1240-	295	100 Year	Existing	6.62	1154.74	1155.23	1155.23	1155.38	0.024841	3.04	2.18	6.99	0.96
S-20230823-1240-	295	100 Year	Proposed	6.62	1154.74	1155.23	1155.23	1155.38	0.024840	3.04	2.18	6.99	0.96
S-20230823-1240-	235	25 Year	Existing	4.55	1145.98	1146.13	1146.45	1149.40	1.964685	14.50	0.31	2.55	7.29
S-20230823-1240-	235	25 Year	Proposed	4.55	1145.98	1146.13	1146.45	1149.40	1.964685	14.50	0.31	2.55	7.29
S-20230823-1240-	235	100 Year	Existing	6.62	1145.98	1146.17	1146.55	1150.20	1.858600	16.09	0.41	2.74	7.32
S-20230823-1240-	235	100 Year	Proposed	6.62	1145.98	1146.17	1146.55	1150.20	1.858600	16.09	0.41	2.74	7.32

HEC-RAS River: Stream 8 Reach: S-20230823-1338-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1338-	315.38	25 Year	Existing	1.07	1225.69	1225.85	1225.96	1226.25	0.237500	5.10	0.21	1.64	2.51
S-20230823-1338-	315.38	25 Year	Proposed	1.07	1225.69	1225.85	1225.96	1226.25	0.237500	5.10	0.21	1.64	2.51
S-20230823-1338-	315.38	100 Year	Existing	1.46	1225.69	1225.88	1226.01	1226.37	0.237416	5.61	0.26	1.76	2.57
S-20230823-1338-	315.38	100 Year	Proposed	1.46	1225.69	1225.88	1226.01	1226.37	0.237416	5.61	0.26	1.76	2.57
S-20230823-1338-	265.38	25 Year	Existing	1.07	1212.53	1212.68	1212.80	1213.15	0.291026	5.48	0.20	1.60	2.76
S-20230823-1338-	265.38	25 Year	Proposed	1.07	1212.53	1212.98	1212.80	1213.01	0.004630	1.25	0.86	2.80	0.40
S-20230823-1338-	265.38	100 Year	Existing	1.46	1212.53	1212.71	1212.85	1213.27	0.289959	6.01	0.24	1.72	2.82
S-20230823-1338-	265.38	100 Year	Proposed	1.46	1212.53	1212.71	1212.85	1213.27	0.289244	6.01	0.24	1.72	2.81
S-20230823-1338-	220.41	25 Year	Existing	1.07	1205.32	1205.54	1205.59	1205.72	0.074300	3.40	0.31	1.88	1.46
S-20230823-1338-	220.41	25 Year	Proposed	1.07	1205.32	1205.59	1205.59	1205.69	0.032770	2.54	0.42	2.09	1.00
S-20230823-1338-	220.41	100 Year	Existing	1.46	1205.32	1205.58	1205.64	1205.79	0.074845	3.73	0.39	2.03	1.50
S-20230823-1338-	220.41	100 Year	Proposed	1.46	1205.32	1205.64	1205.64	1205.76	0.031528	2.73	0.53	2.30	1.00
S-20230823-1338-	154.8	25 Year	Existing	1.07	1198.64	1198.80	1198.91	1199.18	0.215378	4.93	0.22	1.65	2.40
S-20230823-1338-	154.8	25 Year	Proposed	1.07	1198.64	1198.74	1198.91	1200.11	1.427312	9.40	0.11	1.38	5.77
S-20230823-1338-	154.8	100 Year	Existing	1.46	1198.64	1198.84	1198.96	1199.28	0.210496	5.38	0.27	1.78	2.43
S-20230823-1338-	154.8	100 Year	Proposed	1.46	1198.64	1198.76	1198.96	1200.38	1.349308	10.21	0.14	1.46	5.76

HEC-RAS River: Stream 9 Reach: S-20230823-1433-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1433-	162	25 Year	Existing	5.09	1267.28	1267.50	1267.60	1267.85	0.174644	4.74	1.07	7.76	2.25
S-20230823-1433-	162	25 Year	Proposed	5.09	1267.28	1267.50	1267.60	1267.85	0.174644	4.74	1.07	7.76	2.25
S-20230823-1433-	162	100 Year	Existing	5.84	1267.28	1267.51	1267.63	1267.89	0.174330	4.92	1.19	8.08	2.27
S-20230823-1433-	162	100 Year	Proposed	5.84	1267.28	1267.51	1267.63	1267.89	0.174330	4.92	1.19	8.08	2.27
S-20230823-1433-	114	25 Year	Existing	5.09	1259.00	1259.42	1259.63	1260.11	0.145346	6.70	0.76	2.66	2.21
S-20230823-1433-	114	25 Year	Proposed	5.09	1259.00	1259.91	1259.63	1259.97	0.005305	1.97	2.59	4.66	0.47
S-20230823-1433-	114	100 Year	Existing	5.84	1259.00	1259.45	1259.67	1260.19	0.143946	6.92	0.84	2.78	2.22
S-20230823-1433-	114	100 Year	Proposed	5.84	1259.00	1259.97	1259.67	1260.03	0.005434	2.06	2.84	4.87	0.48
S-20230823-1433-	80	25 Year	Existing	5.09	1256.97	1255.77	1255.80	1255.92	0.093700		1.68	8.22	0.00
S-20230823-1433-	80	25 Year	Proposed	5.09	1256.97	1255.80	1255.80	1255.91	0.065975		1.93	8.95	0.00
S-20230823-1433-	80	100 Year	Existing	5.84	1256.97	1255.79	1255.82	1255.95	0.095680		1.86	8.75	0.00
S-20230823-1433-	80	100 Year	Proposed	5.84	1256.97	1255.82	1255.82	1255.94	0.067635		2.13	9.50	0.00
S-20230823-1433-	16	25 Year	Existing	5.09	1247.85	1248.07	1248.21	1248.65	0.342385	6.10	0.83	6.83	3.08
S-20230823-1433-	16	25 Year	Proposed	5.09	1247.85	1248.05	1248.21	1248.98	0.673219	7.76	0.66	6.22	4.21
S-20230823-1433-	16	100 Year	Existing	5.84	1247.85	1248.09	1248.24	1248.69	0.327029	6.24	0.94	7.16	3.04
S-20230823-1433-	16	100 Year	Proposed	5.84	1247.85	1248.06	1248.24	1249.02	0.621874	7.85	0.74	6.53	4.10

HEC-RAS River: Stream 10 Reach: S-20230824-1355-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230824-1355-	197.47	25 Year	Existing	0.84	1320.19	1320.31	1320.36	1320.48	0.125542	3.32	0.25	2.36	1.79
S-20230824-1355-	197.47	25 Year	Proposed	0.84	1320.19	1320.31	1320.36	1320.48	0.125542	3.32	0.25	2.36	1.79
S-20230824-1355-	197.47	100 Year	Existing	1.05	1320.19	1320.32	1320.38	1320.52	0.125566	3.60	0.29	2.41	1.83
S-20230824-1355-	197.47	100 Year	Proposed	1.05	1320.19	1320.32	1320.38	1320.52	0.125566	3.60	0.29	2.41	1.83
S-20230824-1355-	144.31	25 Year	Existing	0.84	1309.60	1309.68	1309.77	1310.05	0.411173	4.85	0.17	2.25	3.08
S-20230824-1355-	144.31	25 Year	Proposed	0.84	1309.60	1309.94	1309.77	1309.96	0.003080	0.97	0.87	3.07	0.32
S-20230824-1355-	144.31	100 Year	Existing	1.05	1309.60	1309.69	1309.79	1310.12	0.407133	5.25	0.20	2.29	3.13
S-20230824-1355-	144.31	100 Year	Proposed	1.05	1309.60	1309.98	1309.79	1310.00	0.003254	1.06	0.99	3.19	0.34
S-20230824-1355-	100.96	25 Year	Existing	0.84	1300.16	1300.27	1300.33	1300.47	0.157656	3.58	0.23	2.34	1.99
S-20230824-1355-	100.96	25 Year	Proposed	0.84	1300.16	1300.33	1300.33	1300.40	0.035238	2.20	0.38	2.53	1.00
S-20230824-1355-	100.96	100 Year	Existing	1.05	1300.16	1300.30	1300.35	1300.49	0.117667	3.52	0.30	2.42	1.77
S-20230824-1355-	100.96	100 Year	Proposed	1.05	1300.16	1300.35	1300.35	1300.44	0.034123	2.35	0.45	2.61	1.00
S-20230824-1355-	49.19	25 Year	Existing	0.84	1295.07	1295.21	1295.24	1295.33	0.071729	2.78	0.30	2.43	1.39
S-20230824-1355-	49.19	25 Year	Proposed	0.84	1295.07	1295.14	1295.24	1295.65	0.704847	5.75	0.15	2.22	3.94
S-20230824-1355-	49.19	100 Year	Existing	1.05	1295.07	1295.22	1295.26	1295.38	0.089224	3.22	0.33	2.46	1.56
S-20230824-1355-	49.19	100 Year	Proposed	1.05	1295.07	1295.15	1295.26	1295.77	0.734185	6.32	0.17	2.24	4.10

HEC-RAS River: Stream 11 Reach: S-20230824-1304-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230824-1304-	281	25 Year	Existing	7.92	1329.65	1329.89	1329.93	1330.02	0.082459	2.89	2.74	23.77	1.50
S-20230824-1304-	281	25 Year	Proposed	7.92	1329.65	1329.89	1329.93	1330.02	0.082459	2.89	2.74	23.77	1.50
S-20230824-1304-	281	100 Year	Existing	10.66	1329.65	1329.92	1329.97	1330.07	0.082338	3.12	3.42	26.33	1.53
S-20230824-1304-	281	100 Year	Proposed	10.66	1329.65	1329.92	1329.97	1330.07	0.082338	3.12	3.42	26.33	1.53
S-20230824-1304-	227.25	25 Year	Existing	7.92	1321.61	1322.14	1322.40	1323.12	0.219818	7.95	1.00	3.80	2.74
S-20230824-1304-	227.25	25 Year	Proposed	7.92	1321.61	1322.15	1322.40	1323.09	0.209213	7.80	1.02	3.84	2.67
S-20230824-1304-	227.25	100 Year	Existing	10.66	1321.61	1322.21	1322.50	1323.30	0.208944	8.40	1.27	4.29	2.72
S-20230824-1304-	227.25	100 Year	Proposed	10.66	1321.61	1322.21	1322.50	1323.27	0.198028	8.23	1.29	4.33	2.66
S-20230824-1304-	195.23	25 Year	Existing	7.92	1317.75	1318.39	1318.59	1319.01	0.080683	6.32	1.25	2.92	1.70
S-20230824-1304-	195.23	25 Year	Proposed	7.92	1317.75	1318.47	1318.59	1318.90	0.049729	5.28	1.50	3.16	1.35
S-20230824-1304-	195.23	100 Year	Existing	10.66	1317.75	1318.49	1318.73	1319.22	0.082263	6.87	1.55	3.21	1.74
S-20230824-1304-	195.23	100 Year	Proposed	10.66	1317.75	1318.57	1318.72	1319.09	0.051648	5.78	1.84	3.47	1.40
S-20230824-1304-	135	25 Year	Existing	7.92	1309.55	1310.05	1310.39	1311.36	0.223435	9.19	0.86	2.48	2.75
S-20230824-1304-	135	25 Year	Proposed	7.92	1309.55	1309.97	1310.39	1312.07	0.428144	11.64	0.68	2.25	3.74
S-20230824-1304-	135	100 Year	Existing	10.66	1309.55	1310.13	1310.53	1311.61	0.212509	9.76	1.09	2.75	2.73
S-20230824-1304-	135	100 Year	Proposed	10.66	1309.55	1310.06	1310.53	1312.30	0.375045	12.02	0.89	2.51	3.57

HEC-RAS River: Stream 12 Reach: S-20230824-1305-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230824-1305-	410	25 Year	Existing	4.55	1330.00	1330.41	1330.55	1330.86	0.082368	5.37	0.85	2.61	1.66
S-20230824-1305-	410	25 Year	Proposed	4.55	1330.00	1330.41	1330.55	1330.86	0.082368	5.37	0.85	2.61	1.66
S-20230824-1305-	410	100 Year	Existing	5.84	1330.00	1330.47	1330.64	1330.99	0.082360	5.78	1.01	2.78	1.69
S-20230824-1305-	410	100 Year	Proposed	5.84	1330.00	1330.47	1330.64	1330.99	0.082360	5.78	1.01	2.78	1.69
S-20230824-1305-	357	25 Year	Existing	4.55	1325.69	1326.35	1326.35	1326.52	0.027326	3.28	1.39	4.11	1.00
S-20230824-1305-	357	25 Year	Proposed	4.55	1325.69	1326.56	1326.35	1326.62	0.006479	1.92	2.38	5.37	0.51
S-20230824-1305-	357	100 Year	Existing	5.84	1325.69	1326.42	1326.42	1326.61	0.025928	3.43	1.70	4.55	0.99
S-20230824-1305-	357	100 Year	Proposed	5.84	1325.69	1326.67	1326.42	1326.73	0.005426	1.95	3.06	7.59	0.48
S-20230824-1305-	319	25 Year	Existing	4.55	1324.13	1324.57	1324.68	1324.95	0.066450	4.98	0.91	2.68	1.50
S-20230824-1305-	319	25 Year	Proposed	4.55	1324.13	1324.68	1324.68	1324.89	0.028159	3.66	1.24	3.00	1.00
S-20230824-1305-	319	100 Year	Existing	5.84	1324.13	1324.63	1324.76	1325.08	0.067122	5.37	1.09	2.85	1.53
S-20230824-1305-	319	100 Year	Proposed	5.84	1324.13	1324.76	1324.76	1325.00	0.027711	3.90	1.50	3.22	1.01
S-20230824-1305-	260	25 Year	Existing	4.55	1315.37	1315.63	1315.92	1316.97	0.394505	9.27	0.49	2.22	3.47
S-20230824-1305-	260	25 Year	Proposed	4.55	1315.37	1315.54	1315.92	1319.28	1.812346	15.52	0.29	1.96	7.07
S-20230824-1305-	260	100 Year	Existing	5.84	1315.37	1315.68	1316.00	1317.17	0.370239	9.80	0.60	2.34	3.42
S-20230824-1305-	260	100 Year	Proposed	5.84	1315.37	1315.58	1316.00	1319.54	1.545424	15.97	0.37	2.06	6.68

HEC-RAS River: Stream 13 Reach: S-20230823-1117-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20230823-1117-	365	25 Year	Existing	14.89	1694.93	1695.12	1695.15	1695.26	0.056085	2.93	5.08	32.26	1.30
S-20230823-1117-	365	25 Year	Proposed	14.89	1694.93	1695.12	1695.15	1695.26	0.056085	2.93	5.08	32.26	1.30
S-20230823-1117-	365	100 Year	Existing	18.96	1694.93	1695.15	1695.18	1695.31	0.056111	3.22	5.89	32.52	1.33
S-20230823-1117-	365	100 Year	Proposed	18.96	1694.93	1695.15	1695.18	1695.31	0.056111	3.22	5.89	32.52	1.33
S-20230823-1117-	306	25 Year	Existing	14.89	1692.95	1693.29	1693.29	1693.42	0.027820	2.94	5.07	18.96	1.00
S-20230823-1117-	306	25 Year	Proposed	14.89	1692.95	1693.45	1693.29	1693.50	0.005997	1.75	8.50	21.82	0.49
S-20230823-1117-	306	100 Year	Existing	18.96	1692.95	1693.33	1693.33	1693.49	0.027940	3.19	5.95	19.73	1.02
S-20230823-1117-	306	100 Year	Proposed	18.96	1692.95	1693.52	1693.33	1693.58	0.005993	1.89	10.04	22.98	0.50
S-20230823-1117-	278	25 Year	Existing	14.89	1691.46	1691.87	1691.98	1692.18	0.076681	4.47	3.33	14.17	1.63
S-20230823-1117-	278	25 Year	Proposed	14.89	1691.46	1691.98	1691.98	1692.11	0.027239	2.96	5.04	18.35	0.99
S-20230823-1117-	278	100 Year	Existing	18.96	1691.46	1691.92	1692.02	1692.26	0.074943	4.69	4.04	15.75	1.63
S-20230823-1117-	278	100 Year	Proposed	18.96	1691.46	1692.02	1692.02	1692.18	0.028875	3.22	5.88	19.67	1.04
S-20230823-1117-	223	25 Year	Existing	14.89	1686.92	1687.17	1687.25	1687.45	0.096739	4.28	3.48	18.82	1.76
S-20230823-1117-	223	25 Year	Proposed	14.89	1686.92	1687.08	1687.25	1687.98	0.582774	7.61	1.96	17.19	3.98
S-20230823-1117-	223	100 Year	Existing	18.96	1686.92	1687.20	1687.30	1687.54	0.099117	4.69	4.04	19.39	1.81
S-20230823-1117-	223	100 Year	Proposed	18.96	1686.92	1687.11	1687.30	1688.04	0.460992	7.71	2.46	17.74	3.65

HEC-RAS River: Stream 14 Reach: S-20231017-1725-

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
S-20231017-1725-	730	25 Year	Existing	2.72	1704.42	1704.54	1704.54	1704.57	0.034073	1.49	1.83	22.05	0.91
S-20231017-1725-	730	25 Year	Proposed	2.72	1704.42	1704.54	1704.54	1704.57	0.034073	1.49	1.83	22.05	0.91
S-20231017-1725-	730	100 Year	Existing	4.39	1704.42	1704.56	1704.56	1704.62	0.040252	1.87	2.34	22.70	1.03
S-20231017-1725-	730	100 Year	Proposed	4.39	1704.42	1704.56	1704.56	1704.62	0.040252	1.87	2.34	22.70	1.03
S-20231017-1725-	675	25 Year	Existing	2.72	1694.97	1695.03	1695.12	1697.60	10.895720	12.86	0.21	7.61	13.60
S-20231017-1725-	675	25 Year	Proposed	2.72	1694.97	1695.04	1695.12	1696.10	3.628826	8.26	0.33	10.09	8.06
S-20231017-1725-	675	100 Year	Existing	4.39	1694.97	1695.05	1695.16	1696.90	5.708512	10.90	0.40	11.43	10.24
S-20231017-1725-	675	100 Year	Proposed	4.39	1694.97	1695.05	1695.16	1696.69	4.947256	10.25	0.43	11.99	9.55
S-20231017-1725-	624	25 Year	Existing	2.72	1684.04	1684.22	1684.23	1684.30	0.051172	2.22	1.22	10.99	1.17
S-20231017-1725-	624	25 Year	Proposed	2.72	1684.04	1684.23	1684.23	1684.29	0.036276	1.98	1.37	11.26	1.00
S-20231017-1725-	624	100 Year	Existing	4.39	1684.04	1684.24	1684.28	1684.38	0.072970	2.94	1.49	11.49	1.44
S-20231017-1725-	624	100 Year	Proposed	4.39	1684.04	1684.28	1684.28	1684.36	0.032784	2.25	1.95	12.29	1.00
S-20231017-1725-	560	25 Year	Existing	2.72	1675.28	1675.45	1675.58	1676.19	0.669867	6.92	0.39	4.42	4.08
S-20231017-1725-	560	25 Year	Proposed	2.72	1675.28	1675.42	1675.58	1677.00	1.842342	10.09	0.27	3.67	6.56
S-20231017-1725-	560	100 Year	Existing	4.39	1675.28	1675.52	1675.65	1676.03	0.293295	5.73	0.77	6.14	2.86
S-20231017-1725-	560	100 Year	Proposed	4.39	1675.28	1675.45	1675.65	1677.57	1.971567	11.68	0.38	4.32	6.98

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
S-2020230821-000	320	25 Year	Existing	11.74	1600.42	1600.63	1600.67	1600.78	0.078711	3.15	3.73	27.45	1.51
S-2020230821-000	320	25 Year	Proposed	11.74	1600.42	1600.63	1600.67	1600.78	0.078711	3.15	3.73	27.45	1.51
S-2020230821-000	320	100 Year	Existing	25.00	1600.42	1600.71	1600.78	1600.96	0.078667	4.02	6.22	31.74	1.60
S-2020230821-000	320	100 Year	Proposed	25.00	1600.42	1600.71	1600.78	1600.96	0.078667	4.02	6.22	31.74	1.60
S-2020230821-000	270	25 Year	Existing	11.74	1595.04	1595.58	1595.75	1596.14	0.109055	5.99	1.96	6.93	1.98
S-2020230821-000	270	25 Year	Proposed	11.74	1595.04	1596.08	1595.75	1596.13	0.003796	1.79	6.55	11.33	0.42
S-2020230821-000	270	100 Year	Existing	25.00	1595.04	1595.78	1596.03	1596.57	0.096294	7.11	3.52	8.74	1.98
S-2020230821-000	270	100 Year	Proposed	25.00	1595.04	1596.41	1596.03	1596.50	0.004322	2.33	10.72	13.73	0.47
S-2020230821-000	215	25 Year	Existing	11.74	1588.95	1589.27	1589.43	1589.78	0.122366	5.68	2.07	8.66	2.05
S-2020230821-000	215	25 Year	Proposed	11.74	1588.95	1589.43	1589.43	1589.60	0.026651	3.32	3.53	10.54	1.01
S-2020230821-000	215	100 Year	Existing	25.00	1588.95	1589.41	1589.66	1590.27	0.138127	7.42	3.37	10.34	2.29
S-2020230821-000	215	100 Year	Proposed	25.00	1588.95	1589.66	1589.66	1589.90	0.023277	3.91	6.40	13.51	1.00
S-2020230821-000	165	25 Year	Existing	11.74	1581.34	1581.84	1582.04	1582.57	0.170807	6.87	1.71	6.89	2.43
S-2020230821-000	165	25 Year	Proposed	11.74	1581.34	1581.68	1582.04	1585.16	1.362815	14.98	0.78	4.67	6.44
S-2020230821-000	165	100 Year	Existing	25.00	1581.34	1582.01	1582.30	1583.04	0.150924	8.13	3.07	8.77	2.42
S-2020230821-000	165	100 Year	Proposed	25.00	1581.34	1581.81	1582.30	1585.98	1.046686	16.39	1.53	6.51	5.97



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June 19, 2026

ADM Welding & Fabrication, LLC
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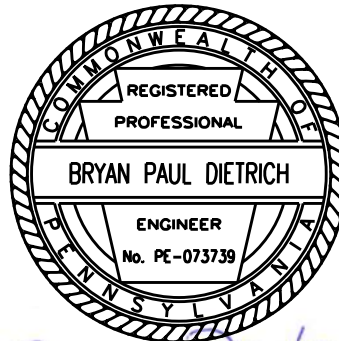
Subject: **ADM Bridge – Foundation Design
PGE- Saluda Access Road Structures
Trout Run, Pennsylvania
Markosky Project No. 26-010C**

To whom it may concern,

Markosky has prepared the attached foundation design for the ADM bridge structure crossing over Wallis Run for the Subject project. LRFD Design and Analysis methods were used to perform reinforced concrete cantilever abutment and wingwall analysis runs with PennDOT's ABLRFD program. Since boring information was not available at this location, a safe bearing capacity of approximately 2.5 TSF max. was conservatively considered.

Respectfully,

Bryan P. Dietrich, PE
Senior Project Manager



Bryan Dietrich
06/19/2026



Project No.: 26-010C Saluda Foundation Design
 Subject: ADM Bridge - Foundation Designs
 PGE - Saluda Access Road Structures
 Input for ABLRFD Analysis Runs

Computed By: LS Checked By: BPD Date: 05/28/2026

Abutment Stem Height Calculations:

PGE Bridge (ABUT. 2)

Prop Deck El - 960.22
 Exist Streambed El - 946.00

Overall Depth - 0.00 in (Asphalt)
 Deck Thick - 5.50 in (Timber)
 Beam Depth - 27.10 in (W27X102)

Superstr Depth - 32.60 in
 Brg Thick - 0.88 in (Bearing Plate)

Beam Seat El - 957.43

Top of Ftg Depth - 4 ft (below streambed)
 Top of Ftg El - 942.00

Abutment Stem Ht - 15.43 ft

PGE Bridge (ABUT. 1)

Prop Deck El - 958.71
 Exist Streambed El - 946.00

Overaly Depth - 0.00 in (Asphalt)
 Deck Thick - 5.50 in (Conc)
 Beam Depth - 27.10 in (W27x102)

Superstr Depth - 32.60 in
 Brg Thick - 0.88 in (Bearing Plate)

Beam Seat El - 955.92

Top of Ftg Depth - 5.51 ft (below streambed)
 Top of Ftg El - 940.49

Abutment Stem Ht - 15.43 ft

Min. Temperature & Shrinkage Reinforcement Calculations - Substructure:

References:

$$A_s \geq \frac{(1.30bh)}{2(b+h)f_y} \quad (A5.10.8)$$

$$A_s \geq 0.2in^2 \quad (D5.10.8.1P)$$

$f_y = 60.00 \text{ ksi}$

Substructure Location		b (in)	h (ft)	Min. A_s (in ²)	Rebar Selection			Check
					Bar Size	Bar Spa. (in)	A_s (in ²)	
Saluda Access Bridge Abutments	Stem Horiz. (F.F. & R.F)	21	15.43	0.20	#5	12	0.31	OK
	Stem Vertical (F.F. Only)	21	20	0.21	#5	12	0.31	OK
	Ftg. Parallel (Top & Bot.)	-	-	#VALUE!	Primary Abut Bars	Primary Abut Bars	#N/A	#N/A
Saluda Access Bridge Wingwalls	Stem Horiz. (F.F. & R.F)	36.75	18.75	0.34	#6	12	0.44	OK
	Stem Vertical (F.F. Only)	36.75	15	0.33	#6	12	0.44	OK
	Ftg. Parallel (Top & Bot.)	-	-	#VALUE!	Primary Wing Bars	Primary Wing Bars	#N/A	#N/A



Project No.: 26-010C Saluda Foundation Design
Subject: ADM Bridge - Foundation Designs
PGE - Saluda Access Road Structures
Input for ABLRFD Analysis Runs
Computed By: LS Checked By: BPD Date: 05/28/2026

TTL - TITLE

ADM BRIDGE - PGE SALUDA ACCESS RD

ABUTMENT & WINGWALL ANALYSIS

BY: LS DATE: 05/28/2026

CHKD: BPD DATE: 06/17/2026

CTL - CONTROL

System of Units - US US Customary Units

Type of Run - A Analysis

Footing Datum - blank Hold top of footing for Design, Leave blank for Analysis, default is top for analysis

AWB - ABUTMENT WITHOUT BACKWALL

Height - 15.43 ft
Top Width - 21 in
Bearing Location - 9 in
Front Face Horiz. Comp. - blank
Front Face Vert. Comp. - blank
Back Face Horiz. Comp. - blank (no batter since stem height <12ft.)
Back Face Vert. Comp. - blank
Additional Fill Height - 2.82 ft (960.25' - 957.43')*
Front Water Level - 3 ft (considers back water level + 3 ft)
Back Water Level - 0 ft (at top since adjacent to waterway)
Type of Wall - C Cantilever
Arch. Treat Thick. - blank

RWL - RETAINING WALL

Height - 18.75 ft (Abut Stem + Add Fill Ht + 6")
Top Width - 18.0 in
Front Face Horiz. Comp. - blank
Front Face Vert. Comp. - blank
Back Face Horiz. Comp. - blank
Back Face Vert. Comp. - 12.00 in
Exposed Stem Height - 6.00 in
Backfill Horiz/Vert/Slope - blank
Front Water Level - 3.5 ft (3 ft+ 6" above grade)
Back Water Level - 0.5 ft (6" above grade)
Type of Wall - C Cantilever
Arch. Treat Thick. - blank

* - from beam seat to PG at bridge end

FTG - FOOTING

Min. Footing Thickness - 2.00 ft
Minimum Toe Projection - 2.75 ft
Minimum Heel Projection - 15.00 ft
Minimum Footing Width - blank ft
Max. Footing Thickness - blank ft
Maximum Toe Projection - blank ft
Maximum Heel Projection - blank ft
Maximum Footing Width - blank ft
Footing Thick. Increment - blank in default = 2
Footing Width Increment - blank in default = 3
Footing Stem Increment - blank in default = 1

N/A

Min. Footing Thickness - 2.00 ft
Minimum Toe Projection - 2.00 ft
Minimum Heel Projection - 12.52 ft
Minimum Footing Width - blank ft
Max. Footing Thickness - blank ft
Maximum Toe Projection - blank ft
Maximum Heel Projection - blank ft
Maximum Footing Width - blank ft
Footing Thick. Increment - blank in default = 2
Footing Width Increment - blank in default = 3
Footing Stem Increment - blank in default = 1



Project No.: 26-010C Saluda Foundation Design

Subject: ADM Bridge - Foundation Designs

PGE - Saluda Access Road Structures

Input for ABLRFD Analysis Runs

Computed By: LS Checked By: BPD Date: 05/28/2026

MAT - MATERIALS

Backwall fc' - blank N/A

Stem fc' - 3 ksi

Footing fc' - 3 ksi

fy - 60 ksi

Backwall Reinf. Epoxy Coated - blank N/A

Stem Reinf. Epoxy Coated - Y Epoxy coated rebar, DM-4 D5.4.3.6(b)

Footing Reinf. Epoxy Coated - Y Epoxy coated rebar, DM-4 D5.4.3.6(b)

Backfill Friction Angle - 30 deg., (D3.11.5.5)

Backfill Unit Weight - Dry - 120 pcf, (D3.11.5.5)

Backfill Unit Weight - Sat. - 135 pcf, (D3.11.5.5)

Min. Equiv. Fluid Press. Backfill - 35 pcf, (D3.11.5.5)

Concrete Unit Weight for DL - 150 pcf

Concrete Unit Weight for E - 145 pcf

Unit Weight of Arch. Treat. - blank pcf

SOI - SOIL DATA

		(N/A)	
Stem Top of Soil Layer -	17.43 stem + footing	Stem Top of Soil Layer -	20.75 stem + footing
Footing Length -	20.00 ft (Conservatively consider only stem length)	Footing Length -	15.00 ft
Footing Near Slope -	N Footing is not near a slope	Footing Near Slope -	N Footing is not near a slope
Soil Level At Toe -	4.00 ft (min. placement depth, rock protection)	Soil Level At Toe -	4.00 ft
Allowable Settlement -	1 in	Allowable Settlement -	1 in
Bearing Cap. Phi Factor -	0.45 (Considers poor soil cond.)	Bearing Cap. Phi Factor -	0.45 (See Geotech Consultant email)
Sliding Phi Factor -	0.80 (Considers poor soil cond.)	Sliding Phi Factor -	0.80 (See Geotech Consultant email)
Number of Soil Layers -	1	Number of Soil Layers -	1
Soil Layer Thickness -	20.00 ft (Considers Poor Soil Conditions)	Soil Layer Thickness -	20.00 ft (~Boring Depth, Geotech Report)
Undrained Shr Strength -	blank ksf	Undrained Shr Strength -	blank ksf
Mass Unit Wght/Dens -	120 pcf, (Considers poor soil cond.)	Mass Unit Wght/Dens -	120 pcf, (from Geotech Report)
Sat Unit Wght/Dens -	137 pcf, (Considers poor soil cond.)	Sat Unit Wght/Dens -	137 pcf, (from Geotech Report)
Elastic Modulus -	300 ksf, (Considers poor soil cond.)	Elastic Modulus -	300 ksf, (from Geotech Report)
Poisson's Ratio -	blank leave blank per ABLRFD Manual	Poisson's Ratio -	blank leave blank per ABLRFD Manual
Cohesion -	blank ksf	Cohesion -	blank ksf
Effective Friction Angle -	30 deg, (Considers poor soil cond.)	Effective Friction Angle -	30 deg, (from Geotech Report)
Ncq -	blank (field no longer used, but not near slope)	Ncq -	blank (field no longer used)
Nyq -	blank (field no longer used, but not near slope)	Nyq -	blank (field no longer used)



Project No.:

26-010C Saluda Foundation Design

Subject:

ADM Bridge - Foundation Designs

PGE - Saluda Access Road Structures

Input for ABLRFD Analysis Runs

Computed By: LS

Checked By: BPD

Date: 05/28/2026

MRD - MISCELLANEOUS REINFORCEMENT DATA

Aggregate Size - 1.0 in, No. 57 coarse aggregate
Development Correction - 1.0
Backwall Exposure - blank
Stem Exposure - 1.0 Class 1 considered
Footing Exposure - 1.0 Class 1 considered

CVR - REINFORCEMENT COVER (Abutments)

Backwall Cover Back, Ver. - blank N/A
Stem Cover Back, Ver. - 3 in, considered
Footing Cover Top, Perpend. - 3 in, considered
Footing Cover Top, Parallel - blank
Footing Cover Bot., Perpend. - 4 in, considered
Footing Cover Bot., Parallel - blank
Toe End Cover - 2 in, considered
Heel End Cover - 2 in, considered

CVR - REINFORCEMENT COVER (Wingwalls)

Backwall Cover Back, Ver. - blank N/A
Stem Cover Back, Ver. - 3 in, considered
Footing Cover Top, Perpend. - 3.875 in (inside Abutment Top bar)
Footing Cover Top, Parallel - blank
Footing Cover Bot., Perpend. - 4.75 in (inside Abutment Bot bar)
Footing Cover Bot., Parallel - blank
Toe End Cover - 2 in, considered
Heel End Cover - 2 in, considered

BAR - BAR SIZE (Abutments)

Backwall Back Vertical - blank
Footing Top Perpend. - 7
Footing Top Parallel - blank for spread footing
Footing Bot Perpend. - 6
Footing Bot Parallel - blank for spread footing
Ftg. Top Perp. Bar Type - S
Ftg. Bot. Perp. Bar Type - S

BAR - BAR SIZE (Wingwalls)

Backwall Back Vertical - blank
Footing Top Perpend. - 7
Footing Top Parallel - blank for spread footing
Footing Bot Perpend. - 5
Footing Bot Parallel - blank for spread footing
Ftg. Top Perp. Bar Type - S
Ftg. Bot. Perp. Bar Type - S

SPA - BAR SPACING FOR ANALYSIS

Backwall Back Vertical - blank in
Footing Top Perpend. - 6 in
Footing Top Parallel - blank for spread footing
Footing Bot Perpend. - 12 in
Footing Bot Parallel - blank for spread footing

SPA - BAR SPACING FOR ANALYSIS

Backwall Back Vertical - blank in
Footing Top Perpend. - 6 in
Footing Top Parallel - blank for spread footing
Footing Bot Perpend. - 12 in
Footing Bot Parallel - blank for spread footing

SRB - STEM REINFORCEMENT BARS

Bar Size - 8
Bar Spacing - 12 in
Group Offset - blank in (for 1st occurrence of this parameter)
End Location - 15.43 ft
Bar Size - 8
Bar Spacing - 12 in
Group Offset - 6 in (for 2nd occurrence of this parameter)
End Location - 4.67 ft (8ft - 3.33ft development length)

SRB - STEM REINFORCEMENT BARS

Bar Size - 7
Bar Spacing - 12 in
Group Offset - blank in (for 1st occurrence)
End Location - 18.75 ft
Bar Size - 7
Bar Spacing - 12 in
Group Offset - 6 in (for 2nd occurrence)
End Location - 5.00 ft (8ft - 3ft dev. length)



Project No.: 26-010C Saluda Foundation Design

Subject: ADM Bridge - Foundation Designs

PGE - Saluda Access Road Structures

Input for ABLRFD Analysis Runs

Computed By: LS Checked By: BPD Date: 05/28/2026

LDC - LOAD CONTROL

Ductility Factor - blank DM-4 D1.3.3, default = 1

Redundancy Factor - blank DM-4 D1.3.4, default = 1

Importance Factor - blank DM-4 D1.3.5, default = 1

Temp. LS - 3.00 ft, Assume this surcharge to account for construction equipment

Final LS - 3.00 ft (DM-4 Table D3.11.6.4-1)

Temp. ES - 0.00 ft

Final ES - 0.00 ft, No earth surcharge present

LAB - LOADS ON ABUTMENTS

DC - 1.850 37 kips (DL RXN from ADM) / 20' = 1.85 klf

DW - blank kip/ft

PL - blank

Vertical WS - -0.480 -0.02 ksf x 60'/2 x 16.0' / 20.0' = -0.480 klf

Horizontal WS - blank bearings not fixed

WL - blank bearings not fixed

TU - blank n/a

Vertical Backwall LL - blank none

Horizontal Backwall LL - blank none

Horiz. WS on Substructure - 0.000 considered negligible exposure of abutment stem

FR - 0.000 considered negligible

DLL - DESIGN LIVE LOADING

Downward LL - 5.54 110.7 kips (LL RXN from ADM) / 20' = 5.54 klf

Upward LL - 0.00

BR - 0.00 bearings not fixed

CE - 0.00



Project No.: 26-010C Saluda Foundation Design
Subject: ADM Bridge - Foundation Designs
PGE - Saluda Access Road Structures
Input for ABLRFD Analysis Runs
Computed By: LS Checked By: BPD Date: 05/28/2026

OIN - OUTPUT OF INPUT

Input File Echo - blank default = 0
Input Commands - 1 default = 0
Input Summary - blank default = 1

OUR - OUT OF RESULTS

Footing Geometry - blank default = 1
Output Legend - blank default = 1
Factored Forces - blank default = 1
Footing Stability - blank default = 1
Footing Controlling Forces - blank default = 1
Footing Flexure - blank default = 1
Reinforcement Summary - blank default = 1
Crack Control - blank default = 1
Shear Results - blank default = 1
Development Length - blank N/A for analysis

OUI - OUTPUT OF INTERMEDIATE DATA

Unfactored Forces - blank default = 0
Load Factors - blank default = 0
Moment/Axial Interaction - blank default = 1
Internal Footing Forces - blank default = 0
Int Bearing Resist Values - blank default = 0
Detailed Cutoff Info - blank default = 0
Minimum Reinf Check - blank default = 1 for analysis

```
*****
*
* Program Title      LRFD Abutment and Retaining Wall
* Program Name      ABLRFD
* Version           1.20.0.0
* Last Updated      04/05/2025
* Documentation      04/2025
* License No.       333193
*
*****
*
* ADM BRIDGE - PGE SALUDA ACCESS RD
* ABUTMENT ANALYSIS
* DESIGNED BY: LS    DATE: 5/29/2026
* CHECKED BY: BPD    DATE:
*
*****
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*
*****
```

COMMAND: CTL			
SYSTEM OF UNITS	US		
TYPE OF RUN	A		
FOOTING DATUM	*		(computed, if necessary)
COMMAND: AWB			
HEIGHT	15.43	ft	
TOP WIDTH	21	in	
BEARING LOCATION	9	in	
FRONT FACE HORZ COMP.	*		(computed, if necessary)
FRONT FACE VERT COMP.	*		(computed, if necessary)
BACK FACE HORZ COMP.	*		(computed, if necessary)
BACK FACE VERT COMP.	*		(computed, if necessary)
ADDITIONAL FILL HEIGHT	2.82	ft	
FRONT WATER LEVEL	3	ft	
BACK WATER LEVEL	0	ft	
TYPE OF WALL	C		
ARCHT TREAT THICKNESS	0.0	in	(default)
COMMAND: FTG			
MINIMUM FOOTING THICKNESS	2	ft	
MINIMUM TOE PROJECTION	2.75	ft	
MINIMUM HEEL PROJECTION	15	ft	
MINIMUM FOOTING WIDTH	*	ft	(computed, if necessary)
MAXIMUM FOOTING THICKNESS	*	ft	(computed, if necessary)
MAXIMUM TOE PROJECTION	*	ft	(computed, if necessary)
MAXIMUM HEEL PROJECTION	*	ft	(computed, if necessary)
MAXIMUM FOOTING WIDTH	*	ft	(computed, if necessary)
FOOTING THICK INCREMENT	2.0	in	(default)
FOOTING WIDTH INCREMENT	3.0	in	(default)
FOOTING STEM INCREMENT	1.0	in	(default)
COMMAND: MAT			
BACKWALL CONC. STRENGTH	*	ksi	(computed, if necessary)
STEM CONC. STRENGTH	3	ksi	
FOOTING CONC. STRENGTH	3	ksi	
REINF. YIELD STRENGTH	60	ksi	
EPOXY COAT BARS - BACK	*		(computed, if necessary)
EPOXY COAT BARS - STEM	Y		
EPOXY COAT BARS - FOOT	Y		
BACKFILL FRICTION ANGLE	30	deg	
BACKFILL UNIT WEIGHT DRY	120	lb/ft^3	
BACKFILL UNIT WEIGHT SAT	135	lb/ft^3	
MIN EQUIV EARTH PRESSURE	35	lb/ft^3	
DENSITY OF CONC. FOR DL	150	lb/ft^3	
DENSITY OF CONC. FOR E	145	lb/ft^3	
DENSITY OF CONC. FOR AT	150.0	lb/ft^3	(default)
REINF ULT TENS STRENGTH	*	ksi	(computed, if necessary)
COMMAND: SOI			
STEM TOP TO SOIL LAYER	17.43	ft	
FOOTING LENGTH (PARALLEL)	20	ft	
FOOTING NEAR SLOPE?	N		
SOIL LEVEL AT TOE	4	ft	
ALLOWABLE SETTLEMENT	1	in	
BEARING CAPACITY PHI FACTOR	0.45		
SLIDING PHI FACTOR	0.80		
NUMBER OF SOIL LAYERS	1		
LAYER 1 SOIL LAYER THICKNESS	20	ft	
LAYER 1 UNDRAINED SHEAR STRENGTH	*	ksf	(computed, if necessary)
LAYER 1 MASS UNIT WEIGHT	120	lb/ft^3	
LAYER 1 SATURATED UNIT WEIGHT	137	lb/ft^3	
LAYER 1 ELASTIC MODULUS	300	ksf	
LAYER 1 POISSON'S RATIO	*		(computed, if necessary)
LAYER 1 COHESION	*	ksf	(computed, if necessary)
LAYER 1 EFFECTIVE FRICTION ANGLE	30	deg	
LAYER 1 NCQ (NEAR SLOPE)	*		(computed, if necessary)
LAYER 1 N_GAMMA_Q (NEAR SLOPE)	*		(computed, if necessary)
LAYER 2 SOIL LAYER THICKNESS	*	ft	(computed, if necessary)
LAYER 2 UNDRAINED SHEAR STRENGTH	*	ksf	(computed, if necessary)
LAYER 2 MASS UNIT WEIGHT	*	lb/ft^3	(computed, if necessary)
LAYER 2 SATURATED UNIT WEIGHT	*	lb/ft^3	(computed, if necessary)
LAYER 2 ELASTIC MODULUS	*	ksf	(computed, if necessary)
LAYER 2 POISSON'S RATIO	*		(computed, if necessary)
LAYER 2 COHESION	*	ksf	(computed, if necessary)
LAYER 2 EFFECTIVE FRICTION ANGLE	*	deg	(computed, if necessary)

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY OF INPUT FILE (cont.)

```

COMMAND: SOI (cont.)
  LAYER 2 NCQ (NEAR SLOPE)                *          (computed, if necessary)
  LAYER 2 N_GAMMA_Q (NEAR SLOPE)          *          (computed, if necessary)
  APPLY INCLINATION FACTOR                Y          (default)
  PRECAST OR CAST-IN-PLACE                C          (default)
  LAYER 1 REDUCTION COEFFICIENT RCBC1      *          (computed, if necessary)
  LAYER 2 REDUCTION COEFFICIENT RCBC2      *          (computed, if necessary)

COMMAND: MRD
  AGGREGATE SIZE                          1 in
  DEVELOPMENT CORRECTION                  1
  BACKWALL EXPOSURE                       *          (computed, if necessary)
  STEM EXPOSURE                           1
  FOOTING EXPOSURE                        1

COMMAND: CVR
  BACKWALL BACK - VERT.                   * in        (computed, if necessary)
  STEM BACK - VERTICAL                     3 in
  FOOTING TOP PERPEND.                    3 in
  FOOTING TOP PARALLEL                     * in        (computed, if necessary)
  FOOTING BOTTOM PERPEND.                  4 in
  FOOTING BOTTOM PARALLEL                   * in        (computed, if necessary)
  TOE END COVER                           2 in
  HEEL END COVER                           2 in

COMMAND: BAR
  BACKWALL BACK - VERT.                   * US bar    (computed, if necessary)
  FOOTING TOP PERPEND.                    7 US bar    (computed, if necessary)
  FOOTING TOP PARALLEL                     * US bar    (computed, if necessary)
  FOOTING BOTTOM PERPEND.                   6 US bar    (computed, if necessary)
  FOOTING BOTTOM PARALLEL                   * US bar    (computed, if necessary)
  FOOTING TOP PERP HOOKED                  S
  FOOTING BOT PERP HOOKED                  S

COMMAND: SPA
  BACKWALL BACK - VERT.                   * in        (computed, if necessary)
  FOOTING TOP PERPEND.                     6 in
  FOOTING TOP PARALLEL                     * in        (computed, if necessary)
  FOOTING BOTTOM PERPEND.                  12 in
  FOOTING BOTTOM PARALLEL                   * in        (computed, if necessary)

COMMAND: SRB
  BAR SIZE                                8 US bar
  BAR SPACING                             12 in
  GROUP OFFSET                            * in        (computed, if necessary)
  END LOCATION                           15.43 ft
  BAR SIZE                                8 US bar
  BAR SPACING                             12 in
  GROUP OFFSET                             6 in
  END LOCATION                           4.67 ft

COMMAND: LDC
  DUCTILITY FACTOR (ETA)                   1.0         (default)
  REDUNDANCY FACTOR (ETA)                   1.0         (default)
  IMPORTANCE FACTOR (ETA)                   1.0         (default)
  LS (TEMP STAGE)                          3 ft
  LS (FINAL STAGE)                         3 ft
  ES (TEMP STAGE)                          0 ft
  ES (FINAL STAGE)                         0 ft

COMMAND: LAB
  DC - SUPERSTRUCTURE                     1.850 kip/ft
  DW - SUPERSTRUCTURE                      0.0 kip/ft (default)
  PL - PEDESTRIAN                         * kip/ft    (computed, if necessary)
  WS - WIND VERTICAL ON SUPERSTRUCTURE     -0.48 kip/ft
  WS - WIND HORIZONTAL ON SUPERSTRUCTURE   * kip/ft    (computed, if necessary)
  WL - WIND ON LIVE LOAD                   0.0 kip/ft (default)
  TU - THERMAL FORCE                        0.0 kip/ft (default)
  BACKWALL VERTICAL LIVE LOAD              * kip/ft    (computed, if necessary)
  BACKWALL HORIZONTAL LIVE LOAD            * kip/ft    (computed, if necessary)
  WS - WIND HORIZONTAL ON SUBSTRUCTURE     0.0 kip/ft (default)
  FR - FRICTION FORCE                      0.0 kip/ft (default)
  WS1 - WIND HORZ SUPERSTRUCTURE SERVICE-I 0.0 kip/ft (default)
  WS3 - WIND HORZ SUPERSTRUCTURE STRENGTH-III 0.0 kip/ft (default)
  WS5 - WIND HORZ SUPERSTRUCTURE STRENGTH-V 0.0 kip/ft (default)
  WS1 - WIND HORZ SUBSTRUCTURE SERVICE-I 0.0 kip/ft (default)

```

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY OF INPUT FILE (cont.)

COMMAND: LAB (cont.)

WS3 - WIND HORZ SUBSTRUCTURE STRENGTH-III	0.0 kip/ft	(default)
WS5 - WIND HORZ SUBSTRUCTURE STRENGTH-V	0.0 kip/ft	(default)

COMMAND: DLL

DESIGN LL - LIVE LOAD - DOWNWARD	5.54 kip/ft	
DESIGN LL - LIVE LOAD - UPWARD	0.0 kip/ft	(default)
DESIGN BR - BRAKING FORCE	0.0 kip/ft	(default)
DESIGN CE - CENTRIFUGAL FORCE	0.0 kip/ft	(default)
PERMIT LL - LIVE LOAD - DOWNWARD	0.0 kip/ft	(default)
PERMIT LL - LIVE LOAD - UPWARD	0.0 kip/ft	(default)
PERMIT BR - BRAKING FORCE	0.0 kip/ft	(default)
PERMIT CE - CENTRIFUGAL FORCE	0.0 kip/ft	(default)

COMMAND: OIN

INPUT FILE ECHO	0
INPUT COMMANDS	1
INPUT SUMMARY	1

COMMAND: OUR

FOOTING GEOMETRY	1	(default)
OUTPUT LEGEND	1	(default)
FACTORED FORCES	1	(default)
FOOTING STABILITY	1	(default)
CONTROL FOOTING FORCES	1	(default)
FOOTING FLEXURE	1	(default)
REINFORCEMENT SUMMARY	1	(default)
CRACK CONTROL	1	(default)
SHEAR RESULTS	1	(default)
DEVELOPMENT LENGTH	1	(default)

COMMAND: OUI

UNFACTORED LOADS	0	(default)
LOAD FACTORS	0	(default)
MOMENT AXIAL INTERACTION	1	(default)
INTERNAL FOOTING FORCES	0	(default)
BEARING RESISTANCE VALUES	*	(computed, if necessary)
DETAILED CUTOFF VALUES	0	(default)
MIN REINFORCEMENT CHECK	*	(computed, if necessary)
INTERMEDIATE SETTLEMENT DATA	*	(computed, if necessary)

The following are system settings:

PRINT DIMENSION FILE	N	(default)
HISTORY FILE	0	(default)
SOIL HISTORY	0	(default)

ADM BRIDGE - PGE SALUDA ACCESS RD
 INPUT SUMMARY

CONTROL

Sys of Units US	Type of Run A	Footing Datum T				
Height (ft)	Top Width (in)	Bearing Location (in)	Front Face Horizontal Component	Front Face Vertical Component	Back Face Horizontal Component	Back Face Vertical Component
15.43	21.0	9.0	none	none	none	none
Additional Fill Height (ft)	Front Water Level (ft)	Back Water Level (ft)	Type of Wall	Architectural Treatment Thickness (in)		
2.82	3.00	0.00	C	0.0		

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
2.00	2.75	15.00	none	none	none	none	none
Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)					
2.00	3.00	1.00					

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Backwall	Epoxy Coated Stem	Concrete Footing
NA	3.000	3.000	60.000	NA	Y	Y
Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete For DL (lb/ft^3)	Density For Ec (lb/ft^3)	
30.00	120.0	135.0	35.0	150.0	145.0	

Architectural Treatment Density (lb/ft^3)	fu (ksi)
150.0	90.000

SOIL

Stem Top to Soil Layer (ft)	Footing Length (Parallel) (ft)	Footing Near Slope	Soil Level At Toe (ft)	Allow Settle (in)	Bearing Cap Resistance Factor	Sliding Resist Factor	No. Soil Layers
17.43	20.00	N	4.00	1.00	0.45	0.80	1
Soil Layer Number	Soil Layer Thick (ft)	Undrained Shear Strength (ksf)	Mass Unit Weight/ Density (lb/ft^3)	Saturated Unit Weight/ Density (lb/ft^3)	Elastic Modulus (ksf)	Poissons Ratio	
1	20.00	none	120.00	137.00	300.00	0.00	
Soil Layer Number	Cohesion (ksf)	Effective Friction Angle (deg)	Ncq	N Gamma q			
1	none	30.00	n/a	n/a			
Apply Inclination Factors Y	Precast or Cast-in- Place C	Reduction Coefficients Layer 1 Layer 2	RC(BC) Layer 1 Layer 2				
		none none	none none				

ADM BRIDGE - PGE SALUDA ACCESS RD
INPUT SUMMARY (cont.)

MISCELLANEOUS REINFORCEMENT DATA							
Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class			
1.00	1.00	none	1	1			
REINFORCEMENT COVER							
Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
none	3.0	3.0	none	4.0	none	2.0	2.0
BAR SIZE							
Backwall Back Vertical (US bar)	Footing Top Perpend (US bar)	Footing Top Parallel (US bar)	Footing Bottom Perpend (US bar)	Footing Bottom Parallel (US bar)	Footing Top Bar Type	Footing Bottom Bar Type	
none	7	none	6	none	Straight	Straight	
BAR SPACING FOR ANALYSIS							
Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)			
none	6.0	0.0	12.0	0.0			

STEM REINFORCING BARS						
Range Number	Bar Size (US bar)	Bar Spacing (in)	Group Offset (in)	End Location (ft)		
1	8	12.00	0.00	15.43		
2	8	12.00	6.00	4.67		
LOAD CONTROL						
Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)
1.00	1.00	1.00	3.00	3.00	0.00	0.00

LOADS ON ABUTMENTS							
DC (kip/ft)	DW (kip/ft)	PL (kip/ft)	Vertical WSUP (kip/ft)	Horizontal WSUP (kip/ft)	WL (kip/ft)	TU (kip/ft)	Backwall Vertical LL (kip/ft)
1.85	0.00	none	-0.48	n/a	0.00	0.00	none
Horizontal WSUB (kip/ft)	FR (kip/ft)	SER-I (kip/ft)	STR-III (kip/ft)	STR-V (kip/ft)	SER-I (kip/ft)	STR-III (kip/ft)	STR-V (kip/ft)
n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DESIGN LIVE LOAD			
Downward LL (kip/ft)	Upward LL (kip/ft)	BR (kip/ft)	CE (kip/ft)
5.54	0.00	0.00	0.00

PERMIT LIVE LOAD			
Downward LL (kip/ft)	Upward LL (kip/ft)	BR (kip/ft)	CE (kip/ft)
0.00	0.00	0.00	0.00

OUTPUT OF INPUT DATA		
Input File Echo	Input Commands	Input Summary
0	1	1

OUTPUT OF RESULTS						
Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Footing Flexure	Reinf Summary
1	1	1	1	1	1	1

ADM BRIDGE - PGE SALUDA ACCESS RD
INPUT SUMMARY (cont.)

OUTPUT OF RESULTS (cont.)

Crack Control	Shear Results	Development Length
1	1	1

OUTPUT OF INTERMEDIATE DATA

Unfactored Forces	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resistance Values	Detailed Stem Cutoff Load Values
0	0	1	0	0	0
Minimum Check	Reinforcement	Intermediate Settlement Data			
	1	0			

ADM BRIDGE - PGE SALUDA ACCESS RD
 ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection		Effective Depth		Stem Width Footing Top (ft)
		Toe (ft)	Heel (ft)	Toe (ft)	Heel (ft)	
2.00	19.50	2.75	15.00	1.64	1.71	1.75

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

COMPUTED VALUES

Front Water Level (ft)(1)	Concrete Density Factor (2)	Modulus of Rupture (3)			Modulus of Elasticity			Modular Ratio		
		Backwall (ksi)	Stem (ksi)	Footing (ksi)	Backwall (ksi)	Stem (ksi)	Footing (ksi)	Bckw	Stem	Foot
N/A	1.000	N/A	0.416	0.416	N/A	3100.	3100.	N/A	9.	9.

- Notes: (1) The computed value complies with DM-4 Section 3.11.3.
 (2) The concrete density modification factor is defined according to AASHTO LRFD Specifications Section 5.4.2.8.
 (3) Modulus of Rupture defined according to AASHTO LRFD Specifications Section 5.4.2.6.

ADM BRIDGE - PGE SALUDA ACCESS RD
OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-II	Strength II	-
STR-III	Strength III	-
STR-V	Strength V	-
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear, reversible horizontal loads towards superstructure
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear, reversible horizontal loads towards superstructure
MxVMnH	MxVMnH	- Maximum downward vertical force, reversible horizontal loads toward abutment
MnVMnH	MnVMnH	- Minimum downward vertical force, reversible horizontal loads toward abutment

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
STR-I	Max	Tmp	9.19	46.76	-517.24
STR-I	Min	Tmp	8.44	32.36	-360.91
STR-I	Max	Fin	7.08	66.29	-598.20
STR-I	Min	Fin	6.71	39.39	-393.09
STR-I	MxVMnH	Fin	7.08	66.29	-598.20
STR-I	MnVMnH	Fin	6.71	39.39	-393.09
STR-II	Max	Tmp	9.20	45.41	-501.04
STR-II	Min	Tmp	8.44	31.01	-344.71
STR-II	Max	Fin	7.70	54.44	-538.35
STR-II	Min	Fin	6.66	37.23	-367.17
STR-II	MxVMnH	Fin	7.70	54.44	-538.35
STR-II	MnVMnH	Fin	6.66	37.23	-367.17
STR-III	Max	Tmp	9.33	37.31	-403.84
STR-III	Min	Tmp	8.37	22.91	-247.51
STR-III	Max	Fin	7.74	47.15	-450.87
STR-III	Min	Fin	6.52	29.46	-278.01
STR-III	MxVMnH	Fin	7.74	47.15	-450.87
STR-III	MnVMnH	Fin	6.52	29.46	-278.01
STR-V	Max	Tmp	9.20	45.41	-501.04
STR-V	Min	Tmp	8.44	31.01	-344.71
STR-V	Max	Fin	7.70	54.44	-538.35
STR-V	Min	Fin	6.66	37.23	-367.17
STR-V	MxVMnH	Fin	7.70	54.44	-538.35
STR-V	MnVMnH	Fin	6.66	37.23	-367.17
SER-I	Max	Tmp	8.74	29.30	-319.48
SER-I	Min	Tmp	8.74	29.30	-319.48
SER-I	Max	Fin	6.72	42.21	-373.59
SER-I	Min	Fin	7.21	36.67	-354.20
SER-I	MxVMnH	Fin	6.72	42.21	-373.59
SER-I	MnVMnH	Fin	7.21	36.67	-354.20
CSS	Max	Fin	7.17	31.27	-289.40
CSS	Min	Fin	7.17	31.27	-289.40
CSS	MxVMnH	Fin	7.17	31.27	-289.40
CSS	MnVMnH	Fin	7.17	31.27	-289.40

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
STR-I	Max	Tmp	9.19	12.16	87.73
STR-I	Min	Tmp	8.44	12.16	87.73
STR-I	Max	Fin	7.08	15.94	128.97
STR-I	Min	Fin	6.71	15.94	128.97
STR-I	MxVMnH	Fin	7.08	15.94	128.97
STR-I	MnVMnH	Fin	6.71	15.94	128.97
STR-II	Max	Tmp	9.20	11.63	83.17
STR-II	Min	Tmp	8.44	11.63	83.17
STR-II	Max	Fin	7.70	14.96	119.13
STR-II	Min	Fin	6.66	14.96	119.13
STR-II	MxVMnH	Fin	7.70	14.96	119.13
STR-II	MnVMnH	Fin	6.66	14.96	119.13
STR-III	Max	Tmp	9.33	8.50	55.83
STR-III	Min	Tmp	8.37	8.50	55.83
STR-III	Max	Fin	7.74	11.68	85.91
STR-III	Min	Fin	6.52	11.68	85.91
STR-III	MxVMnH	Fin	7.74	11.68	85.91
STR-III	MnVMnH	Fin	6.52	11.68	85.91
STR-V	Max	Tmp	9.20	11.63	83.17
STR-V	Min	Tmp	8.44	11.63	83.17
STR-V	Max	Fin	7.70	14.96	119.13
STR-V	Min	Fin	6.66	14.96	119.13
STR-V	MxVMnH	Fin	7.70	14.96	119.13
STR-V	MnVMnH	Fin	6.66	14.96	119.13
SER-I	Max	Tmp	8.74	8.75	63.39
SER-I	Min	Tmp	8.74	8.75	63.39
SER-I	Max	Fin	6.72	11.21	89.82
SER-I	Min	Fin	7.21	11.21	89.82
SER-I	MxVMnH	Fin	6.72	11.21	89.82
SER-I	MnVMnH	Fin	7.21	11.21	89.82
CSS	Max	Fin	7.17	8.78	65.22

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL (cont.)

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
CSS	Min	Fin	7.17	8.78	65.22
CSS	MxVMnH	Fin	7.17	8.78	65.22
CSS	MnVMnH	Fin	7.17	8.78	65.22

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

STEM LOCATION A 3.86 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	1.27	2.50	1.52
STR-I	Min	Tmp	0.91	2.50	1.52
STR-I	Max	Fin	13.27	11.52	3.00
STR-I	Min	Fin	2.58	7.95	3.00
STR-II	Max	Tmp	1.27	2.28	1.41
STR-II	Min	Tmp	0.91	2.28	1.41
STR-II	Max	Fin	3.58	7.63	2.68
STR-II	Min	Fin	2.58	6.88	2.68
STR-III	Max	Tmp	1.27	0.94	0.71
STR-III	Min	Tmp	0.91	0.94	0.71
STR-III	Max	Fin	3.58	4.02	1.60
STR-III	Min	Fin	2.10	3.13	1.60
STR-V	Max	Tmp	1.27	2.28	1.41
STR-V	Min	Tmp	0.91	2.28	1.41
STR-V	Max	Fin	3.58	7.63	2.68
STR-V	Min	Fin	2.58	6.88	2.68
SER-I	Max	Tmp	1.01	1.71	1.08
SER-I	Min	Tmp	1.01	1.71	1.08
SER-I	Max	Fin	8.40	7.25	2.02
SER-I	Min	Fin	2.86	5.02	2.02

STEM LOCATION B 7.71 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	2.53	12.71	3.86
STR-I	Min	Tmp	1.82	12.71	3.86
STR-I	Max	Fin	14.54	28.72	6.00
STR-I	Min	Fin	3.49	25.15	6.00
STR-II	Max	Tmp	2.53	11.82	3.63
STR-II	Min	Tmp	1.82	11.82	3.63
STR-II	Max	Fin	4.84	23.23	5.49
STR-II	Min	Fin	3.49	22.48	5.49
STR-III	Max	Tmp	2.53	6.46	2.24
STR-III	Min	Tmp	1.82	6.46	2.24
STR-III	Max	Fin	4.84	14.24	3.79
STR-III	Min	Fin	3.01	13.35	3.79
STR-V	Max	Tmp	2.53	11.82	3.63
STR-V	Min	Tmp	1.82	11.82	3.63
STR-V	Max	Fin	4.84	23.23	5.49
STR-V	Min	Fin	3.49	22.48	5.49
SER-I	Max	Tmp	2.03	9.11	2.81
SER-I	Min	Tmp	2.03	9.11	2.81
SER-I	Max	Fin	9.42	19.08	4.18
SER-I	Min	Fin	3.88	16.85	4.18

STEM LOCATION C 11.57 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	3.80	33.00	6.75
STR-I	Min	Tmp	2.73	33.00	6.75
STR-I	Max	Fin	15.80	58.50	9.54
STR-I	Min	Fin	4.40	54.93	9.54
STR-II	Max	Tmp	3.80	30.99	6.40

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

STEM LOCATION C 11.57 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-II	Min	Tmp	2.73	30.99	6.40
STR-II	Max	Fin	6.11	50.70	8.84
STR-II	Min	Fin	4.40	49.96	8.84
STR-III	Max	Tmp	3.80	18.93	4.32
STR-III	Min	Tmp	2.73	18.93	4.32
STR-III	Max	Fin	6.11	33.92	6.51
STR-III	Min	Fin	3.92	33.04	6.51
STR-V	Max	Tmp	3.80	30.99	6.40
STR-V	Min	Tmp	2.73	30.99	6.40
STR-V	Max	Fin	6.11	50.70	8.84
STR-V	Min	Fin	4.40	49.96	8.84
SER-I	Max	Tmp	3.04	23.85	4.89
SER-I	Min	Tmp	3.04	23.85	4.89
SER-I	Max	Fin	10.43	39.94	6.70
SER-I	Min	Fin	4.89	37.71	6.70

STEM LOCATION D 15.43 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	5.06	65.44	10.17
STR-I	Min	Tmp	3.65	65.44	10.17
STR-I	Max	Fin	17.07	102.96	13.61
STR-I	Min	Fin	5.31	99.39	13.61
STR-II	Max	Tmp	5.06	61.86	9.71
STR-II	Min	Tmp	3.65	61.86	9.71
STR-II	Max	Fin	7.38	92.14	12.73
STR-II	Min	Fin	5.31	91.39	12.73
STR-III	Max	Tmp	5.06	40.44	6.93
STR-III	Min	Tmp	3.65	40.44	6.93
STR-III	Max	Fin	7.38	65.16	9.78
STR-III	Min	Fin	4.83	64.27	9.78
STR-V	Max	Tmp	5.06	61.86	9.71
STR-V	Min	Tmp	3.65	61.86	9.71
STR-V	Max	Fin	7.38	92.14	12.73
STR-V	Min	Fin	5.31	91.39	12.73
SER-I	Max	Tmp	4.05	47.32	7.34
SER-I	Min	Tmp	4.05	47.32	7.34
SER-I	Max	Fin	11.44	71.21	9.58
SER-I	Min	Fin	5.90	68.97	9.58

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.27	0.65	0.91	37.11	42.02	312.47
STR-I	Min	Tmp	0.16	0.36	0.52	26.03	29.51	218.63
STR-I	Max	Fin	0.27	0.65	0.91	43.78	49.55	317.53
STR-I	Min	Fin	0.16	0.36	0.52	30.79	34.88	220.83
STR-II	Max	Tmp	0.27	0.65	0.91	35.92	40.67	302.34
STR-II	Min	Tmp	0.16	0.36	0.52	24.83	28.16	208.51
STR-II	Max	Fin	0.27	0.65	0.91	41.87	47.39	301.33
STR-II	Min	Fin	0.16	0.36	0.52	28.87	32.72	204.63
STR-III	Max	Tmp	0.27	0.65	0.91	28.74	32.57	241.59
STR-III	Min	Tmp	0.16	0.36	0.52	17.66	20.06	147.76
STR-III	Max	Fin	0.27	0.65	0.91	35.41	40.10	246.65
STR-III	Min	Fin	0.16	0.36	0.52	22.42	25.43	149.95
STR-V	Max	Tmp	0.27	0.65	0.91	35.92	40.67	302.34
STR-V	Min	Tmp	0.16	0.36	0.52	24.83	28.16	208.51
STR-V	Max	Fin	0.27	0.65	0.91	41.87	47.39	301.33
STR-V	Min	Fin	0.16	0.36	0.52	28.87	32.72	204.63
SER-I	Max	Tmp	0.19	0.45	0.63	22.84	25.91	191.63
SER-I	Min	Tmp	0.19	0.45	0.63	22.84	25.91	191.63
SER-I	Max	Fin	0.19	0.45	0.63	27.74	31.44	195.01
SER-I	Min	Fin	0.19	0.45	0.63	27.74	31.44	195.01
CSS	Max	Fin	0.19	0.45	0.63	22.95	26.04	154.51
CSS	Min	Fin	0.19	0.45	0.63	22.95	26.04	154.51

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

FOOTING - W/O FOUNDATION PRESSURE (cont.)

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING STABILITY

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	0.56	6.50	11.53	2.81	1.98	2.54	5.09	2.001
STR-I	Min	Tmp	1.31	6.50	4.97	2.33	0.99	1.92	4.90	2.555
STR-I	Max	Fin	2.67	6.50	2.43	6.19	0.60	4.68	4.92	1.050
STR-I	Min	Fin	3.04	6.50	2.13	3.91	0.13	2.94	4.30	1.463
STR-I	MxVMnH	Fin	2.67	6.50	2.43	6.19	0.60	4.68	4.92	1.050
STR-I	MnVMnH	Fin	3.04	6.50	2.13	3.91	0.13	2.94	4.30	1.463
STR-II	Max	Tmp	0.55	6.50	11.88	2.72	1.94	2.47	5.10	2.066
STR-II	Min	Tmp	1.31	6.50	4.94	2.23	0.95	1.84	4.89	2.663
STR-II	Max	Fin	2.05	6.50	3.17	4.55	1.03	3.53	4.60	1.300
STR-II	Min	Fin	3.09	6.50	2.11	3.72	0.10	2.79	4.28	1.534
STR-II	MxVMnH	Fin	2.05	6.50	3.17	4.55	1.03	3.53	4.60	1.300
STR-II	MnVMnH	Fin	3.09	6.50	2.11	3.72	0.10	2.79	4.28	1.534
STR-III	Max	Tmp	0.42	6.50	15.42	2.16	1.67	2.00	5.41	2.704
STR-III	Min	Tmp	1.38	6.50	4.70	1.67	0.68	1.37	5.14	3.758
STR-III	Max	Fin	2.01	6.50	3.24	3.91	0.92	3.05	4.93	1.618
STR-III	Min	Fin	3.23	6.50	2.01	3.01	0.01	2.26	4.49	1.986
STR-III	MxVMnH	Fin	2.01	6.50	3.24	3.91	0.92	3.05	4.93	1.618
STR-III	MnVMnH	Fin	3.23	6.50	2.01	3.01	0.01	2.26	4.49	1.986
STR-V	Max	Tmp	0.55	6.50	11.88	2.72	1.94	2.47	5.10	2.066
STR-V	Min	Tmp	1.31	6.50	4.94	2.23	0.95	1.84	4.89	2.663
STR-V	Max	Fin	2.05	6.50	3.17	4.55	1.03	3.53	4.60	1.300
STR-V	Min	Fin	3.09	6.50	2.11	3.72	0.10	2.79	4.28	1.534
STR-V	MxVMnH	Fin	2.05	6.50	3.17	4.55	1.03	3.53	4.60	1.300
STR-V	MnVMnH	Fin	3.09	6.50	2.11	3.72	0.10	2.79	4.28	1.534
SER-I	Max	Tmp		NA*		1.97	1.04	1.68	NA*	
SER-I	Min	Tmp		NA*		1.97	1.04	1.68	NA*	
SER-I	Max	Fin		NA*		4.18	0.15	3.14	NA*	
SER-I	Min	Fin		NA*		3.35	0.41	2.54	NA*	
SER-I	MxVMnH	Fin		NA*		4.18	0.15	3.14	NA*	
SER-I	MnVMnH	Fin		NA*		3.35	0.41	2.54	NA*	

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel.
The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

NA* Indicates Eccentricity and Bearing Resistance checks Not Applicable for Service I

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	12.16	14.94	1.229
STR-I	Min	Fin	15.94	18.19	1.142
STR-II	Min	Tmp	11.63	14.32	1.231
STR-II	Min	Fin	14.96	17.20	1.149
STR-III	Min	Tmp	8.50	10.58	1.245
STR-III	Min	Fin	11.68	13.61	1.165
STR-V	Min	Tmp	11.63	14.32	1.231
STR-V	Min	Fin	14.96	17.20	1.149

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 0.80.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

Elastic (in)	Layer 1 Height (ft)	Layer 2 Height (ft)	Consol (in)	Settlement Second (in)	Total (in)	Allow (in)	Perform Ratio	Temp Stage Settlement (in)
0.79	20.00	NA	0.00	0.00	0.79	1.00	1.273	0.43

Notes:

Elastic settlement is based on:
effective width of 13.45 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 14.34 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 17.48 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

ADM BRIDGE - PGE SALUDA ACCESS RD
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State	Load Case	Stage	Moment (kip-ft)		Limit State	Load Case	Stage	Shear (kip)
(Controlling)					(Controlling)			
STR-I	Max	Fin	21.52T	(Strength)	STR-I	Max	Fin	6.45
SER-I	Max	Fin	14.46T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State	Load Case	Stage	Moment (kip-ft)		Limit State	Load Case	Stage	Shear (kip)
(Controlling)					(Controlling)			
STR-I	Min	Fin	97.30H	(Strength)	STR-I	Max	Fin	12.45
SER-I	Min	Fin	64.02H	(Crack Control)				(Xdist)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

The Maximum shear in Heel is located at Xdist from back face of stem, where Xdist is (5.40) ft.

ADM BRIDGE - PGE SALUDA ACCESS RD
MOMENT AXIAL INTERACTION

STEM LOCATION A 3.86 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	2.50	84.06	1.27	42.56	TN	33.628	0.79	0.900
STR-I	Min	Tmp	2.50	75.33	0.91	27.46	TN	30.137	0.79	0.900
STR-I	Max	Fin	11.52	123.34	13.27	142.05	TR	10.702	0.79	0.822
STR-I	Min	Fin	7.95	73.16	2.58	23.70	TN	9.199	0.79	0.900
STR-II	Max	Tmp	2.28	87.62	1.27	48.71	TN	38.487	0.79	0.900
STR-II	Min	Tmp	2.28	77.36	0.91	30.97	TN	33.981	0.79	0.900
STR-II	Max	Fin	7.63	81.58	3.58	38.28	TN	10.697	0.79	0.900
STR-II	Min	Fin	6.88	75.88	2.58	28.40	TN	11.024	0.79	0.900
STR-III	Max	Tmp	0.94	123.14	1.27	166.28	TR	131.367	0.79	0.761
STR-III	Min	Tmp	0.94	123.52	0.91	120.10	TR	131.780	0.79	0.877
STR-III	Max	Fin	4.02	122.64	3.58	109.29	TN	30.544	0.79	0.900
STR-III	Min	Fin	3.13	97.00	2.10	64.94	TN	30.978	0.79	0.900
STR-V	Max	Tmp	2.28	87.62	1.27	48.71	TN	38.487	0.79	0.900
STR-V	Min	Tmp	2.28	77.36	0.91	30.97	TN	33.981	0.79	0.900
STR-V	Max	Fin	7.63	81.58	3.58	38.28	TN	10.697	0.79	0.900
STR-V	Min	Fin	6.88	75.88	2.58	28.40	TN	11.024	0.79	0.900
SER-I	Max	Tmp	1.71	90.28	1.01	53.32	TN	52.656	0.79	0.900
SER-I	Min	Tmp	1.71	90.28	1.01	53.32	TN	52.656	0.79	0.900
SER-I	Max	Fin	7.25	123.33	8.40	142.85	TR	17.001	0.79	0.820
SER-I	Min	Fin	5.02	88.68	2.86	50.55	TN	17.657	0.79	0.900

Section Thickness = 21.00 (in)
Effective Depth = 17.50 (in)

STEM LOCATION B 7.71 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	12.71	67.19	2.53	13.38	TN	5.286	0.79	0.900
STR-I	Min	Tmp	12.71	64.83	1.82	9.30	TN	5.101	0.79	0.900
STR-I	Max	Fin	28.72	84.06	14.54	42.56	TN	2.927	0.79	0.900
STR-I	Min	Fin	25.15	64.64	3.49	8.97	TN	2.571	0.79	0.900
STR-II	Max	Tmp	11.82	67.86	2.53	14.54	TN	5.742	0.79	0.900
STR-II	Min	Tmp	11.82	65.28	1.82	10.07	TN	5.524	0.79	0.900
STR-II	Max	Fin	23.23	67.61	4.84	14.10	TN	2.911	0.79	0.900
STR-II	Min	Fin	22.48	65.32	3.49	10.13	TN	2.905	0.79	0.900
STR-III	Max	Tmp	6.46	76.87	2.53	30.12	TN	11.897	0.79	0.900
STR-III	Min	Tmp	6.46	71.04	1.82	20.04	TN	10.996	0.79	0.900
STR-III	Max	Fin	14.24	74.02	4.84	25.19	TN	5.199	0.79	0.900
STR-III	Min	Fin	13.35	68.36	3.01	15.40	TN	5.120	0.79	0.900
STR-V	Max	Tmp	11.82	67.86	2.53	14.54	TN	5.742	0.79	0.900
STR-V	Min	Tmp	11.82	65.28	1.82	10.07	TN	5.524	0.79	0.900
STR-V	Max	Fin	23.23	67.61	4.84	14.10	TN	2.911	0.79	0.900
STR-V	Min	Fin	22.48	65.32	3.49	10.13	TN	2.905	0.79	0.900
SER-I	Max	Tmp	9.11	68.23	2.03	15.17	TN	7.492	0.79	0.900
SER-I	Min	Tmp	9.11	68.23	2.03	15.17	TN	7.492	0.79	0.900
SER-I	Max	Fin	19.08	83.18	9.42	41.04	TN	4.359	0.79	0.900
SER-I	Min	Fin	16.85	68.57	3.88	15.77	TN	4.069	0.79	0.900

Section Thickness = 21.00 (in)
Effective Depth = 17.50 (in)

STEM LOCATION C 11.57 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	33.00	120.53	3.80	13.87	TN	3.653	1.58	0.900
STR-I	Min	Tmp	33.00	118.45	2.73	9.81	TN	3.590	1.58	0.900
STR-I	Max	Fin	58.50	131.68	15.80	35.57	TN	2.251	1.58	0.900
STR-I	Min	Fin	54.93	118.28	4.40	9.47	TN	2.153	1.58	0.900
STR-II	Max	Tmp	30.99	121.03	3.80	14.83	TN	3.906	1.58	0.900
STR-II	Min	Tmp	30.99	118.79	2.73	10.48	TN	3.834	1.58	0.900
STR-II	Max	Fin	50.70	120.89	6.11	14.57	TN	2.384	1.58	0.900
STR-II	Min	Fin	49.96	118.78	4.40	10.46	TN	2.378	1.58	0.900
STR-III	Max	Tmp	18.93	126.43	3.80	25.36	TN	6.678	1.58	0.900
STR-III	Min	Tmp	18.93	122.49	2.73	17.69	TN	6.470	1.58	0.900
STR-III	Max	Fin	33.92	124.97	6.11	22.51	TN	3.684	1.58	0.900
STR-III	Min	Fin	33.04	120.77	3.92	14.33	TN	3.655	1.58	0.900
STR-V	Max	Tmp	30.99	121.03	3.80	14.83	TN	3.906	1.58	0.900

ADM BRIDGE - PGE SALUDA ACCESS RD
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 11.57 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in ²)	Phi Factor
STR-V	Min	Tmp	30.99	118.79	2.73	10.48	TN	3.834	1.58	0.900
STR-V	Max	Fin	50.70	120.89	6.11	14.57	TN	2.384	1.58	0.900
STR-V	Min	Fin	49.96	118.78	4.40	10.46	TN	2.378	1.58	0.900
SER-I	Max	Tmp	23.85	121.35	3.04	15.46	TN	5.089	1.58	0.900
SER-I	Min	Tmp	23.85	121.35	3.04	15.46	TN	5.089	1.58	0.900
SER-I	Max	Fin	39.94	130.97	10.43	34.20	TN	3.279	1.58	0.900
SER-I	Min	Fin	37.71	121.50	4.89	15.75	TN	3.222	1.58	0.900

Section Thickness = 21.00 (in)
Effective Depth = 17.50 (in)

STEM LOCATION D 15.43 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in ²)	Phi Factor
STR-I	Max	Tmp	65.44	118.10	5.06	9.14	TN	1.805	1.58	0.900
STR-I	Min	Tmp	65.44	116.75	3.65	6.50	TN	1.784	1.58	0.900
STR-I	Max	Fin	102.96	123.97	17.07	20.55	TN	1.204	1.58	0.900
STR-I	Min	Fin	99.39	116.61	5.31	6.23	TN	1.173	1.58	0.900
STR-II	Max	Tmp	61.86	118.39	5.06	9.69	TN	1.914	1.58	0.900
STR-II	Min	Tmp	61.86	116.95	3.65	6.89	TN	1.890	1.58	0.900
STR-II	Max	Fin	92.14	118.27	7.38	9.47	TN	1.284	1.58	0.900
STR-II	Min	Fin	91.39	116.90	5.31	6.79	TN	1.279	1.58	0.900
STR-III	Max	Tmp	40.44	121.20	5.06	15.18	TN	2.997	1.58	0.900
STR-III	Min	Tmp	40.44	118.92	3.65	10.72	TN	2.941	1.58	0.900
STR-III	Max	Fin	65.16	120.41	7.38	13.63	TN	1.848	1.58	0.900
STR-III	Min	Fin	64.27	117.96	4.83	8.87	TN	1.835	1.58	0.900
STR-V	Max	Tmp	61.86	118.39	5.06	9.69	TN	1.914	1.58	0.900
STR-V	Min	Tmp	61.86	116.95	3.65	6.89	TN	1.890	1.58	0.900
STR-V	Max	Fin	92.14	118.27	7.38	9.47	TN	1.284	1.58	0.900
STR-V	Min	Fin	91.39	116.90	5.31	6.79	TN	1.279	1.58	0.900
SER-I	Max	Tmp	47.32	118.63	4.05	10.15	TN	2.507	1.58	0.900
SER-I	Min	Tmp	47.32	118.63	4.05	10.15	TN	2.507	1.58	0.900
SER-I	Max	Fin	71.21	123.61	11.44	19.86	TN	1.736	1.58	0.900
SER-I	Min	Fin	68.97	118.62	5.90	10.15	TN	1.720	1.58	0.900

Section Thickness = 21.00 (in)
Effective Depth = 17.50 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Zone Code Descriptions

TN - Tension controlled section
TR - Transition section
CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State	Load Case (Controlling)	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	STR-I	Max	Fin	21.52T	38.00	0.900	1.766	0.440
Heel	STR-I	Min	Fin	97.30H	104.68	0.900	1.076	1.200

Phi Factor Epsilon (cl) = 0.00200

Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling
moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling
moment is found in the Heel for the current location.

ADM BRIDGE - PGE SALUDA ACCESS RD
MINIMUM REINFORCEMENT CHECK

STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	1.33*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Stem A	3.86	32.59	15.33+	0.20	0.20*	0.79	
Stem B	7.71	32.59+	38.19	0.42*	0.20	0.79	
Stem C	11.57	32.59+	77.81	0.42*	0.20	1.58	
Stem D	15.43	32.59+	136.93	0.42*	0.20	1.58	
Stem 1	10.76	32.59+	69.46	0.42*	0.20	0.79	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	1.33*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	42.57	28.62+	0.33*	0.24	0.44	
Heel	42.57+	129.40	0.47*	0.24	1.20	

Status Code Descriptions

- + - Controlling moment for Rho Min Area calculation
- * - Controlling minimum area of steel
- A - Area provided smaller than required minimum area of steel

ADM BRIDGE - PGE SALUDA ACCESS RD
CRACK CONTROL - ANALYSIS

STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Axial (kip)	Status Codes
Stem A	3.86	0.79	0.00	999.99	7.25	8.40	E
Stem B	7.71	0.79	0.00	999.99	19.08	9.42	E
Stem C	11.57	1.58	16.71	25.58	37.71	4.89	
Stem D	15.43	1.58	31.52	10.27	68.97	5.90	
Stem 1	10.76	0.79	28.24	12.28	33.31	4.67	

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	0.44	0.00	999.99	14.46T	E
Heel	1.20	34.03	9.73	64.02H	

NOTE: A "T" following the moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)

- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to $0.6 \cdot f_y$ in allowable spacing calculation

ADM BRIDGE - PGE SALUDA ACCESS RD
REINFORCEMENT SUMMARY - ANALYSIS

STEM LOCATION D 15.43 (ft) FROM TOP OF STRUCTURE

Bar Size	Bar Spacing (in)	Develop Hooked (in)	Length Straight (in)	Area Reqd (in^2)	Area Prov (in^2)	Splice Length (in)	Status Codes
8	6.0	17.7	12.0	1.324	1.580	15.6	

Available Length in Footing = 20.0 (in)

Status Code Descriptions

- A - Hooked development length exceeds available length
- B - Straight development length exceeds available length

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
6	12.0	22.4	31.0	S	0.329	0.440

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
7	6.0	45.8	178.0	S	1.110	1.200

Bar Type Description

- S - Straight Bar
- H - Hooked Bar

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	STEM		Service Status	Shear Status
			Total Design Width (in)	Area/Strength (in^2)		
Stem A	3.86	8 @ 12.00		0.79	OK	OK
Stem B	7.71	8 @ 12.00		0.79	OK	OK
Stem C	11.57	8 @ 12.00		1.58	OK	OK
Stem D	15.43	8 @ 12.00		1.58	OK	OK
Stem 1	10.76	8 @ 12.00		0.79	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Total Design Width (in)	Area/Strength (in^2)	Service Status	Shear Status
Toe	6 @ 12.00		0.44	OK	OK
Heel	7 @ 6.00		1.20	OK	OK

ADM BRIDGE - PGE SALUDA ACCESS RD
SHEAR RESULTS

STEM

Location	Dist from Struc Top (ft)	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Stem A	3.86	STR-I	Max	Fin	3.00	19.77	6.580
Stem B	7.71	STR-I	Max	Fin	6.00	19.77	3.296
Stem C	11.57	STR-I	Max	Fin	9.54	18.86	1.978
Stem D	15.43	STR-I	Max	Fin	13.61	18.86	1.385
Stem 1	10.76	STR-I	Max	Fin	8.79	19.77	2.249

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	STR-I	Max	Fin	6.45	22.69	3.516
Heel	STR-I	Max	Fin	12.45	22.92	1.841

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program did not encounter any specification check warnings for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program did not encounter any specification check errors for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

ADM BRIDGE - PGE SALUDA ACCESS RD
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*****
*
* Program Title      LRFD Abutment and Retaining Wall
* Program Name      ABLRFD
* Version           1.20.0.0
* Last Updated      04/05/2025
* Documentation      04/2025
* License No.       333193
*
*****
*
* ADM BRIDGE - PGE SALUDA ACCESS RD
* ABUTMENT ANALYSIS
* DESIGNED BY: LS    DATE: 5/29/2026
* CHECKED BY: BPD    DATE:
*
*****
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COMMAND: CTL		
SYSTEM OF UNITS	US	
TYPE OF RUN	A	
FOOTING DATUM	*	(computed, if necessary)
COMMAND: RWL		
HEIGHT	18.75 ft	
TOP WIDTH	18 in	
FRONT FACE HORZ COMP.	*	(computed, if necessary)
FRONT FACE VERT COMP.	*	(computed, if necessary)
BACK FACE HORZ COMP.	1	
BACK FACE VERT COMP.	12	
EXPOSED STEM HEIGHT	6 in	
BACKFILL HORZ COMP.	*	(computed, if necessary)
BACKFILL VERT COMP.	*	(computed, if necessary)
BACKFILL SLOPE HEIGHT	* ft	(computed, if necessary)
FRONT WATER LEVEL	3.5 ft	
BACK WATER LEVEL	0.5 ft	
TYPE OF WALL	C	
ARCHT TREAT THICKNESS	0.0 in	(default)
COMMAND: FTG		
MINIMUM FOOTING THICKNESS	2 ft	
MINIMUM TOE PROJECTION	2 ft	
MINIMUM HEEL PROJECTION	12.52 ft	
MINIMUM FOOTING WIDTH	* ft	(computed, if necessary)
MAXIMUM FOOTING THICKNESS	* ft	(computed, if necessary)
MAXIMUM TOE PROJECTION	* ft	(computed, if necessary)
MAXIMUM HEEL PROJECTION	* ft	(computed, if necessary)
MAXIMUM FOOTING WIDTH	* ft	(computed, if necessary)
FOOTING THICK INCREMENT	2.0 in	(default)
FOOTING WIDTH INCREMENT	3.0 in	(default)
FOOTING STEM INCREMENT	1.0 in	(default)
COMMAND: MAT		
BACKWALL CONC. STRENGTH	* ksi	(computed, if necessary)
STEM CONC. STRENGTH	3 ksi	
FOOTING CONC. STRENGTH	3 ksi	
REINF. YIELD STRENGTH	60 ksi	
EPOXY COAT BARS - BACK	*	(computed, if necessary)
EPOXY COAT BARS - STEM	Y	
EPOXY COAT BARS - FOOT	Y	
BACKFILL FRICTION ANGLE	30 deg	
BACKFILL UNIT WEIGHT DRY	120 lb/ft^3	
BACKFILL UNIT WEIGHT SAT	135 lb/ft^3	
MIN EQUIV EARTH PRESSURE	35 lb/ft^3	
DENSITY OF CONC. FOR DL	150 lb/ft^3	
DENSITY OF CONC. FOR E	145 lb/ft^3	
DENSITY OF CONC. FOR AT	150.0 lb/ft^3	(default)
REINF ULT TENS STRENGTH	* ksi	(computed, if necessary)
COMMAND: SOI		
STEM TOP TO SOIL LAYER	20.75 ft	
FOOTING LENGTH (PARALLEL)	15 ft	
FOOTING NEAR SLOPE?	N	
SOIL LEVEL AT TOE	4 ft	
ALLOWABLE SETTLEMENT	1 in	
BEARING CAPACITY PHI FACTOR	0.45	
SLIDING PHI FACTOR	0.80	
NUMBER OF SOIL LAYERS	1	
LAYER 1 SOIL LAYER THICKNESS	20 ft	
LAYER 1 UNDRAINED SHEAR STRENGTH	* ksf	(computed, if necessary)
LAYER 1 MASS UNIT WEIGHT	120 lb/ft^3	
LAYER 1 SATURATED UNIT WEIGHT	137 lb/ft^3	
LAYER 1 ELASTIC MODULUS	300 ksf	
LAYER 1 POISSON'S RATIO	*	(computed, if necessary)
LAYER 1 COHESION	* ksf	(computed, if necessary)
LAYER 1 EFFECTIVE FRICTION ANGLE	30 deg	
LAYER 1 NCQ (NEAR SLOPE)	*	(computed, if necessary)
LAYER 1 N_GAMMA_Q (NEAR SLOPE)	*	(computed, if necessary)
LAYER 2 SOIL LAYER THICKNESS	* ft	(computed, if necessary)
LAYER 2 UNDRAINED SHEAR STRENGTH	* ksf	(computed, if necessary)
LAYER 2 MASS UNIT WEIGHT	* lb/ft^3	(computed, if necessary)
LAYER 2 SATURATED UNIT WEIGHT	* lb/ft^3	(computed, if necessary)
LAYER 2 ELASTIC MODULUS	* ksf	(computed, if necessary)
LAYER 2 POISSON'S RATIO	*	(computed, if necessary)

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY OF INPUT FILE (cont.)

```

COMMAND: SOI (cont.)
  LAYER 2 COHESION                * ksf      (computed, if necessary)
  LAYER 2 EFFECTIVE FRICTION ANGLE * deg      (computed, if necessary)
  LAYER 2 NCQ (NEAR SLOPE)         *          (computed, if necessary)
  LAYER 2 N_GAMMA_Q (NEAR SLOPE)   *          (computed, if necessary)
  APPLY INCLINATION FACTOR         Y          (default)
  PRECAST OR CAST-IN-PLACE         C          (default)
  LAYER 1 REDUCTION COEFFICIENT RCBC1 *        (computed, if necessary)
  LAYER 2 REDUCTION COEFFICIENT RCBC2 *        (computed, if necessary)

COMMAND: MRD
  AGGREGATE SIZE                   1 in
  DEVELOPMENT CORRECTION           1
  BACKWALL EXPOSURE                *          (computed, if necessary)
  STEM EXPOSURE                    1
  FOOTING EXPOSURE                 1

COMMAND: CVR
  BACKWALL BACK - VERT.            * in      (computed, if necessary)
  STEM BACK - VERTICAL              3 in
  FOOTING TOP PERPEND.             3.875 in
  FOOTING TOP PARALLEL              * in      (computed, if necessary)
  FOOTING BOTTOM PERPEND.           4.75 in
  FOOTING BOTTOM PARALLEL           * in      (computed, if necessary)
  TOE END COVER                    2 in
  HEEL END COVER                   2 in

COMMAND: BAR
  BACKWALL BACK - VERT.            * US bar  (computed, if necessary)
  FOOTING TOP PERPEND.             7 US bar
  FOOTING TOP PARALLEL             * US bar  (computed, if necessary)
  FOOTING BOTTOM PERPEND.           5 US bar
  FOOTING BOTTOM PARALLEL           * US bar  (computed, if necessary)
  FOOTING TOP PERP HOOKED          S
  FOOTING BOT PERP HOOKED          S

COMMAND: SPA
  BACKWALL BACK - VERT.            * in      (computed, if necessary)
  FOOTING TOP PERPEND.             6 in
  FOOTING TOP PARALLEL             * in      (computed, if necessary)
  FOOTING BOTTOM PERPEND.          12 in
  FOOTING BOTTOM PARALLEL           * in      (computed, if necessary)

COMMAND: SRB
  BAR SIZE                         7 US bar
  BAR SPACING                     12 in
  GROUP OFFSET                     * in      (computed, if necessary)
  END LOCATION                    18.75 ft
  BAR SIZE                         7 US bar
  BAR SPACING                     12 in
  GROUP OFFSET                     6 in
  END LOCATION                    5 ft

COMMAND: LDC
  DUCTILITY FACTOR (ETA)           1.0        (default)
  REDUNDANCY FACTOR (ETA)          1.0        (default)
  IMPORTANCE FACTOR (ETA)          1.0        (default)
  LS (TEMP STAGE)                  3 ft
  LS (FINAL STAGE)                 3 ft
  ES (TEMP STAGE)                  0 ft
  ES (FINAL STAGE)                 0 ft

COMMAND: OIN
  INPUT FILE ECHO                   0
  INPUT COMMANDS                    1
  INPUT SUMMARY                     1

```

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY OF INPUT FILE (cont.)

COMMAND: OUR

FOOTING GEOMETRY	1	(default)
OUTPUT LEGEND	1	(default)
FACTORED FORCES	1	(default)
FOOTING STABILITY	1	(default)
CONTROL FOOTING FORCES	1	(default)
FOOTING FLEXURE	1	(default)
REINFORCEMENT SUMMARY	1	(default)
CRACK CONTROL	1	(default)
SHEAR RESULTS	1	(default)
DEVELOPMENT LENGTH	1	(default)

COMMAND: OUI

UNFACTORED LOADS	0	(default)
LOAD FACTORS	0	(default)
MOMENT AXIAL INTERACTION	1	(default)
INTERNAL FOOTING FORCES	0	(default)
BEARING RESISTANCE VALUES	*	(computed, if necessary)
DETAILED CUTOFF VALUES	0	(default)
MIN REINFORCEMENT CHECK	*	(computed, if necessary)
INTERMEDIATE SETTLEMENT DATA	*	(computed, if necessary)

The following are system settings:

PRINT DIMENSION FILE	N	(default)
HISTORY FILE	0	(default)
SOIL HISTORY	0	(default)

ADM BRIDGE - PGE SALUDA ACCESS RD
INPUT SUMMARY

CONTROL

Sys of Units US	Type of Run A	Footing Datum T	RETAINING WALL				
Height (ft)	Top Width (in)	Front Face Horizontal Component	Front Face Vertical Component	Back Face Horizontal Component	Back Face Vertical Component		
18.75	18.0	none	none	1.00	12.00		
Exposed Stem Height (in)	Backfill Horizontal Component	Backfill Vertical Component	Backfill Slope Height (ft)	Front Water Level (ft)	Back Water Level (ft)	Type of Wall	Architectural Treatment Thickness (in)
6.0	none	none	none	3.50	0.50	C	0.0

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
2.00	2.00	12.52	none	none	none	none	none
Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)					
2.00	3.00	1.00					

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Backwall	Epoxy Coated Stem	Concrete Footing
NA	3.000	3.000	60.000	NA	Y	Y
Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete For DL (lb/ft^3)	Density For Ec (lb/ft^3)	
30.00	120.0	135.0	35.0	150.0	145.0	

Architectural Treatment Density (lb/ft^3)	fu (ksi)
150.0	90.000

SOIL

Stem Top to Soil Layer (ft) 20.75	Footing Length (Parallel) (ft) 15.00	Footing Near Slope N	Soil Level At Toe (ft) 4.00	Soil Allow Settle (in) 1.00	Bearing Cap Resistance Factor 0.45	Sliding Resist Factor 0.80	No. Soil Layers 1
Soil Layer Number 1	Soil Layer Thick (ft) 20.00	Undrained Shear Strength (ksf) none	Mass Unit Weight/ Density (lb/ft^3) 120.00	Saturated Unit Weight/ Density (lb/ft^3) 137.00	Elastic Modulus (ksf) 300.00	Poissons Ratio 0.00	
Soil Layer Number 1	Cohesion (ksf) none	Effective Friction Angle (deg) 30.00	Ncq n/a	N Gamma q n/a			
Apply Inclination Factors Y	Precast or Cast-in- Place C	Reduction Coefficients Layer 1 Layer 2 none none		RC(BC) Layer 1 Layer 2 none none			

ADM BRIDGE - PGE SALUDA ACCESS RD
INPUT SUMMARY (cont.)

MISCELLANEOUS REINFORCEMENT DATA							
Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class	DATA		
1.00	1.00	none	1	1			
REINFORCEMENT COVER							
Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
none	3.0	3.9	none	4.8	none	2.0	2.0
BAR SIZE							
Backwall Back Vertical (US bar)	Footing Top Perpend (US bar)	Footing Top Parallel (US bar)	Footing Bottom Perpend (US bar)	Footing Bottom Parallel (US bar)	Footing Perp Top Bar Type	Footing Perp Bot Bar Type	
none	7	none	5	none	Straight	Straight	
BAR SPACING FOR ANALYSIS							
Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)			
none	6.0	0.0	12.0	0.0			
STEM REINFORCING BARS							
Range Number	Bar Size (US bar)	Bar Spacing (in)	Group Offset (in)	End Location (ft)			
1	7	12.00	0.00	18.75			
2	7	12.00	6.00	5.00			
LOAD CONTROL							
Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)	
1.00	1.00	1.00	3.00	3.00	0.00	0.00	

OUTPUT OF INPUT DATA

Input File Echo	Input Commands	Input Summary
0	1	1

OUTPUT OF RESULTS

Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Footing Flexure	Reinf Summary
1	1	1	1	1	1	1
Crack Control	Shear Results	Development Length				
1	1	1				

OUTPUT OF INTERMEDIATE DATA

Unfactored Forces	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resistance Values	Detailed Stem Cutoff Load Values
0	0	1	0	0	0
Minimum Reinforcement Check	Intermediate Settlement Data				
1	0				

ADM BRIDGE - PGE SALUDA ACCESS RD
ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection		Effective Depth		Stem Width Footing Top (ft)
		Toe (ft)	Heel (ft)	Toe (ft)	Heel (ft)	
2.00	17.58	2.00	12.52	1.58	1.64	3.06

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

COMPUTED VALUES

Front Water Level (ft)(1)	Concrete Density Factor (2)	Modulus of Rupture (3)			Modulus of Elasticity			Modular Ratio		
		Backwall (ksi)	Stem (ksi)	Footing (ksi)	Backwall (ksi)	Stem (ksi)	Footing (ksi)	Bckw	Stem	Foot
N/A	1.000	N/A	0.416	0.416	N/A	3100.	3100.	N/A	9.	9.

- Notes: (1) The computed value complies with DM-4 Section 3.11.3.
(2) The concrete density modification factor is defined according to AASHTO LRFD Specifications Section 5.4.2.8.
(3) Modulus of Rupture defined according to AASHTO LRFD Specifications Section 5.4.2.6.

ADM BRIDGE - PGE SALUDA ACCESS RD
OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-II	Strength II	-
STR-III	Strength III	-
STR-V	Strength V	-
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear, reversible horizontal loads towards superstructure
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear, reversible horizontal loads towards superstructure
MxVMnH	MxVMnH	- Maximum downward vertical force, reversible horizontal loads toward abutment
MnVMnH	MnVMnH	- Minimum downward vertical force, reversible horizontal loads toward abutment

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
STR-I	Max	Tmp	7.15	48.96	-476.19
STR-I	Min	Tmp	6.03	33.42	-327.58
STR-I	Max	Fin	7.15	48.96	-476.19
STR-I	Min	Fin	6.03	33.42	-327.58
STR-I	MxVMnH	Fin	7.15	48.96	-476.19
STR-I	MnVMnH	Fin	6.03	33.42	-327.58
STR-II	Max	Tmp	7.19	47.70	-462.84
STR-II	Min	Tmp	6.04	32.16	-314.23
STR-II	Max	Fin	7.21	46.94	-454.83
STR-II	Min	Fin	6.05	31.40	-306.22
STR-II	MxVMnH	Fin	7.21	46.94	-454.83
STR-II	MnVMnH	Fin	6.05	31.40	-306.22
STR-III	Max	Tmp	7.47	40.12	-382.76
STR-III	Min	Tmp	6.14	24.57	-234.15
STR-III	Max	Fin	7.47	40.12	-382.76
STR-III	Min	Fin	6.14	24.57	-234.15
STR-III	MxVMnH	Fin	7.47	40.12	-382.76
STR-III	MnVMnH	Fin	6.14	24.57	-234.15
STR-V	Max	Tmp	7.19	47.70	-462.84
STR-V	Min	Tmp	6.04	32.16	-314.23
STR-V	Max	Fin	7.21	46.94	-454.83
STR-V	Min	Fin	6.05	31.40	-306.22
STR-V	MxVMnH	Fin	7.21	46.94	-454.83
STR-V	MnVMnH	Fin	6.05	31.40	-306.22
SER-I	Max	Tmp	6.60	30.80	-294.22
SER-I	Min	Tmp	6.60	30.80	-294.22
SER-I	Max	Fin	6.60	30.80	-294.22
SER-I	Min	Fin	6.60	30.80	-294.22
SER-I	MxVMnH	Fin	6.60	30.80	-294.22
SER-I	MnVMnH	Fin	6.60	30.80	-294.22
CSS	Max	Fin	6.77	25.74	-240.83
CSS	Min	Fin	6.77	25.74	-240.83
CSS	MxVMnH	Fin	6.77	25.74	-240.83
CSS	MnVMnH	Fin	6.77	25.74	-240.83

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
STR-I	Max	Tmp	7.15	15.21	126.22
STR-I	Min	Tmp	6.03	15.21	126.22
STR-I	Max	Fin	7.15	15.21	126.22
STR-I	Min	Fin	6.03	15.21	126.22
STR-I	MxVMnH	Fin	7.15	15.21	126.22
STR-I	MnVMnH	Fin	6.03	15.21	126.22
STR-II	Max	Tmp	7.19	14.60	120.07
STR-II	Min	Tmp	6.04	14.60	120.07
STR-II	Max	Fin	7.21	14.23	116.38
STR-II	Min	Fin	6.05	14.23	116.38
STR-II	MxVMnH	Fin	7.21	14.23	116.38
STR-II	MnVMnH	Fin	6.05	14.23	116.38
STR-III	Max	Tmp	7.47	10.95	83.16
STR-III	Min	Tmp	6.14	10.95	83.16
STR-III	Max	Fin	7.47	10.95	83.16
STR-III	Min	Fin	6.14	10.95	83.16
STR-III	MxVMnH	Fin	7.47	10.95	83.16
STR-III	MnVMnH	Fin	6.14	10.95	83.16
STR-V	Max	Tmp	7.19	14.60	120.07
STR-V	Min	Tmp	6.04	14.60	120.07
STR-V	Max	Fin	7.21	14.23	116.38
STR-V	Min	Fin	6.05	14.23	116.38
STR-V	MxVMnH	Fin	7.21	14.23	116.38
STR-V	MnVMnH	Fin	6.05	14.23	116.38
SER-I	Max	Tmp	6.60	10.90	91.04
SER-I	Min	Tmp	6.60	10.90	91.04
SER-I	Max	Fin	6.60	10.90	91.04
SER-I	Min	Fin	6.60	10.90	91.04
SER-I	MxVMnH	Fin	6.60	10.90	91.04
SER-I	MnVMnH	Fin	6.60	10.90	91.04
CSS	Max	Fin	6.77	8.47	66.43

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL (cont.)

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Moment (kip-ft)
CSS	Min	Fin	6.77	8.47	66.43
CSS	MxVMnH	Fin	6.77	8.47	66.43
CSS	MnVMnH	Fin	6.77	8.47	66.43

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

STEM LOCATION A 4.69 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	1.84	2.89	1.70
STR-I	Min	Tmp	1.39	2.88	1.70
STR-I	Max	Fin	1.84	2.89	1.70
STR-I	Min	Fin	1.39	2.88	1.70
STR-II	Max	Tmp	1.81	2.65	1.58
STR-II	Min	Tmp	1.36	2.64	1.58
STR-II	Max	Fin	1.79	2.51	1.50
STR-II	Min	Fin	1.34	2.50	1.50
STR-III	Max	Tmp	1.62	1.22	0.82
STR-III	Min	Tmp	1.17	1.21	0.82
STR-III	Max	Fin	1.62	1.22	0.82
STR-III	Min	Fin	1.17	1.21	0.82
STR-V	Max	Tmp	1.81	2.65	1.58
STR-V	Min	Tmp	1.36	2.64	1.58
STR-V	Max	Fin	1.79	2.51	1.50
STR-V	Min	Fin	1.34	2.50	1.50
SER-I	Max	Tmp	1.42	2.03	1.22
SER-I	Min	Tmp	1.42	2.03	1.22
SER-I	Max	Fin	1.42	2.03	1.22
SER-I	Min	Fin	1.42	2.03	1.22

STEM LOCATION B 9.38 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	4.39	17.37	4.67
STR-I	Min	Tmp	3.30	17.34	4.67
STR-I	Max	Fin	4.39	17.37	4.67
STR-I	Min	Fin	3.30	17.34	4.67
STR-II	Max	Tmp	4.32	16.24	4.41
STR-II	Min	Tmp	3.24	16.21	4.41
STR-II	Max	Fin	4.28	15.56	4.25
STR-II	Min	Fin	3.20	15.53	4.25
STR-III	Max	Tmp	3.92	9.46	2.81
STR-III	Min	Tmp	2.84	9.43	2.81
STR-III	Max	Fin	3.92	9.46	2.81
STR-III	Min	Fin	2.84	9.43	2.81
STR-V	Max	Tmp	4.32	16.24	4.41
STR-V	Min	Tmp	3.24	16.21	4.41
STR-V	Max	Fin	4.28	15.56	4.25
STR-V	Min	Fin	3.20	15.53	4.25
SER-I	Max	Tmp	3.37	12.59	3.40
SER-I	Min	Tmp	3.37	12.59	3.40
SER-I	Max	Fin	3.37	12.59	3.40
SER-I	Min	Fin	3.37	12.59	3.40

STEM LOCATION C 14.06 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	7.61	47.65	8.44
STR-I	Min	Tmp	5.71	47.59	8.44
STR-I	Max	Fin	7.61	47.65	8.44
STR-I	Min	Fin	5.71	47.59	8.44
STR-II	Max	Tmp	7.51	44.97	8.04

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

STEM LOCATION C 14.06 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-II	Min	Tmp	5.61	44.91	8.04
STR-II	Max	Fin	7.45	43.36	7.79
STR-II	Min	Fin	5.54	43.30	7.79
STR-III	Max	Tmp	6.90	28.89	5.60
STR-III	Min	Tmp	4.99	28.83	5.60
STR-III	Max	Fin	6.90	28.89	5.60
STR-III	Min	Fin	4.99	28.83	5.60
STR-V	Max	Tmp	7.51	44.97	8.04
STR-V	Min	Tmp	5.61	44.91	8.04
STR-V	Max	Fin	7.45	43.36	7.79
STR-V	Min	Fin	5.54	43.30	7.79
SER-I	Max	Tmp	5.84	34.64	6.11
SER-I	Min	Tmp	5.84	34.64	6.11
SER-I	Max	Fin	5.84	34.64	6.11
SER-I	Min	Fin	5.84	34.64	6.11

STEM LOCATION D 18.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	11.51	97.49	13.01
STR-I	Min	Tmp	8.61	97.38	13.01
STR-I	Max	Fin	11.51	97.49	13.01
STR-I	Min	Fin	8.61	97.38	13.01
STR-II	Max	Tmp	11.37	92.60	12.47
STR-II	Min	Tmp	8.47	92.49	12.47
STR-II	Max	Fin	11.29	89.66	12.14
STR-II	Min	Fin	8.39	89.56	12.14
STR-III	Max	Tmp	10.55	63.25	9.18
STR-III	Min	Tmp	7.65	63.15	9.18
STR-III	Max	Fin	10.55	63.25	9.18
STR-III	Min	Fin	7.65	63.15	9.18
STR-V	Max	Tmp	11.37	92.60	12.47
STR-V	Min	Tmp	8.47	92.49	12.47
STR-V	Max	Fin	11.29	89.66	12.14
STR-V	Min	Fin	8.39	89.56	12.14
SER-I	Max	Tmp	8.84	70.69	9.36
SER-I	Min	Tmp	8.84	70.69	9.36
SER-I	Max	Fin	8.84	70.69	9.36
SER-I	Min	Fin	8.84	70.69	9.36

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.10	0.48	0.49	34.00	39.24	243.90
STR-I	Min	Tmp	0.06	0.27	0.28	23.48	27.13	168.08
STR-I	Max	Fin	0.10	0.48	0.49	34.00	39.24	243.90
STR-I	Min	Fin	0.06	0.27	0.28	23.48	27.13	168.08
STR-II	Max	Tmp	0.10	0.48	0.49	33.02	38.11	236.84
STR-II	Min	Tmp	0.06	0.27	0.28	22.50	26.00	161.03
STR-II	Max	Fin	0.10	0.48	0.49	32.44	37.44	232.61
STR-II	Min	Fin	0.06	0.27	0.28	21.91	25.33	156.80
STR-III	Max	Tmp	0.10	0.48	0.49	27.15	31.35	194.52
STR-III	Min	Tmp	0.06	0.27	0.28	16.62	19.24	118.71
STR-III	Max	Fin	0.10	0.48	0.49	27.15	31.35	194.52
STR-III	Min	Fin	0.06	0.27	0.28	16.62	19.24	118.71
STR-V	Max	Tmp	0.10	0.48	0.49	33.02	38.11	236.84
STR-V	Min	Tmp	0.06	0.27	0.28	22.50	26.00	161.03
STR-V	Max	Fin	0.10	0.48	0.49	32.44	37.44	232.61
STR-V	Min	Fin	0.06	0.27	0.28	21.91	25.33	156.80
SER-I	Max	Tmp	0.07	0.33	0.34	20.87	24.12	149.27
SER-I	Min	Tmp	0.07	0.33	0.34	20.87	24.12	149.27
SER-I	Max	Fin	0.07	0.33	0.34	20.87	24.12	149.27
SER-I	Min	Fin	0.07	0.33	0.34	20.87	24.12	149.27
CSS	Max	Fin	0.07	0.33	0.34	16.95	19.62	121.06
CSS	Min	Fin	0.07	0.33	0.34	16.95	19.62	121.06

ADM BRIDGE - PGE SALUDA ACCESS RD
FACTORED FORCES (cont.)

FOOTING - W/O FOUNDATION PRESSURE (cont.)

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING STABILITY

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	1.64	5.86	3.57	4.35	1.22	3.43	4.08	1.191
STR-I	Min	Tmp	2.77	5.86	2.12	3.69	0.11	2.77	3.76	1.355
STR-I	Max	Fin	1.64	5.86	3.57	4.35	1.22	3.43	4.08	1.191
STR-I	Min	Fin	2.77	5.86	2.12	3.69	0.11	2.77	3.76	1.355
STR-I	MxVMnH	Fin	1.64	5.86	3.57	4.35	1.22	3.43	4.08	1.191
STR-I	MnVMnH	Fin	2.77	5.86	2.12	3.69	0.11	2.77	3.76	1.355
STR-II	Max	Tmp	1.61	5.86	3.65	4.20	1.23	3.32	4.09	1.232
STR-II	Min	Tmp	2.75	5.86	2.13	3.55	0.11	2.66	3.76	1.413
STR-II	Max	Fin	1.58	5.86	3.71	4.11	1.23	3.26	4.09	1.258
STR-II	Min	Fin	2.74	5.86	2.14	3.46	0.11	2.60	3.76	1.450
STR-II	MxVMnH	Fin	1.58	5.86	3.71	4.11	1.23	3.26	4.09	1.258
STR-II	MnVMnH	Fin	2.74	5.86	2.14	3.46	0.11	2.60	3.76	1.450
STR-III	Max	Tmp	1.32	5.86	4.43	3.31	1.25	2.69	4.45	1.657
STR-III	Min	Tmp	2.65	5.86	2.21	2.66	0.14	2.00	4.06	2.032
STR-III	Max	Fin	1.32	5.86	4.43	3.31	1.25	2.69	4.45	1.657
STR-III	Min	Fin	2.65	5.86	2.21	2.66	0.14	2.00	4.06	2.032
STR-III	MxVMnH	Fin	1.32	5.86	4.43	3.31	1.25	2.69	4.45	1.657
STR-III	MnVMnH	Fin	2.65	5.86	2.21	2.66	0.14	2.00	4.06	2.032
STR-V	Max	Tmp	1.61	5.86	3.65	4.20	1.23	3.32	4.09	1.232
STR-V	Min	Tmp	2.75	5.86	2.13	3.55	0.11	2.66	3.76	1.413
STR-V	Max	Fin	1.58	5.86	3.71	4.11	1.23	3.26	4.09	1.258
STR-V	Min	Fin	2.74	5.86	2.14	3.46	0.11	2.60	3.76	1.450
STR-V	MxVMnH	Fin	1.58	5.86	3.71	4.11	1.23	3.26	4.09	1.258
STR-V	MnVMnH	Fin	2.74	5.86	2.14	3.46	0.11	2.60	3.76	1.450
SER-I	Max	Tmp		NA*		3.06	0.44	2.33	NA*	
SER-I	Min	Tmp		NA*		3.06	0.44	2.33	NA*	
SER-I	Max	Fin		NA*		3.06	0.44	2.33	NA*	
SER-I	Min	Fin		NA*		3.06	0.44	2.33	NA*	
SER-I	MxVMnH	Fin		NA*		3.06	0.44	2.33	NA*	
SER-I	MnVMnH	Fin		NA*		3.06	0.44	2.33	NA*	

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel.
The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

NA* Indicates Eccentricity and Bearing Resistance checks Not Applicable for Service I

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	15.21	15.44	1.015
STR-I	Min	Fin	15.21	15.44	1.015
STR-II	Min	Tmp	14.60	14.85	1.017
STR-II	Min	Fin	14.23	14.50	1.019
STR-III	Min	Tmp	10.95	11.35	1.036
STR-III	Min	Fin	10.95	11.35	1.036
STR-V	Min	Tmp	14.60	14.85	1.017
STR-V	Min	Fin	14.23	14.50	1.019

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 0.80.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

Elastic (in)	Layer 1 Height (ft)	Layer 2 Height (ft)	Consol (in)	Settlement Second (in)	Total (in)	Allow (in)	Perform Ratio	Temp Stage Settlement (in)
0.55	20.00	NA	0.00	0.00	0.55	1.00	1.803	0.55

Notes:

Elastic settlement is based on:
effective width of 13.19 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 13.55 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 13.19 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

ADM BRIDGE - PGE SALUDA ACCESS RD
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State	Load Case	Stage	Moment (kip-ft)		Limit State	Load Case	Stage	Shear (kip)
(Controlling)					(Controlling)			
STR-I	Max	Tmp	7.97T	(Strength)	STR-I	Max	Tmp	1.71
SER-I	Max	Tmp	5.59T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State	Load Case	Stage	Moment (kip-ft)		Limit State	Load Case	Stage	Shear (kip)
(Controlling)					(Controlling)			
STR-I	Min	Tmp	92.97H	(Strength)	STR-I	Min	Tmp	10.27
SER-I	Max	Tmp	65.98H	(Crack Control)				(Xdist)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

The Maximum shear in Heel is located at Xdist from back face of stem, where Xdist is (2.25) ft.

ADM BRIDGE - PGE SALUDA ACCESS RD
MOMENT AXIAL INTERACTION

STEM LOCATION A 4.69 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	2.89	85.16	1.84	54.29	TN	29.455	0.60	0.900
STR-I	Min	Tmp	2.88	72.96	1.39	35.24	TN	25.327	0.60	0.900
STR-I	Max	Fin	2.89	85.16	1.84	54.29	TN	29.455	0.60	0.900
STR-I	Min	Fin	2.88	72.96	1.39	35.24	TN	25.327	0.60	0.900
STR-II	Max	Tmp	2.65	89.58	1.81	61.18	TN	33.773	0.60	0.900
STR-II	Min	Tmp	2.64	75.18	1.36	38.70	TN	28.455	0.60	0.900
STR-II	Max	Fin	2.51	92.92	1.79	66.39	TN	37.030	0.60	0.900
STR-II	Min	Fin	2.50	76.79	1.34	41.21	TN	30.733	0.60	0.900
STR-III	Max	Tmp	1.22	137.99	1.62	183.65	TR	113.143	0.60	0.787
STR-III	Min	Tmp	1.21	132.85	1.17	128.72	TN	109.883	0.60	0.900
STR-III	Max	Fin	1.22	137.99	1.62	183.65	TR	113.143	0.60	0.787
STR-III	Min	Fin	1.21	132.85	1.17	128.72	TN	109.883	0.60	0.900
STR-V	Max	Tmp	2.65	89.58	1.81	61.18	TN	33.773	0.60	0.900
STR-V	Min	Tmp	2.64	75.18	1.36	38.70	TN	28.455	0.60	0.900
STR-V	Max	Fin	2.51	92.92	1.79	66.39	TN	37.030	0.60	0.900
STR-V	Min	Fin	2.50	76.79	1.34	41.21	TN	30.733	0.60	0.900
SER-I	Max	Tmp	2.03	91.20	1.42	63.70	TN	44.978	0.60	0.900
SER-I	Min	Tmp	2.03	91.20	1.42	63.70	TN	44.978	0.60	0.900
SER-I	Max	Fin	2.03	91.20	1.42	63.70	TN	44.978	0.60	0.900
SER-I	Min	Fin	2.03	91.20	1.42	63.70	TN	44.978	0.60	0.900

Section Thickness = 22.69 (in)
Effective Depth = 19.25 (in)

STEM LOCATION B 9.38 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	17.37	78.36	4.39	19.80	TN	4.512	0.60	0.900
STR-I	Min	Tmp	17.34	73.94	3.30	14.08	TN	4.265	0.60	0.900
STR-I	Max	Fin	17.37	78.36	4.39	19.80	TN	4.512	0.60	0.900
STR-I	Min	Fin	17.34	73.94	3.30	14.08	TN	4.265	0.60	0.900
STR-II	Max	Tmp	16.24	79.39	4.32	21.13	TN	4.889	0.60	0.900
STR-II	Min	Tmp	16.21	74.56	3.24	14.88	TN	4.601	0.60	0.900
STR-II	Max	Fin	15.56	80.09	4.28	22.04	TN	5.148	0.60	0.900
STR-II	Min	Fin	15.53	74.98	3.20	15.43	TN	4.829	0.60	0.900
STR-III	Max	Tmp	9.46	92.83	3.92	38.50	TN	9.817	0.60	0.900
STR-III	Min	Tmp	9.43	82.17	2.84	24.72	TN	8.718	0.60	0.900
STR-III	Max	Fin	9.46	92.83	3.92	38.50	TN	9.817	0.60	0.900
STR-III	Min	Fin	9.43	82.17	2.84	24.72	TN	8.718	0.60	0.900
STR-V	Max	Tmp	16.24	79.39	4.32	21.13	TN	4.889	0.60	0.900
STR-V	Min	Tmp	16.21	74.56	3.24	14.88	TN	4.601	0.60	0.900
STR-V	Max	Fin	15.56	80.09	4.28	22.04	TN	5.148	0.60	0.900
STR-V	Min	Fin	15.53	74.98	3.20	15.43	TN	4.829	0.60	0.900
SER-I	Max	Tmp	12.59	79.50	3.37	21.28	TN	6.317	0.60	0.900
SER-I	Min	Tmp	12.59	79.50	3.37	21.28	TN	6.317	0.60	0.900
SER-I	Max	Fin	12.59	79.50	3.37	21.28	TN	6.317	0.60	0.900
SER-I	Min	Fin	12.59	79.50	3.37	21.28	TN	6.317	0.60	0.900

Section Thickness = 27.37 (in)
Effective Depth = 23.94 (in)

STEM LOCATION C 14.06 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	47.65	171.74	7.61	27.42	TN	3.604	1.20	0.900
STR-I	Min	Tmp	47.59	165.21	5.71	19.81	TN	3.472	1.20	0.900
STR-I	Max	Fin	47.65	171.74	7.61	27.42	TN	3.604	1.20	0.900
STR-I	Min	Fin	47.59	165.21	5.71	19.81	TN	3.472	1.20	0.900
STR-II	Max	Tmp	44.97	172.99	7.51	28.88	TN	3.847	1.20	0.900
STR-II	Min	Tmp	44.91	165.99	5.61	20.72	TN	3.696	1.20	0.900
STR-II	Max	Fin	43.36	173.82	7.45	29.85	TN	4.008	1.20	0.900
STR-II	Min	Fin	43.30	166.51	5.54	21.32	TN	3.845	1.20	0.900
STR-III	Max	Tmp	28.89	186.39	6.90	44.50	TN	6.452	1.20	0.900
STR-III	Min	Tmp	28.83	174.10	4.99	30.17	TN	6.039	1.20	0.900
STR-III	Max	Fin	28.89	186.39	6.90	44.50	TN	6.452	1.20	0.900
STR-III	Min	Fin	28.83	174.10	4.99	30.17	TN	6.039	1.20	0.900
STR-V	Max	Tmp	44.97	172.99	7.51	28.88	TN	3.847	1.20	0.900

ADM BRIDGE - PGE SALUDA ACCESS RD
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 14.06 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in ²)	Phi Factor
STR-V	Min	Tmp	44.91	165.99	5.61	20.72	TN	3.696	1.20	0.900
STR-V	Max	Fin	43.36	173.82	7.45	29.85	TN	4.008	1.20	0.900
STR-V	Min	Fin	43.30	166.51	5.54	21.32	TN	3.845	1.20	0.900
SER-I	Max	Tmp	34.64	173.29	5.84	29.22	TN	5.002	1.20	0.900
SER-I	Min	Tmp	34.64	173.29	5.84	29.22	TN	5.002	1.20	0.900
SER-I	Max	Fin	34.64	173.29	5.84	29.22	TN	5.002	1.20	0.900
SER-I	Min	Fin	34.64	173.29	5.84	29.22	TN	5.002	1.20	0.900

Section Thickness = 32.06 (in)
Effective Depth = 28.62 (in)

STEM LOCATION D 18.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Zone	Perform Ratio	Area Prov (in ²)	Phi Factor
STR-I	Max	Tmp	97.49	196.52	11.51	23.20	TN	2.016	1.20	0.900
STR-I	Min	Tmp	97.38	190.19	8.61	16.81	TN	1.953	1.20	0.900
STR-I	Max	Fin	97.49	196.52	11.51	23.20	TN	2.016	1.20	0.900
STR-I	Min	Fin	97.38	190.19	8.61	16.81	TN	1.953	1.20	0.900
STR-II	Max	Tmp	92.60	197.57	11.37	24.26	TN	2.134	1.20	0.900
STR-II	Min	Tmp	92.49	190.85	8.47	17.48	TN	2.063	1.20	0.900
STR-II	Max	Fin	89.66	198.27	11.29	24.96	TN	2.211	1.20	0.900
STR-II	Min	Fin	89.56	191.28	8.39	17.91	TN	2.136	1.20	0.900
STR-III	Max	Tmp	63.25	207.89	10.55	34.67	TN	3.287	1.20	0.900
STR-III	Min	Tmp	63.15	197.20	7.65	23.88	TN	3.123	1.20	0.900
STR-III	Max	Fin	63.25	207.89	10.55	34.67	TN	3.287	1.20	0.900
STR-III	Min	Fin	63.15	197.20	7.65	23.88	TN	3.123	1.20	0.900
STR-V	Max	Tmp	92.60	197.57	11.37	24.26	TN	2.134	1.20	0.900
STR-V	Min	Tmp	92.49	190.85	8.47	17.48	TN	2.063	1.20	0.900
STR-V	Max	Fin	89.66	198.27	11.29	24.96	TN	2.211	1.20	0.900
STR-V	Min	Fin	89.56	191.28	8.39	17.91	TN	2.136	1.20	0.900
SER-I	Max	Tmp	70.69	198.07	8.84	24.76	TN	2.802	1.20	0.900
SER-I	Min	Tmp	70.69	198.07	8.84	24.76	TN	2.802	1.20	0.900
SER-I	Max	Fin	70.69	198.07	8.84	24.76	TN	2.802	1.20	0.900
SER-I	Min	Fin	70.69	198.07	8.84	24.76	TN	2.802	1.20	0.900

Section Thickness = 36.75 (in)
Effective Depth = 33.31 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Zone Code Descriptions

TN - Tension controlled section
TR - Transition section
CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

ADM BRIDGE - PGE SALUDA ACCESS RD
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State	Load Case (Controlling)	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	STR-I	Max	Tmp	7.97T	25.99	0.900	3.261	0.310
Heel	STR-I	Min	Tmp	92.97H	99.96	0.900	1.075	1.200

Phi Factor Epsilon (cl) = 0.00200

Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling
moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling
moment is found in the Heel for the current location.

ADM BRIDGE - PGE SALUDA ACCESS RD
MINIMUM REINFORCEMENT CHECK

STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	1.33*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Stem A	4.69	38.04	3.85+	0.04	0.20*	0.60	
Stem B	9.38	55.38	23.10+	0.22*	0.20	0.60	
Stem C	14.06	75.97	63.38+	0.50*	0.20	1.20	
Stem D	18.75	99.81+	129.66	0.68*	0.20	1.20	
Stem 1	13.75	74.50	60.69+	0.48*	0.20	0.60	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	1.33*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	42.57	10.60+	0.13	0.23*	0.31	
Heel	42.57+	123.66	0.49*	0.23	1.20	

Status Code Descriptions

- + - Controlling moment for Rho Min Area calculation
- * - Controlling minimum area of steel
- A - Area provided smaller than required minimum area of steel

ADM BRIDGE - PGE SALUDA ACCESS RD
CRACK CONTROL - ANALYSIS

STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Axial (kip)	Status Codes
Stem A	4.69	0.60	0.00	999.99	2.03	1.42	E
Stem B	9.38	0.60	0.00	999.99	12.59	3.37	E
Stem C	14.06	1.20	0.00	999.99	34.64	5.84	E
Stem D	18.75	1.20	0.00	999.99	70.69	8.84	E
Stem 1	13.75	0.60	0.00	999.99	33.17	5.68	E

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	0.31	0.00	999.99	5.59T	E
Heel	1.20	36.69	6.19	65.98H	G

NOTE: A "T" following the moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)

- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to $0.6 \cdot f_y$ in allowable spacing calculation

ADM BRIDGE - PGE SALUDA ACCESS RD
REINFORCEMENT SUMMARY - ANALYSIS

STEM LOCATION D 18.75 (ft) FROM TOP OF STRUCTURE

Bar Size	Bar Spacing (in)	Develop Hooked (in)	Length Straight (in)	Area Reqd (in^2)	Area Prov (in^2)	Splice Length (in)	Status Codes
7	6.0	9.2	12.0	0.679	1.200	15.6	

Available Length in Footing = 19.2 (in)

Status Code Descriptions

- A - Hooked development length exceeds available length
- B - Straight development length exceeds available length

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
5	12.0	18.8	22.0	S	0.233	0.310 *

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
7	6.0	45.8	148.2	S	1.111	1.200

* Indicates area required was governed by the minimum temperature and shrinkage reinforcement criteria.

Bar Type Description

- S - Straight Bar
- H - Hooked Bar

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	STEM		Service Status	Shear Status
			Total Design	Area/Width (in^2)		
Stem A	4.69	7 @ 12.00		0.60	OK	OK
Stem B	9.38	7 @ 12.00		0.60	OK	OK
Stem C	14.06	7 @ 12.00		1.20	OK	OK
Stem D	18.75	7 @ 12.00		1.20	OK	OK
Stem 1	13.75	7 @ 12.00		0.60	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Total Area/Design Width (in^2)	Strength Status	Service Status	Shear Status
Toe	5 @ 12.00	0.31	OK	OK	OK
Heel	7 @ 6.00	1.20	OK	OK	OK

ADM BRIDGE - PGE SALUDA ACCESS RD
SHEAR RESULTS

STEM

Location	Dist from Struc Top (ft)	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Stem A	4.69	STR-I	Max	Tmp	1.70	22.06	12.972
Stem B	9.38	STR-I	Max	Tmp	4.67	27.60	5.906
Stem C	14.06	STR-I	Max	Tmp	8.44	32.45	3.843
Stem D	18.75	STR-I	Max	Tmp	13.01	37.99	2.920
Stem 1	13.75	STR-I	Max	Tmp	8.19	32.78	4.000

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	STR-I	Max	Tmp	1.71	22.03	12.858
Heel	STR-I	Min	Tmp	10.27	21.88	2.130

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program did not encounter any specification check warnings for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

ADM BRIDGE - PGE SALUDA ACCESS RD
SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program did not encounter any specification check errors for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

ADM BRIDGE - PGE SALUDA ACCESS RD
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August 13, 2026

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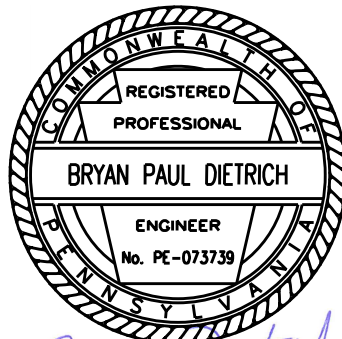
Subject: **ADM Bridge – Foundation Design2
PGE- Saluda Access Road Structures
Trout Run, Pennsylvania
Markosky Project No. 26-010C**

To whom it may concern,

Markosky has prepared the attached foundation design for the remaining fifteen (15) ADM bridge structures crossing over various drainage features and smaller streams along the haul route for the Subject project. ASD Design and Analysis methods were used to perform reinforced concrete strip footing abutment bearing capacity checks with hand calculations. Since boring information was not available at this location, a safe bearing capacity of approximately 2 TSF max. was conservatively considered.

Respectfully,

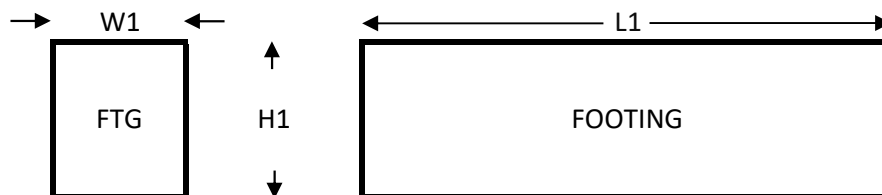
Bryan P. Dietrich, PE
Senior Project Manager



Bryan Dietrich
08/13/2026

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COLLABORATIVE ENGINEERING

JOB **PA - PGE Saluda Bridge Foundation Design**SHEET NO. **1** OF **2**CALCULATED BY **IDW** DATE **7/15/2026**CHECKED BY **BPD** DATE **8/13/2026****Verify Bearing Capacity from Vehicular Bridge Loads on CIP Concrete Foundation** (Consider ASD Method)Span Length = **60** ft (Max. Out-to-Out Bridge)Bridge No's: **1-1, 1-2, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8, 2-9, 3-1, 3-2, 5-1, 5-2, & 5-3****Dead Loads****ADM Bridge (Max. Total RXN per Abutment)**DL RXN = **37000** lbsBridge Dead Load = **37,000** lbs**Future Wearing Surface (Asphalt)**H = **0.25** ft (3-inch)Unit Wt. = **140** pcfW = **16** ft (Width of Deck)L = **30** ft (1/2 Span Length)Volume = **120** cfFuture Wearing Surface Load = **16,800** lbs**Future Wearing Surface (Timber Planks)**H = **0.125** ft (2x's)Unit Wt. = **50** pcfW = **16** ft (Width of Deck)L = **30** ft (1/2 Span Length)Volume = **60** cfFuture Wearing Surface Load = **3,000** lbs**Abutment Footing (CIP Concrete)**H1 = **4** ftUnit Wt. = **150** pcfW1 = **4** ftL1 = **18** ftVolume = **288** cfAbutment Footing Dead Load = **43,200** lbs**Total Dead Load = 100,000 lbs****Live Loads****Vehicular Live Load (Max RXN per Abutment)**LL RXN = **98400** lbs**Vehicular Live Load = 98,400 lbs****Check Bearing**DL Bearing = **100,000** lbsLL Bearing = **98,400** lbsTotal Bearing = **198,400** lbsBearing Area = **72** sfBearing Stress_{ALLOW} = **4,000** psfBearing Stress_{ACTUAL} = **2,756** psfF.S. = **1.45** OKABUTMENT SECTIONABUTMENT ELEVATION

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COLLABORATIVE ENGINEERING

JOB **PA - PGE Saluda Bridge Foundation Design**SHEET NO. **2** OF **2**CALCULATED BY **IDW** DATE **7/15/2026**CHECKED BY **BPD** DATE **8/13/2026****Min. Temperature & Shrinkage Reinforcement Calculations - Substructure:**

References:

$$A_s \geq \frac{(1.30bh)}{2(b+h)f_y} \quad (A5.10.6-1)$$

$$A_s \geq 0.2in^2 \quad (A5.10.6-2)$$

$$f_y = 60.00 \text{ ksi}$$

 A_s is required area of steel in both directions (in^2 / ft).

b is the least width of the component (in).

h is the least thickness of the component (in).

 f_y is the reinforcement yield strength (ksi).

Sub Units	b (in)	h (in)	Min. A_s (in^2)	Rebar Selection			Check
				Bar Size	Bar Spa. (in)	A_s (in^2)	
Horiz. Face (Top & Bot.)	48	48	0.26	#5	12	0.31	OK
Vert. Face (Front & Back)	48	48	0.26	#5	12	0.31	OK

- Per A 5.10.6.1: Where the least dimension varies along the length of the component, multiple sections should be examined.

- Per A 5.10.6.1 & D 5.10.6: Spacing should not exceed: 12" for walls > 18" thick, 12" for other components > 36" thick, or 3.0 times the component thickness but not less than 18".

- Per D 5.10.6: For members which have a sacrificial wearing surface or architectural treatments, the total thickness shall be used, not the structure thickness.

- Per D 5.10.6.1P: temperature and shrinkage reinforcement shall be #4 at 12" or #5 at 18" minimum.