

Steel Escalation Option

The undersigned hereby certifies that he/she is authorized to make a decision, on behalf of the Bidder, regarding application of the provisions of the Standard Special Provision entitled "Price Adjustment for Steel Cost Fluctuations" to the following project:

ECMS Project No. _____ S.R. _____, Section _____ Letting Date _____

SSP SUBSECTION	CATEGORY NAME	OPTION-IN*	OPTION-OUT**
4.a	Guide Rail and Metal Median Barrier	<input type="checkbox"/>	<input type="checkbox"/>
4.b	Reinforcement Bars	<input type="checkbox"/>	<input type="checkbox"/>
4.c	Piles	<input type="checkbox"/>	<input type="checkbox"/>
4.d	Steel Sign Structure(s)	<input type="checkbox"/>	<input type="checkbox"/>
4.e	Fabricated Structural Steel	<input type="checkbox"/>	<input type="checkbox"/>
4.f	Precast Reinforced Concrete Box Culvert(s) / Prestressed Concrete Bridge Beam(s)	<input type="checkbox"/>	<input type="checkbox"/>

* Checking here **elects** the option to apply the provisions of the SSP entitled "Price Adjustment for Steel Cost Fluctuations" to the steel used in applicable materials placed as part of the work items in the indicated category.

** Checking here **declines** the option to apply the provisions of the SSP entitled "Price Adjustment for Steel Cost Fluctuations" to the steel used in applicable materials placed as part of the work items in the indicated category.

CONTRACTOR NAME

X

SIGNATURE

PRINTED NAME

DATE

The apparent low bidder is required to submit this form via fax to (717) 705-1504 by 3:00 pm prevailing local time within 7 calendar days after the bid opening. When the seventh calendar day after the bid opening falls on a day PennDOT offices are closed, submit this form via fax by 3:00 pm prevailing local time on the next business day.

If a properly completed form is not provided by the apparent low bidder within the time specified, the Department will consider the option to apply the price adjustment provisions to the project to be declined (i.e. Option-OUT will be selected for the project). If the form, when provided within the time specified, has been completed such that the Department is unable to ascertain the bidder's intention with regard to the inclusion of any one of the applicable steel product categories, the Department will consider the option to apply the price adjustment provisions to that product category to be declined (i.e. Option-OUT will be selected for the category). No further opportunity to elect steel escalation for the project or an individual steel product category will be made available to the bidder.



DESIGN-BUILD DESIGN ACTIVITIES FIRM IDENTIFICATION AND QUALIFICATIONS

Fill in the following information as applicable. If not applicable insert "n/a". Attach additional pages as necessary.

Contract Number _____ Project Description _____

District _____ County _____ SR _____ Section _____

Contractor _____

Lead Design Engineer _____ Design Activity(ies) _____ Lead Design Project Manger (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
Quality Control Reviewer _____ Quality Control (QC) Manager (Attach resume) _____ Alternate QC Manager (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
(If applicable) Quality Assurance Reviewer _____ Quality Assurance (QA) Manager (Attach resume) _____ Alternate QA Manager (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
Secondary Design Services Professional firm _____ Design Activity(ies) _____ Secondary Design Services Professional Manger (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
Secondary Design Services Professional firm _____ Design Activity(ies) _____ Secondary Design Services Professional Manger (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
Secondary Design Services Professional firm _____ Design Activity(ies) _____ Secondary Design Services Professional Manger (Attach resume) _____	For Department Use Only <input type="checkbox"/> District Approval <input type="checkbox"/> District Disallowance (Attach Justification)
Have you faxed (a) a letter disclosing potential conflict as defined in the State Adverse Interest Act; (b) a letter disclosing potential organization conflicts of interests; or (c) a completed "Request for Consideration of Engineering Involvement" form? Yes <input type="checkbox"/> No <input type="checkbox"/>	
I certify that all information included on this form is correct to the best of my knowledge. _____ Contractor Authorized Representative Signature Date	For Department Use Only _____ PennDOT Project Manager Signature _____ Date
Contractor Authorized Representative Printed Name Fax this form to the District Project Manager indicated in the Special Provision entitled, "Special Bidding – Design-build" within 3 calendar days after the Award of the Contract.	Notify Contractor within 8 calendar days indicating Approval or Disallowance.



REQUEST FOR CONSIDERATION FOR ENGINEERING INVOLVEMENT RESTRICTIONS

Fill in the following information as applicable:

Agreement Number _____ Contract Number _____ MPMS _____

District _____ County _____ SR _____ Section _____

SPN _____ Allot. _____ FPN _____

Consultant _____ Local Municipality _____

Project Description _____

- Involvement on Department Agreement**
- Preliminary Engineering
 - Preliminary Review
 - Final Design
 - PS&E Preparation
 - Department Review
 - Construction Inspection
 - Other _____

Actual duties performed: _____

Were recommendations, deliverables, or services developed related to the subject project?

Yes No (If yes, request will be denied)

Planned Involvement on Contractor Design-Build Team _____

Executive Summary why consultant feels a conflict of interest does not exist

CONSULTANT REPRESENTATIVE (authorizes that information provided is true and correct)	
X _____	
Date	Title

<p>CONSULTANT AGREEMENT CHIEF <input type="checkbox"/> Concur - Forward <input type="checkbox"/> Do not Concur</p> <p>X _____ Date</p> <p>Reason for Non-Concurrence _____</p> <p><input type="checkbox"/> FHWA Concurrence</p>	<p>OFFICE OF CHIEF COUNSEL <input type="checkbox"/> Concur <input type="checkbox"/> Do not Concur</p> <p>X _____ Date</p> <p>Reason for Non-Concurrence _____</p>
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REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract,

which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer

shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (ii) The classification is utilized in the area by the construction industry; and
- (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the

contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at

<http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages.

Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary

to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed,

or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification

or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each

participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each

participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--
Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR
APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL
ACCESS ROAD CONTRACTS**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

General Decision Number: PA120014 08/03/2012 PA14

Superseded General Decision Number: PA20100014

State: Pennsylvania

Construction Types: Heavy and Highway

Counties: Adams, Berks, Bradford, Carbon, Columbia, Cumberland, Dauphin, Juniata, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Lycoming, Monroe, Montour, Northampton, Northumberland, Perry, Pike, Schuylkill, Snyder, Sullivan, Susquehanna, Tioga, Union, Wayne, Wyoming and York Counties in Pennsylvania.

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS (Excluding Sewer Grouting Projects and Excluding Sewage and Water Treatment Plant Projects)

Modification Number	Publication Date
0	01/06/2012
1	02/10/2012
2	02/24/2012
3	03/02/2012
4	04/13/2012
5	06/01/2012
6	06/15/2012
7	06/22/2012
8	07/13/2012
9	07/20/2012
10	08/03/2012

BOIL0013-003 01/01/2011

	Rates	Fringes
BOILERMAKER.....	\$ 37.35	30.02

 CARP0076-011 05/01/2008

COLUMBIA, MONTOUR, NORTHUMBERLAND, SCHUYLKILL, SNYDER, UNION, the lower part of Luzerne county, Carbon County, Banks, Lusanna, Lehigh, Packer, Kidder townships, and part of Penn Forest

	Rates	Fringes
MILLWRIGHT.....	\$ 26.56	13.02

 CARP0191-002 05/01/2008

YORK COUNTY

	Rates	Fringes
MILLWRIGHT.....	\$ 26.56	13.02

CARP0287-009 05/01/2008

ADAMS, CUMBERLAND, DAUPHIN, JUNIATA, LANCASTER, LEBANON, PERRY,
NEW CUMBERLAND ARMY DEPOT AND HARRISBURG YORK STATE AIRPORT IN
YORK COUNTY

	Rates	Fringes
MILLWRIGHT.....	\$ 26.56	13.02

CARP0454-008 07/01/2011

Lehigh and Northampton Counties

	Rates	Fringes
PILEDRIVERMAN.....	\$ 38.15	28.27

CARP0492-002 06/01/2010

BERKS COUNTY

	Rates	Fringes
MILLWRIGHT.....	\$ 26.71	11.02

CARP0600-005 05/01/2011

LEHIGH AND NORTHAMPTON COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 33.44	20.17

CARP1906-002 07/01/2011

CARBON (Townships: East Penn, Lower Towamensing, Mahoning,
Franklin, Towamensing, Penn Forest. Everything south of Route
903 and east to the Kidder Township Line. Boroughs: Hauto,
Nesquehoning, Lansford, Summit Hill, Jim Thorpe, Weissport,
Bownmanstown, Palmerton, Lehigh, and Parryville) , LEHIGH
AND NORTHAMPTON COUNTIES

	Rates	Fringes
MILLWRIGHT.....	\$ 33.76	24.84

CARP2274-002 05/01/2012

EXCEPT LEHIGH AND NORTHAMPTON COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 27.18	12.38

CARP2274-003 05/01/2012

Adams, Berks, Bradford, Carbon, Columbia, Cumberland, Dauphin,

Juniata, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Monroe, Montour, Northumberland, Perry, Pike, Schuylkill, Snyder, Sullivan, Susquehanna, Tioga, Union, Wayne, Wyoming and York

	Rates	Fringes
PILEDRIVERMAN.....	\$ 27.18	12.38

ELEC0126-001 05/28/2012

	Rates	Fringes
Line Construction: (ADAMS, CUMBERLAND, DAUPHIN, LANCASTER, LEBANON, JUNIATA, PERRY AND YORK COUNTIES)		
Groundman.....	\$ 22.98	26%+7.50
Lineman.....	\$ 38.30	26%+7.50
Truck Driver.....	\$ 24.89	26%+7.50
Winch Truck Operator.....	\$ 26.81	26%+7.50

Line Construction: (BERKS AND LEHIGH NORTHAMPTON COUNTIES)		
Groundman.....	\$ 22.98	26%+7.50
Lineman.....	\$ 38.30	26%+7.50
Truck Driver.....	\$ 24.89	26%+7.50
Winch Truck Operator.....	\$ 26.81	26%+7.50

ELEC1319-001 09/05/2011

BRADFORD, CARBON, COLUMBIA, LACKAWANNA, LUZERNE, LYCOMING, MONROE, MONTOUR, NORTHUMBERLAND, PIKE, SCHUYLKILL, SNYDER, SULLIVAN, SUSQUEHANNA, TIOGA, UNION, WAYNE, AND WYOMING COUNTIES

	Rates	Fringes
Line Construction:		
Equipment Operators.....	\$ 45.45	14.40
Groundmen.....	\$ 28.46	10.13
Lineman.....	\$ 45.91	18.45
Truck Drivers.....	\$ 29.84	10.24

* ENGI0542-004 05/01/2012

	Rates	Fringes
Power equipment operators: (HIGHWAY CONSTRUCTION AND WATER LINES CONSTRUCTION (OFF PLANT SITE))		
GROUP 1.....	\$ 30.09	19.51
GROUP 1a.....	\$ 32.34	20.19
GROUP 2.....	\$ 28.91	19.17
GROUP 3.....	\$ 28.21	18.97
GROUP 4.....	\$ 27.75	18.85
GROUP 5.....	\$ 27.25	18.69
GROUP 6.....	\$ 30.33	19.57
GROUP 6a.....	\$ 32.58	20.23

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1 - Pile drivers, all types of cranes, all types of backhoes, draglines, keystones, all types of shovels, derricks, trench shovels, trenching machines, paver (blacktop and concrete), gradalls, all front end loaders, tandem scrapers, pippin types backhoes, boat captains, batch plant with mixer, drill self contained (drill-master type), CMI Autograde, milling machine, vemeer saw, conveyor loader (euclid type) scraper and tournapulls, bulldozers and tractors, concrete pumps, motor patrols, mechanic welders, log skidder, side boom, bobcat type (with attachments), boring machines including directional boring machines, chipper with boom, hydro ax, machines similar to the above including remote control equipment.

GROUP 1a: Crawler backhoes and Crawler gradalls over one cubic yard factory rating; Hydraulic backhoes over one cubic yard factory rating; All types of cranes 15 ton and over factory rating; Single person operation truck cranes 15 ton and over factory rating; Cherry picker type machinery and equipment 15 ton and over factory rating; Machines similar to above, including remote control equipment; Equipment in this Wage Group that does not require an oiler.

GROUP 2 - Spreaders, asphalt plant engineers, rollers (high grade finishing), machine similar to above, including remote control equipment, and forklifts 20ft and over.

GROUP 3 - Welding machine, well points, compressors, pump heaters, farm tractors, form line graders, ditch witch type trencher, road finishing machines, concrete breaking machines, rollers, miscellaneous equipment operator, seaman pulverizing mixer, power broom, seeding spreader, tireman - (for power equipment) conveyors, loaders other than EUC type, conveyors, driller second class, machines similar to the above including remote control equipment, and forklift under 20 ft.

GROUP 4 - Fireman and grease truck

GROUP 5 - Oilers and deck hands

GROUP 6 - All machines with booms (including jibs, masts, leads, etc.) 100 ft. and over.

GROUP 6a: All machines with Booms (including Jibs, Masts, Leads, etc.) 100 feet 15 ton and over factory rating; Machines similar to above, including remote control equipment; Equipment in this Wage Group that does not require an oiler.

TOXIC/HAZARDOUS WAST REMOVAL

Add 20 per cent to basic hourly rate for all classifications

* ENGI0542-022 05/01/2012

	Rates	Fringes
Power equipment operators: (HEAVY CONSTRUCTION:)		
GROUP 1.....	\$ 32.06	20.10+A
GROUP 1a.....	\$ 34.31	20.76+A
GROUP 2.....	\$ 31.77	20.02+A
GROUP 2a.....	\$ 34.02	20.69+A
GROUP 3.....	\$ 28.85	19.16+A
GROUP 4.....	\$ 27.71	18.83+A
GROUP 5.....	\$ 27.26	18.70+A
GROUP 6.....	\$ 26.39	18.43+A
HEAVY CONSTRUCTION:		

FOOTNOTE:

A: PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day, the employee works the day before and the day after the holiday.

TOXIC/HAZARDOUS WASTE REMOVAL

Add 20 per cent to basic hourly rate for all classifications

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Machines doing hook work, any machine handling machinery, cable spinning machines, helicopters, machines similar to the above, including remote control equipment, all types of cranes, cableways, and draglines.

GROUP 1a: Machines doing hook work; Machines handling machinery; All types of cranes 15 ton and over factory rating; Cable ways; Draglines 15 ton and over factory rating; High Rail/Burro Crane 15 ton and over factory rating; Rail Loader (Winch Boom Type) 15 ton and over factory rating; Machines similar to above, including remote control equipment; Equipment in this Wage Group that does not require an oiler.

GROUP 2: Backhoes, keystones, shovels, derricks, trench shovels, trenching machines, hoist with two towers, pavers 21E and over, overhead cranes, building hoists (double drum) gradalls, mucking machines in tunnels, front end loaders, tandem scrapers, pippin type backhoes, boat captains, batch plant operators concrete drills, self-contained rotary drills, fork lifts, 20ft, lift and over, scrapers, tournapulls, spreaders, bulldozers and tractors, rollers (high grade finishing), mechanic-welder, motor patrols, concrete pumps, grease truck, bob cat type (all attachments), boring machines including directional boring machines, hydro ax, side boom, vermeer saw, chipper with boom, machines similar to the above including remote control equipment

GROUP 2a: Crawler backhoes and crawler gradalls over one cubic yard factory rating; Hydraulic backhoes over one cubic yard factory rating; Equipment 15 ton and over factory rating; Machines similar to above, including remote

control equipment; Equipment in this Wage Group that does not require an oiler.

GROUP 3: Conveyors, building hoist (single drum), high or low pressure boilers, drill operators, well drillers, asphalt plant engineers, ditch witch type trencher, second class driller, forklift truck under 20ft. lift, stump grinder, tireman (for power equipment), machines similar to above including remote control equipment.

GROUP 4: Welding machines, well points, compressors, pumps, heaters, farm tractors, form line graders, road finishing machines, concrete breaking machines, rollers, seaman pulverizing mixer, power boom, seeding spreader, chipper without boom, machines similar to the above including remote control equipment.

GROUP 5: Fireman.

GROUP 6: Oilers and deck hands (personnel boats).

IRON0036-002 07/01/2012

CARBON, LEHIGH (Except Fogelsville), NORTHAMPTON AND MONROE (Except Tobyhanna Army Depot)

	Rates	Fringes
Ironworkers:		
Projects Over 25 Million		
Dollars.....	\$ 33.55	24.00
Projects Under 25 Million		
Dollars.....	\$ 33.05	24.00

IRON0404-006 07/01/2011

ADAMS, CUMBERLAND, DAUPHIN, LEBANON (Western 3/4), LANCASTER (Western part), LYCOMING, MONTOUR, NORTHUMBERLAND, JUNIATA, PERRY, SCHUYLKILL (Western tip to include the twps. of Fearnot, Good Spring, Hegins, Jolett, Klingerstown, Muir, Pittman Haas, Rough and Ready, Sacramento, Spring Glen, Suedberg, Tower City, and Valley View), SNYDER, UNION, AND YORK COUNTIES

	Rates	Fringes
Ironworkers:.....	\$ 29.02	24.05

* IRON0420-006 07/01/2012

BERKS, LANCASTER (Eastern Part), LEBANON (Eastern 1/4), LEHIGH (Fogelsville), AND SCHUYLKILL (Remainder) COUNTIES

	Rates	Fringes
Ironworkers:		
Projects less than		
\$200,000,000.....	\$ 30.00	23.00

STRUCTURAL, ORNAMENTAL,
AND REINFORCING: Projects
\$200,000,000 and greater,
(all work).....\$ 31.00 23.00

IRON0489-002 07/01/2010

BRADFORD, COLUMBIA, LACKAWANNA, LUZERNE, MONROE (Tobyhanna
Depot only), PIKE, SULLIVAN, TIOGA, SUSQUEHANNA, WAYNE,
WYOMING, CARBON (Northern tip - McAdoo), LYCOMING (Southern tip
- Hughsville)

Rates Fringes

Ironworkers:

Structural and Ornamental...\$ 30.82 24.80

LABO0158-001 05/01/2012

Rates Fringes

Laborers:

GROUP 1.....	\$ 17.71	13.39
GROUP 2.....	\$ 24.33	13.39
GROUP 3.....	\$ 21.32	13.39
GROUP 4.....	\$ 21.67	13.39
GROUP 5.....	\$ 22.34	13.39
GROUP 6.....	\$ 21.76	13.39
GROUP 7.....	\$ 22.05	13.39
GROUP 8.....	\$ 22.53	13.39

LABORERS CLASSIFICATIONS

GROUP 1: Flag person

GROUP 2: Hazardous/Toxic/Asbestos Waste Handler, Lead Paint
Handler

GROUP 3: concrete pitman, puddlers, highway guide rail right
of way and property fence slab reinforcement placers,
Laborers, landscaper, seeders, planters, magazine tenders,
laser beam men for pipe laying and paving machines,,
railroad trackman, signalman, asphalt rakers, asphalt
tamper, lute or screed man, pneumatic and electric tool
operators, jackmammers, paving breakers, concrete saws,
whacker vibrator, chainsaw, highway concrete block layers,
sheet hammer, pipe layers, Walk Behind Rollers, Walk Behind
Trencher

GROUP 4: Caisson-open air below 8 feet, cofferdam open air
below 8 feet where excavations for circular caissons and
cofferdams 8 ft and below level of natural grade adjacent
to starting point, form setters (road) wagon drill diamond
point drill, gunite nozzle operators, walk behind rollers
and concrete rubbers, blaster.

GROUP 5: Form Setter, Reinforced Steel Placer, Bonding
Aligning and Securing and Burning and welding in
Conjunction wth Rebar, and Concrete Surfacer.

FREE AIR TUNNELS AND ROCK SHAFTS

GROUP 6: Outside labers in conjunction with tunnels and rock shafts

GROUP 7: Chuck tenders, muckers, nippers, miners, inside laborers

GROUP 8: Miners, drillers, blasters, pneumatic shield operators, lining, spotting and timber workmen, rebar steel placer, bonding and securing, welders, and concrete surfacers

 PAIN0021-026 05/01/2010

ADAMS, CUMBERLAND, DAUPHIN, LANCASTER, PERRY, AND YORK COUNTIES

	Rates	Fringes
Painters:		
Bridge.....	\$ 28.45	9.60
Brush.....	\$ 22.57	9.60
Spray, Sandblast.....	\$ 23.57	9.60

 PAIN0057-021 06/01/2012

JUNIATA COUNTY

	Rates	Fringes
Painters: (Commercial)		
Brush and Roller.....	\$ 26.25	14.35
Industrial Brush & Roller...	\$ 29.60	14.35
Spray.....	\$ 26.25	14.35
Painters: (Industrial)		
Bridge.....	\$ 31.70	14.35
Brush and Roller.....	\$ 26.25	14.35
Spray.....	\$ 26.25	14.35

 PAIN1021-001 05/01/2009

BERKS, CARBON, LEBANON, LEHIGH, NORTHAMPTON, AND MONROE COUNTIES

	Rates	Fringes
Painters:		
Bridge; Brush, Roller.....	\$ 25.60	12.30
Bridge; Spray.....	\$ 26.60	12.30
Brush and Roller.....	\$ 24.75	12.30
Spray and Sandblast.....	\$ 25.75	12.30

 PAIN1021-002 05/01/2009

BRADFORD, COLUMBIA, LACKWANNA, LUZERNE, LYCOMING, MONTOUR, NORTHUMBERLAND, PIKE, SCHUYLKILL, SNYDER, SULLIVAN, SUSQUEHANNA, TIOGA, UNION, WAYNE, WYOMING COUNTIES

Rates	Fringes
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Painters:

Bridge; Brush, Roller.....	\$ 25.60	12.05
Bridge; Spray.....	\$ 26.60	12.05
Brush and roller.....	\$ 22.75	12.05
Spray, Sandblast.....	\$ 23.75	12.05

PLAS0592-004 06/01/2012

MONROE COUNTY; (EXCEPT TOBYHANNA DEPOT)

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 30.38	9.10

PLAS0592-005 06/01/2012

COLUMBIA COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 30.38	9.10

PLAS0592-017 05/01/2011

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER BERKS (Northeastern part lying North of a line starting from the Southern boundary line of Lehigh County continuing through Huffs Church, Fredericksville, Dryville, Lyon Station, Kutztown, Krumsville, and Stoney run in Berks County to the Lehigh County line), CARBON, LEHIGH, NORTHAMPTON (Northwest part including the towns of Walnutport, Bath, and Northampton) COUNTIES.....	\$ 26.00	18.15

PLAS0592-018 05/01/2009

	Rates	Fringes
Cement Mason/Concrete Finisher Adams, Lancaster, and York Counties.....	\$ 25.35	15.05
PLASTERER Adams, Berks (Portions of), Lancaster, and Lebanon Counties.....	\$ 23.70	12.96

PLAS9592-002 05/01/2000

MONROE COUNTY (TOBYHANNA ARMY DEPOT)

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 21.88	4.05

 TEAM0229-003 05/01/2012

	Rates	Fringes
TRUCK DRIVER (ADAMS, BERKS, CARBON, COLUMBIA, CUMBERLAND, DAUPHIN, JUNIATA, LACKAWANA, LANCASTER, LEBANON, LEHIGH, LUZERNE, LYCOMING, MONROE, MONTOUR, NORTHAMPTON, NORTHUMBERLAND, PERRY, PIKE, SCHUYKILL, SNYDER, SULLIVAN, SUSQUEHANNA, UNION, WAYNE, WYOMING, AND YORK COUNTIES)		
GROUP 1.....	\$ 30.98	0.00
GROUP 2.....	\$ 31.05	0.00
GROUP 3.....	\$ 31.54	0.00
Truck drivers: (BRADFORD AND TIOGA COUNTIES)		
GROUP 1.....	\$ 19.78	11.20
GROUP 2.....	\$ 19.85	11.20
GROUP 3.....	\$ 20.34	11.20

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Flat Bed Truck (Single-Axle), Dump Trucks (Under 10 Yds Single Axle), Stake Body Trck (Single Axle), Dumpster (Single Axle)

GROUP 2: Dump Truck (Over 10 Yds), Asphalt Distributors, Transit Mix (Under 5 Yds), Transit Mix (Over 5 Yds.), Flat or Stake Body (Tandem), Fuel Truck A-Frame/Winch Trucks, Dry Batch Truck, Truck Mounted Sweeper and Vac Trucks, Buses, Dumpster (Tandem)

GROUP 3: Euclid-Type, Off Highway Equipment-Back or Double Bottom Dump Trucks (Over 20 Tons), Straddle Trucks, Pusher, Articulate Dumped Trucks, Low Boy Trailers, Semi Trailers

Water Tank, Sprinkler Trucks, Winch Trucks and Fuel Trucks shall be governed by the appropriate classification as listed above.

 WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

PENNDOT FORM EDD-VI

ENVIRONMENTAL DUE DILIGENCE (EDD) PHASE 1
VISUAL INSPECTION FORM

DATE: _____

SR/SEC: _____ COUNTY: _____

SEGMENT: _____

ECMS
Project#: _____

ACTIVITY: _____

Location: _____

Visual Site Inspection (EDD-PHASE 1):

- *Stressed Vegetation* Yes [] No []
- *Staining on Soils* Yes [] No []
- *Staining Along PennDOT ROW
or on ROW Materials* Yes [] No []
- *Detectable Odors* Yes [] No []

Comments: Attached additional pages or information as necessary.

Findings

Check one:

- Due diligence inspection performed and no visual evidence of a spill or release in project ROW was detected.
- Due diligence inspection performed and evidence of a spill or release in project ROW was detected. Phase 2 documents attached.
- Due diligence not applicable for this project. No waste or fill.

SIGNATURE: _____

PRINTED NAME: _____

TITLE: _____

ORGANIZATION: _____

*** FORM MUST BE MAINTAINED FOR A MINIMUM 5 YEARS IN THE PROJECT FILE***

PENNDOT EDD-VII

CLEAN FILL ENVIRONMENTAL DUE DILIGENCE [EDD] PHASE 2

DATE : _____

SR/SEC : _____ ECMS PROJECT # : _____

SEGMENT : _____

COUNTY : _____

ACTIVITY : _____

LOCATION : _____

A Phase 1 EDD was conducted for the above project and has identified evidence of a potential spill or release of regulated substances to the material. A Phase 2 EDD was performed.

Findings Check all that apply:

- 1. Based on the results of the Phase 2 investigations, it has been determined that **no** spill or release has occurred.
- 2. Based on the results of the Phase 2 investigations, there is documented evidence that a spill or release has occurred. **MUST COMPLETE ITEM 3**
- 3. If Item 2 is checked, Item 3 must be completed: The materials were Collected and sampled, in accordance with Appendix A of the PADEP Management of Fill Guidance, and
 - All regulated substances analyzed were reported as non-detectable. Form FP-001 must be completed along with the laboratory data, and provided to the property owner of the fill receiving site. Attach documentation.
 - The concentration of regulated substances detected were below the levels indicated in Table FP-1a/1b. Form FP-001 must be completed along with the laboratory data, and provided to the property owner of the fill receiving site. Attach documentation.
 - The concentration of regulated substances detected exceeds the levels in Table FP-1a/1b, but are below the levels indicated in Table GP-1a/1b. **The material is Regulated Fill** and must be approval by the PENNDOT Project Manager for use. If approved, PADEP General Permit WMGR096 must be obtained.
 - The concentration of regulated substances detected exceeds the levels in Table GP-1a/1b. **The materials are a waste.** Manage in accordance with applicable PA Solid Waste Management Act waste regulations. Attach documentation.

SIGNATURE : _____

PRINTED NAME : _____

TITLE : _____

ORGANIZATION : _____

ENVIRONMENTAL DUE DILIGENCE PHASE 2: CLEAN FILL DETERMINATION

NOTE: PERSONS INVOLVED IN PERFORMING EDD ACTIVITIES DO NOT NEED TO COMPLETE ALL STEPS OF THIS PROCESS. ONLY THOSE REQUIRED FOR PROPERLY CHARACTERIZING MATERIALS TO DETERMINE THEY ARE CLEAN FILL.

EDD Phase 2: STEP 1

- **Property ownership and use histories (deed reviews) for evidence of potential releases of wastes or chemicals from operations along the PennDOT ROW:**

Land and Property Use and Ownership Types Found (Check All That Apply):

- *Public* []
- *Private* []
- *Agricultural* []
- *Industrial* []
- *Commercial* []
- *Residential* []
- *Unused* []
- *Other* []

(Specify) _____

- **Searching environmental databases to determine the existence of potential impacts from any types of waste sites or related activities that exist or may have existed within the vicinity of the PennDOT ROW: (See Appendix 1)**

Databases Searched (Check All That Apply):

- *PennDOT* []
- *PA DEP* []
- *US EPA* []
- *Other* []

(Specify) _____

ENVIRONMENTAL DUE DILIGENCE PHASE 2: CLEAN FILL DETERMINATION

- **Conducting Interviews with All Relevant Parties to determine whether there had been any incidents that involved the release of substances directly to the PennDOT ROW:**

Interviews Conducted (Check All That Apply):

- *Former Property Owners* []
- *Current Property Owners* []
- *Former Land Owners* []
- *Current Land Owners* []
- *Fire Departments* []
- *Hazardous Materials Teams* []
- *Regulatory Agencies* []

(Specify) _____

- **Examination of aerial photographs in order to determine all land uses within the vicinity of the ROW:**
 - Aerial Photographs Evaluated Yes [] No []; if “Yes”: refer to Appendix 1 for a Pennsylvania Department of Conservation and Natural Resources (PA DCNR) web site address for locating aerial photographs.
- **Examination of Sanborne or other fire insurance maps (*there is an additional cost for obtaining these*), in order to determine the existence of businesses that may have had any prior releases of **regulated substances** to the PennDOT ROW:**
 - *Sanborne Fire Insurance Maps Examined* []; refer to Appendix 1 for web site address and telephone number for obtaining these maps;
 - *Alternate Fire Insurance Maps Examined* []

(Specify) _____

EDD Phase 2 STEP 2:

- **Sampling and Analysis of PennDOT ROW Materials. If there is documented evidence of a spill or release, materials must be tested to determine if they are clean fill, **regulated fill, or** to characterize for proper waste disposal.**
- **Sampling and analysis should be conducted in accordance with Appendix A of the PA DEP Management of Fill Guidance: 258-2182-773 April 24, 2004.**

ENVIRONMENTAL DUE DILIGENCE PHASE 2: CLEAN FILL DETERMINATION

APPENDIX 1: LISTING OF WEB SITES AND RELATED CONTACTS FOR ENVIRONMENTAL DUE DILIGENCE DATABASE SEARCHES

Pennsylvania Department of Environmental Protection (PA DEP) -Related Sites

- **Pennsylvania Municipal and Residual Waste Facilities** (web link: www.dep.state.pa.us/dep/deputate/airwaste/wm/mrw/Docs/Landfill_list.htm); (this website contains descriptions of all Pennsylvania landfills and incinerators (site name, permit number, host county, municipality, and contact person), all arranged by PA DEP region; for more information, click on either the facility name link (this leads to the PA DEP Environmental Facility Application and Compliance Tracking System (E-Facts) information about any specific facility) or contact person (e-mail) link).
- **Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) Sites** (web link: www.pasitefinder.state.pa.us/Site_listing.asp); this website contains information on all Act 2 sites that have been completed to date and updates that are made to the website when needed; click on the “more details” box associated with each site listed to obtain an interactive “E-Map” location/link for any site selected along with pertinent site information).
- **Pennsylvania Hazardous Sites Cleanup Act (HSCA) Sites** (web link: www.dep.state.pa.us/dep/deputate/airwaste/wm/hscp/docs/HSCA_Site_List.pdf); this website brings up a list of Pennsylvania HSCA sites that are arranged by PA DEP Region and shows municipality, county, number and dates for HSCA responses (interim and remedial levels), in addition to the site status (complete, listed on Pennsylvania Priority List, or de-listed).
- **Pennsylvania Storage Tank Release and Active Storage Tank Sites** (web link for storage tank releases: www.dep.state.pa.us/dep/deputate/airwaste/wm/Tanks/Document/tank_release.htm); this website contains a listing of all known storage tank incidents, and is arranged by PA DEP region (with each regional incident alphabetized by county); other details included are facility I. D. #, site name, address, city, county, incident description, confirmation date, type of incident (underground storage tank release (petroleum or hazardous material), or above-ground storage tank release; click on the “Tank Incidents” PDF or Adobe Acrobat Files to see the entire list of storage tank releases to date); web link for active storage tanks: www.dep.state.pa.us/dep/deputate/airwaste/wm/tanks/storagetanks/tank_listings.htm; click on the PA DEP Regional links to obtain Excel spreadsheet lists of storage tanks; information similar to what can be found on the storage tank release sites (except releases) can be found on the active storage tanks list).

ENVIRONMENTAL DUE DILIGENCE PHASE 2: CLEAN FILL DETERMINATION

APPENDIX 1: LISTING OF WEB SITES AND RELATED CONTACTS FOR ENVIRONMENTAL DUE DILIGENCE DATABASE SEARCHES

United States Environmental Protection Agency (US EPA)-Related Sites

- ***Pennsylvania Comprehensive Environmental Response and Liability Act (CERCLA/Superfund) Sites*** (web link: www.epa.gov/reg3hwmd/super/PA/index.htm); this website contains information on all Pennsylvania Superfund sites, including name, address, city, county, zip code, US EPA I. D. number, and National Priority List (NPL) status; click on the site name to learn more about any Superfund site).
- ***Pennsylvania Resource Conservation and Recovery Act (RCRA) Facilities*** (web link: www.epa.gov/reg3wcmd/ca/pa.htm); this website contains information for all Pennsylvania RCRA sites, including facility name (click on this for more details), US EPA I. D. number, location (click on this link to get a map showing the site in relation to nearby roadways), environmental indicators (human exposure, groundwater – click on either of these to get the documentation sheets for either or both), and clean up status (initiated, remedy selected, complete with or without controls, construction completed)).
- ***Toxic Release Inventories (TRI)*** (web link: www.epa.gov/tri); this website is from the US EPA, and contains some background information about TRI is and how it is used; releases for specific areas can be found by entering a zip code on the title page; from here, the user can view the facilities that are part of the TRI for the zip code entered, and the extent of releases that have occurred over the years (starting with 1989, and continuing through 2001, the latest year for which TRI information is available); click on the name of any facility shown to obtain a detailed report about the releases and related activities associated with the facility (onsite, off-site, air emissions, water discharges, land disposal)).
- ***Comprehensive Federal and State Site Environmental Database (Enviro-Facts)*** (web link: www.epa.gov/enviro/index_java.html); this website contains information about virtually every type of environmental matter known, both in terms of facilities and the media affected by these facilities' collective activities; under the “**topics**” tab, click on the links related to “*waste*”, “*water*”, “*air*”, “*toxics*”, “*land*”, “*radiation*”, “*maps*”, and “*other*”, to determine the type of media information desired; under the “**advanced capabilities**” tab, click on the “*queries*”, “*maps*”, or “*reports*” links to locate more specific information; from here, the user will be led to a page where queries about any type of environmental site can be entered using a zip code, county or State abbreviation; click on the “find it” link to locate information about one or multiple environmental sites, or, to generate map locations for the any type of environmental site activity desired; the map is interactive, and the user can “zoom in” for closer details about the site; this database may include information on sites from the aforementioned Municipal and Residual Waste, Storage Tanks, RCRA, HSCA, CERCLA, Act 2, and TRI databases; sites with National Pollutant Discharge Elimination System (NPDES) and radiation-related permits also included in this database).

ENVIRONMENTAL DUE DILIGENCE PHASE 2: CLEAN FILL DETERMINATION

APPENDIX 1: LISTING OF WEB SITES AND RELATED CONTACTS FOR ENVIRONMENTAL DUE DILIGENCE DATABASE SEARCHES

Sites for Aerial Photographs and Fire Insurance Maps

- ***Aerial Photographs:*** Aerial photographs may be accessed via the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) web site (web link: www.dcnr.state.pa.us/topogeo/gismaps/aerials.aspx.htm; click on the “Proceed to the new DCNR” link, then click on the “Aerial Photos” option; this will lead to a link for the U. S. Geological Survey’s Aerial Photo Finder; information can be sought, and site location maps can be generated by selecting the “zip code”, “populated place”, or “map location” options).
- ***Sanborne Fire Insurance Maps:*** These maps may be obtained from EDR Sanborne, Inc., at 1-800-352-0050, or at www.edrnet.com; click on the “Sanborne Maps” link, and then click on the phrase “Download Sample” to view an example of this map type. **There is an additional cost for obtaining these maps.**

PENNDOT FORM EDD-VI

**ENVIRONMENTAL DUE DILIGENCE (EDD) PHASE 1
VISUAL INSPECTION FORM**

DATE: October 13, 2011

SR/SEC: 0061, 03B

COUNTY: Schuylkill

SEGMENT:

ECMS

PROJECT #: 12700

ACTIVITY: Bridge Replacement

LOCATION: North Manheim and West Brunswick Townships (40.641075 N, -76.107026 W)

Visual Site Inspection (EDD-PHASE 1):

- | | | |
|---|---------|----------|
| ▪ Stressed Vegetation | Yes [] | No [X] |
| ▪ Staining on Soils | Yes [] | No [X] |
| ▪ Staining Along PennDOT ROW
or on ROW Materials | Yes [] | No [X] |
| ▪ Detectable odors | Yes [] | No [X] |

Comments:

Former gas station (Kramer) located to southeast of bridge site, previous Phase I ESA at bridge site and Kramer property Phase II investigation indicated that no contamination exists and that the tanks have been removed.

No other environmental issues observed.

FINDINGS

Check One:

- Due diligence inspection performed and no visual evidence of a spill or release in project ROW was detected.
- Due diligence inspection performed and evidence of a spill or release in project ROW was detected. Phase 2 documents attached.
- Due diligence not applicable for this project. No waste or fill.

SIGNATURE:



PRINTED NAME:

John-Thomas Graupensperger

TITLE:

Senior Environmental Specialist

ORGANIZATION:

ASC Group, Inc.

FORM MUST BE MAINTAINED FOR A MINIMUM 5 YEARS IN THE PROJECT FILE

**Bridge / Structures Related Effective Policy Letters
For Contractor's Alternate Designs**

In addition to applicable portions of Design Manual Part 4, Pub 408, BC and BD standards, and AASHTO Bridge Specifications all applicable portions of the following design policy (strike-off) letters will apply for alternate designs developed by the contractor. These policy letters cover a variety of issues, concepts, and specifications. Unless specifically permitted by the Alternate Specifications Part A or Part B, the contractor is not permitted to utilize new concepts.

Number	Date	Subject
431-04-01	1/13/04	Quality Control of Design Submissions
431-06-01	1/24/06	Moratorium on Non-Composite Adjacent Prestressed Concrete Box Beam Bridges
431-09-14	12/2/09	Publication 15M, Design Manual Part 4 Change No. 1
431-10-12	8/29/10	Bridge Design Standards, BD-600M Series (Pub. 218M): September 2010 Edition
431-10-13	11/16/10	Bridge Construction Standards, BC-700M Series (Pub. 219M): October 2010 Edition
431-11-03	4/4/11	Publication 218M, BD-628M Modifications to Approach Slab Joints and Waterproofing Details Implementation into Active Projects in Construction
431-11-06	7/13/11	Modification to Publication 15M, Design Manual Part 4 Implementation Measures to Mitigate Corrosion Of Substructure J-Bar Reinforcement
431-11-08	7/29/11	Publication 15M, Design Manual Part 4 Addition of Section B 2.9P and Quality Assurance Form D-519 to Design Manual Part 4 for Construction Loading on Bridges
431-11-09	8/26/11	Publication 15M, Design Manual Part 4 Revision of Appendix J - Approved Commercially Available or Consultant - Developed Software
431-11-10	12/21/11	Summary of New Bridge and Structure Products
431-12-01	1/20/12	Publication 219M, BC-799M - Mechanically Stabilized Earth (MSE) Retaining Walls - Modifications to Drainage Pipe Requirements for 100-Year Design Life and Implementation into Active Projects
431-12-02	2/13/12	Implementation of AAAP Cement Concrete

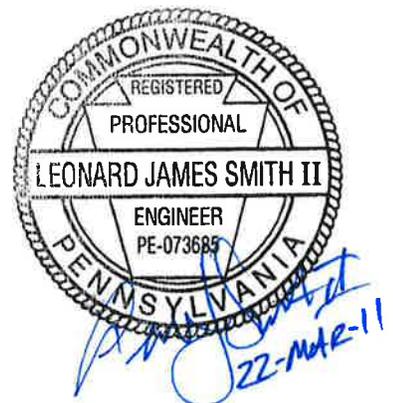
**STATE ROUTE 0061 BRIDGE
OVER MAHANNON CREEK
NORTH MANHEIM TOWNSHIP
SCHUYLKILL COUNTY, PENNSYLVANIA
HYDROLOGIC AND HYDRAULIC REPORT**



**November 4, 2010
Revised: March 22, 2011**

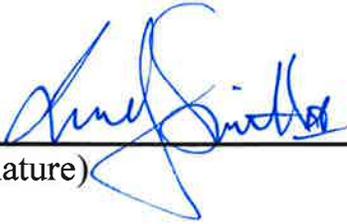
**PREPARED FOR:
PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
DISTRICT 5-0**

**PREPARED BY:
BORTON-LAWSON
LEHIGH VALLEY OFFICE
3893 ADLER PLACE, SUITE 100
BETHLEHEM, PA 18017
Project No. 2009-2515-01**



Engineer's Seal and Certification

I, LEONARD J SMITH II, do hereby certify pursuant to the penalties of 18 Pa. C.S.A. Sec. 4904 to the best of my knowledge, information and belief, that the information contained in this hydrology and hydraulics report, accompanying plans and specifications for State Route 0061 Bridge over Mahannon Creek have been prepared in accordance with accepted engineering practice, is true and correct, and is in conformance with Chapter 105 Rules and Regulations of the Department of Environmental Protection.



(Signature)

22-MARCH-11

(Date)

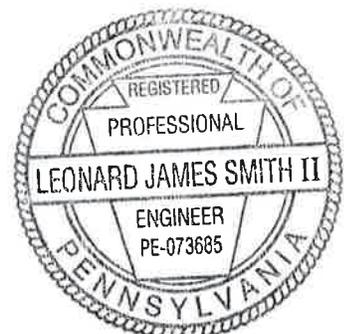


TABLE OF CONTENTS

I.	PROJECT OVERVIEW	1
A.	INTRODUCTION.....	1
B.	EXISTING FLOODPLAIN MANAGEMENT REGULATIONS.....	1
C.	PROPOSED STRUCTURE REHABILITATION	1
II.	HYDROLOGIC AND HYDRAULIC REPORT	2
A.	SITE DATA (10.7.B.1).....	2
1.	<i>Project Location and Description (10.7.B.1.a)</i>	2
2.	<i>Existing Structures (10.7.B.1.b)</i>	2
3.	<i>Environmental (10.7.B.1.b)</i>	3
4.	<i>Ice and Stream Stability (10.7.B.1.c)</i>	3
5.	<i>Photographs (10.7.B.1.d)</i>	4
6.	<i>Debris (10.7.B.1.e)</i>	4
7.	<i>Site Inspections (10.7.B.1.e)</i>	4
8.	<i>Approvals (10.7.B.1.)</i>	4
B.	HYDROLOGIC ANALYSIS (10.7.B.2)	4
1.	<i>Drainage Area (10.7.B.2.a)</i>	4
2.	<i>Design Flood Discharges – Methods (10.7.B.2.b)</i>	5
C.	HYDRAULIC ANALYSIS (10.7.B.3).....	6
1.	<i>Existing Conditions Model</i>	6
2.	<i>Proposed Bridge Rehabilitation (10.7.B.3.b.1)</i>	8
D.	TEMPORARY CONDITIONS (10.7.B.3.B.3)	13
E.	RISK ASSESSMENT (10.7.B.4)	15
1.	<i>Economic Assessment</i>	15
2.	<i>Overtopping</i>	15
3.	<i>Community Impact</i>	15
4.	<i>Environmental Risk</i>	15
5.	<i>Preliminary Cost Estimate (10.7.C.6)</i>	15
F.	SUMMARY DATA SHEET (10.7.B.5).....	16
G.	DRAWINGS (10.7.B.6)	16

LIST OF TABLES

Table 1 – NFF Regression Equation Parameters	5
Table 2 – PSU IV Regression Equation Parameters	5
Table 3 – Summary of Flows.....	6
Table 4 – Existing and Proposed Conditions Water Surface Elevation Comparison	9
Table 5 – Channel Velocity Comparison.....	10
Table 6 – Temporary Condition WSE Impacts.....	14

LIST OF APPENDICES

APPENDIX A-1	FEMA Flood Insurance Stud
APPENDIX A-2	FEMA Flood Insurance Rate Map
APPENDIX A-3	Project Location Map
APPENDIX A-4	Aerial Photograph
APPENDIX A-5	Photographs
APPENDIX A-6	Bridge Inspection Report
APPENDIX A-7	Drainage Area Map
APPENDIX A-8	Hydrologic Computations
APPENDIX A-9	Preliminary Cost Estimate
APPENDIX A-10	Summary Data Sheet
APPENDIX B-1	Existing Conditions HEC-RAS Modeling 25-year Water Surface Profile
APPENDIX B-2	Existing Conditions HEC-RAS Modeling 50-year Water Surface Profile
APPENDIX B-3	Existing Conditions HEC-RAS Modeling 100-year Water Surface Profile
APPENDIX C-1	Proposed Conditions HEC-RAS Modeling 25-year Water Surface Profile
APPENDIX C-2	Proposed Conditions HEC-RAS Modeling 50-year Water Surface Profile
APPENDIX C-3	Proposed Conditions HEC-RAS Modeling 100-year Water Surface Profile
APPENDIX C-4	Temporary Conditions HEC-RAS Modeling Base Flow & 2.33-year Water Surface Profile
APPENDIX C-5	Scour Calculations
APPENDIX D-1	TS&L Drawings
APPENDIX D-2	Roadway Plan and Profile
APPENDIX D-3	Floodplain Drawing
APPENDIX D-4	Temporary Conditions Sketch

I. PROJECT OVERVIEW

A. Introduction

The State Road (S.R.) 0061 over Mahannon Creek is an approximately 22-foot long single span bridge. The bridge is located near the municipal boundary between North Manheim Township and West Brunswick Township, Schuylkill County. The intersection of S.R. 0061 with S.R. 2013, known locally as Centre Turnpike and South Liberty Street, respectively, is adjacent to the bridge. The structure carries four lanes of traffic over the Creek and is scheduled for rehabilitation.

B. Existing Floodplain Management Regulations

The Federal Emergency Management Agency (FEMA) performs flood studies to identify areas prone to flooding. These studies generally include a report, the Flood Insurance Study (FIS), and a corresponding map, the Flood Insurance Rate Map (FIRM). FEMA FIS were published for: North Manheim Township, community number 422013, November 6, 1996 (Reference 1), West Brunswick Township, community number 422028, dated August 19, 1997 (Reference 2), and Orwigsburg Borough, community number 421204, March 2, 1989 (Reference 3). The corresponding FIRMs for North Manheim Township, map number 422013 0008 B, dated November 6, 1996 and Orwigsburg Borough, map number 421204 0005 B, dated March 2 1989, indicate that Mahannon Creek is located in a detailed study area within the Orwigsburg corporate limits, but is in an approximate study area at the S.R. 0061 Bridge. Minimal hydrologic and no hydraulic information on Mahannon Creek is available to aid in the development of a hydraulic model. As such, the hydraulic model will be based primarily upon data collected specifically for this project. Copies of the FEMA FIS and FIRM are provided in Appendices A-1 and A-2, respectively.

PennDOT's design criteria are based upon road classification. S.R. 0061 is classified as a principal arterial highway and as such, the structure is required to pass the 50-year storm without overtopping the roadway. The Pennsylvania Department of Environmental Protection (PADEP) design storm is based upon the development condition of the project area. Since this segment of S.R. 0061 is located in a rural area, the PADEP check storm is the 25-year event. According to Chapter 105 of the Pennsylvania Code, any rehabilitation to S.R. 0061 cannot increase water surface elevations more than 1.0 feet. FEMA regulations do not apply to this project, as the subject structure is not located in a FEMA detailed study area.

C. Proposed Structure Rehabilitation

The existing abutments will be rehabilitated and the bridge superstructure and deck will be replaced. Minor profile adjustments to the bridge approaches closely matching current vertical geometry will be performed as part of the rehabilitation. Low chord elevations at the upstream end of the bridge will beset at elevations of 528.78 feet and 528.61 feet for the left and right abutments, respectively, as measured from the North Geodetic Vertical Datum of 1929 (NAVD 1929). Compared to the Existing Conditions, the proposed low chord elevations are approximately 0.92 feet and 0.52 feet higher than the existing low chord elevations of 527.86 feet and 528.09 feet at the left and right abutments, respectively. The proposed bridge width will not be changed from its current width, which is approximately 72 feet in the direction of flow after accounting for the 15-degree bridge skew.

II. HYDROLOGIC AND HYDRAULIC REPORT

This section of the report generally follows the H&H Report outline for an abbreviated H&H Report set forth in PennDOT's Publication 13M Design Manual 2, Chapter 10. The parentheses in the headings designate the section of DM-2, Chapter 10 each section of the report is intended to address.

A. Site Data (10.7.B.1)

1. Project Location and Description (10.7.B.1.a)

The bridge is located in Schuylkill County in North Manheim Township near the municipal border with West Brunswick Township. Orwigsburg Borough municipal limits are approximately 0.5 miles north of the project location. The bridge is adjacent to the intersection of S.R. 0061 (known locally as Centre Highway) with S.R. 2013 (South Liberty Street). FIRM's of the project area are provided in Appendix 2 and a map showing the project location is provided in Appendix A-3.

The area surrounding the S.R. 0061 Bridge over Mahannon Creek is generally rural with limited roadside development. Upstream of the bridge, a sewage treatment plant is located on the right floodplain and is visible on the aerial photograph provided in Appendix A-4.

2. Existing Structures (10.7.B.1.b)

- a. Upstream. The nearest upstream structure to the S.R. 0061 Bridge is the Woodview Road Bridge. This bridge is a 27-foot single span, concrete bridge located approximately 800 feet upstream of the S.R. 0061 Bridge. Low chords were approximately 6 feet above the channel bed. No high water marks were observed in the vicinity of the Woodview Road Bridge. Since this bridge is not located in close proximity of the project location, the Woodview Road Bridge was not included in this project's hydraulic model. A photograph of this bridge is provided in Appendix A-5.
- b. Site. The S.R. 0061 Bridge is a single span, reinforced concrete T-Beam bridge that carries four lanes of traffic over Mahannon Creek. The clear bridge span from abutment to abutment is approximately 22.22 feet. Bridge low chords are approximately 12.0 feet above the channel bed at elevations of 527.86 feet (NAVD 1929) at the west abutment (left abutment facing downstream), and 528.09 feet at the east abutment. The width of the structure is 73.5 feet, measured along the skew. No high water marks were observed in the vicinity of the S.R. 0061 Bridge. Photographs of the existing S.R. 0061 Bridge are provided in Appendix A-5. HEC-RAS cross sections of the bridge are provided throughout Appendix B.

- c. Downstream. The nearest downstream structure to the S.R. 0061 Bridge is the Antique Lane Bridge. This bridge is a 13.5-foot single span, grate bridge located approximately 400 feet downstream of the S.R. 0061 Bridge. Upstream low chord elevations are 522.36 at both abutments. No high water marks were observed in the vicinity of the Antique Lane Bridge. Since this bridge is located in close proximity of the project location, the Antique Lane Bridge was included in this project's hydraulic model. A photograph of this bridge is provided in the Appendix A-5.

3. Environmental (10.7.B.1.b)

Headwaters to Mahannon Creek are located north of the S.R. 0061 Bridge. The stream flows through Orwigsburg Borough into North Manheim Township and discharges into the Schuylkill River. At the time of the field reconnaissance, Mahannon Creek was noted as having continuous flow. According to Pennsylvania Code Title 25 Environmental Protection, Chapter 93 Water Quality Standards, Mahannon Creek drainage basin is classified as a Cold Water Fishery with Migratory Fishes (CWF, MF). The PA Fish and Boat Commission does not list Mahannon Creek as a stocked stream. Mahannon Creek is verified as having natural trout reproduction; however, Class A Wild Trout are not located in the creek.

4. Ice and Stream Stability (10.7.B.1.c)

Construction plans for the bridge indicate that the bridge footings were built on bedrock. Other existing bridge records include an inspection report dated August 27, 2007 documenting the presence of a scour hole underneath the bridge. The scour hole was measured as 33 inches deep at the upstream bridge face and tapered to 18 inches at the downstream face (as indicated on page 5 under channel protection of the inspection report).. Contraction scour and lateral streambed movement were noted upstream of the bridge. A copy of the inspection report is provided in Appendix A-6.

Field reconnaissance indicated that the current conditions were consistent with the information provided in the inspection report. Streambanks showed signs of erosion. Streambanks were exposed, and trees were tilted toward the main channel. Upstream of the bridge, a scour hole in the center of the channel had formed. Exact scour depths were not measured at the time of the field reconnaissance. The streambed appeared to consist mostly of granular material, with some cobbles. The streambed under the bridge has no vegetation and has some debris buildup. Rock protection was noted along the abutments, which appear to be a countermeasure for scour. Based upon field observations and documentation, erosion and scour is not an immediate concern at the bridge. Scour depths have reached the bedrock, and the likelihood of additional channel erosion will be minimized with regular maintenance and inspections.

North Manheim Township Officials were unavailable to provide comment about problems with scour or any issues related to ice jams at the bridge. The FIS does not address ice and stream stability issues.

5. Photographs (10.7.B.1.d)

Photographs of the existing bridge, downstream structure, upstream structure and the surrounding area are provided in Appendix A-5. Included in Appendix A-5 is a photo location map that shows the location and orientation of each photograph.

6. Debris (10.7.B.1.e)

During site reconnaissance for this project, no significant accumulation of debris was observed at the S.R. 0061 Bridge. Site reconnaissance was conducted during low flow conditions, at which time the flow through the bridge was absent of debris. North Manheim Township officials could not be reached to comment on any debris related issues. Based on field observations, debris is not considered a significant problem at the bridge and problems should be handled on an as-needed basis.

7. Site Inspections (10.7.B.1.e)

The conditions of the project site, including the channel and bank areas, were observed by the engineer responsible for the hydrologic and hydraulic analysis. Survey personnel also spent numerous days in the project area collecting data for this analysis. During these periods, field survey data such as key dimensions, elevations, and photographs were obtained. Site observations were made on the following dates:

- July 31, 2009 – H&H field reconnaissance
- Summer, 2009 – Survey conducted

8. Approvals (10.7.B.1.)

Line and grade was approval by PennDOT District on April 2, 2010.

B. Hydrologic Analysis (10.7.B.2)

1. Drainage Area (10.7.B.2.a)

The FEMA FIS for Orwigsburg Borough provides the drainage area to a point approximately 1000 feet upstream of the S.R. 0061 Bridge. This point is the downstream corporate limit for the Borough. This area was listed as 5.5 square miles. Delineation of the drainage area to the S.R. 0061 Bridge was determined using StreamStats. StreamStats is an internet-based interactive mapping tool created by USGS to assist users in determining watershed characteristics such as drainage area and basin composition. The drainage area to the S.R. 0061 Bridge over Mahannon Creek was determined to be 5.61 square miles. The drainage area obtained from StreamStats was compared to a USGS map to verify the drainage area to the S.R. 0061 Bridge. Based on the proximity to the Orwigsburg Borough municipal limits, and comparisons to a USGS map, a drainage area of 5.61 square miles to the S.R. 0061 Bridge was considered accurate. A map depicting the drainage area is provided in Appendix A-7.

2. Design Flood Discharges – Methods (10.7.B.2.b)

The Orwigsburg FIS reports a flow of 2,040 cfs at the downstream corporate limit. The FIS flows were calculated by the United States Army Corps of Engineers (USACE) in 1988 using Bulletin 17b, which is based on flows from gaged streams in Schuylkill, Carbon, and other adjacent counties. A regional curve depicting drainage area vs. 100-year discharge was generated and applied to all ungaged streams including Mahannon Creek. There is no approved Act 167 Stormwater Management Plan for Mahannon Creek; therefore, there are no Act 167 flows available for use by this project.

The National Flood Frequency (NFF) program version 3.0 utilizes USGS regression equations published in document USGS WRI 2000-4189 to determine the peak flows for various design storms. Variables used by the regression equations to compute design flows for the Mahannon Creek are provided in Table 1.

Table 1 – NFF Regression Equation Parameters

NFF Hydrologic Parameter	Value
Peak Flow Region	A
Percentage of Forested Area	60.0%
Percentage of Urbanized Area	13.2%
Percentage of Area Underlain by Carbonate Geology	0.00%
Percentage of Area Controlled by Lakes, Swamps, and Reservoirs	0.73%

Since PSU-IV was superseded by USGS WRI 00-4189, it is no longer valid as a sole source of hydrology. However, since no FEMA flows are available, the flows to the S.R. 0061 Bridge were calculated using PSU-IV for comparison purposes. Variables used by the PSU-IV to compute design flows for the Mahannon Creek are provided in Table 2.

Table 2 – PSU IV Regression Equation Parameters

PSU-IV Hydrologic Parameter	Value
Latitude of Drainage Area Outlet	40°, 38', 29"
Longitude of Drainage Area Outlet	76°, 6', 20"
Percent Forest	60.0%
Std. Deviation Sy (Plate 2):	0.295
Skew Coefficient (Plate 3):	0.370

Table 3 provides a comparison of the design flows computed by various hydrologic methods. The FEMA 100-year flow will be used as the 100-year design flow because it is the most conservative value. The NFF flows will be used for all other design flows because no FEMA flows were provided for these events. A table listing both sets of flows is provided in Table 3. Supporting hydrologic calculations are provided in Appendix A-8.

Table 3 – Summary of Flows

Method	Peak Discharges (cfs)		
	25-year	50-year	100-year
FEMA	N/A	N/A	2,040
NFF	1,290	1,610	2,000
PSU-IV	855	1,103	1,397
Design Flows	1,290	1,610	2,040

C. Hydraulic Analysis (10.7.B.3)

1. Existing Conditions Model

The Existing Conditions Model was created with information based on field observations and topographic data collected specifically for this project. No prior hydraulic models were available to use as a foundation for this project's hydraulic model. This model was based on the following parameters:

- Ground Survey Data
- Manning's "n" Roughness Coefficients Obtained from Field Reconnaissance
- Ineffective Flow Areas Identified from Bridge Geometry
- Incorporation of Project Design Flows
- Boundary Conditions Based Upon Normal Depth

Survey Data - Survey for this bridge replacement project was collected in the summer of 2009. Cross sections within 500 feet upstream and downstream of the bridge were created based upon project survey. Cross sections were placed at important changes to the floodplain and channel geometry. The S.R. 0061 Bridge and the Antique Lane Bridge geometry were coded into the hydraulic model based upon surveyed measurements.

Manning's "n" Roughness Coefficients - Manning's "n" roughness coefficients within the reach were entered to reflect conditions noted during the field reconnaissance. Coefficients for both the left floodplain and right floodplains upstream of S.R. 0061 Bridge were modeled as 0.08 to be consistent with the forest cover on the floodplain. Downstream of the S.R. 0061 Bridge was light brush and the Manning's "n" for the left floodplains was modeled as 0.06. The right floodplains downstream of the S.R. 0061 Bridge consisted of medium to dense brush and the coefficient used to model this cover was 0.10. At the project location,

the channel was generally straight with no shoals. A Manning's coefficient of 0.040 was used for the main channel.

Ineffective Flow Areas - Ineffective flow areas were added to the model to identify locations where water would likely pond and not provide any conveyance capacity. In areas where the bridge geometry impedes flow, beyond the upstream and downstream bridge faces, ineffective flow areas were added to the model to represent the influence of contraction and expansion around the bridge on W.S.E. Ineffective flow areas were added to the model based on a contraction ratio of 1:1 upstream of the bridge, and an expansion ratio of 2:1 downstream of the bridge. Contraction/expansion coefficients of 0.3 and 0.5, respectively, were applied for most cross sections with ineffective flow areas around the bridges. Cross section 11+41 had higher contraction/expansion coefficients (0.6 and 0.8, respectively) to account for the abrupt contraction of the flow from the wide floodplain to the smaller bridge opening.

Design Flows - Design flows calculated in the hydrologic section were incorporated into the hydraulic model. Flows remained constant throughout the reach.

Boundary Conditions - A mixed flow regime was used to calculate the Water Surface Elevations (W.S.E.) for the Existing Conditions Model. Mixed flow utilizes both subcritical flow and supercritical flow to determine water surface elevations. In subcritical flow, the program determines water surface elevations at the furthest downstream cross section and continues the calculations upstream. In supercritical flow, the program determines water surface elevations at the furthest upstream cross section and continues the calculations downstream. Running HEC-RAS in a mixed regime allows the program to select a W.S.E. with the highest energy grade line to identify the appropriate water surface.

In order to obtain a starting water surface elevation, boundary conditions were required. The boundary conditions of both the upstream and downstream cross sections were established as a function of normal depth. A bed slope of 0.017 ft/ft was used to compute a normal depth boundary condition at the downstream end of the reach. A bed slope of 0.003 was used to determine the normal W.S.E. at the upstream portion of the reach.

In order to balance the energy calculations computed by the HEC-RAS program more quickly and obtain a more accurate W.S.E. at the downstream end of the model, the downstream cross section was copied several times and offset at the downstream end of the model. These additional cross sections were added to the model to obtain a W.S.E. elevation at the downstream cross section that is based on successive calculations of cross section geometry, channel slope, and downstream water surface elevations, which more accurately reflects the W.S.E. at the downstream cross section than that calculated with the channel slope alone. Five (5) additional cross sections were added at the downstream end of the reach by copying cross section 05+29 downstream at 100-foot intervals. Ground elevations for the copied cross sections were adjusted to be consistent with the downstream channel slope of Mahannon Creek.

Table 4 lists the Existing Conditions Water Surface Elevations. The S.R. 0061 Bridge is not overtopped by the 100-year event; however, backwater from the bridge will impact the sewage treatment plant. Although increases in the 100-year W.S.E. are acceptable for streams not located in detailed study areas, increasing the risk of flooding at any non-PennDOT structure is not permissible. Thus, the 100-year W.S.E.'s cannot increase upstream of the S.R. 0061 Bridge. Output tables and cross sections are provided for the 25-year, 50-year, and 100-year storms in Appendices B-1, B-2, and B-3, respectively.

2. Proposed Bridge Rehabilitation (10.7.B.3.b.1)

a. Bridge Description

The existing bridge abutments will be rehabilitated at the S.R. 0061 crossing of Mahannon Creek, and the superstructure and deck will be replaced as part of this project. The anticipated rehabilitation includes removal of up to six inches of concrete from the existing abutment faces, installation of new rebar, and constructing up to six inches of new concrete on each face. The Proposed Conditions were modeled with the maximum reduction of six inches per side for a total reduction of one foot. With these changes, the clear span will be reduced to a minimum of 21.22 feet. The existing reinforced concrete T-beam superstructure will be replaced with composite P/S concrete spread box beams. To compensate for the narrower waterway opening, the low chords of the bridge will be raised approximately 0.92 feet and 0.52 feet to elevations 528.78 feet and 528.61 feet at the left and right abutments. Approach roadwork will be conducted to tie the new bridge deck in with the existing roadway.

b. Backwater & Velocity (10.7.B.3.b.1)

The resultant W.S.E.'s for the existing and proposed S.R. 0061 Bridge are provided in Table 4. For the 25-year, and 50-year storms, the backwater upstream of the bridge will be increased by the bridge rehabilitation. Backwater for the 100-year storm will be reduced for those sections situated outside of the right-of-way. These results are attributable to alteration of the bridge opening configuration. For the smaller events, the low chord is not submerged, thus water surfaces will increase due to the reduction in flow area with the addition of new concrete to the existing bridge abutments. The increase in flow area from raising the proposed low chords offsets the loss of flow area from the addition of new concrete to the abutments. This results in a 0.06-foot increase in the W.S.E. directly upstream of the bridge for the 100-year storm, and a reduction of up to -0.03 feet further upstream. As the proposed bridge rehabilitation will not be overtopped by the 50-year storm and does not create an increase in the backwater upstream, the proposed bridge configuration is considered acceptable.

The hydraulic analysis indicates that there will be an increase in the 25- and 50- year water surface elevations upstream of the proposed bridge rehabilitation in the vicinity of the Orwigsburg Sewage Treatment Plant. The ground elevation at the southeast corner of the Plant is 528.95 feet. The proposed 25-year water surface elevation in the Mahannon Creek is less than this ground elevation and the proposed 50-year water surface elevation increases 0.04 feet to elevation 529.36 feet at this location. Structures at the water treatment plant are above ground and the water surface increase for the 50-year event is not anticipated to noticeably impact the access, function,

Table 4 – Existing and Proposed Conditions Water Surface Elevation Comparison

River Sta.	Existing Conditions WSE			Proposed Conditions WSE			Δ WSE		
	25-year	50-year	100-year	25-year	50-year	100-year	25-year	50-year	100-year
-	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
17+47	528.16	529.40	531.28	528.45	529.44	531.25	0.29	0.04	-0.03
16+14	528.02	529.36	531.27	528.36	529.39	531.24	0.34	0.03	-0.03
15+06	527.95	529.32	531.26	528.31	529.36	531.23	0.36	0.04	-0.03
13+99	527.93	529.32	531.25	528.30	529.35	531.22	0.37	0.03	-0.03
12+82	527.88	529.28	531.23	528.26	529.31	531.20	0.38	0.03	-0.03
12+03	527.75	529.16	531.20	528.15	529.20	531.18	0.40	0.04	-0.02
11+58	527.68	529.12	531.11	528.10	529.16	531.08	0.42	0.04	-0.03
11+41	527.20	528.48	530.32	527.70	528.60	530.38	0.50	0.12	0.06
11+00	SR 0061								
10+45	523.83	524.62	525.55	523.80	524.51	524.93	-0.03	-0.11	-0.62
09+77	523.35	523.55	520.75	523.35	523.55	520.81	0.00	0.00	0.06
8+72	523.40	523.65	523.95	523.40	523.65	523.95	0.00	0.00	0.00
07+29	523.34	523.59	523.87	523.34	523.59	523.87	0.00	0.00	0.00
06+60	523.29	523.53	523.81	523.29	523.53	523.81	0.00	0.00	0.00
06+50	Antique Lane Bridge								
06+24	522.37	522.95	523.62	522.37	522.95	523.62	0.00	0.00	0.00
05+92.50*	522.37	522.94	523.62	522.37	522.94	523.62	0.00	0.00	0.00
05+60.50*	522.36	522.94	523.61	522.36	522.94	523.61	0.00	0.00	0.00
05+29	520.80	521.22	521.76	520.80	521.22	521.76	0.00	0.00	0.00
04+29	518.30	518.30	518.30	518.30	518.30	518.30	0.00	0.00	0.00
03+29	516.60	516.60	516.60	516.60	516.60	516.60	0.00	0.00	0.00
02+29	514.90	514.90	514.90	514.90	514.90	514.90	0.00	0.00	0.00
01+29	513.20	513.20	513.20	513.20	513.20	513.20	0.00	0.00	0.00
00+29	511.50	511.50	511.50	511.50	511.50	511.50	0.00	0.00	0.00

***Interpolated Cross Section**

Table 5 – Channel Velocity Comparison

River Sta.	Existing Conditions Channel Velocity			Proposed Conditions Channel Velocity			Δ Channel Velocity		
	25-year	50-year	100-year	25-year	50-year	100-year	25-year	50-year	100-year
-	(fps)	(fps)	(fps)	(fps)	(fps)	(fps)	(fps)	(fps)	(fps)
17+47	4.97	3.88	3.02	4.39	3.84	3.04	-0.58	-0.04	0.02
16+14	4.24	3.24	2.55	3.67	3.21	2.56	-0.57	-0.03	0.01
15+06	2.98	2.49	1.95	2.65	2.47	1.95	-0.33	-0.02	0.00
13+99	1.87	1.60	1.40	1.67	1.59	1.41	-0.20	-0.01	0.01
12+82	2.68	2.55	2.12	2.44	2.53	2.14	-0.24	-0.02	0.02
12+03	3.69	3.59	2.48	3.42	3.58	2.49	-0.27	-0.01	0.01
11+58	3.77	3.58	3.25	3.47	3.56	3.26	-0.30	-0.02	0.01
11+41	5.83	6.32	6.73	5.31	6.01	6.44	-0.52	-0.31	-0.29
11+00	SR 0061								
10+45	12.37	13.23	14.32	12.14	13.13	15.43	-0.23	-0.10	1.11
09+77	5.75	6.82	18.72	5.75	6.82	18.38	0.00	0.00	-0.34
8+72	2.47	2.75	3.09	2.47	2.75	3.09	0.00	0.00	0.00
07+29	2.77	3.16	3.62	2.77	3.16	3.62	0.00	0.00	0.00
06+60	3.01	3.40	3.73	3.01	3.40	3.73	0.00	0.00	0.00
06+50	Antique Lane Bridge								
06+24	2.53	2.44	2.29	2.53	2.44	2.29	0.00	0.00	0.00
05+92.50*	1.86	1.87	1.91	1.86	1.87	1.91	0.00	0.00	0.00
05+60.50*	1.50	1.54	1.61	1.50	1.54	1.61	0.00	0.00	0.00
05+29	9.04	9.65	10.22	9.04	9.65	10.22	0.00	0.00	0.00
04+29	4.27	5.32	6.74	4.27	5.32	6.74	0.00	0.00	0.00
03+29	4.27	5.32	6.75	4.27	5.32	6.75	0.00	0.00	0.00
02+29	4.27	5.32	6.74	4.27	5.32	6.74	0.00	0.00	0.00
01+29	4.27	5.32	6.74	4.27	5.32	6.74	0.00	0.00	0.00
00+29	4.27	5.32	6.75	4.27	5.32	6.75	0.00	0.00	0.00

*Interpolated Cross Section

or intrinsic value of the structures at this cross section. Since water surfaces for the 25- and 50-year events are less than the ground elevations near the sewage treatment plant at all other upstream cross sections, and the 100-year water surface elevations are less than the existing condition a flowage easement should not be necessary.

A comparison of the existing and proposed changes in channel velocity for the S.R. 0061 Bridge is provided in Table 5. For the 25-year and 50-year flows, the channel velocity will decrease due to the rise in W.S.E. For the 100-year flow, the channel velocity will increase downstream of the bridge. This is attributable to the decrease in the 100-year W.S.E. Overall changes to channel velocity are less than 0.5 feet per second of the Existing Conditions upstream of the S.R. 0061 Bridge. Supporting hydraulic information and tables for the 25-year, 50-year, and 100-year flows are provided in Appendices C-1, C-2, and C-3, respectively.

c. Scour (10.7.B.3.b.2)

A preliminary scour analysis was completed for the 100-year and 500-year storm events. Because no specific grain size of the material lining the channel was available, the D_{50} particle size was estimated from visual observations during the site reconnaissance. Scour calculations will be updated when a sieve analysis is available. Visual observation of the main channel identified the bed material as consisting of primarily gravel and cobbles. As such, a D_{50} particle size of 0.5 inches (0.042 feet) was chosen. D_{95} values were assumed to be approximately three times the size of D_{50} values. Using a D_{50} particle size of 0.042 feet, the 100-year and 500-year critical velocities were determined. Since both the 100-year and 500-year velocities in the channel are less than the critical velocity (determined by the methods in HEC-18), clear-water scour occurs. Positive contraction scour depths of 4.94 feet and 10.37 feet were calculated for the 100-year and 500-year events, respectively. Although contraction scour is positive, scour will not occur since the bottom of the channel is at bedrock.

The abutments will be protected from the damaging effects of scour by riprap. Based upon the bridge opening velocity of 9.65 ft/s for the 100-year event, the abutments will be protected with R-8 riprap. Therefore, no abutment scour is anticipated.

d. Comments and Computations (10.7.B.3.b.3)

Geometric data for the Mahannon Creek HEC-RAS Model was Obtained from two different sources. In the vicinity of the S.R. 0061 Bridge, geometric data was obtained from a digital terrain model (DTM) of the project area developed from topographic ground survey data collected in the summer of 2009. The stream geometry was exported to HEC-RAS as a GEO file and imported into the program to form the basic hydraulic model.

Due to the size of the floodplain, a DTM was not created for the entire floodplain. Survey point shots taken at select points crossing the floodplain to create cross sections of the floodplain upstream and downstream of the DTM. Point shots were taken in rows perpendicular to the flow in the Mahannon Creek, at approximately 50 foot intervals crossing the floodplain. Rows of point shots forming the cross sections were located approximately 100 feet apart.

To ensure that all cross sections closed, contours extracted from a digital elevation map (DEM) of a USGS Quad Map were used to supplement the survey data at the outside edges of the floodplain, locations beyond the limits of the DTM or point shots. All data imported into HEC-RAS was manually manipulated in order to obtain the proper geometric representation of the cross sections and the existing and proposed bridge geometries.

The hydraulic model of the project was developed as follows:

1. For the Existing Conditions Model, cross sectional information was inserted into HEC-RAS electronically and was manually manipulated to produce cross sections consistent with actual conditions. Design flows were added for the 25-year, 50-year and 100-year storms, and their corresponding boundary conditions were programmed to utilize normal depth as both an upstream and downstream boundary condition since known water surfaces were not available.
2. Once current topographical data was entered into the Existing Conditions Model, the furthest downstream cross section was copied five times at the downstream end of the model. This helped to balance energies more quickly and obtain a more accurate downstream water surface elevation when using the normal depth as a boundary condition.
3. The proposed modifications to the bridge geometry indicative to the rehabilitation were inserted into the Existing Conditions Model to create the Proposed Conditions Model.

The Antique Lane Bridge, existing S.R. 0061 Bridge and proposed S.R. 0061 Bridge were modeled in HEC-RAS by entering roadway data for the two configurations into the model using high and low chord elevations of the structures. While the Antique Lane Bridge is roughly perpendicular to the flow, the S.R. 0061 is skewed approximately 15 degrees. The existing and proposed S.R. 0061 Bridge's span length and width were adjusted manually before coding the bridge geometry into HEC-RAS for the bridge skew. No skew adjustments were made to the Antique Lane Bridge

There are no computational errors in HEC-RAS for either the Existing Conditions or Proposed Conditions hydraulic models. Warnings were noted at several cross sections in each model; however, these warnings are similar for each model based upon the frequency of the event evaluated and are considered to have essentially no impact upon the modeling results. Warnings produced at multiple cross sections indicated the need for additional cross sections. As the cross sections were situated at important channel changes and were typically placed no more than 100 feet apart within the survey limits, additional cross sections were not added to the model. At some locations, the warnings noted that divided flow was calculated for the low flow events. In most of these locations, where split flow occurs, a portion of the overbank was blocked from the conveyance calculations for the cross section by coding the overbank areas as ineffective flow. HEC-RAS also noted at multiple cross sections that the critical depth could not be determined during the specified number of iterations and defaulted to the iteration with the lowest energy. When the number of iterations was increased to the maximum permissible by HEC-RAS, the critical depth warnings persisted. A warning message at

one cross section indicated that there was no valid subcritical solution and the program defaulted to the W.S.E. equivalent critical depth. Since the program was run in a mixed-flow regime, no action was necessary to address this warning.

e. Channel Changes and Bank Protection (10.7.C.3.b.8.iv and v)

There are no permanent substantial channel realignments, widening or alterations proposed to Mahannon Creek associated with this project. Limited clearing of vegetation within the floodplains surrounding the bridge will be necessary to provide access to the existing bridge. The size of this area is anticipated to be limited to only the area necessary to access the bridge, rehabilitate the existing abutments, and construct the new superstructure. All earth disturbance caused by this project will be permanently stabilized according to the specifications set forth in the project's Erosion and Sediment Pollution Control Plan. This limited amount of disturbance within the floodplain is not anticipated to measurably alter the hydrology or hydraulics of the creek.

D. Temporary Conditions (10.7.B.3.b.3)

The Temporary Conditions Model depicts the staging needed to provide a work environment for the contractor to complete the demolition of the bridge and construction of a new structure. This model is created to demonstrate that the construction staging does not significantly affect the surrounding area and does not require an excessive expenditure or effort to construct. Temporary staging was developed to accommodate construction activities and provide for two lanes of traffic during the construction.

The base flow, 1-year and the 2.33-year storm events were examined for the Temporary Conditions Model. The base flow value was determined by StreamStats. The 10-year Base Flow (BF10YR) of 4.21 cfs was from the StreamStats output tables contained in Appendix A-7. The 1-year and 2.33-year flows were extrapolated from the NFF flood frequency curve provided in Appendix A-8. The 1-year and 2.33-year flows were approximated to be 100 cfs and 400 cfs, respectively.

As no suitable traffic detours are available, the bridge rehabilitation will be constructed in multiple phases. Each phase will consist of traffic being detoured to one side of the bridge. While traffic is detoured, the other side of the bridge deck and superstructure will be removed to allow access to the abutments. Once repairs to the abutments are complete, the superstructure and deck for that half of the bridge will be erected. Traffic will then be detoured onto the renovated section of the bridge while the same process is repeated to renovate the other half of the existing bridge.

To maintain a dry work area, two (2) three-foot (3') diameter RCP pipes will be placed on the channel bed that will extend from the upstream to downstream face of the bridge. A sandbag cofferdam will be erected to an elevation of approximately 522.75 feet. The temporary pipes and cofferdam are to remain in place during both phases of construction.

Modeling results indicate that these Temporary Conditions are sufficient to prevent the 1-year storm from flooding the work zone during construction. The 2.33-year storm will overtop the sandbag cofferdam by approximately 2.5 feet. Although the 10-year storm will overtop the cofferdam, S.R. 0061 will not be overtopped, and S.R. 0061 will be useable during the Temporary Conditions.

Backwater from the 2.33-year storm in the temporary condition will propagate upstream of the bridge to the upper limit of the model, located approximately 700 feet upstream of the bridge at cross

section 17+47. The 2-year water surface during the bridge rehabilitation will tie into the existing 2-year water surface between cross sections 16+14 and 17+47. During this storm event, water will leave the banks of the stream in a similar manner to the existing condition and pond in the left floodplain upstream of the bridge. Upstream WSE's are below 526.30 feet and will not impact any structures. A comparison of the Existing Conditions and Temporary Conditions 2.33-year WSE's are provided in Table 6.

Table 6 – Temporary Condition WSE Impacts

River Sta.	Existing Conditions WSE	Temporary Conditions WSE	Δ WSE
	2.33-year	2.33-year	2.33-year
-	(ft)	(ft)	(ft)
17+47	526.39	526.29	-0.10
16+14	525.28	525.65	0.37
15+06	524.66	525.61	0.95
13+99	524.44	525.57	1.13
12+82	523.26	525.54	2.28
12+03	523.17	525.49	2.32
11+58	523.08	525.47	2.39
11+41	523.07	525.42	2.35
11+00	SR 0061		
10+45	522.23	522.25	0.02
09+77	522.30	522.30	0.00
8+72	522.28	522.28	0.00
07+29	522.26	522.26	0.00
06+60	521.02	521.02	0.00
06+50	Antique Lane Bridge		
06+24	519.59	519.59	0.00
05+92.50*	519.73	519.73	0.00
05+60.50*	519.56	519.57	0.01
05+29	518.75	518.74	-0.01
04+29	517.04	517.04	0.00
03+29	515.35	515.34	-0.01
02+29	513.64	513.64	0.00
01+29	511.95	511.94	-0.01
00+29	510.24	510.24	0.00

***Interpolated Cross Section**

Field conditions may necessitate the need to change the Temporary Conditions from those depicted in the hydraulic analysis. It is the intent of this analysis to demonstrate that the bridge construction can be completed with reasonable efforts to accommodate flow in the stream and maintenance of two lanes of traffic during construction. The HEC-RAS results of the Temporary Conditions Modeling are provided in Appendix C-4.

E. Risk Assessment (10.7.B.4)

1. Economic Assessment

Floodplains around the creek are generally forested and rural. The only structure within the floodplain is the sewage treatment plant upstream of the bridge. The effect of backwater from the bridge on this structure was considered in the design. As the existing 100-year storm impacts the sewage treatment plant, any proposed modifications to the S.R. 0061 Bridge cannot cause an increase in backwater for the 100-year event. As the proposed abutment rehabilitation is expected to decrease the span of the bridge, the low chords of the bridge needed to be raised to compensate for the 1-foot reduction in span. The proposed design of the bridge was intended to limit the amount of vertical profile adjustments to S.R. 0061. With few structures in the floodplain and an overall decrease in the 100-year W.S.E., the economic impact of the project is expected to be minimal.

2. Overtopping

The existing structure has a hydraulic opening of 194.80 square feet. Raising the low chords and reducing the span length will increase the proposed hydraulic opening by approximately 7 square feet to 201.94 square feet. Based upon the surrounding topography and the vertical profile of S.R. 0061, the proposed structure will not be overtopped during the 100-year design flow. As this exceeds the 50-year design storm specification based upon roadway classification, the hydraulic opening is considered acceptable.

3. Community Impact

As S.R. 0061 is principal arterial highway and one of the areas primary routes of transportation; therefore, inundation of the road by flooding would have a significant impact upon North Manheim Township. Flooding of the road is expected to be a rare occurrence, however. Modeling results indicate that the Proposed Conditions are not overtopped by the 100-year storm.

4. Environmental Risk

The potential for changes to the ecology or the aquatic habitat of the creek and floodplains by this project is anticipated to be minimal. No permanent rock or other foreign material will be introduced into the main channel or overbank areas other than the riprap protection adjacent to the abutments of the bridge, which is necessary to protect the bridge from scour and stabilize the embankment adjacent to the bridge abutments.

5. Preliminary Cost Estimate (10.7.C.6)

A Preliminary cost estimate for the S.R. 0061 Bridge rehabilitation was prepared as part of the conceptual TS&L package. The total cost for the bridge rehabilitation was estimated to be \$269,000. A copy of the preliminary cost estimate is provided in Appendix A-9.

F. Summary Data Sheet (10.7.B.5)

A summary data sheet with pertinent project information is provided in Appendix A-10.

G. Drawings (10.7.B.6)

Final TS&L Drawings are pending. A copy of a conceptual TS&L Drawing is provided in Appendix D-1. Supplementary roadway drawings are provided in Appendix D-2. A map depicting the existing and proposed 100-year floodplain limits is provided in Appendix D-3. A sketch of the Temporary Conditions is provided in Appendix D-4.

REFERENCES

1. Federal Emergency Management Agency, *Flood Insurance Study Township of North Manheim*, Pennsylvania, Schuylkill County, November 6, 1995. Community Number 422013.
2. Federal Emergency Management Agency, *Flood Insurance Study Township of West Brunswick*, Pennsylvania, Schuylkill County, August 19, 1997. Community Number 422028.
3. Federal Emergency Management Agency, *Flood Insurance Study Borough of Orwigsburg*, Pennsylvania, Schuylkill County, March 2, 1989. Community Number 421204
4. U.S. Department of the Interior, U.S. Geological Survey, *The National Flood Frequency Program, Version 3: A Computer Program for Estimating Magnitude and Frequency of Floods for Ungaged Sites*, Water-Resources Investigation Report 02-4168, 2002.
5. U.S. Army Corps of Engineers (COE), 2003, *HEC-RAS River Analysis System*, Version 4.0 (the Latest Version Available), March 2008.
6. U.S. Army Corps of Engineers (COE), 2008, *HEC-RAS River Analysis System - User's Manual*, Version 4.0 (Latest Version Available on the Internet), March 2008.

APPENDIX A-1

FEMA Flood Insurance Studies

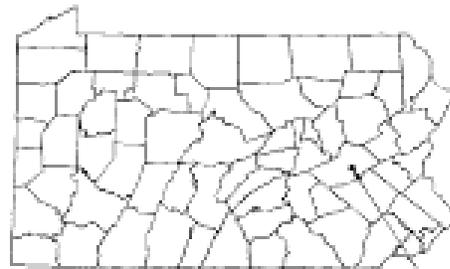
Appendix Includes: North Manheim Township FIS, West Brunswick Township FIS, and Orwigsburg Borough FIS



FLOOD INSURANCE STUDY



**TOWNSHIP OF
NORTH MANHEIM,
PENNSYLVANIA
SCHUYLKILL COUNTY**



TOWNSHIP OF NORTH MANHEIM

REVISED:
NOVEMBER 6, 1996



Federal Emergency Management Agency

COMMUNITY NUMBER - 432013

The climate is characterized by temperatures ranging from average highs of 72 degrees Fahrenheit (°F) in summer to 27°F in winter. The average annual rainfall for the region is 44 inches.

The topography of the area varies from steep mountain slopes in the north section to gently rolling hills throughout most of the township.

2.3 Principal Flood Problems

The major flood problems in the Township of North Manheim are associated with Mahanoy Creek and the Schuylkill River. Flooding along the Schuylkill River occurs during all seasons of the year with the main flood season being spring. Spring floods are generally the result of a combination of heavy rains and snow melt. Summer and fall floods are generally the result of widespread heavy rainfall.

The Schuylkill River has a recorded flood history dating back to 1933. Floods that inundated various parts of the borough are known to have occurred in July 1935, May 1942, and June 1972. The largest flood of record occurred in June 1972 and resulted from a four-day rainfall associated with Tropical Storm Agnes. There is little available information concerning the history of flooding in the community.

2.4 Flood Protection Measures

The USACE constructed Blue Marsh Dam, a multi-purpose structure, on Tulpehocken Creek, approximately 7 miles above its confluence with the Schuylkill River. This project was completed in 1982, and significantly reduces flood levels in the City of Reading in Berks County. This reduction in flood waters is subsequently experienced downstream along the Schuylkill River. The effects of Blue Marsh Dam were considered in the hydrologic analysis for this FIS.

Several dams exist along the study reach of the Schuylkill River. However, these dams are used for purposes other than flood control.

No measures have been taken to alleviate flooding within the Township of North Manheim. Residents depend on warnings issued through radio and television broadcasts, and local newspapers for information about possible flood conditions. Flood warnings and flood-peak predictions are issued by the National Oceanic and Atmospheric Administration Flood Forecasting Centers in Harrisburg, Pennsylvania, and Trenton, New Jersey.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Frequency discharge relationships were developed for six streamflow gaging stations on the Schuylkill River, which have periods of record greater than 20 years, using the HECWRC computer program, which utilizes procedures outlined in Bulletin 17B (Reference 2). Input into the program were unregulated and naturalized annual peak flow data, a generalized, regional skew value, and mean squared error of this skew. Peak flow data were obtained from the USCS Flood Peaks and Discharge Summaries in the Delaware River Basin and Water Resource Data, Pennsylvania, Surface Water Records (References 3 and 4).

The peak flows were adjusted to the historical floods of 1850, 1870, 1902, and 1972 in the lower basin and 1942 and 1972 in the upper basin, which were specified as being major flood events. Where there was no published peak for a major event, the peak flow was estimated by means of linear regression with surrounding gages. Peak flows recorded since 1978 on the Schuylkill River downstream of the confluence of Tulpehocken Creek are subject to a varying degree of regulation by Blue Marsh Lake. Generalized, regional skew and mean squared error were obtained from Generalized Skew Study for the Delaware River Basin performed by the USACE (Reference 5). Naturalized frequency discharge curves developed for the six gages were transformed to regulated

conditions curves using flow reduction curves published in "Special Projects Memo #475, Discharge Reduction Curves, Schuylkill River, Pennsylvania" (Reference 6).

The flood-frequency discharge values for Mahonney Creek were determined by application of USGS Bulletin 17B procedures to area stream gages (Reference 2). All USGS stream gages with a reasonable number of years of record in Carbon, Schuylkill, and other nearby counties were analyzed. A regional curve showing drainage area versus 100-year flood discharge was then generated using the results of the statistical analysis. Data from this curve was applied to all ungaged streams in the study area.

For Long Run Creek, the discharge-frequency relationships were developed using the rational formula due to the small size of its drainage area. The discharge for the 500-year flood was determined by extrapolation of graphs of flood discharges computed for frequencies up to 100 years.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

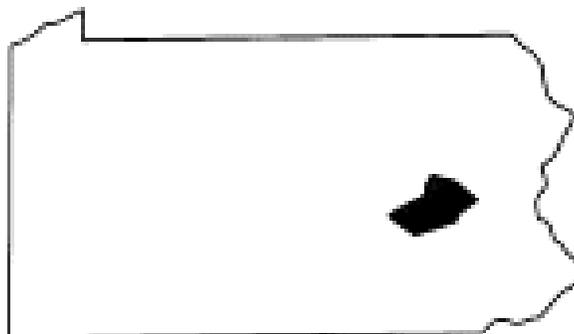
TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
MAHONNEY CREEK					
At downstream corporate limits	4.3	N/A	N/A	1,700	N/A
LONG RUN CREEK					
At confluence with Schuylkill River	3.59	506	643	735	890
SCHUYLKILL RIVER					
Upstream of confluence with Little Schuylkill River	160	8,600	13,800	16,500	24,000
Approximately 1,000 feet downstream of Landingville gage	133	6,790	11,000	13,200	19,400
Upstream of confluence with West Branch Schuylkill River	53.4	3,990	7,740	9,880	16,500

FLOOD INSURANCE STUDY



**BOROUGH OF
ORWIGSBURG,
PENNSYLVANIA
SCHUYLKILL COUNTY**



MARCH 2, 1999



Federal Emergency Management Agency

COMMUNITY NUMBER - 421204

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Borough of Owingsburg, Schuylkill County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

Mahanon Creek was studied by detailed methods from the downstream corporate limits to approximately 1,850 feet upstream of State Route 443. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed reconstruction through September 1992.

The remaining portion of Mahanon Creek and several unnamed streams were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Borough of Owingsburg.

2.2 Community Description

The Borough of Owingsburg is located in southeastern Schuylkill County. It is surrounded by the Townships of West Brunswick and North Mahan. The borough covers an area of 2.1 square miles and had a 1992 population of 2,748.

Owingsburg was laid out and named by Peter Owig in 1796. It was the Schuylkill County seat from 1811 to 1838, when the county seat was moved to Pottsville. Residential, commercial, and industrial areas are located in the center of the borough. Most new residential developments have been built in the southwest or northeast corners of the community. The major transportation route through the community is State Route 443.

The climate in this geographic area is characterized by temperatures ranging from an average of 72 degrees Fahrenheit (°F) in summer to 27°F in winter. The average annual rainfall for the region is 44 inches.

The topography of the area varies from gently rolling hills to steep mountainous terrain in the northwest section of the borough. Mahanon Creek divides the community as it flows south to its confluence with the Schuylkill River at Landingville, which is approximately 2 miles east of Schuylkill Haven.

2.3 Principal Flood Problems

The principal flood problems in the Borough of Owingsburg are associated with Mahanon Creek because of its extensive floodplains

caused by the topography in the vicinity of the stream. Historic information relative to past flooding events within the borough is unavailable.

2.4 Flood Protection Measures

There are no local flood protection measures located within the Borough of Orwigsburg. Residents of the borough depend on the usual warnings through radio, television, and local newspapers for information concerning possible flood conditions. Flood warnings and predicted flood peaks are issued by the National Oceanic and Atmospheric Administration Flood Forecasting Centers located at Harrisburg, Pennsylvania, and Trenton, New Jersey.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

All USGS stream gages with a reasonable number of years of record in Carbon, Schuylkill, and nearby counties were analyzed. The methodology described in Bulletin 17B was used to develop the 100-year flood discharges (Reference 1). A regional curve showing drainage area versus 100-year flood discharge was then generated using the results of the statistical analysis. Data from this curve was applied to Mahannon Creek.

A summary of the drainage area-peak discharge relationships for the stream studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGE (cfs) 100-YEAR</u>
MAHANNON CREEK		
At downstream corporate limits	5.5	2,040
Downstream of State Route 443	4.5	1,770

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analysis were photogrammetric and field surveyed (Reference 2). Cross sections were located at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures. The ground control for the photogrammetry was acquired using conventional surveying techniques.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 3). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The starting water-surface elevation for Mahannon Creek was obtained from normal depth calculations. The results of the water-surface computations are tabulated for selected cross sections (Table 2).

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas (Reference 4). For Mahannon Creek, the channel "n" value was 0.045, and the overbank "n" values ranged from 0.045 to 0.090.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

FLOODING SOURCE		STREAM CHANNEL			LEFT OVERBANK			RIGHT OVERBANK			100 YEAR FLOOD WATER SURFACE ELEVATION
CROSS SECTION	DISTANCE (FT)	WIDTH (FT)	DISCHARGE (CFS)	MEAN VELOCITY (FT/SEC)	WIDTH (FT)	DISCHARGE (CFS)	MEAN VELOCITY (FT/SEC)	WIDTH (FT)	DISCHARGE (CFS)	MEAN VELOCITY (FT/SEC)	
A	0	20	650	5.4	35	80	1.5	200	1310	1.8	535.0
B	1560	30	620	3.7	325	1020	1.2	165	400	1.1	542.6
C (1)	2080	35	1090	9.0	115	770	3.9	260	180	3.9	547.5
D	3000	10	570	11.2	175	200	1.6	75	1270	6.3	555.1
E (1)	4060	5	130	5.7	600	1900	2.4	5	10	1.5	565.3
F	5680	20	560	8.5	55	210	2.7	665	1000	2.0	591.0
G	6360	10	120	5.4	70	50	1.2	475	1600	2.5	600.2

(1) Topwidth adjusted

FEDERAL EMERGENCY MANAGEMENT AGENCY

Borough of Orwigsburg
Schuylkill County
Pennsylvania

REGULATORY DATA

Mohannon Creek

TABLE 2

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 5).

For the flooding sources studied by approximate methods, the boundary of the 100-year flood was delineated using the Flood Hazard Boundary Map for the Borough of Orwigsburg (Reference 6).

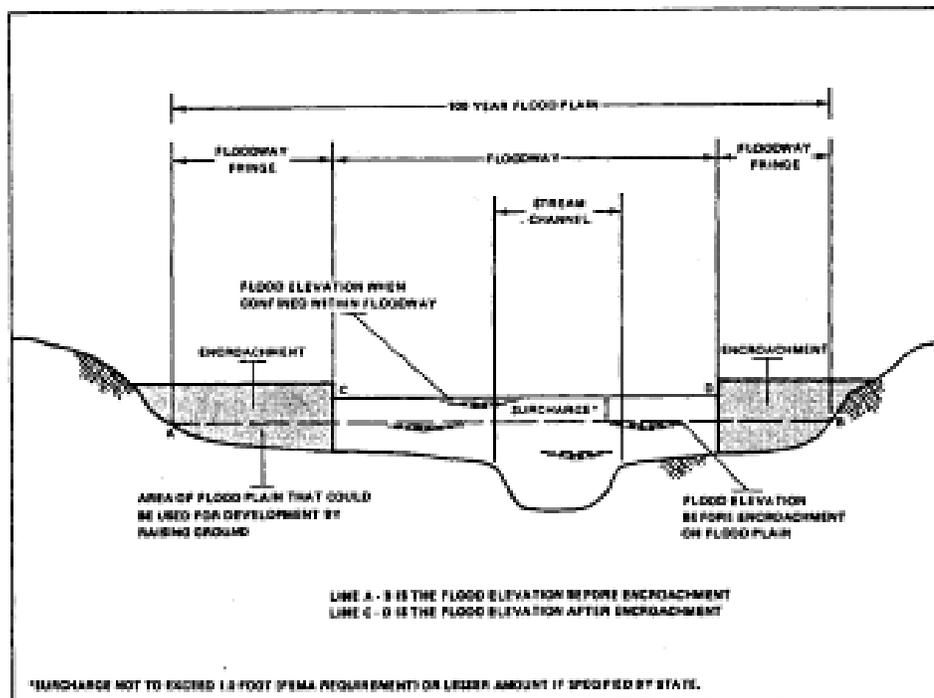
The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the

100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.



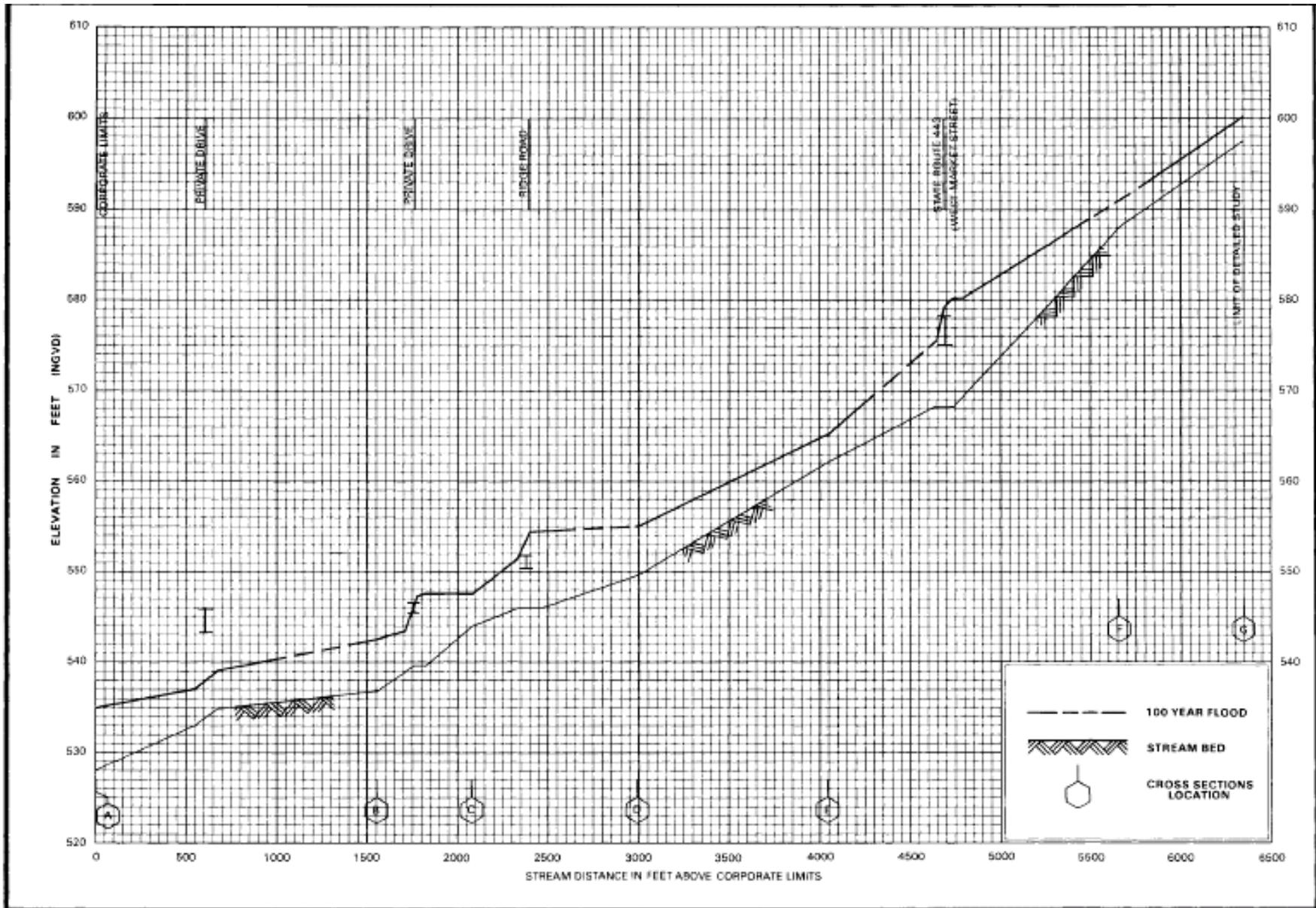
FLOODWAY SCHEMATIC

Figure 2

No floodways were calculated as part of this study.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

<u>Reference Mark</u>	<u>Elevation (Feet NGVD)</u>	<u>Description of Location</u>
RM 1	619.63	Chiseled square on southeast corner at east end of south parapet of stone arch bridge; located approximately 2,140 feet north along State Route 2006 (Lincoln Avenue) from intersection of State Route 443, and approximately 260 feet west of centerline of road.
RM 2	578.87	USGS standard tablet stamped TT 3K, 1942, in top of parapet of culvert; located at west end of Orwigsburg, 160 feet west along State Route 443 from intersection of State Route 2066 (Lincoln Avenue), 12 feet south and 34 feet east of center of culvert with iron railing over Mahannon Creek, approximately 25 feet south of centerline of road.
RM 3	³ 551.41	Chiseled square on top of stone retaining wall on northeast side of Mahannon Creek crossing; located approximately 285 feet southwest along Ridge Road from intersection of South State Route 2013 (Liberty Street) approximately 11 feet northwest of centerline of road.
RM 4	547.82	Chiseled square on top of stone headwall; located approximately 3,000 feet north along State Route 2013 (South Liberty Street) and the intersection of State Route 61, approximately 40 feet south of Private Drive and approximately 16 feet east of centerline of road.
RM 5	530.27	Chiseled square on top of east abutment of bridge; located approximately 800 feet north along State Route 2013 (South Liberty Street) from intersection of State Route 61 to macadam road, then approximately 250 feet west along macadam road to bridge.
RM 6	530.36	Standard P.D.H. Disk (unstamped) set in top of northeast wing wall of concrete bridge; located at intersection of State Route 61 and State Route 2013, 38 feet north of centerline of State Route 61 and 35 feet west of centerline of State Route 2013.



FLOOD PROFILES
MAHANION CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
BOROUGH OF ORWIGSBURG, PA
(SCHUYLKILL CO.)

01P

FLOOD INSURANCE STUDY



**TOWNSHIP OF
WEST BRUNSWICK,
PENNSYLVANIA
SCHUYLKILL COUNTY**



**Township of
West Brunswick**

REVISED:
AUGUST 19, 1997



Federal Emergency Management Agency

COMMUNITY NUMBER - 422028

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Frequency discharge relationships were developed for six streamflow gaging stations on the Schuylkill River, which have periods of record greater than 20 years, using the HECWRC computer program, which utilizes procedures outlined in Bulletin 17B (Reference 2). Input into the program were unregulated and naturalized annual peak flow data, a generalized, regional skew value, and mean squared error of this skew. Peak flow data were obtained from the USGS Flood Peaks and Discharge Summaries in the Delaware River Basin and Water Resource Data, Pennsylvania (References 3 and 4).

The peak flows were adjusted to the historical floods of 1850, 1870, 1902, and 1972 in the lower basin and 1942 and 1972 in the upper basin, which were specified as being major flood events. Where there was no published peak for a major event, the peak flow was estimated by means of linear regression with surrounding gages. Peak flows recorded since 1978 on the Schuylkill River downstream of the confluence of Tulpehocken Creek are subject to a varying degree of regulation by Blue Marsh Lake. Generalized, regional skew and mean squared error were obtained from Generalized Skew Study for the Delaware River Basin performed by the USACE (Reference 5). Naturalized frequency discharge curves developed for the six gages were transformed to regulated conditions curves using flow reduction curves published in

"Special Projects Memo #475, Discharge Reduction Curves, Schuylkill River, Pennsylvania" (Reference 6).

For Pine Creek and the Little Schuylkill River, all USGS stream gages with a reasonable number of years of record in Carbon, Schuylkill, and nearby counties were analyzed. The methodology described in USGS Bulletin 17B was used to develop 100-year flood discharges (Reference 2). A regional curve showing drainage area vs. 100-year flood discharge was then generated using the results of the statistical analysis. Data from this curve were applied to all ungaged streams in the study area.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
SCHUYLKILL RIVER					
Upstream of confluence with Little Schuylkill River	160	8,600	13,800	16,500	24,000
Approximately 1,000 feet downstream of Landingville gage	133	6,790	11,000	13,200	19,400
Upstream of confluence with West Branch Schuylkill River	53.4	3,990	7,740	9,880	16,500
LITTLE SCHUYLKILL RIVER					
Cross section A	132	*	*	19,900	*
PINE CREEK					
Confluence with Schuylkill River	17.2	*	*	4,600	*
Downstream of State Route 61 bridge	14.6	*	*	4,100	*
Upstream of unnamed tributary	12.2	*	*	3,600	*

*Data not available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

APPENDIX A-2

FEMA Flood Insurance Rate Map

Appendix Includes: FEMA FIRM's for portions of Orwigsburg Borough, North Manheim Township, and West Brunswick Township

Insurance agent or call the National Flood Insurance Program at (800) 638-6620.



APPROXIMATE SCALE
500 0 500 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

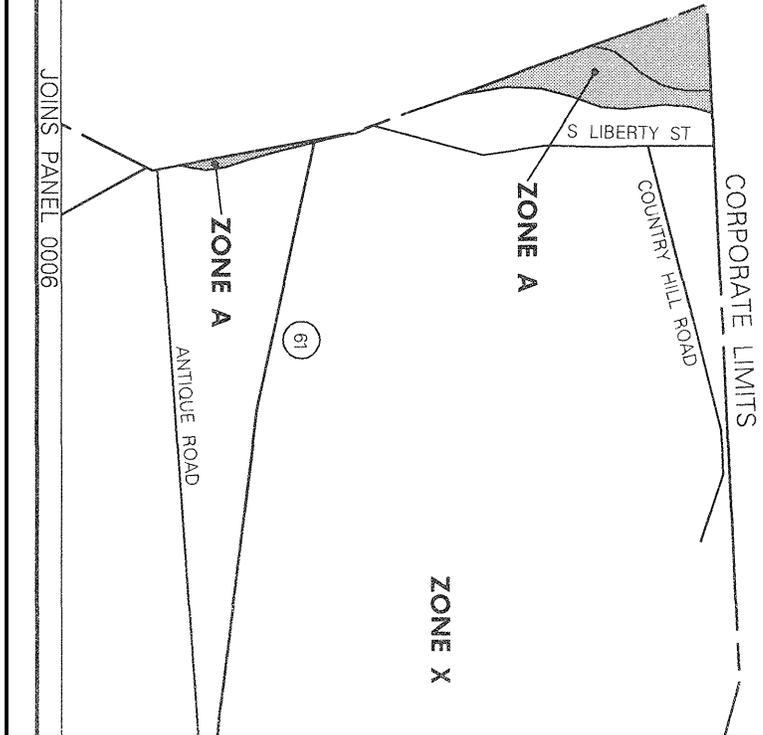
TOWNSHIP OF
WEST BRUNSWICK,
PENNSYLVANIA
SCHUYLKILL COUNTY

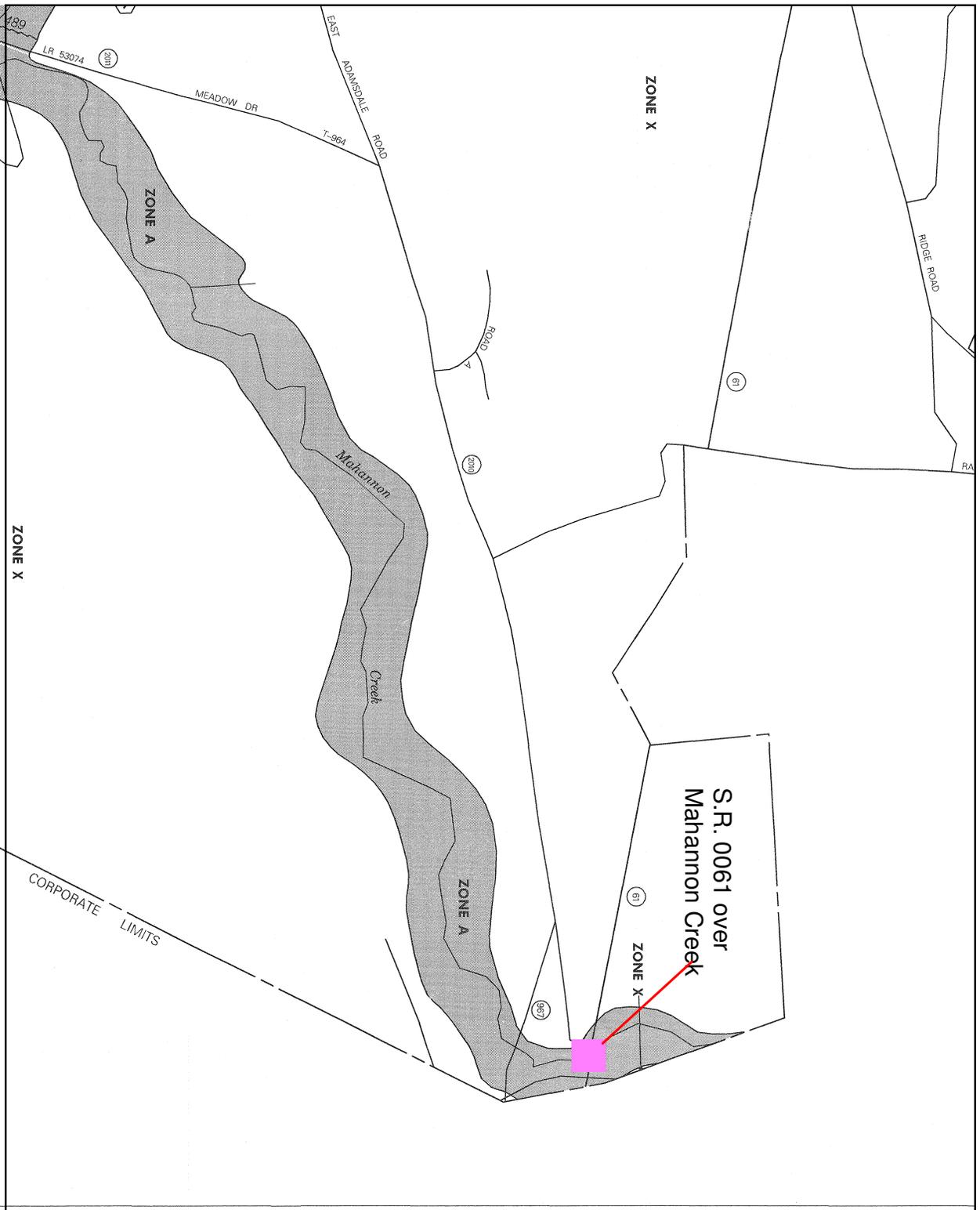
PANEL 3 OF 11
(SEE MAP INDEX FOR PANELS NOT PRINTED)



COMMUNITY - PANEL NUMBER
422028 0003 B
MAP REVISED:
AUGUST 19, 1997
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov





500
 APPROXIMATE SCALE
 0 500 FEET



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

TOWNSHIP OF
 NORTH MANHEIM,
 PENNSYLVANIA
 SCHUYLKILL COUNTY

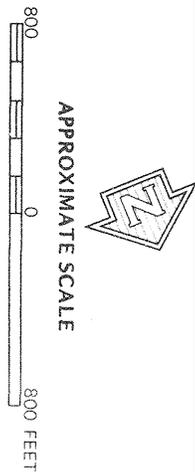
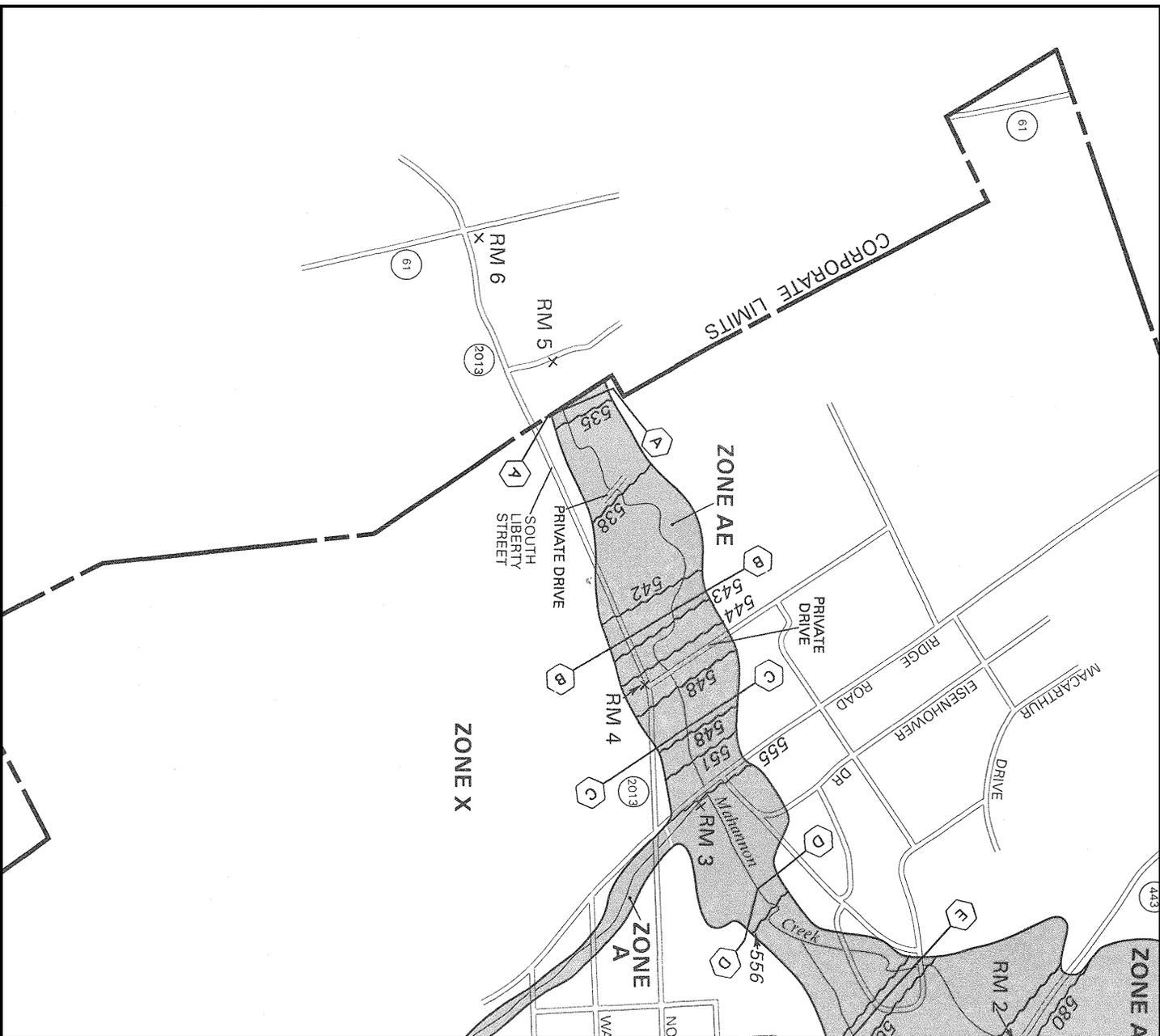
PANEL 8 OF 10
 (SEE MAP INDEX FOR PANELS NOT PRINTED)



COMMUNITY - PANEL NUMBER
 422013 0008 B
MAP REVISED:
 NOVEMBER 6, 1996

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using the "Map Online" tool. This map does not reflect changes in the flood hazard data since the date of the original map. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.fema.gov



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
and
STREET INDEX

BOROUGH OF
 ORWIGSBURG,
 PENNSYLVANIA
 SCHUYLKILL COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
 421204 0005 B

EFFECTIVE DATE:
 MARCH 2, 1989



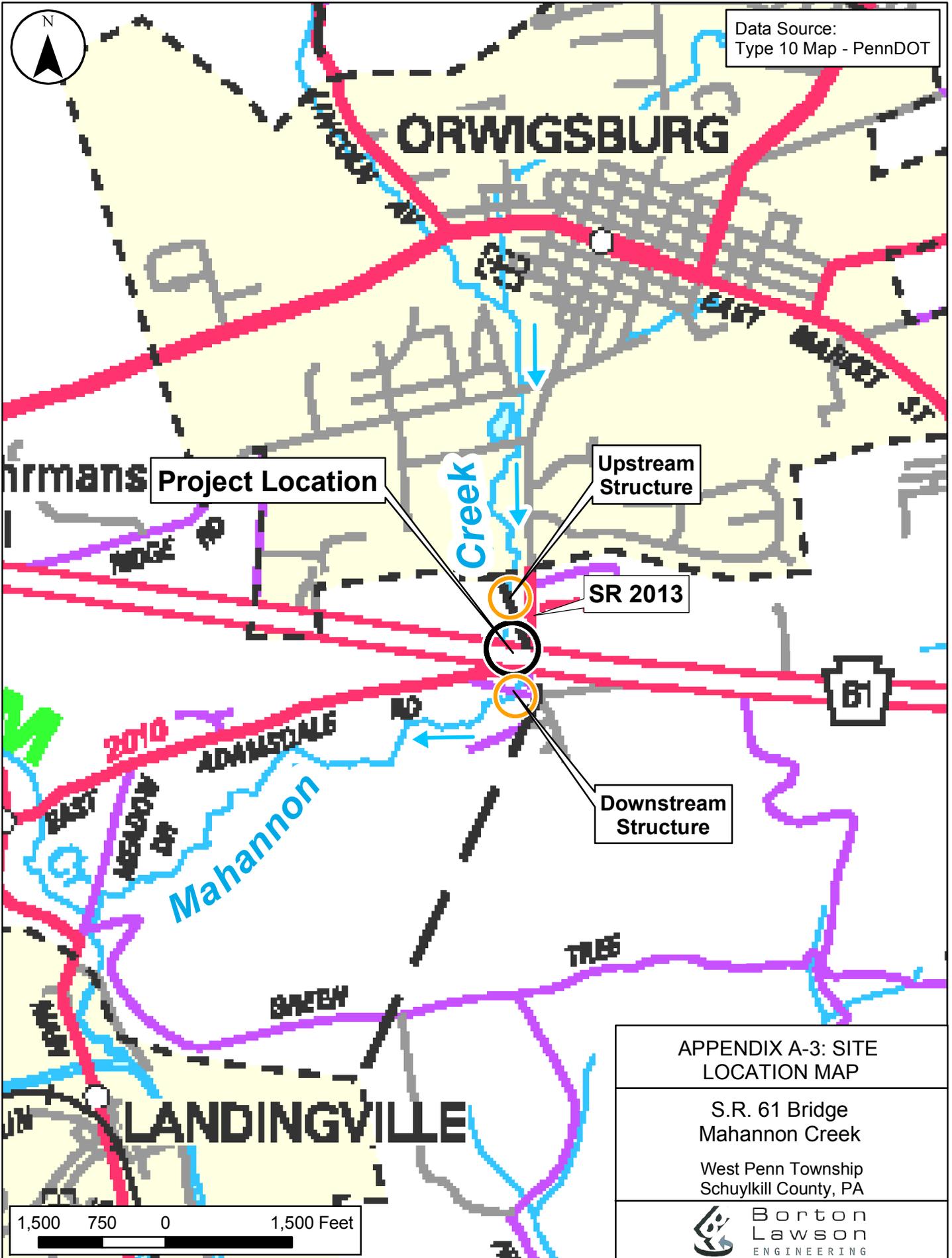
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX A-3

Project Location Map

Appendix Type 10 Project Location Map



DATE: 7/8/2009

FILE: NP:\2009\2915\00\DATA\GIS\ARC\MAP

APPENDIX A-3: SITE LOCATION MAP

S.R. 61 Bridge
Mahannon Creek

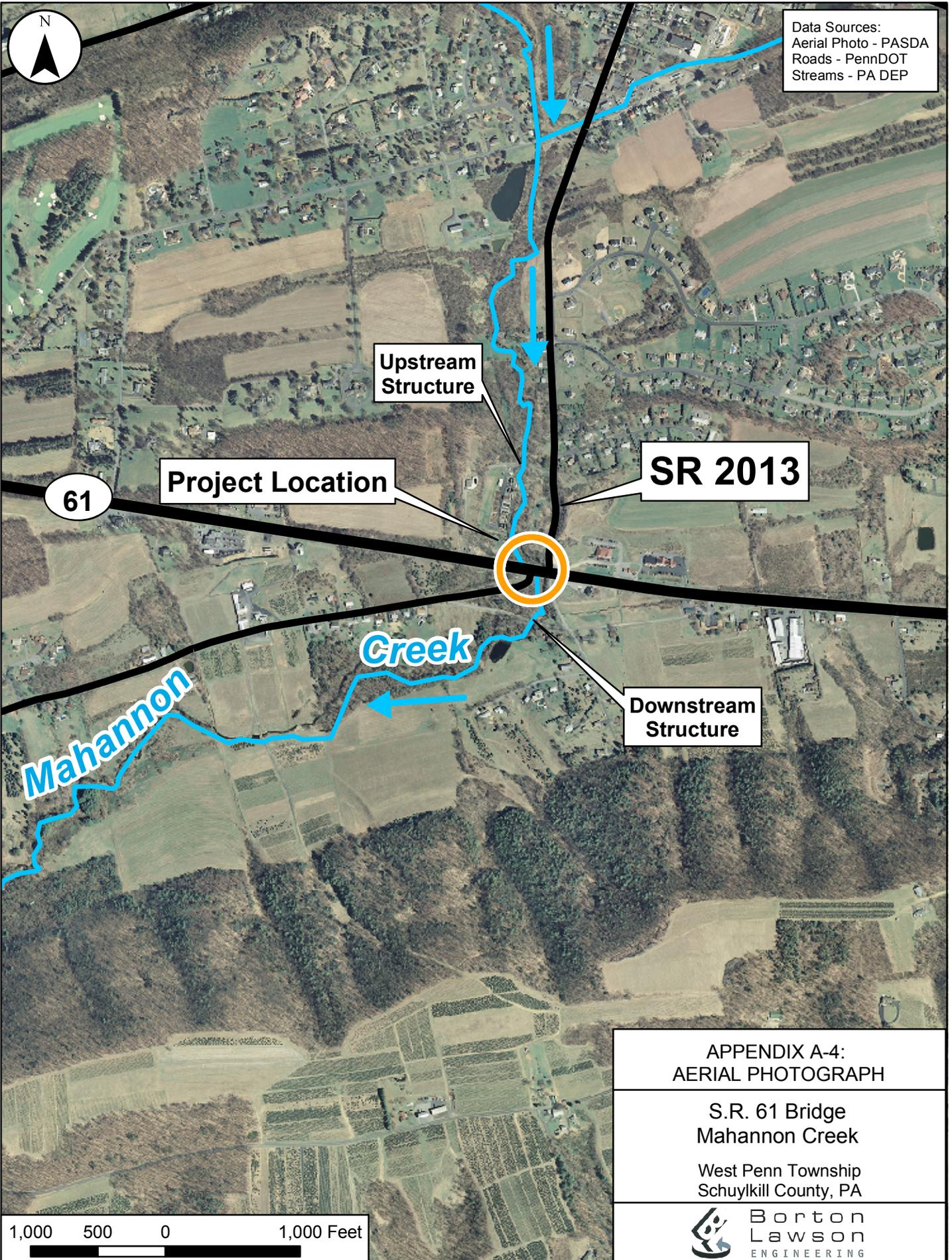
West Penn Township
Schuylkill County, PA



APPENDIX A-4

Aerial Photograph

Appendix Includes: Aerial Photograph



Data Sources:
Aerial Photo - PASDA
Roads - PennDOT
Streams - PA DEP

Upstream Structure

Project Location

SR 2013

61

Creek

Downstream Structure

Mahannon

APPENDIX A-4:
AERIAL PHOTOGRAPH

S.R. 61 Bridge
Mahannon Creek

West Penn Township
Schuylkill County, PA



1,000 500 0 1,000 Feet

DATE: 7/8/2009

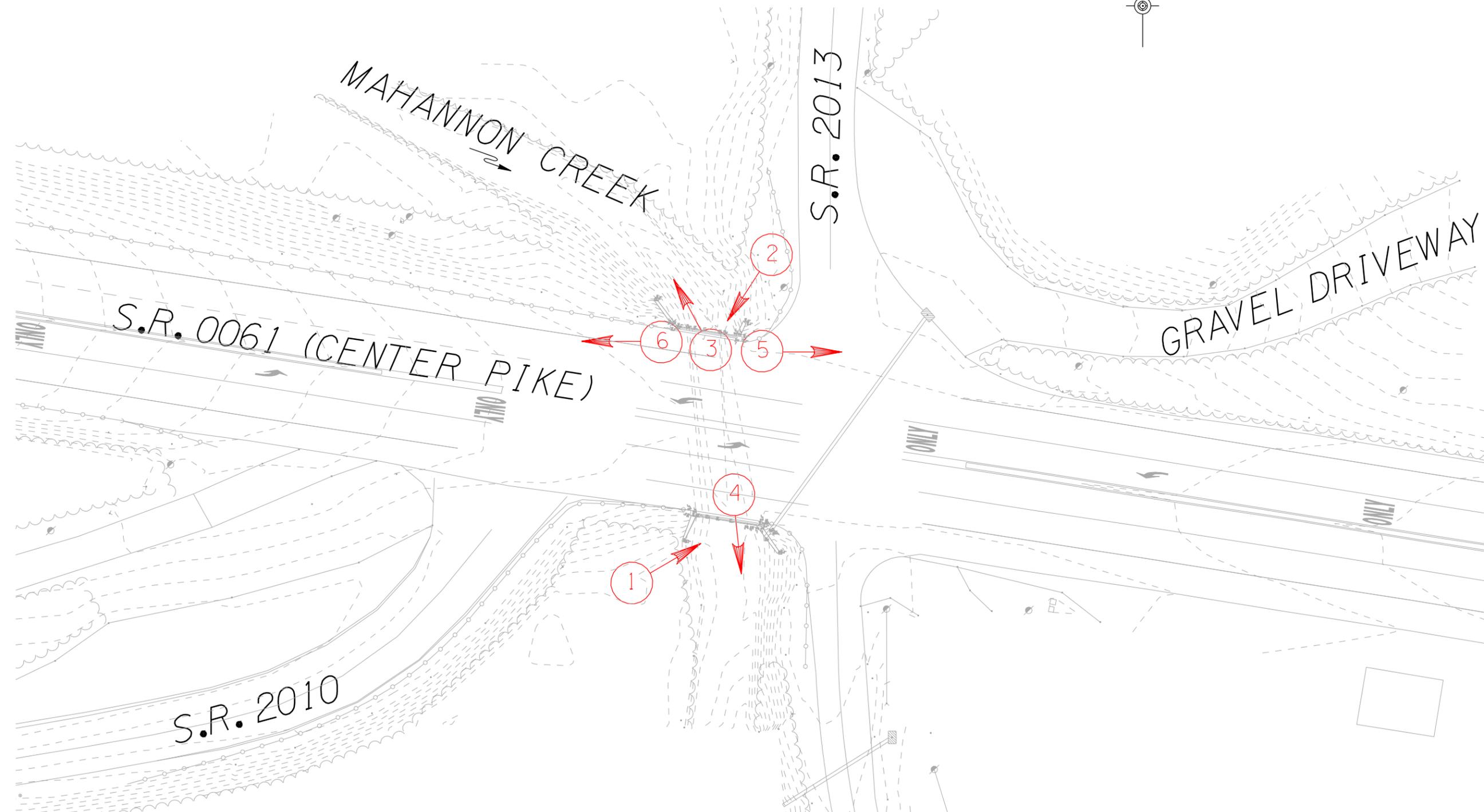
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APPENDIX A-5

Photographs

Appendix Includes: Existing Bridge, Upstream Structure, Downstream Structure, Surrounding Floodplains and Accompanying Photo Location Map

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	1 OF 1
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	TITLE	DATE	BY	
1	PHOTO LOCATION MAP	07/10	PAK	





Picture 1 - S.R. 0061 Downstream Face



Picture 2 - S.R. 0061 Upstream Face



Picture 3 - S.R. 0061 Over Mahannon Creek Looking Upstream



Picture 4 - S.R. 0061 Over Mahannon Creek Looking Downstream



Picture 5 - S.R. 0061 East Approach (Looking East)



Picture 6 - S.R. 0061 West Approach (Looking West)



Picture 7 – Upstream Bridge – Access Road to Sewage Treatment Plant



Picture 8 – Downstream Bridge – Ridge Road over Mahannon Creek

APPENDIX A-6

Inspection Report

Appendix Includes: August 27, 2007 Inspection Report

53 0061 0170 0031

**SR 61
over
Mahannon Creek**

**North Manheim Township,
Schuylkill County, Pennsylvania**



Category:	A1
Cost	
Inspect.:	\$1,444.21
PDA	\$0
Posting:	
None	
Fracture Critical?	
No	
U/W Inspect. Req'd?	
No	
Analysis Required?	
No	
Inspection Date:	
August 27, 2007	

Confidential – Structure Safety Inspection Study

This document is the property of the Commonwealth of Pennsylvania, Department of Transportation. The data and information contained herein are part of a structure safety inspection study. This safety study is only provided to those official agencies or persons who have responsibility in the highway transportation system and may only be used by such agencies or persons for safety-related planning or research. The document and information are confidential pursuant to 65 P.S. §66.1 et seq., 75 Pa. C.S. §3754, and 23 U.S.C. §409 and may not be published, reproduced, released or discussed without the written permission of the PA Department of Transportation

Submitted to:

Pennsylvania Department
Of Transportation
District 5-0

Inspection / Report:

Daniel S. Klick, E.I.T. C.B.S.I.
Daniel W. Durr



Inspected by:

Erdman, Anthony, Associates, Inc.
3 Crossgate Drive, Suite 100
Mechanicsburg, PA 17050-2459

Quality Review:

John M. Fitzsimmons, P.E.
Todd B. Smeltz, P.E.

TABLE OF CONTENTS

LOCATION MAP

BRIDGE DESCRIPTION

INSPECTION SUMMARY

LOAD RATING SUMMARY

RECOMMENDATIONS

FIELD INSPECTION NOTES

I - Forms

Field Sketches

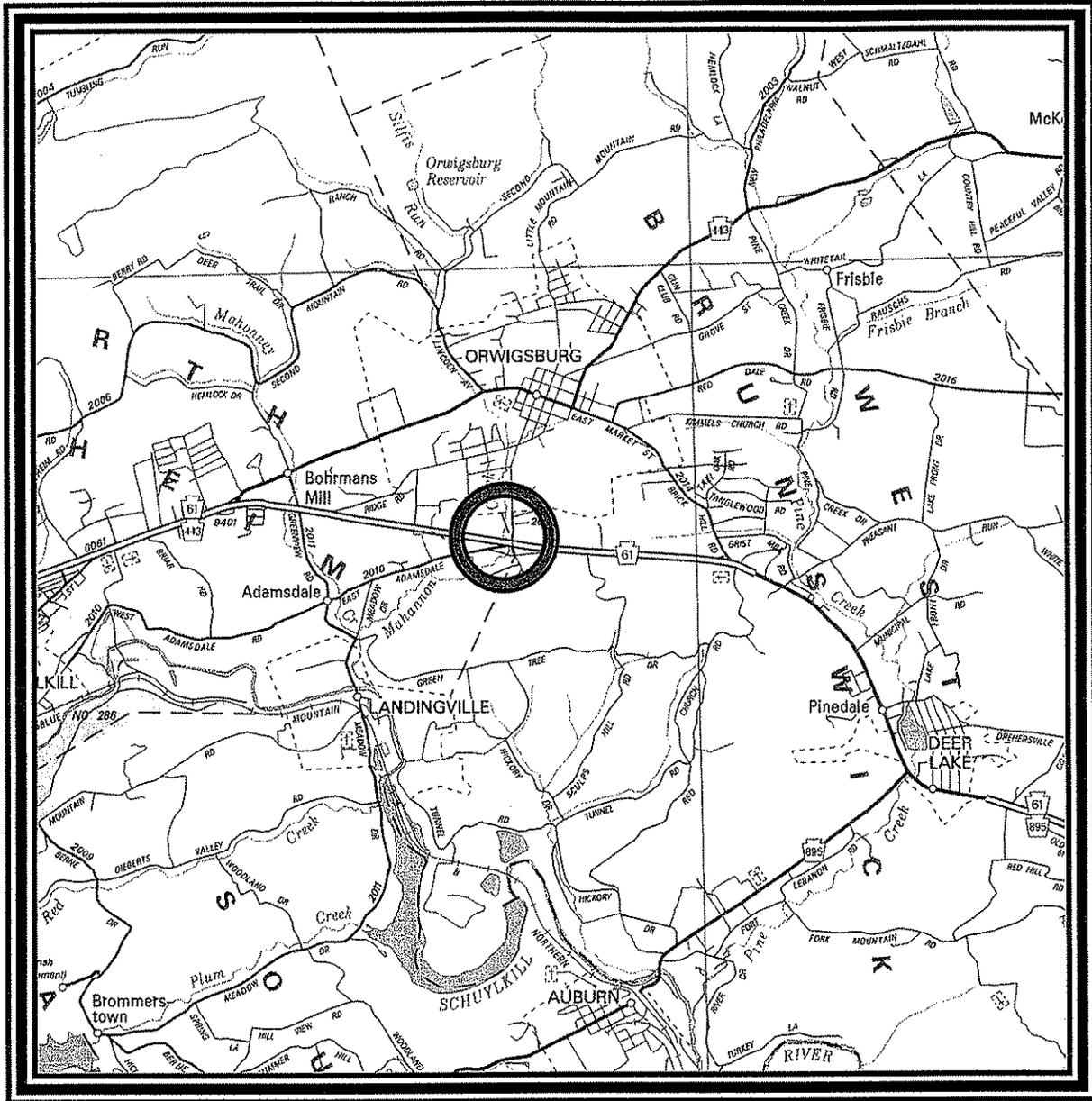
Posting Sheet

Safety Feature Sheet

PHOTOGRAPHS

53 0061 0170 0031

SR 0061 over Mahannon Creek



LOCATION MAP

SCALE: 1" = 1 MILE

BRIDGE DESCRIPTION

Year Built: 1936 (Reconstructed – 1955)
Structure Type: Reinforced Concrete T-Beams
Structure Length: 27.0'
Number of Spans: 1
Curb-Curb Width: 67.0'
Underclearance: 11'-05"

INSPECTION SUMMARY

This bridge was inspected by Erdman, Anthony, Associates, Inc August 27, 2007.

Approach Slab:

There is no approach slab.

Prior Cond. Rating

N

Current Cond. Rating

N

Approach Roadway:

The asphalt approach roadway has moderate wear and minor wheel rutting throughout. There are a few open longitudinal cracks throughout. There is heavy erosion at the near and far left. The far left shoulder transition has a 6" drop-off.

Prior Cond. Rating

6

Current Cond. Rating

5

Deck Wearing Surface:

The asphalt wearing surface has moderate wear and minor wheel rutting with a few wide, random cracks. There is heavy depression at the centerline at the near.

Prior Cond. Rating

6

Current Cond. Rating

6

Deck:

The top of the reinforced concrete deck is not visible is not visible due to the asphalt wearing surface. The underside of the widened deck has shotcrete coating throughout. The previous report listed

Prior Cond. Rating

4

Current Cond. Rating

4

BMS# 53 0061 0170 0031
SR 61 over Mahannon Creek

evidence of cracking and seepage in the "old" section with minor delamination.

Superstructure:

Prior Cond. Rating

5

Current Cond. Rating

5

There are fifteen reinforced concrete T-beams. The "old" section has heavy scale, efflorescence and longitudinal cracking throughout. There is vertical hairline cracking throughout with some cracks wrapping around the beams. The beams have heavy concrete patchwork with heavy delamination. Beams G7, G8, G9 have severe spalling along the bottom flange with exposed and deteriorated stirrups and longitudinal reinforcement. There is minor section loss to the longitudinal reinforcement and several of the stirrups are broken. The widened section has moderate delamination and honeycombing and a minor spall to the bottom of beam G15, at the near abutment. The right face of beam G15 has minor delamination at the far end. The reinforced concrete end diaphragms in the "old" section have horizontal and map cracking with seepage, minor delamination and efflorescence.

Paint Condition:

Prior Cond. Rating

N

N

Current Cond. Rating

N

N

The bridge is a reinforced concrete T-beam bridge.

Substructure:

Prior Cond. Rating

4

Current Cond. Rating

4

The reinforced concrete abutments have minor hairline map cracks to the widened section. There is heavy map cracking to the "old" section, heavy abrasion at the waterline, heavy efflorescence and minor to moderate delamination throughout. The far abutment has a full height vertical, 1/8" wide crack under beam G6 with 1/4" separation to the right side (leaning outward). The near right wingwall has moderate spalling on the top face. There is moderate erosion behind the near left and far left wingwalls.

Channel Protection:

Prior Cond. Rating

4

Current Cond. Rating

4

The stream flows in from a sharp curve in the upstream, impacts the near right bank, and exits at full width. The gradually sloped banks are lined with large trees and exhibit minor erosion. There is 33" of contraction scour in the center of the channel, under the upstream edge of the bridge, tapering to 18" at the downstream of channel. There is rip-rap placed at the upstream wings and along the full length of the abutments.

Safety Features:

Prior Cond. Rating

4

4

4

4

Current Cond. Rating

4

4

3

5

The bridge railings are 36" high reinforced concrete pigeon holed parapet with minor scale. There is 25' of Type 2-SC with 3'-1 1/2" post spacing and steel offsets. The near right, left and far left has 25' of Type 2-S with 6'-3" post spacing and steel offsets. There is no approach guiderail provided. The far left approach rail and end treatment has gouge marks throughout. The near corners are 37.5' turndowns and

BMS# 53 0061 0170 0031
SR 61 over Mahannon Creek

the far has continuous Type 2-S guiderail. The near left and far right corners are trailing ends.

Additional Remarks:

For detailed inspection findings, see the INSPECTION SHEETS section of this report.

BMS# 53 0061 0170 0031
SR 61 over Mahannon Creek

LOAD RATING SUMMARY

The chart shown below is a summary of the current ratings. These ratings are based upon a load factor analysis performed during a previous inspection cycle. A copy of that analysis was not included in this report. These ratings are still valid, as the current condition of the bridge is similar to the condition noted during the previous inspection cycle.

LOAD RATING SUMMARY		
	INVENTORY RATING (TONS)	OPERATING RATING (TONS)
H20	24	40
HS20	36	60
ML80	30	50
TK527	42	71

POSTING REVIEW

The bridge is currently not posted. This posting level may remain until the next inspection. At that time, the posting level should be reviewed again.

RECOMMENDATIONS

PROMPT ACTION REQUIRED (Priority Code 0)

None \$0

HIGH PRIORITY (Priority Code 1)

Improve the off bridge drainage the near left and far left.
2 EA. x \$2,000 per EA \$4,000

Install standard approach guiderail and end treatment at the near and far left.
2 EA. x \$1,000 per EA. \$2,000

PRIORITY ADJUST SCHEDULE AS NEEDED (Priority Code 2)

None \$0

ADD TO SCHEDULED WORK (Priority Code 3)

Repair the deteriorated concrete T-beams.
4 EA. x \$7,000 per EA. \$28,000

Repair the deteriorated concrete sub-structures.
6 C.Y. x \$1,200 per C.Y. \$7,200

Backfill scour hole at the upstream and under the structure.
10 C.Y. x \$40 per C.Y. \$400

Repair the near and far left shoulders.
20 S.Y. x \$60 per S.Y. \$1,200

Repair the bituminous wearing surface.
1 S.Y. x \$25 per S.Y. \$25

ROUTINE STRUCTURAL (Priority Code 4)

None \$0

ROUTINE NON-STRUCTURAL (Priority Code 5)

Clean and flush the deck.
1 EB. x \$400 per EB. \$400

TOTAL COST OF REPAIRS = \$43,225



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

1 Inspection Status: 2 - Submitted
7A02 Team Leader: 560 Erdman, AnthonyDan Klick
7A03 Inspection Type: R - Regular (routine)
7A05 Inspected By: 8 - Consulting Firm

Structure Description

5A08 FHWA Facility Carried: SR 61 (LR 141)
5A07 Features Intersected: MAHANNON CREEK
5A09 Location: AT S.LIBERTY STREET
5C01 Roadway Name: PA 61
5A06 City / Borough Name: 53/218 - NORTH MANHEIM

Structure Type

Main

6A26 Material Makeup: 2 - Concrete(in place)
6A27 Physical Makeup: 1 - Reinforced
6A28 Span Interaction: 1 - Simple, non-comp
6A29 Structural Config: 03 - T-beams

Approach

6A26 Material Makeup:
6A27 Physical Makeup:
6A28 Span Interaction:
6A29 Structural Config:

5A01 SR ID: 53006101700031 5A03 BMS Ref: 30526 7A01 Inspection Date: August 27, 2007

Sign Information

ID01 ID02 ID03 ID06 ID04 ID07 ID05

Type of Sign	Sign Needed	Sign Message	Near Adv	Bridge Site Near	Far Adv	Comments
0 - Bridge						
1 - Bridge Weight Limit	No					
2 - Except Combinations	No					
3 - One Truck at a Time	No					
4 - Vertical Clearance On	No					
5 - Vertical Clearance Under	No					
6 - One Lane Bridge	No					
7 - Narrow Bridge	No					
8 - Hazardous Clearance	No					
9 - Other	Yes			G	G	SEGMENT MARKERS AT NL, NR &FR INTERSECTING RDWS

Features Intersected

SR	Seg	On/Under	Skew Angle	Dir	NHS	Min Lat Left	Cl Right	Tot Hor Left	Cl Right	Min Vrt Left	Cl Rdwys Right	Vrt Cl Over 10ft Left	Cl Right	VT Sign	ADT
0061	0170	1	90	1 - North	1 - On the NHS	-1.0	-1.0	-1.0	67.0	99.9	99.9	99.9	99.9		8,344
0061	0171	12	90	3 - South	1 - On the NHS	-1.0	-1.0	-1.0	67.0	99.9	99.9	99.9	99.9		8,547
		2	0	N/A	-1	-1.0	-1.0	-1.0	-1.0	-1.0	8.3 11.4	-1.0	-1.0		-1

5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

6A01 Design Exceptions:
6A51 Sub Latent Problem: _
6A50 Sup Latent Problem: _

Deck Geometry

Table Used for Appraisal:

Controlling Values

5C10 ADT: 16,891
5C27 Bridge Road Width: 67.0
4A10 Appraisal: 8 - Desirable Criteria
 Notes:

4A11 Underclr Appr: N - Not applicable (NBI)
6B13 Controlling Vertical: -1.0 FT
 Controlling Lateral:

Traffic Safety Features

Feature Type	Location	Adequacy Rating	Description	Posted Spd Lmt (mph)
1 - Railing		4 - does not meet code 6		55
Comment: CONCRETE PIGEON HOLE PARAPETS - LIGHT SCALING				
2 - Transition		4 - does not meet code 6		55
Comment: TYPE 2-SC ROADWAY GUIDERAILS FIRMLY ATTACHED TO PARAPETS BUT LOW HEIGHT				
3 - Approach Guiderail		<u>3</u> - Req not provided		55
Comment: TYPE 2-S APPROACH SECTION WITH STEEL OFFSET BRACKETS AT FAR RIGHT AND FAR LEFT. NONE AT NEAR RIGHT AND NEAR LEFT DUE TO INTERSECTING ROADWAY. (N.L. & F.R. ARE TRAILING ENDS); DAMAGE @ F.L.				
4 - Approach railend		5 - Meets code 6/repair		55

Comment: near - 37.5' turndown and far has continuous Type 2-S guiderail; fr left has gouge marks

Approach Alignment

4A02 Code: 8 - Equal Desirable Crit
Comment: TANGENT ROADWAY GOOD SIGHT DISTANCE, NO SPEED REDUCTION REQUIRED

Approach Roadway

6B39 Code: 5 - Fair
Pavement: ASPHALT - moderate wear and minor wheel rutting; few open longitudinal cracks
Drainage: Natural - heavy erosion at the near left and far left
Shoulders: ASPHALT - 4" settlement at the near left and 6" at the far left transitions

Approach Slab

6R38 Code: N - N/A
Pavement:



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

5A01 Bump at Bridge: No Bump

6A39 Relief Joints: Unknown **6A41** Number of Joints: 0
Comment: NONE

6B02 New Wearing Surface Under Bridge: No

FA01 SR ID: 53006101700031 5A03 BMS Ref: 30526 7A01 Inspection Date: August 27, 2007

Deck Wearing Surface

<p>Main</p> <p>5B02 Type of Wearing Surface: 6 - Bituminous</p> <p>5B03 Type of Memb. Water-Proof: 0 - None</p> <p>5B04 Deck Corrosion Protection: 0 - None</p> <p>6A33 Thickness: 2.5</p> <p>6A34 Date Recorded: 01/01/1901</p> <p>6B36 Condition Rating: 6 - Satisfactory-structural elements show some minor deterioration.</p> <p>IC02 Dk WS Notes: ASPHALT - moderate wear with minor wheel rutting and few wide random cracks; heavy depression at centerline of the near</p>	<p>Approach</p> <p>6A30 Type of Wearing Surface: _ - Unknown (NBI)</p> <p>6A31 Type of Memb. Water-Proof: _ - Unknown (NBI)</p> <p>6A32 Deck Corrosion Protection: _ - Unknown (NBI)</p> <p>6A33 Thickness: 0.0</p> <p>6A34 Date Recorded: 01/01/1901</p>
--	--

Expansion Joints

6A41	Number of Expansion Joints:	0
	VD25 Joint Type	VD26 Movement Class
	VD27 Manufacture Code	
1	B - Premolded Filler	A - Up to 2"
		G - Unknown

Deck

1A01 Condition Rating: 4 - Poor-advanced section loss, deterioration, spalling or scour.

6B07 Est. Spall Delamination: 0.00 % 6B08 Date: 01/01/1901

6B10 Est. Chloride Content: 0.00 % 6B11 Date: 01/01/1901

1A07 Unrepaired Spalls: -1.00 SF

IC Deck Drainage: SCUPPERS - OPEN

IC02 Deck Notes: TOP: not visible due to the asphalt wearing surface; underside- widened and evidence of cracking and seepage in old section, minor delamination; shotcrete repair throughout

Super Structure

1A04 Condition Rating: 5 - Fair-all primary structural elements are sound but may have minor section loss, cracking spalling.

IC02 Sup Notes: (15) R/C T-beams
 OLD section : heavy scale, efflorescence and longitudinal cracking throughout; vertical hairline cracking throughout with some wrapping around beam; heavy concrete patchwork throughout with heavy delamination; Beams 7,8,9 have severe spalling along bottom flange with exposed and deteriorated longitudinal rebar and stirrups; minor section loss to rebar with some stirrups broken; active water seepage throughout.
 NEW section: moderate delamination/honeycomb and minor spall to beam 15 at near bottom; minor delamination to beam G15 at right web at far

IC02 Diaphragms: R/C - END DIAPHRAMS located in original section exhibits several horizontal and map cracks and seepage with minor delamination and efflorescence.

IC02 Portal Bracings: N/A

IC02 Drainage System: SCUPPERS EXTENDED WITH PVC PIPES IN THE WIDENED PORTION- OPEN



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

1.1.2 Substructure Condition Rating: 4 - Poor-ad. section loss, deterioration, spalling or scour.

Notes:

Near Abutment

Backwall: N/A

Bridge Seats: R/C - wet and delaminated below beams in the original bridge section

Cheekwalls: N/A

Stem: R/C- minor hairline map cracking to new; heavy map cracking to old section and heavy scale throughgout, heavy abrasion at the waterline; heavy efflorescence throughout, minor to moderate delamination throughgout.

Wings: R/C -12" diameter storm drain at the near left wing, moderate erosion behind WNL; light scale on top of the near right wingwall; large rip-rap at face of near wingwalls; WNR - moderate spalling along the top face

Footing: Not Visible

Piles: N/A

IN20 Scour Undermine: 1 - Yes

Settlement: NONE VISIBLE

Embank Slope-wall: NONE

Wall Drainage: WEEP HOLES - OPEN

Far Abutment

Backwall: N/A
N/A

Bridge Seats: R/C - wet and delaminated below beams in the original bridge section

Cheekwalls: N/A
N/A

Stem: R/C- minor hairline map cracking to new; heavy map cracking to old section and heavy scale throughgout, heavy abrasion at the waterline; heavy efflorescence throughout, minor to moderate delamination throughgout. full height 1/8" wide vertical crack under B

Wings: R/C large rip-rap at face of WFL and WFR wingwall. moderate erosion behind far left wingwall

Footing: Not Visible

Piles: N/A
N/A

IN20 Scour Undermine: 0 - No

Settlement: NONE VISIBLE
NONE VISIBLE

Embank Slope-wall: NONE
NONE

Wall Drainage: WEEP HOLES - OPEN
WEEP HOLES - OPEN



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

4A21 Navigational Control Controls Exist: Unknown

- 4A22** Vert Clearance: 0.00
- 4A24** Lift Vertical: -1.00
- 4A23** Horz Clearance: -1.00
- 4A07** Pier Protection: Not Applicable (N)

Pier Details

5D02 Pier/Bent Number: **IN20** Scour Undermine:

- Condition Summary:
- Bridge Seats:
- Cheekwalls:
- Columns/Stems:
- Settlement:



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

6B01 Inventory Item Review Recommended: No

IC01 Notes:

Element Details

5D02 Span: Overall Structure **5D04** Span Type: F - Frame

1B01 Element ID: 999 - Dummy Element Inspect by Each: Yes

Environment: Ben. **1B05** Scale Factor: 1

Description: Dummy placeholder element

1A10 Total QTY:	1.00 each	1A11 QTY1:	1.00	1A11 QTY2:	0.00
QTY3:	0.00	1A11 QTY4:	0.00	1A11 QTY5:	0.00

Condition:



FA01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

Material

6A44 Group: 9 - Group 9
Critical Rating Factor: 9992
Total Critical Rating Factor: 29

Structure Type

6A26 Material Makeup: 2 - Concrete(in place)
6A27 Physical Makeup: 1 - Reinforced
6A28 Span Interaction: 1 - Simple, non-comp
6A29 Structural Config: 03 - T-beams

Approach

6A44 Group:
Critical Rating Factor:
Total Critical Rating Factor: 0

Structure Type

6A26 Material Makeup:
6A27 Physical Makeup:
6A28 Span Interaction:
6A29 Structural Config:

Fracture Critical Details

IF01 Location: **IF02** Type: **IF05** FC Stress Category:
IF03 Member:
IF04 Member Detail:
IF06 Notes:



5A01 SR ID: 53006101700031 **5A03** BMS Ref: 30526 **7A01** Inspection Date: August 27, 2007

IU00a UW Reviewer Action:

IU00b Reviewer Comments:

IU02 Number of Units: 0

IU03 SCBI Source: C-computed

IU01 Recalculate SCBI: 0 - no recal needed

4A08 SCBI: 3 - SC - Unstable

OSA:

SAR: 0.00

IU06 Streambed Material #1: A3 - High erod alluv/adv

IU06 Streambed Material #2:

IU07 Notes: SILT; GRAVEL/STONES; RIPRAP

Current Countermeasures

CM Num	Type	Location	Condition	Subunit
	IU21		IU22	IU23
				IU24

Possible Countermeasures

PCM Num	Location	Work Candidate
	IU25	IU26

SAR Calculation Data

IU08 Debris Potential:

IU09 Trapping Potential:

IU10 Pressure Flow:

IU11 NAB Location:

IU12 FAB Location:

US Left Wingwall

IU13 Presence:

IU14 Condition:

US Right Wingwall

IU15 Presence:

IU16 Condition:

Horizontal Debris Blockage

IU17 Start: 0

IU18 End: 0

Vertical Debris Blockage

IU19 Start: 0

IU20 End: 0



5A01

SR ID: 53006101700031

5A03

BMS Ref: 30526

7A01

Inspection Date: August 27, 2007

Sub Unit OSA Data

Observed Scour Rating Components

IN01	IN12	IN13	IN14	IN15	IN19	IN04	IN05	IN06	IN07	IN08	IN09	IN10	IN11	IN03
Sub Unit	Pier/ Abut Type	Inv. Found Type	Found Type	Strmbd Mat	Move Ind	Chg Since Last Insp	Scour Hole	Debris Potential	Scour-ability	Opening Adeq. / Channel	Sediment	Alignment	Velocity/ Stream Slope	Observed Scour Rating
AB	S	P		A3	0	7	B	5	4	6	6	5	7	4
AB	S	P		A3	0	7	B	5	4	6	6	5	7	4

Other Subunit Details

IN01	IN16	IN18	IN17	IN20	IN21	IN02	IN22	IN23	OSA Code	SAR
Sub Unit	UW Insp Type	Water Dept	Observed Scour Depth	Scour Undermine	Counter-measures	Info from Current Insp	Flood Calc 100 yr Scour Depth	Flood Calc 500 yr Scour Depth		
AB	E E	1.0	2.5 0.0	0	0	0.1 0.1	-1.0	-1.0		0.00
	IN24	Notes: No scour - rip-rap protection full length								
AB	E E	1.0	0.0	1.0 0	0	0.1 0.1	-1.0	-1.0		0.00
	IN24	Notes: No scour - rip-rap protection full length								

Inlet Clearance

IL09	Origin Description:
IL10	Horizontal:
IL11	Vertical:
IL12	Notes:

This document includes structure safety inspection information that is confidential pursuant to 65 P.S. §66.1 et seq., 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation.



5A01 SR ID: 53006101700031 5A03 BMS Ref: 30526 7A01 Inspection Date: August 27, 2007

5A03 Culvert Condition Rating: N

Notes:

5B18 Length of Culvert Barrel: 27.0

#	Opening Type	Length	Min Fill Height	Max Fill Height	Eff Width
---	--------------	--------	-----------------	-----------------	-----------

Top Slab:

Barrel:

Floor/Paving:

Headwall:

Wings:

Settlement:

Debris:



01 SR ID: 53006101700031 5A03 BMS Ref: 30526 7A01 Inspection Date: August 27, 2007

Channel

1A05 Channel/ Channel Protection Cond. Rating: 4

Channel: Stream flows in from a sharp curve U/S impacting the near right bank and exits at full width. There is 33" of contraction scour upstream tapering to 18" downstream;

Banks: the banks have a gradual slope and are well vegetated with large trees and exhibits minor erosion.

Streambed Movements: DEEP CONTRACTION SCOURING AND LATERAL STREAMBED MOVEMENT UPSTREAM AND UNDER BRIDGE

Debris, Vegetation: NONE

River Control Devices: NONE

Embank/Strmbed Contr: Rip-rap placed at the near right and far right and along the abutments

Drift Other:

Waterway Adequacy

1A06 Appraisal Code: 8

Notes: SLIGHT CHANCE OF OVERTOPPING BRIDGE AND ROADWAY APPROACHES

IL02 Overtop Risk:

IL03 Traffic Delay:

5C22 Functional Class: 02 - Rural Other Princ

High Water Mark

IL05 Elevation: 0.0

IL06 Date: January 01, 1901

IL07 New High Water Mark: No

Notes:



SR ID: 53006101700031 5A03 BMS Ref: 30526 7A01 Inspection Date: August 27, 2007

Paint Condition

6B36 Paint Cond Rating: N - Not Applicable 6B37 Ext of Paint Cond: N - Not Applicable
6B35 New Paint: 0 - no new paint
Int Beam / Gird: R/C T-BEAMS
Fascias: N/A
Splsh Zone Truss Gird: N/A
Truss: N/A
Bearings: N/A
Other: N/A

4B03 Brdge Cap. Appraisal: 9 - 31% or more above
6B16 Controlling: (blank)
4A09 Struct Cond Appraisal: 4

Structure Condition Appraisal Based on

The following Ratings:

1A04 Superstructure Condition Rating: 5 - Fair-all primary strutral elements are
1A02 Substructure Condition Rating: 4 - Poor-ad. section loss, deterioration,
1A03 Culvert Rating: N - Not applicable

Load Ratings

4B15 Load Rating Review Recommended: Recalc not required
e To:
Calculation Date: August 25, 2005
Rating Approval Date: August 25, 2005

Load Rating Details

Table with columns: IR10, IR11, IR05, IR06, IR07, IR08, IR09, IR18, IR16, IR14, IR15, IR13, IR12. Rows include load type, IR, OR, NBI, RTNG, CONT, FTG, FTG, LD, STRESS, ANALYSIS, AASHTO MANUAL, AASHTO SPEC, OPR, INV, GOV, GOV. Includes 'Notes:' sections for each row.



5A04 SR ID: 53006101700031

5A03 BMS Ref: 30526

7A01 Inspection Date: August 27, 2007

3A05 Element	Type of Work	3A06 Action	3A08 Priority	3A09 Date Rec	3A04 Est Qty UOM	3A13 Candidate for Completion By	3A12 Ass. WK	3A11 Target Year
3A 3	Bridge	Flexible	23 - A743101-CLEAN/FLUSH DK	5	08/25/2005	1 EA	No	0
3A Notes:								
3A 3	Bridge	Flexible	42 - A744603-RPR/RPL.CONC.BEAM	3	08/25/2005	4 EA	No	0
3A Notes: H03 LOCATION: 1 Converted from BMS - H01 code: A744603								
3A 3	Bridge	Flexible	28 - B744802-REPAIR ABUTMENT	3	04/27/1992	6 EA	No	0
3A Notes: H03 LOCATION: N,F Converted from BMS - H01 code: B744802								
3A 3	Bridge	Flexible	11 - C745301-BKFL.SCOUR HOLE	3	08/25/2005	10 EA	0 - Agency	No 2007
3A Notes: H03 LOCATION: UPUN Converted from BMS - H01 code: C745301								
3A 3	Bridge	Flexible	47 - RDDRAIN-IMPR.OFF BR.DRAINAGE	1	11/10/1997	2 EA	No	0
3A Notes: H03 LOCATION: LN FL Converted from BMS - H01 code: RDDRAIN								
3A 3	Bridge	Flexible	46 - RDSHLDR-RPR/RECONST SHOULDER	3	08/25/2005	20 EA	0 - Agency	No 0
3A Notes: H03 LOCATION: LN,FL,FR Converted from BMS - H01 code: RDSHLDR								
3A 3	Bridge	Flexible	27 - RDGDERL-CONNECT GDERAIL TO BR	1	08/27/2007	2 EA	No	0
3A Notes: NL And FL								
3A 3	Bridge	Flexible	10 - BITWRGS-RPR/RPL.BIT.W.S.	3	08/27/2007	1 EA	No	0
3A Notes:								



5A01

SR ID: 53006101700031

5A03

BMS Ref: 30526

7A01

Inspection Date: August 27, 2007

Current Inspection

7A03

Primary Type: R - Regular (routine)

7A06

Types of Inspections Performed:

NBI	Underwater	Element	Fracture Critical	Other Special
Yes	No	Yes	No	No

Inspection Man Hours

6B26

NBI Crew: 14.00

6B30

Underwater: 0.00

6B28

Fracture Critical: 0.00

6B29

Other 1: -1.00

6B27

Crane: 0.00

6B31

Other 2: -1.00

Inspection Costs (in hundreds)

6B32

Engineering: 1,444

6B33

Rigging: 0

6B34

Office: 0

Special Equip Used:

6B12

Temperature: 70.0

6B09

Weather: 1 - Clear

6B03

Inventory Review Recommended: No

Change Notes:

Inspection Team

7

Inspected By: 8 - Consulting Firm

7Avz

Team Leader: Erdman, AnthonyDan Klick

6B23

Team Member:

6B24

Hired By: 1

6B25

Insp Contract Num:

2A02

Inspection Notes: PARK AT NEAR RIGHT. ACCESS THROUGH NEAR RIGHT



5A01

SR ID: 53006101700031

5A03

BMS Ref: 30526

7A01

Inspection Date: August 27, 2007

Next Inspection

7A14 Next Inspection By:

Schedule

Insp Types	7A09 Required	7A09 Frequency	7A10 Next Date
NBI	----	24	August 25, 2007
Fractical Critical	No	-1	January 01, 1901
Underwater	No	-1	January 01, 1901
Other Special	No	-1	January 01, 1901
Element	----	24	August 07, 2005
Crane	----		6B18 January 01, 1901

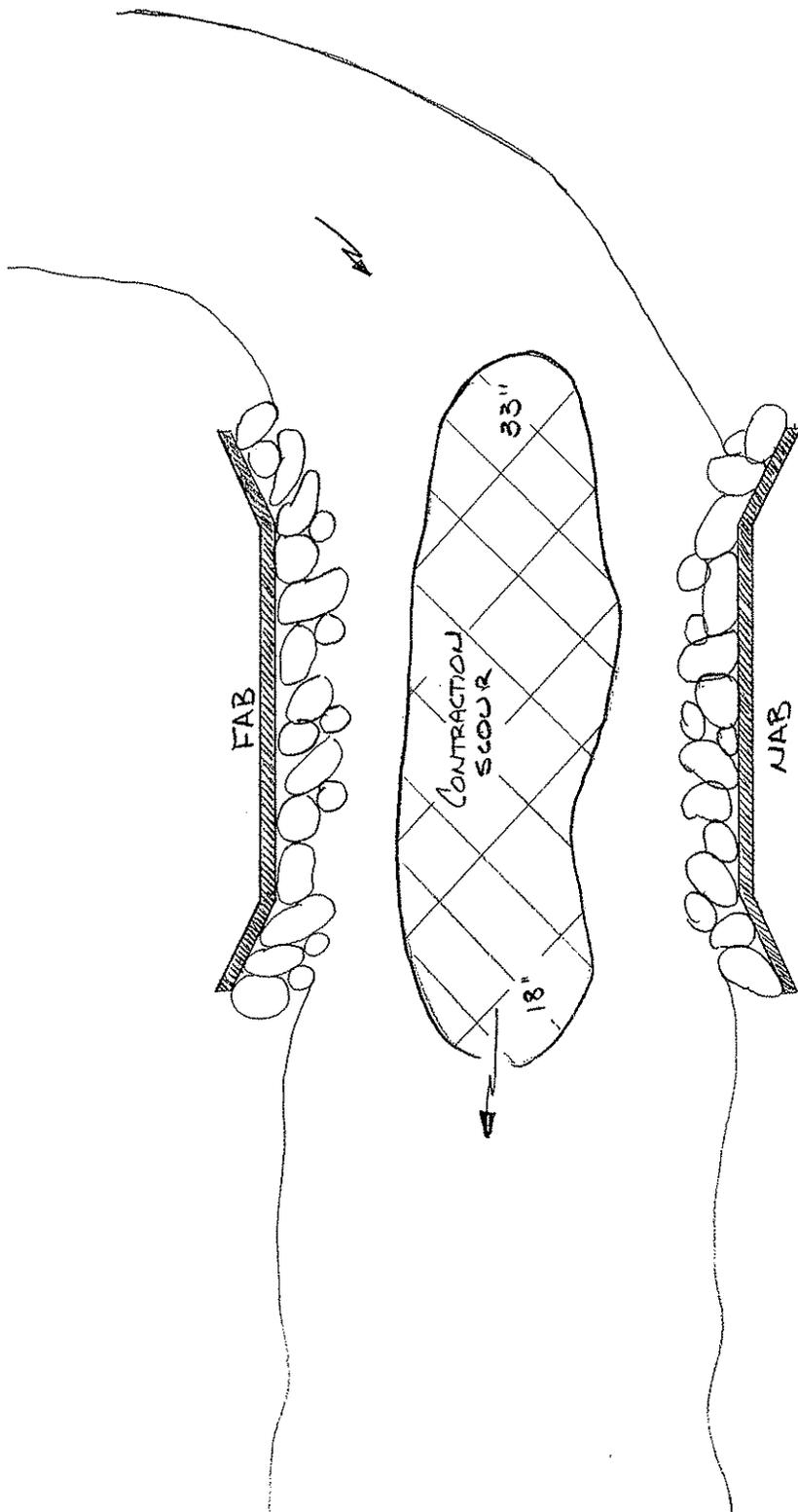
6B01 Special InspType:

Estimated Inspection Man Hours

7A12	NBI Crew:	0.00	7A17	Underwater:	0.00
7A15	Fracture Critical:	0.00	7A16	Other 1:	0.00
7A13	Crane:	0.00	7A18	Other 2:	0.00

SHEET OF SUBSHEET NO.
BY DATE 8/27/07 CKD DATE
PROJECT NAME & NO. 53-0061-0170-0031
CLIENT
IBJECT

ERDMAN
ANTHONY



BRIDGE MANAGEMENT SYSTEM

SKETCH SHEET

A01

5 3

0 0 6 1

0 1 7 0

0 0 3 1

E06

0 8 2 7 2 0 0 7

ELEVATION PROFILE MEASUREMENTS

UPSTREAM ELEVATION

(N.T.S.)

NAB

FAB

Bottom of fascia beam.

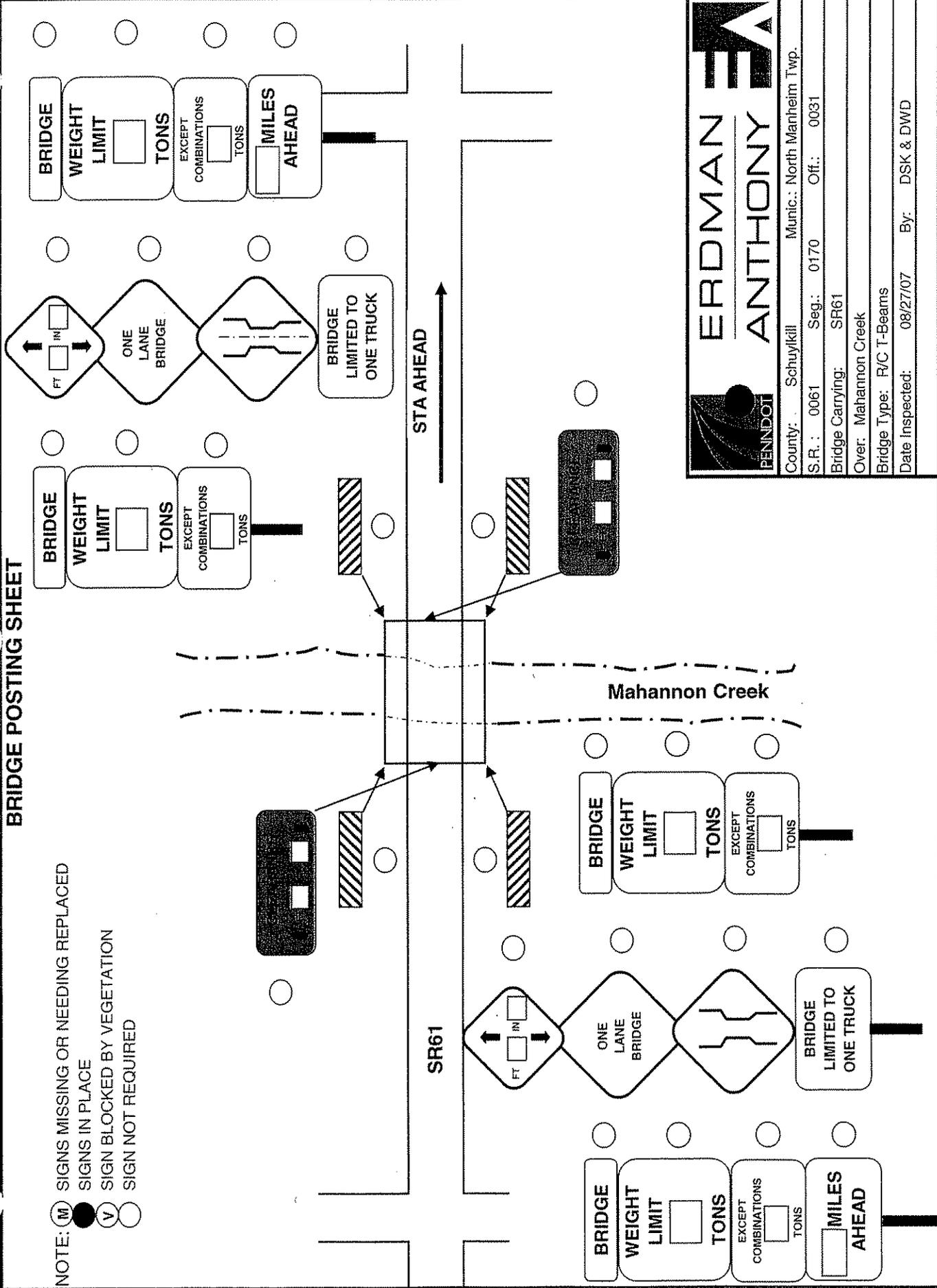
7.0'

11.4'

7.8'

BRIDGE POSTING SHEET

- NOTE: (M) SIGNS MISSING OR NEEDING REPLACED
 (●) SIGNS IN PLACE
 (V) SIGN BLOCKED BY VEGETATION
 (○) SIGN NOT REQUIRED





ERDMAN ANTHONY

Munic.: North Manheim Twp.

S.R. : 0061 Seg.: 0170 Off.: 0031

Bridge Carrying: SR61

Over: Mahannon Creek

Bridge Type: R/C T-Beams

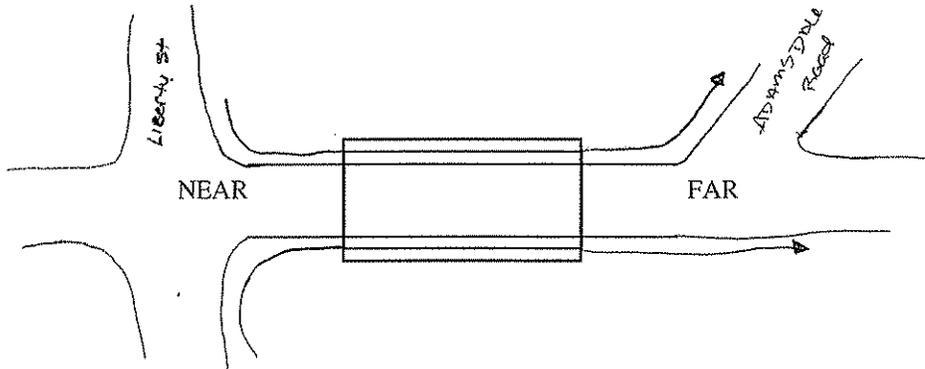
Date Inspected: 08/27/07 By: DSK & DWD

SAFETY FEATURE SHEET

5 3
0 0 6 1
0 1 7 0
0 0 3 1

Feature Carried:	SR 61 (LR 141)
Feature Intersected:	Mahannon Creek

Field Sketch:



POSTED SPEED LIMIT = 55 ADT = 16,891

Key:

* - Approach guiderail = For all traffic less than 40mph, the clear zone width is established at 10 feet or 1'-06" beyond the face of the curb in urban areas. DM#2, Table 2.12.1

- T - Trailing End.
- ◇ - Steel Offset Brackets.
- D - Damaged.
- R - Required.

Other Notes:

F.L. (D) - Gouge marks
 A.L. (D) - impact Damage to end treatment

E28-A Coding Summary

Bridge Railing									E28 Rating	
36" High R/C Rigid Holog Parapet w/min scale									4	
Location	Bridge Terminal ◇				Approach Guiderail ◇				End Treatments	
	Type	Post Spacing	Length	Height	Type	Post Spacing	Length	Height	Type	Offset Dist.
Near Right	Z-SC	3'-1 1/2"	25'	29'	Z-S	6'-3"	25'	29'	37.5' TURN DOWN	>10'
(7) Far Right	Z-SC	3'-1 1/2"	25'	30"	Z-S	6'-3"	25'	29'	CONT TYPE Z-S	-
(7) Near Left	Z-SC	3'-1 1/2"	25'	30"	None				37.5' TURN DOWN	3'-6"
Far Left	Z-SC	3'-1 1/2"	25'	31"	Z-S (D)	6'-3"	25'	29'	CONT TYPE Z-S	-
E28 Rating	4				3				5	

BMS # 53 0061 0170 0031

SR 61 over Mahannon Creek



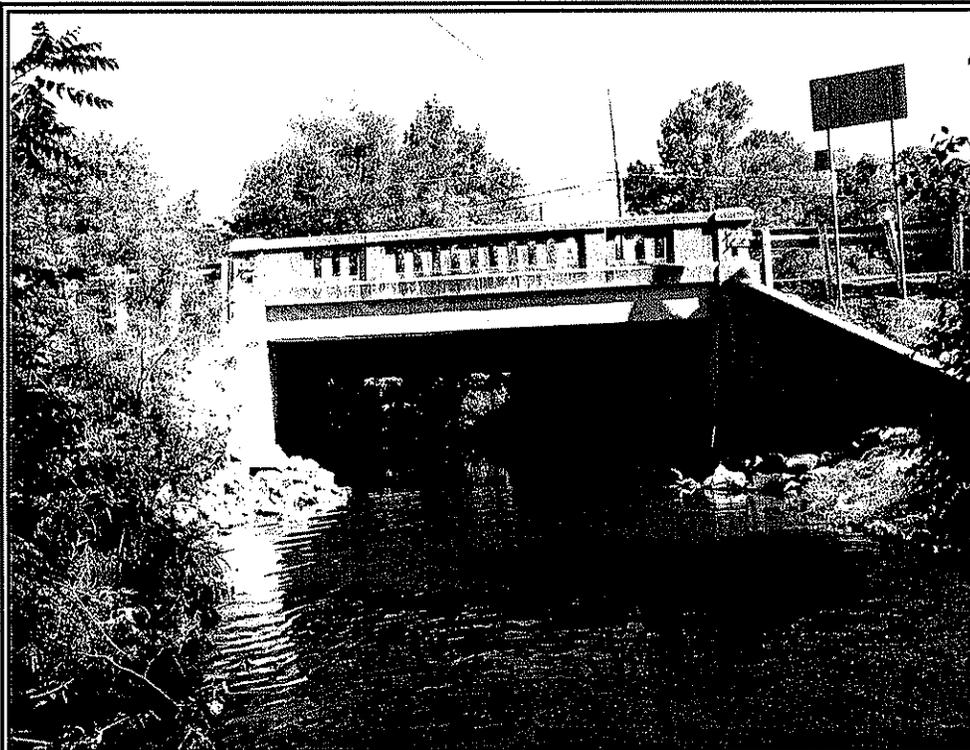
NEAR APPROACH
South



FAR APPROACH
North

BMS # 53 0061 0170 0031

SR 61 over Mahannon Creek



LEFT ELEVATION
Downstream



RIGHT ELEVATION
Upstream

BMS # 53 0061 0170 0031

SR 61 over Mahannon Creek



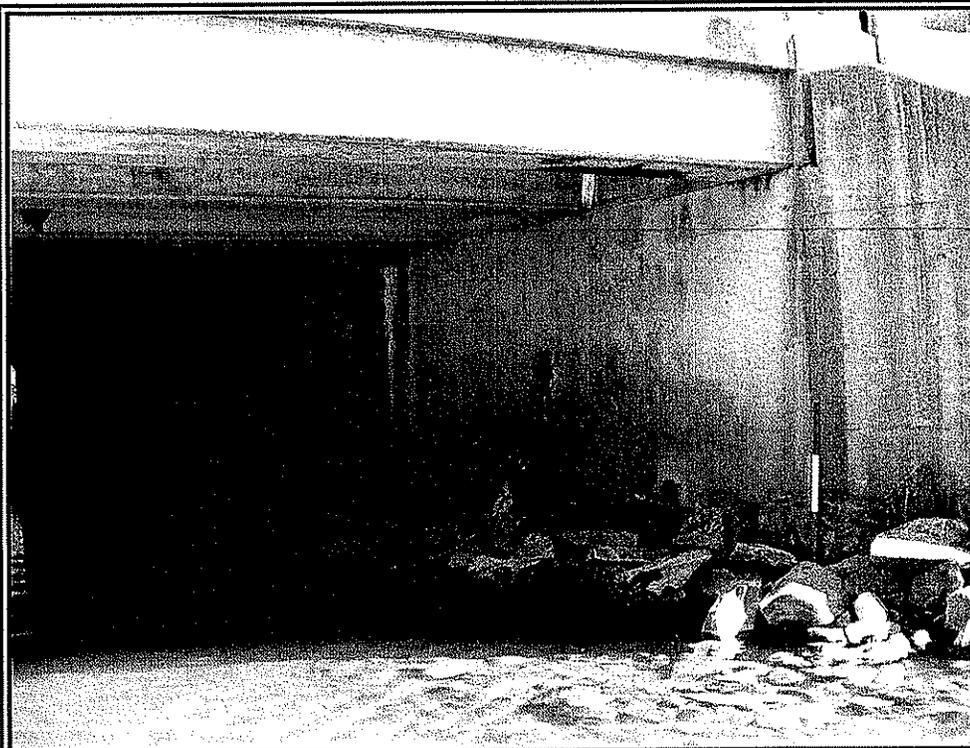
Upstream Channel
Looking Upstream



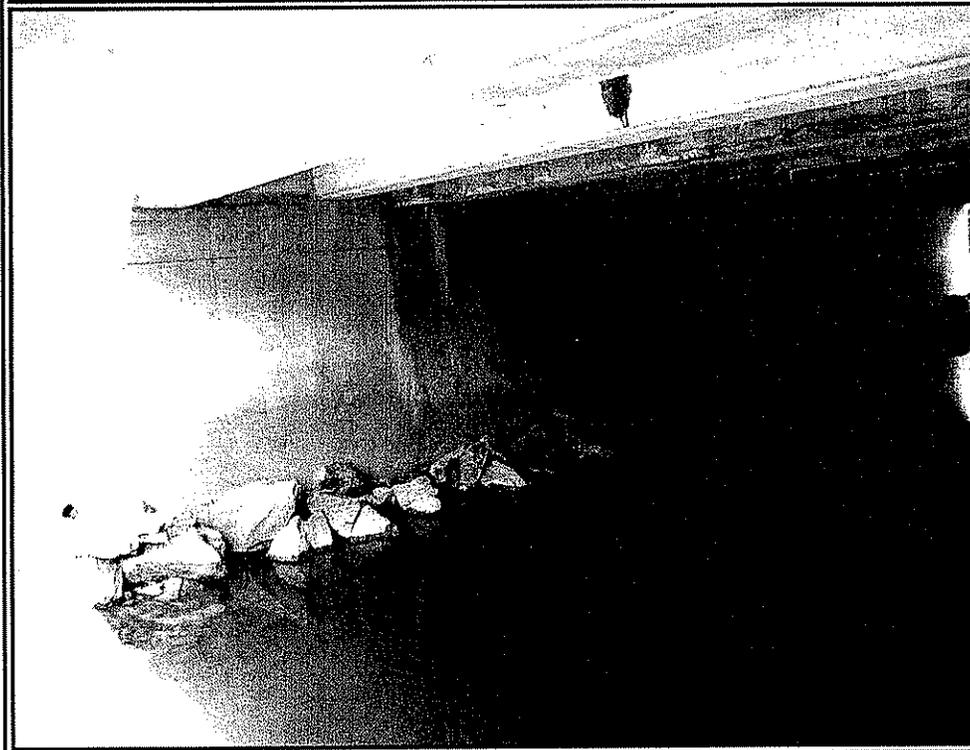
Downstream Channel
Looking Downstream

BMS # 53 0061 0170 0031

SR 61 over Mahannon Creek

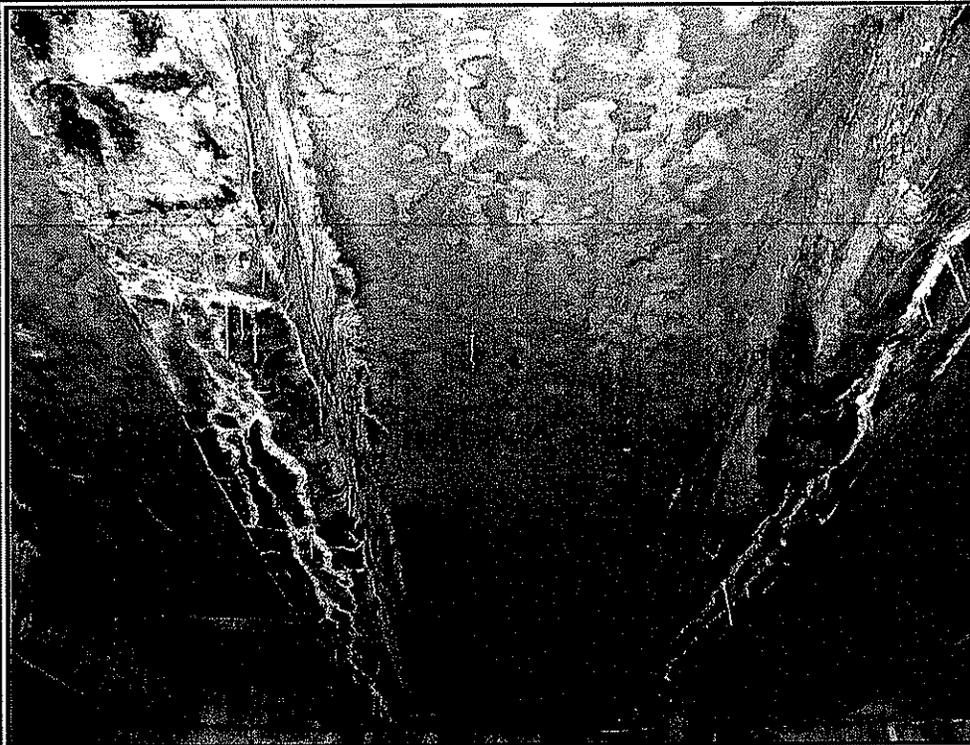


Near Abutment
South



Far Abutment
North

SR 61 over Mahannon Creek

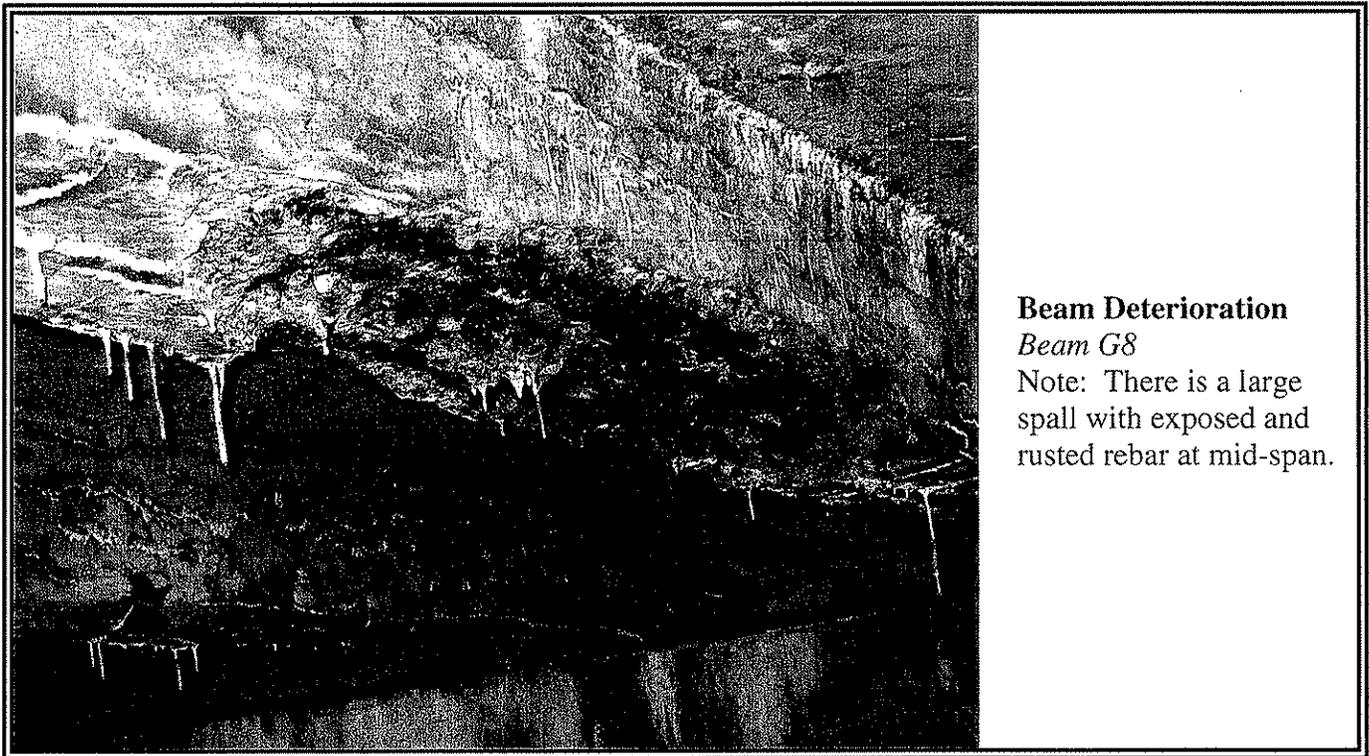


General Underside
Looking Back



Shoulder Deterioration
Far Left
Note: There is a 6" drop-off at the far left transition.

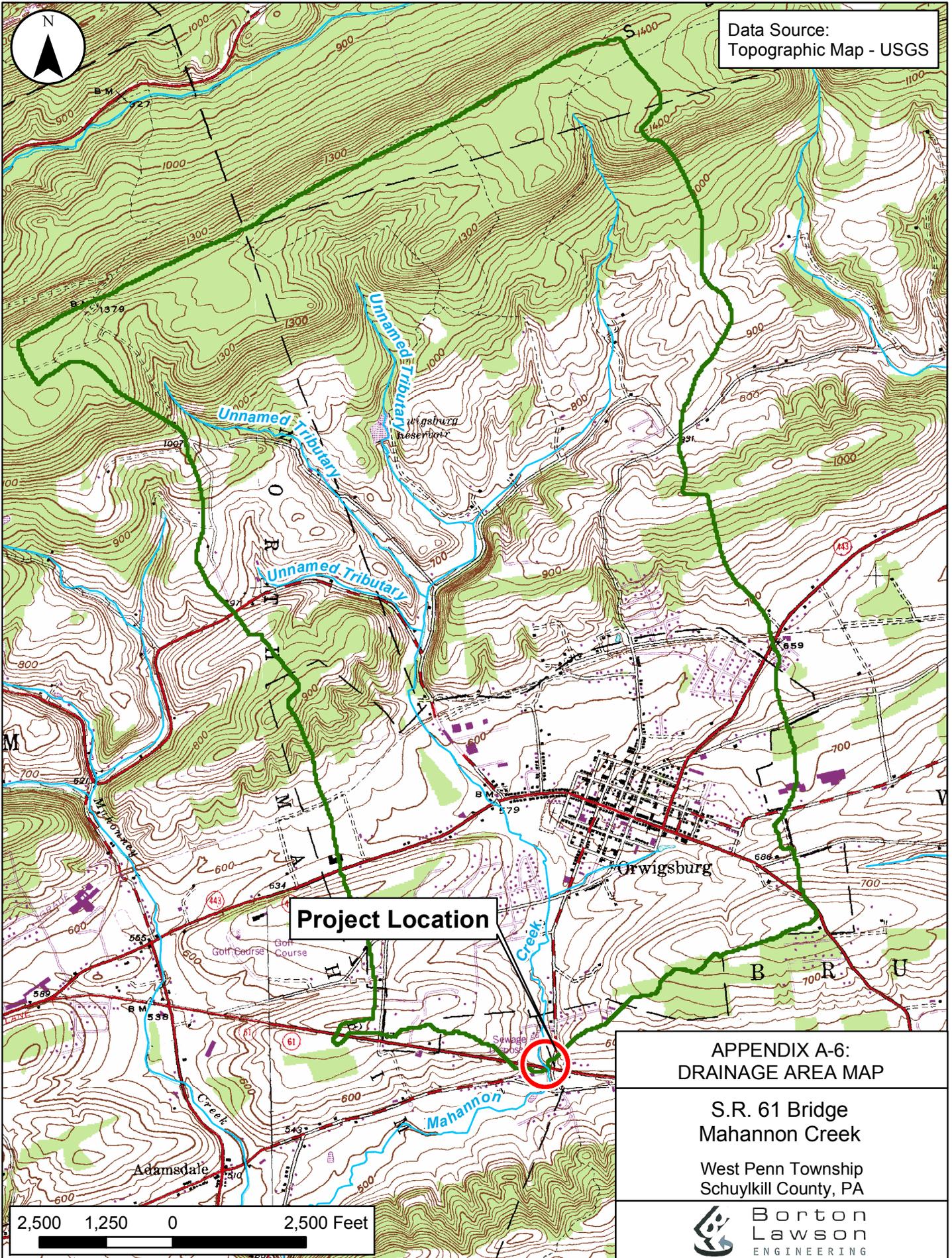
SR 61 over Mahannon Creek



APPENDIX A-7

Drainage Area Map

Appendix Includes: Drainage Area Map



Data Source:
Topographic Map - USGS

Project Location

**APPENDIX A-6:
DRAINAGE AREA MAP**

**S.R. 61 Bridge
Mahannon Creek**

West Penn Township
Schuylkill County, PA



FILE: NP:2009291500\DATA\GIS\ARCMAP DATE: 7/8/2009

2,500 1,250 0 2,500 Feet

APPENDIX A-8

Hydrologic Computations

Appendix Includes: StreamStats Basin Characteristics Reports, NFF Hydrology, PSU IV Hydrology, and Temporary Flows



StreamStats

Basin Characteristics Report

Date: Wed Jul 1 2009 11:05:23

Latitude (NAD83): 40.6416 (40 38 29)

Longitude (NAD83): -76.1058 (-76 06 20)

Parameter	Value
Mean basin elevation in feet	861
Unadjusted basin slope, in degrees	6.82
Percent of area covered by forest	60
Mean annual precipitation in inches	47.5
Total stream length in miles	7.76
Percent of area covered by urban	13.2
Percent of area covered by glacial activity	0
Depth to rock in feet	4.21
Percent of area covered by carbonate bedrock	0
Drainage Area in square miles	5.61
Stream density (miles/square mile)	1.38
Adjusted basin slope, in degrees	6.61
Percentage of area of storage (lakes ponds reservoirs wetlands)	1.75



StreamStats

StreamStats Ungaged Site Report

Date: Mon Feb 23 2009 14:18:11

Site Location: Pennsylvania

Drainage Area: 5.61 mi²

Latitude (NAD83): 40.6412 (40 38 28)

Longitude (NAD83): -76.1058 (-76 06 20)

Low Flow Basin Characteristics			
100% Low Flow Region 2 (5.61 mi²)			
Parameter	Value	Min	Max
Drainage Area (square miles)	5.61	4.93	1280
Mean Annual Precipitation (inches)	47.5	35	50.4
Stream Density (miles per square mile)	1.38	0.51	3.1
Depth to Rock (feet)	4.21	3.32	5.65
Percent Carbonate (percent)	0	0	99

Mean-Annual and Base-Flow Basin Characteristics			
100% Statewide Mean and Base Flow (5.61 mi²)			
Parameter	Value	Min	Max
Drainage Area (square miles)	5.61	2.26	1720
Mean Basin Elevation (feet)	861	130	2700
Mean Annual Precipitation (inches)	47.5	33.1	50.4
Percent Carbonate (percent)	0	0	99
Percent Forest (percent)	59.9	5.1	100
Percent Urban (percent)	13.2	0	89

Peak Flow Basin Characteristics			
100% Peak Flow Region 1 (5.61 mi²)			
Parameter	Value	Min	Max
Drainage Area (square miles)	5.61	1.72	1280
Mean Basin Elevation (feet)	861	0	1960
Percent Carbonate (percent)	0	0	83
Percent Urban (percent)	13.2	0	20
Percent Storage (percent)			

	1.75	0	21.2
--	------	---	------

Streamflow Statistics					
Statistic	Flow (ft ³ /s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Low-Flow Statistics					
M7D2Y	1.05	38			
M30D2Y	1.43	33			
M7D10Y	0.45	51			
M30D10Y	0.61	46			
M90D10Y	0.97	36			

Streamflow Statistics					
Statistic	Flow (ft ³ /s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Mean-Annual and Base-Flow Statistics					
QA	10.3	12			
QAH	2.96	38			
BF10YR	4.21	21			
BF25YR	3.77	21			
BF50YR	3.51	23			

Streamflow Statistics					
Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Peak-Flow Statistics					
PK2	285	33	3		
PK5	504	31	6		
PK10	681	31	9		
PK50	1150	36	13		
PK100	1390	38	13		
PK500	2050	46	14		



BORTON-LAWSON
LEHIGH VALLEY OFFICE
 3893 ADLER PLACE, SUITE 100
 BETHLEHEM, PA 18017
 (484) 821-0470
 FAX (484) 821-0474

JOB S.R. 0061 over Mahannon Creek

SHEET NO. _____ OF _____

CALCULATED BY PAK DATE 29-Oct-10

CHECKED BY LJS DATE 1-Nov-10

SCALE Not Applicable

- Drainage Area at bridge 5.61 Square Miles 3,590 Acres

- % of Urban Area 13.2 %

(Obtained from Streamstats and verified using USGS Quad Maps and Aerial Photography of the drainage area)

The following lakes and swamps were located within the Mahannon Creek drainage area, according to the USGS Quad Map. For each of the lakes and swamps, the surface area and drainage area was measured in GIS. Drainage areas were adjusted to exclude areas flowing to other storage areas located upstream of a given storage area. WRI Report 00-4189 recommends that the area controlled by the lake or swamp be the smaller value of either ten times the surface area of the storage area or the drainage area to the lake or swamp.

Name	Surface Area (ac)	DA (ac)	Adjusted DA (ac)	Control Area (ac)
Orwigsburg Reservoir	2.62	351	351	26.2
Total	2.62	351		26.2
USGS 2000-4189 Controlled Area				0.73%

SR61

National Flood Frequency Program
Version 3.0

Based on Water-Resources Investigations Report 02-4168
Equations from database C:\Program Files\NFF\NFFv3.2_2004-12-14.mdb
Updated by kries 9/22/2004 at 4:03:24 PM fixed decimal place in constant
Equations for Pennsylvania developed using English units

Site: Mahannon Creek, Pennsylvania
User: exy
Date: Friday, October 02, 2009 03:29 PM

Rural Estimate: SR61
Basin Drainage Area: 5.61 mi²
1 Region
Region: Region_A
Drainage_Area = 5.61 mi²
Forest_Cover = 60 percent
Urban_Development = 13.2 percent
Area_Underlain_by_Carbonate_Rock = 0 percent
Area_Controlled_by_Lakes_Swamps_and_Reservoirs = 0.73 percent

Flood Peak Discharges, in cubic feet per second

Estimate	Recurrence Interval, yrs	Peak, cfs	Standard Error, %	Equivalent Years
SR61	10	914	43	5
	25	1290	45	6
	50	1610	50	8
	100	2000	55	10
	500	3120	66	16

SR 61 over Mahannon PSU-IV results

ESTIMATED PEAK RATES OF RUNOFF
PSU-IV METHOD - Version 4.0

COUNTY: Schuylkill SR-SECTION: 61/
MUNICIPALITY: North Manheim SEGMENT/OFFSET: /
STREAM NAME: Mohannon HIGHWAY CLASS: Arterial

Latitude of Drainage Area Centroid: 40° 38' 29"
Longitude of Drainage Area Centroid: 76° 6' 20"

Region Number: Region 2
Drainage Area (sq.mi): 5.60
Percent of Forest (%): 60
Std. Deviation Sy (Plate 2): 0.295
Skew Coefficient (Plate 3): 0.37

Using the Equation for Ybar from Table 1.1
Ybar = 1.90 + 0.81 Log A - 0.0021 FOR
where A (Drainage Area) is in sq. mi.
and FOR (Percent Forest) is in %.

Ybar = 2.380

YEAR	KY	YTR	Unadjusted Q (ft ³ /s)
2.33	0.117	2.41	260
5	0.818	2.62	418
10	1.315	2.77	586
25	1.871	2.93	855
50	2.246	3.04	1,103
100	2.594	3.15	1,397
500	3.330	3.36	2,303
*500	----	----	2,375

NOTE: The discharges listed are for a normal watershed at a 50 percent confidence limit, except *500 which is (1.7 * Q100).

Comments:

Date: 7/1/2009

All references refer to the PSU-IV Research Report.

APPENDIX A-9

Preliminary Cost Estimate

Appendix Includes: Cost Estimate Table

**PENNSYLVANIA DEPARTMENT OF TRANSPORTATION DISTRICT 5-0
REPLACEMENT OF BRIDGE - S.R. 0061 OVER MAHANNON CREEK
SCHUYLKILL COUNTY - NORTH MANHEIM TOWNSHIP**

SINGLE SPAN SUPERSTRUCTURE REPLACEMENT COST ESTIMATE

ITEM	UNIT	UNIT COST	SPREAD BOX	
			QUANTITY	COST
SUBSTRUCTURE				
CLASS A BEAM SEAT LEVELING	C.Y.	\$3,000.00	10	\$30,000.00
SUBSTRUCTURE CONCRETE REPAIR	S.F.	\$50.00	645	\$32,250.00
+20% CONTINGENCY				\$6,450.00
TOTAL - SUBSTRUCTURE				\$68,700.00
SUPERSTRUCTURE				
REMOVAL OF EXISTING SUPERSTRUCTURE	L.S.		---	\$50,000.00
P/S CONCRETE BOX BEAMS	L.S.		---	\$35,504.00
CLASS AAA CEMENT CONCRETE	C.Y.	\$1,000.00	55	\$55,000.00
CLASS AA CEMENT CONCRETE	C.Y.	\$900.00	9	\$8,100.00
EPOXY REINFORCING STEEL	LBS.	\$1.50	12,100	\$18,150.00
SUBTOTAL - SUPERSTRUCTURE				\$166,754.00
+20% CONTINGENCY				\$33,350.80
TOTAL - SUPERSTRUCTURE				\$200,000.00
TOTAL				\$269,000.00

ONE 24'-8" SPAN, 7 48/17 P/S CONCRETE SPREAD BOX BEAMS @ 10.5' ON EXISTING ABUTMENTS

APPENDIX A-10

Summary Data Sheet

Appendix Includes Summary Data Sheet

Appendix A-10 - Summary Data Sheet**Location Data**

County	Schuylkill County	Municipality	North Manheim & West Brunswick Townships
Location - U.S.G.S. Map	Orwigsburg Quad	Route - Section	S.R. 61- 03B
Latitude	40° 38' 29"	Station	424+70.22
Longitude	76° 6' 20"	Segment/Offset	0170/0030
Present ADT:	17,688	Year:	2012
Future ADT:	19,197	Year:	2032
River Basin:	Delaware River Basin		

Channel Data

Stream Name	Mahannon Creek	Side Slope (looking downstream)	Left:	0.3-0.7
			Right:	0.5-0.7
Stream Slope	0.005	Type of Channel	natural	
Normal Stream Flow Depth	2.0 ft	Average Top Width	30-35 ft.	
Average Stream Bed Elevation at Bridge (Sta. 11+00)	517.5	Average Bottom Width	15-20 ft.	
Stream Bed Elev. ~500' upstream	Exact Dist. 473 ft.	Stream Bed Elev. ~500' downstream	Exact Dist. 476 ft.	
	Elevation 521.22 ft.		Elevation 514.75 ft.	
Average Stream Channel Depth	3-7 ft.	High Water Elev. and Date	unknown	
Temporary Wetland Impacts (ac)	0	Temporary Fill below OHW (CY)	50	
Permanent Wetland Impacts (ac)	0	Permant Fill below OHW (CY)	50	

Hydrology

	Design Flows	PSU-IV	FEMA	NFF 00-4189
Hydrology Method Used	NFF 00-4189/FEMA		17B curve	
Drainage Area	5.61	5.6	5.5	5.61
Q10 (CFS)	914	586	N/A	914
Q25 (CFS)	1,290	855	N/A	1,290
Q50 (CFS)	1,610	1,103	N/A	1,610
Q100 (CFS)	2,040	1,397	2,040	2,000
Q500 (CFS)	3,120	2,375	N/A	3120

Hydraulics

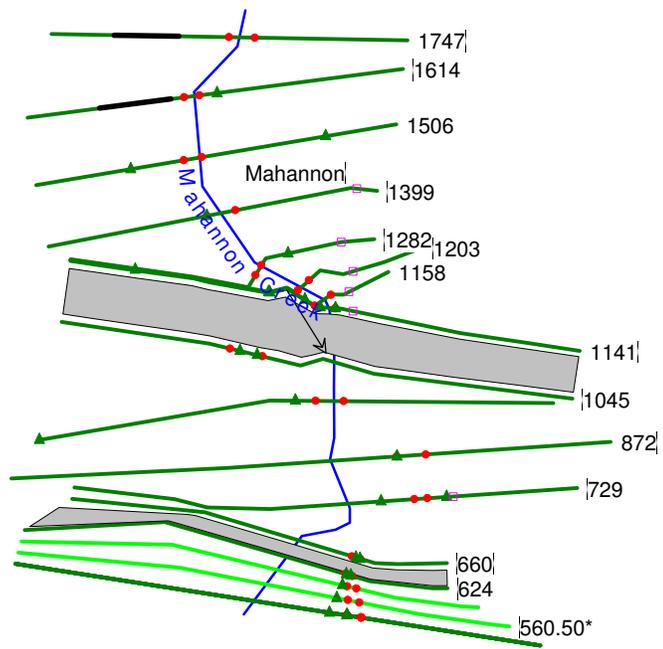
<i>EXISTING STRUCTURE</i>				<i>PROPOSED REHABILITATION</i>			
Bridge Type	Concrete T-Beam			Bridge Type	Spread Concrete Box Beams		
Clear Span - Centerline	24.0			Clear Span - Centerline	23.0		
Clear Span - Normal	22.22			Clear Span - Normal	21.22		
Skew (for hydraulic computations)	15°			Skew (for hydraulic computations)	15°		
Minimum Underclearance	11.36			Minimum Underclearance	12.14		
Length of Channel Impacted	100			Length of Channel Impacted	100		
Number of Spans	1			Number of Spans	1		
Low Chord Elevation	527.86			Low Chord Elevation	528.61		
Hydraulic Method Used	HEC-RAS			Hydraulic Method Used	HEC-RAS		
Return Period*	Q	WSE	Velocity	Return Period*	Q	WSE	Velocity
10	914	525.64	5.07	10	914	525.97	4.68
25	1,290	527.20	5.83	25	1,290	527.70	5.31
✓50	1,610	528.48	6.32	✓50	1,610	528.60	6.01
100	2,040	530.32	6.73	100	2,040	530.38	6.44
Overtopping	Q500			Overtopping	Q500		
WSE as taken at river station 11+41				WSE as taken at river station 11+41			

*Indicate Design Return Period with a ✓ at the appropriate year. Or if year is not shown, fill in Design Return Period in blank row.

APPENDIX B-1

Existing Conditions HEC-RAS Modeling

**Appendix Includes: 25-Year Water Surface Profile, Cross Sections (US to DS),
Hydraulic Properties Tables**



HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

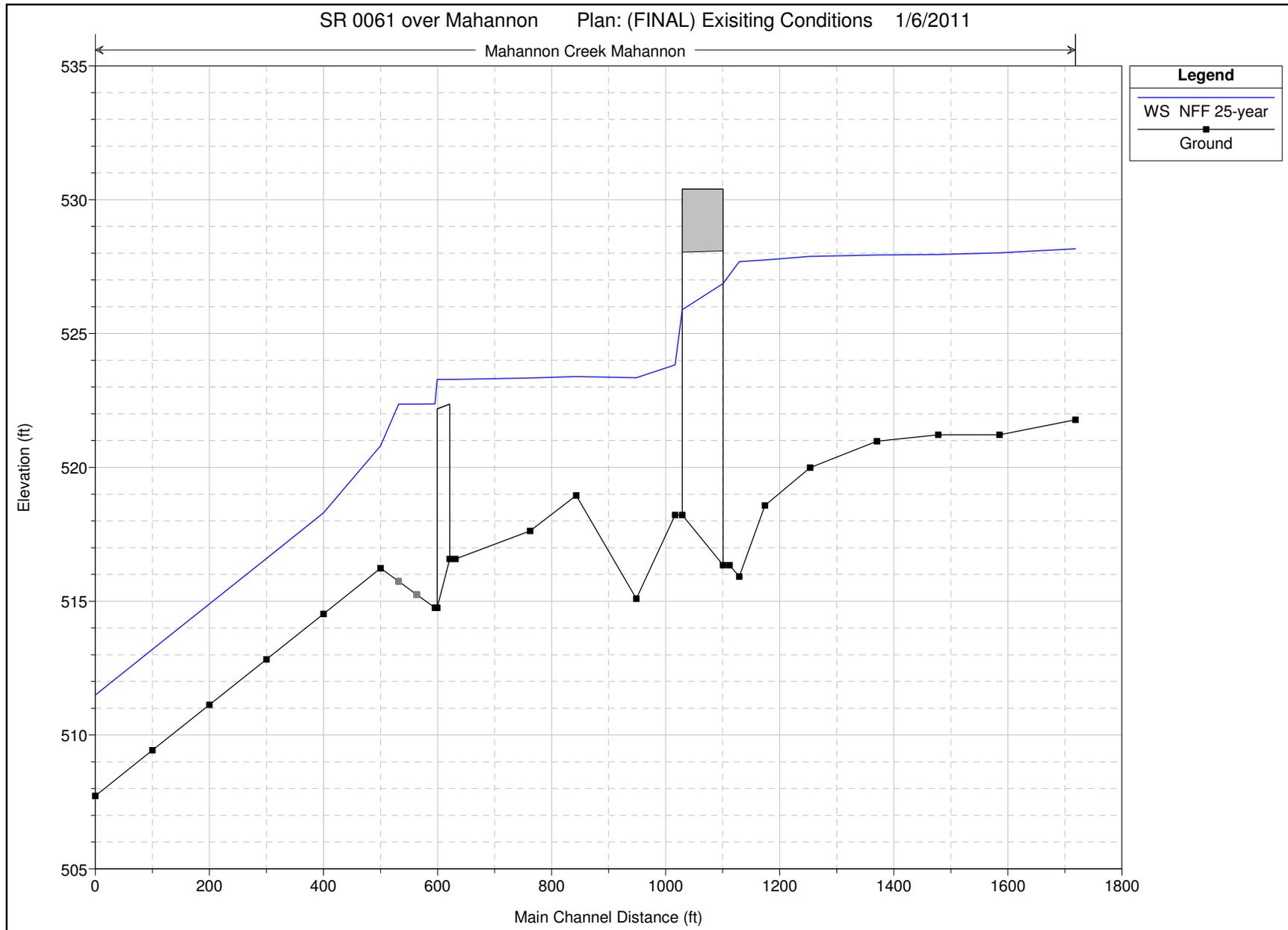
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	NFF 25-year	1290.00	521.78	528.16	527.23	528.44	0.002932	4.97	475.38	253.17	0.43
Mahannon	1614	NFF 25-year	1290.00	521.22	528.02	526.64	528.15	0.001763	4.24	699.91	295.90	0.34
Mahannon	1506	NFF 25-year	1290.00	521.22	527.95	525.60	528.02	0.000705	2.98	973.48	357.74	0.22
Mahannon	1399	NFF 25-year	1290.00	520.98	527.93	524.84	527.96	0.000260	1.87	1500.28	463.93	0.14
Mahannon	1282	NFF 25-year	1290.00	519.99	527.88	524.76	527.93	0.000409	2.68	1153.43	316.28	0.18
Mahannon	1203	NFF 25-year	1290.00	518.58	527.75	524.11	527.89	0.000658	3.69	647.80	275.48	0.23
Mahannon	1158	NFF 25-year	1290.00	515.92	527.68	523.48	527.85	0.000800	3.77	544.98	230.67	0.24
Mahannon	1141	NFF 25-year	1290.00	516.35	527.20	522.91	527.73	0.001617	5.83	221.15	215.41	0.35
Mahannon	1100			Bridge								
Mahannon	1045	NFF 25-year	1290.00	518.22	523.83	523.83	526.21	0.014621	12.37	104.28	37.59	1.01
Mahannon	977	NFF 25-year	1290.00	515.09	523.35	521.14	523.85	0.003503	5.75	256.80	143.93	0.47
Mahannon	872	NFF 25-year	1290.00	518.95	523.40	521.81	523.44	0.000964	2.47	1309.19	645.31	0.24
Mahannon	729	NFF 25-year	1290.00	517.63	523.34	522.25	523.39	0.000790	2.77	1360.88	608.73	0.23
Mahannon	660	NFF 25-year	1290.00	516.58	523.29	522.25	523.34	0.000657	3.01	1481.20	702.11	0.22
Mahannon	650			Bridge								
Mahannon	624	NFF 25-year	1290.00	514.76	522.37	522.26	522.40	0.000467	2.53	1913.53	780.25	0.18
Mahannon	592.50*	NFF 25-year	1290.00	515.25	522.37	521.03	522.38	0.000274	1.86	2231.68	789.69	0.14
Mahannon	560.50*	NFF 25-year	1290.00	515.74	522.36	520.94	522.37	0.000193	1.50	2517.54	816.88	0.12
Mahannon	529	NFF 25-year	1290.00	516.23	520.80	520.80	521.97	0.013086	9.04	189.01	771.20	0.89
Mahannon	429	NFF 25-year	1290.00	514.53	518.30	518.30	518.40	0.003748	4.27	950.52	753.63	0.46
Mahannon	329	NFF 25-year	1290.00	512.83	516.60	516.60	516.70	0.003748	4.27	950.52	753.63	0.46
Mahannon	229	NFF 25-year	1290.00	511.13	514.90	514.90	515.00	0.003747	4.27	950.53	753.63	0.46
Mahannon	129	NFF 25-year	1290.00	509.43	513.20	513.20	513.30	0.003748	4.27	950.53	753.63	0.46
Mahannon	29	NFF 25-year	1290.00	507.73	511.50	511.50	511.60	0.003748	4.27	950.50	753.63	0.46

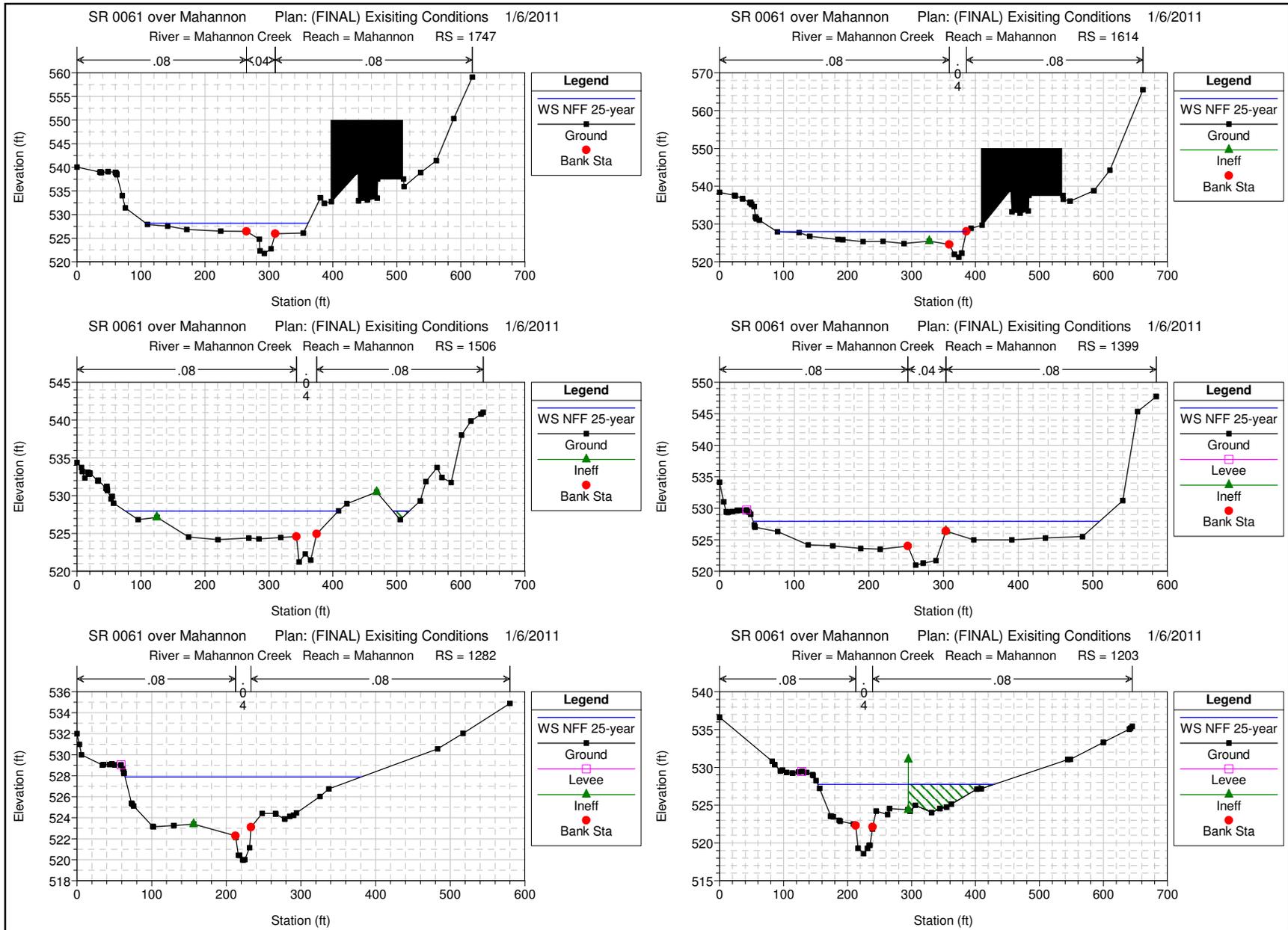
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

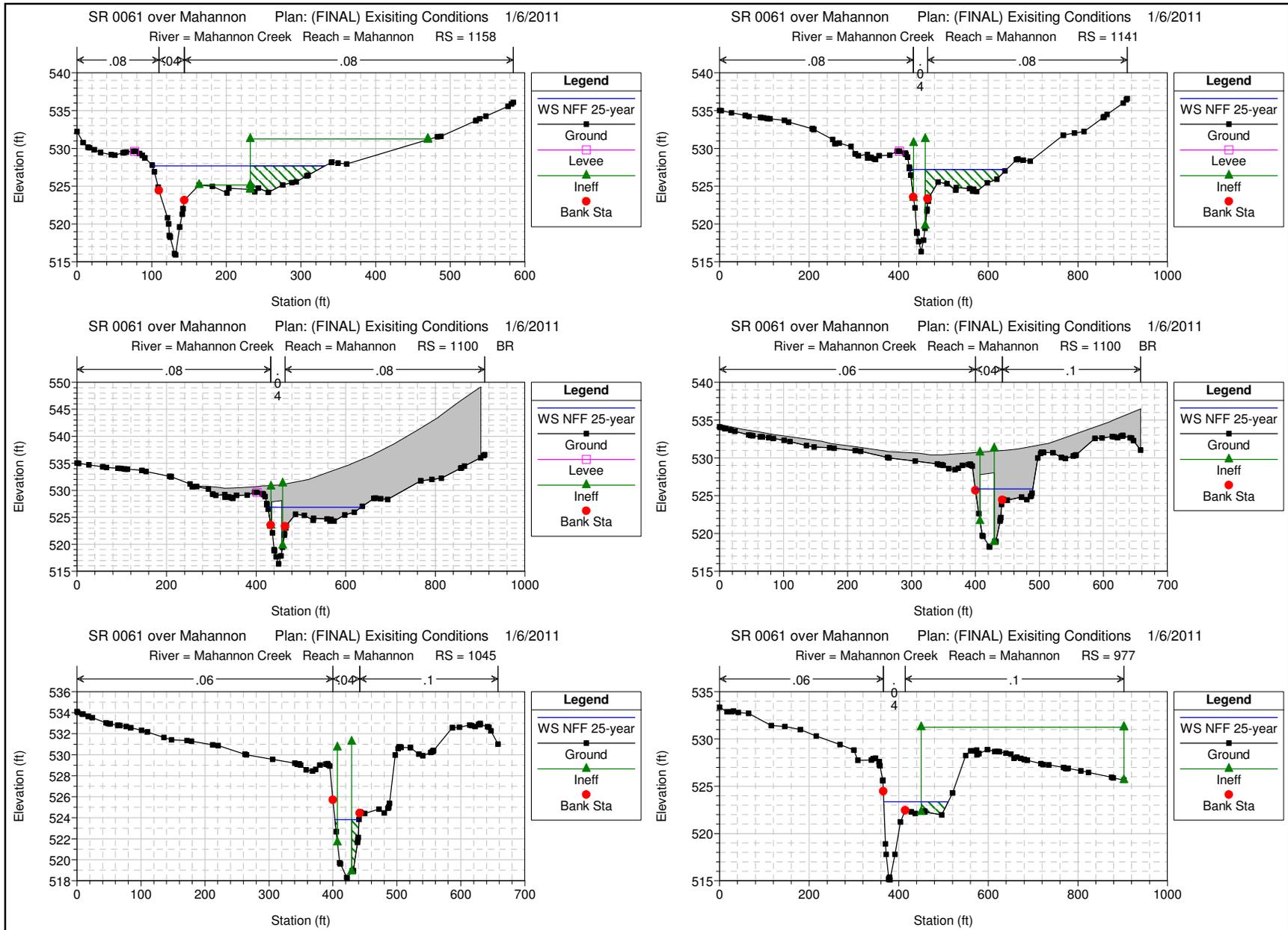
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	NFF 25-year	528.44	528.16	0.28	0.25	0.04	218.39	911.96	159.65	253.17
Mahannon	1614	NFF 25-year	528.15	528.02	0.14	0.12	0.02	728.00	562.00		295.90
Mahannon	1506	NFF 25-year	528.02	527.95	0.07	0.04	0.01	730.22	527.54	32.24	357.74
Mahannon	1399	NFF 25-year	527.96	527.93	0.03	0.03	0.00	469.38	537.42	283.20	463.93
Mahannon	1282	NFF 25-year	527.93	527.88	0.04	0.03	0.01	654.50	396.01	239.49	316.28
Mahannon	1203	NFF 25-year	527.89	527.75	0.14	0.02	0.01	273.69	794.99	221.32	275.48
Mahannon	1158	NFF 25-year	527.85	527.68	0.17	0.02	0.11	8.72	978.09	303.19	230.67
Mahannon	1141	NFF 25-year	527.73	527.20	0.53	0.03	0.11		1290.00		215.41
Mahannon	1100	Bridge									
Mahannon	1045	NFF 25-year	526.21	523.83	2.38	0.50	0.94		1290.00		37.59
Mahannon	977	NFF 25-year	523.85	523.35	0.50	0.18	0.23		1254.49	35.51	143.93
Mahannon	872	NFF 25-year	523.44	523.40	0.04	0.05	0.00	5.56	503.83	780.61	645.31
Mahannon	729	NFF 25-year	523.39	523.34	0.05	0.04	0.00	55.21	436.97	797.82	608.73
Mahannon	660	NFF 25-year	523.34	523.29	0.05				454.88	835.12	702.11
Mahannon	650	Bridge									
Mahannon	624	NFF 25-year	522.40	522.37	0.02	0.01	0.00		237.37	1052.63	780.25
Mahannon	592.50'	NFF 25-year	522.38	522.37	0.01	0.01	0.00	2.87	282.01	1005.12	789.69
Mahannon	560.50'	NFF 25-year	522.37	522.36	0.01	0.05	0.35	4.82	262.94	1022.24	816.88
Mahannon	529	NFF 25-year	521.97	520.80	1.17	0.70	0.53	0.69	1181.03	108.28	771.20
Mahannon	429	NFF 25-year	518.40	518.30	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	329	NFF 25-year	516.70	516.60	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	229	NFF 25-year	515.00	514.90	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	129	NFF 25-year	513.30	513.20	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	29	NFF 25-year	511.60	511.50	0.10				423.80	866.20	753.63

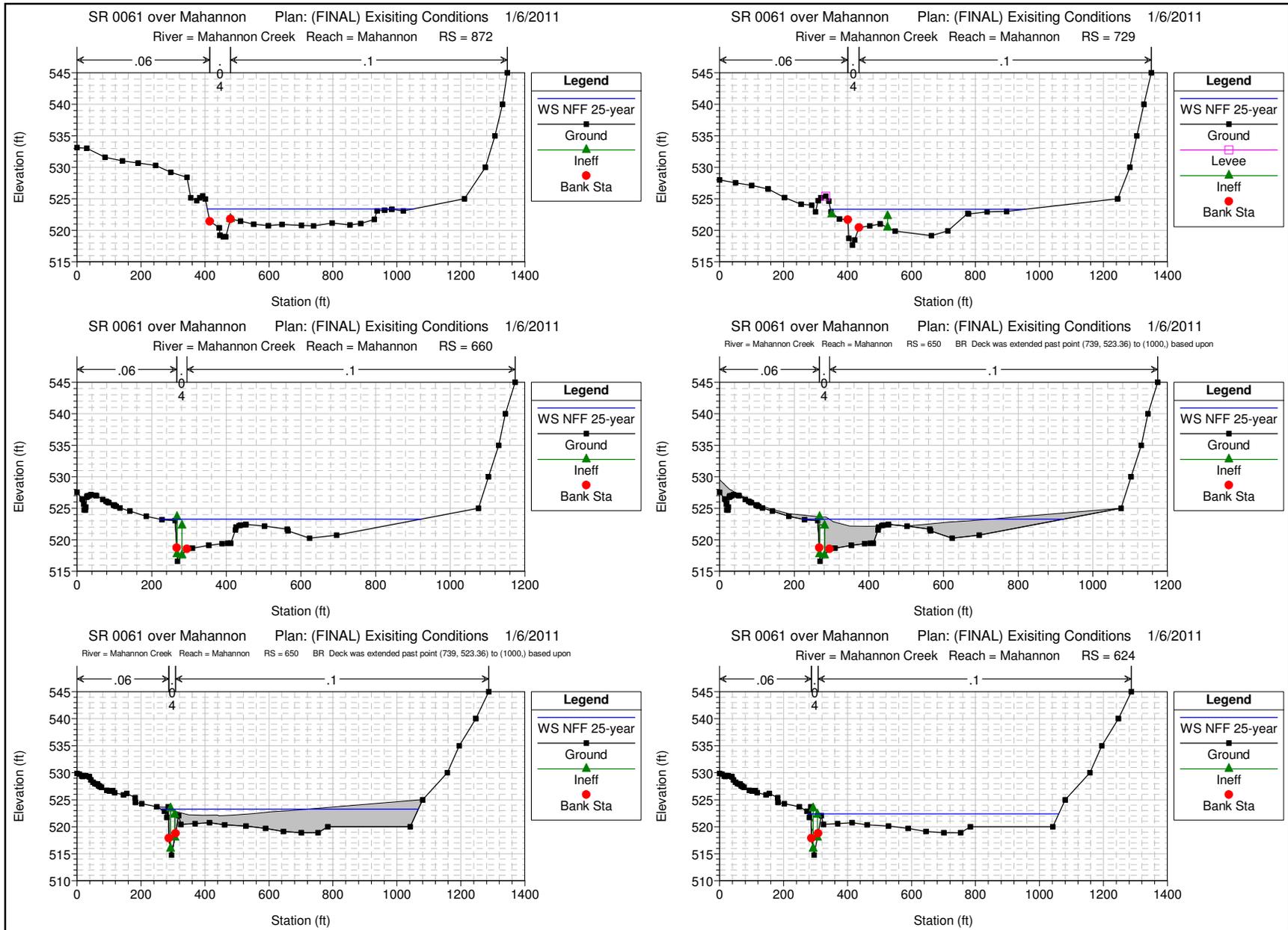
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

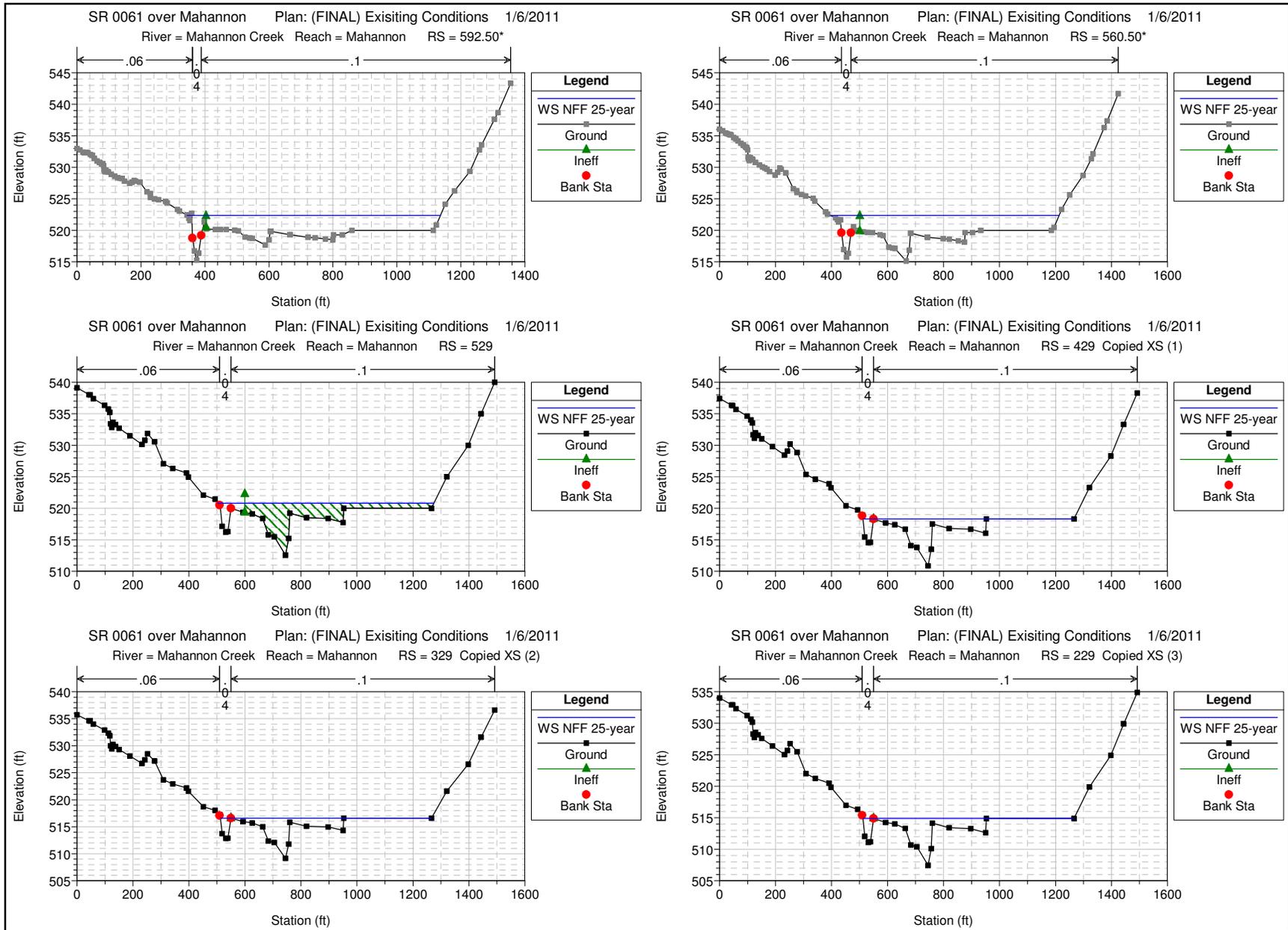
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	NFF 25-year	527.85	527.68	523.48	0.02	0.11	230.67	8.72	978.09	303.19	3.77
Mahannon	1141	NFF 25-year	527.73	527.20	522.91	0.03	0.11	215.41		1290.00		5.83
Mahannon	1100 BR U	NFF 25-year	527.59	526.87	523.05	0.29	0.26	22.23		1290.00		6.79
Mahannon	1100 BR D	NFF 25-year	527.04	525.89	523.84	0.10	0.74	22.36		1290.00		8.59
Mahannon	1045	NFF 25-year	526.21	523.83	523.83	0.50	0.94	37.59		1290.00		12.37
Mahannon	977	NFF 25-year	523.85	523.35	521.14	0.18	0.23	143.93		1254.49	35.51	5.75
Mahannon	729	NFF 25-year	523.39	523.34	522.25	0.04	0.00	608.73	55.21	436.97	797.82	2.77
Mahannon	660	NFF 25-year	523.34	523.29	522.25			702.11		454.88	835.12	3.01
Mahannon	650 BR U	NFF 25-year	523.34	523.29	523.60			430.60		451.32	838.13	6.32
Mahannon	650 BR D	NFF 25-year	523.34	523.29	523.44			430.12		451.32	838.13	5.25
Mahannon	624	NFF 25-year	522.40	522.37	522.26	0.01	0.00	780.25		237.37	1052.63	2.53
Mahannon	592.50*	NFF 25-year	522.38	522.37	521.03	0.01	0.00	789.69	2.87	282.01	1005.12	1.86

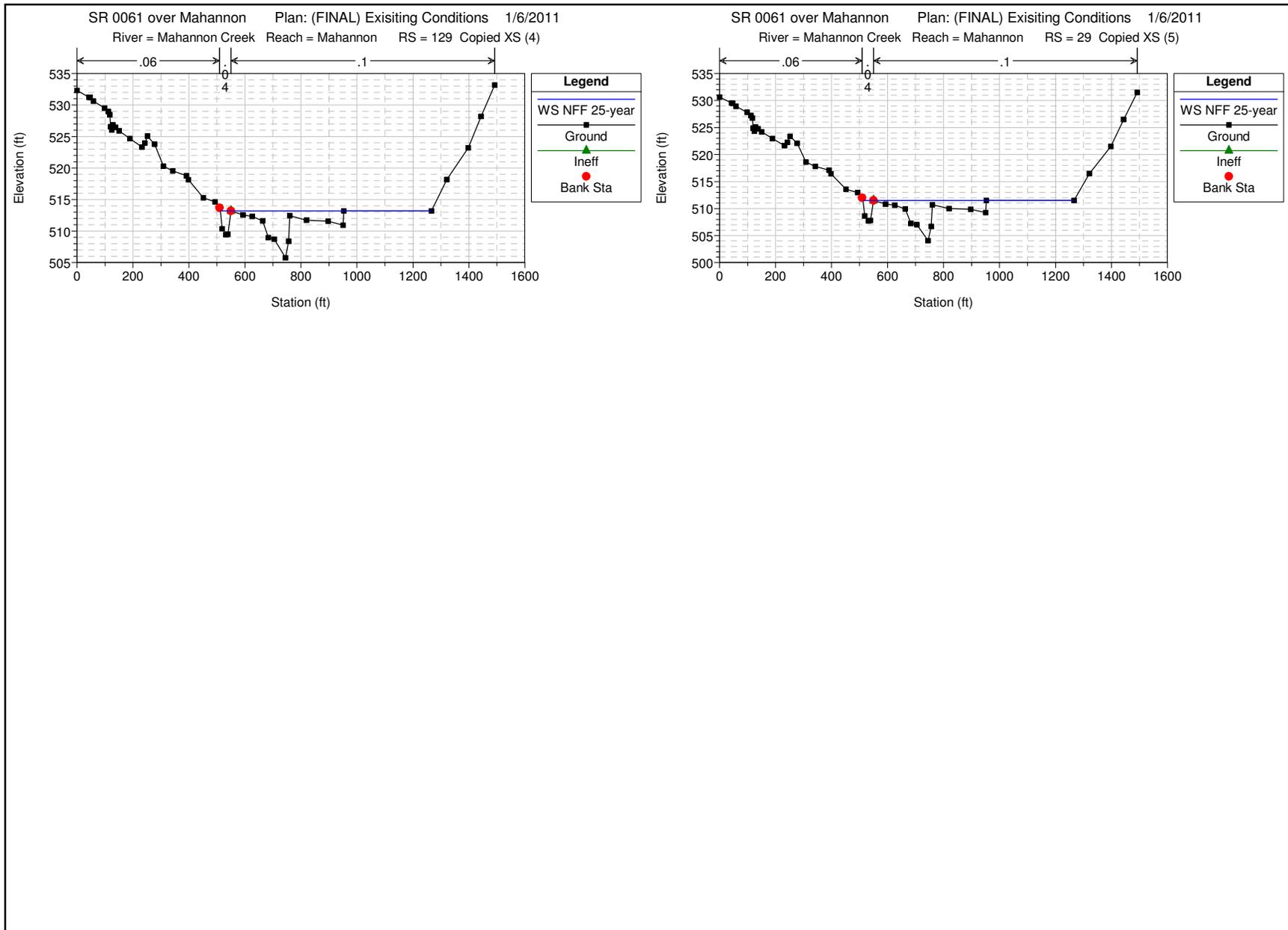








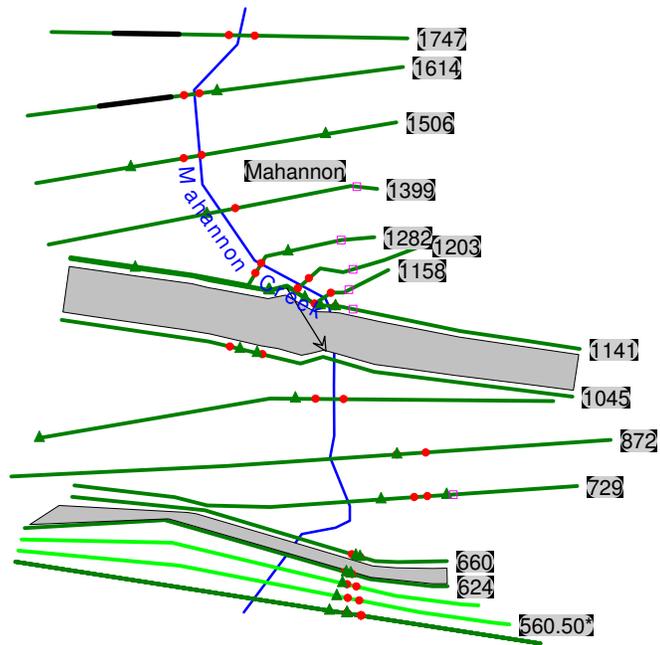




APPENDIX B-2

Existing Conditions HEC-RAS Modeling

**Appendix Includes: 50-Year Water Surface Profile, Cross Sections (US to DS),
Hydraulic Properties Tables**



HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

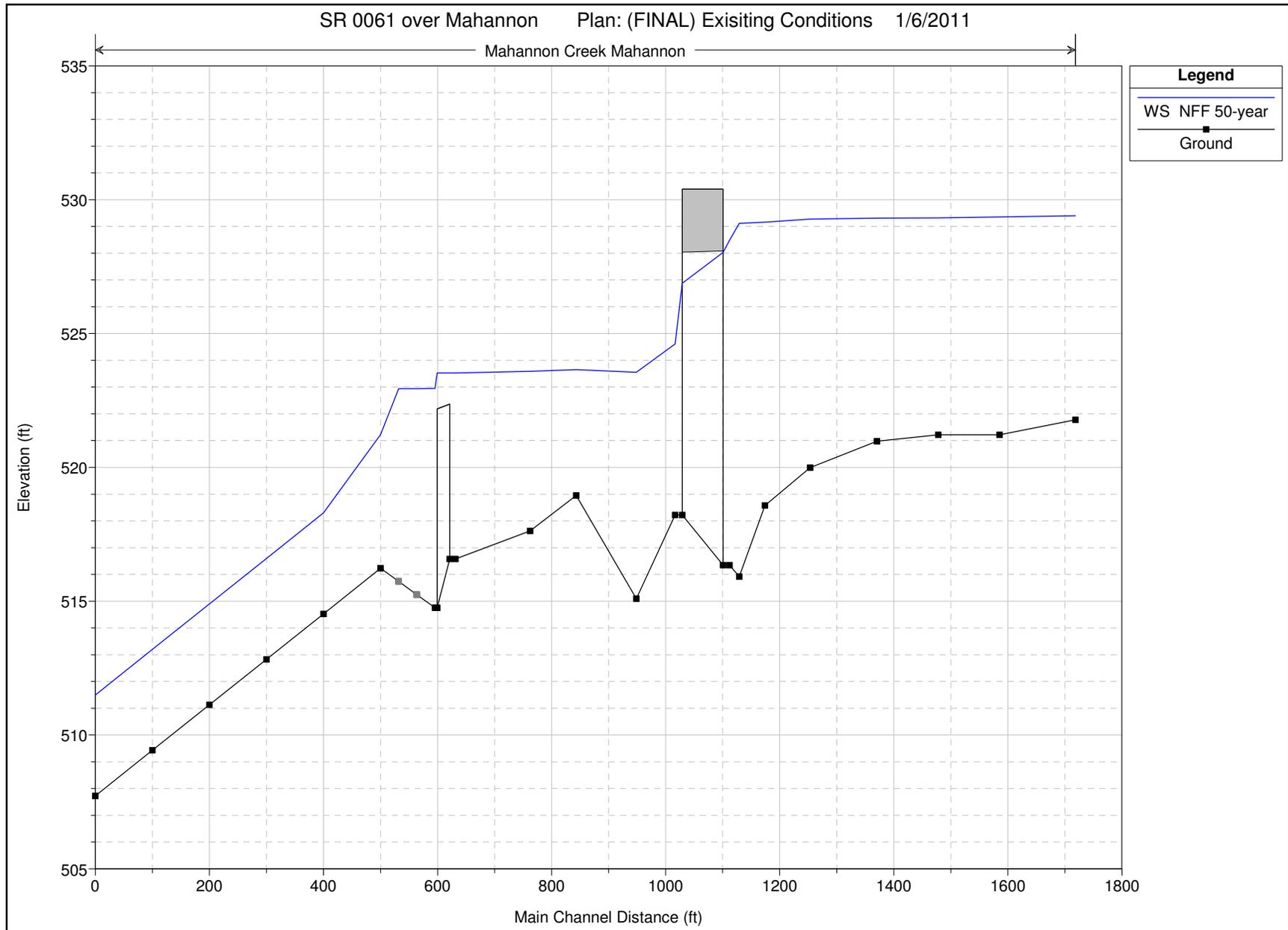
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	NFF 50-year	1610.00	521.78	529.40	527.53	529.55	0.001255	3.88	799.84	269.83	0.30
Mahannon	1614	NFF 50-year	1610.00	521.22	529.36	526.92	529.43	0.000747	3.24	1114.25	325.63	0.23
Mahannon	1506	NFF 50-year	1610.00	521.22	529.32	525.85	529.36	0.000367	2.49	1459.48	433.06	0.17
Mahannon	1399	NFF 50-year	1610.00	520.98	529.32	525.10	529.33	0.000142	1.60	2153.49	482.11	0.11
Mahannon	1282	NFF 50-year	1610.00	519.99	529.28	525.03	529.31	0.000292	2.55	1641.94	407.60	0.15
Mahannon	1203	NFF 50-year	1610.00	518.58	529.16	524.83	529.29	0.000503	3.59	853.92	337.19	0.20
Mahannon	1158	NFF 50-year	1610.00	515.92	529.12	524.21	529.26	0.000574	3.58	742.33	314.17	0.21
Mahannon	1141	NFF 50-year	1610.00	516.35	528.48	523.65	529.10	0.001571	6.32	254.79	263.31	0.36
Mahannon	1100			Bridge								
Mahannon	1045	NFF 50-year	1610.00	518.22	524.62	524.62	527.33	0.013606	13.23	121.71	64.44	1.00
Mahannon	977	NFF 50-year	1610.00	515.09	523.55	521.85	524.25	0.004691	6.82	273.74	146.23	0.55
Mahannon	872	NFF 50-year	1610.00	518.95	523.65	521.95	523.71	0.001079	2.75	1478.73	671.77	0.26
Mahannon	729	NFF 50-year	1610.00	517.63	523.59	522.25	523.65	0.000959	3.16	1516.08	652.58	0.26
Mahannon	660	NFF 50-year	1610.00	516.58	523.53	522.25	523.59	0.000793	3.40	1640.24	741.96	0.24
Mahannon	650			Bridge								
Mahannon	624	NFF 50-year	1610.00	514.76	522.95	522.25	522.97	0.000384	2.44	2356.91	791.73	0.17
Mahannon	592.50*	NFF 50-year	1610.00	515.25	522.94	521.76	522.96	0.000243	1.87	2694.21	816.26	0.13
Mahannon	560.50*	NFF 50-year	1610.00	515.74	522.94	521.46	522.95	0.000177	1.54	2996.43	840.25	0.11
Mahannon	529	NFF 50-year	1610.00	516.23	521.22	521.22	522.51	0.012659	9.65	230.53	782.96	0.89
Mahannon	429	NFF 50-year	1610.00	514.53	518.30	518.30	518.46	0.005831	5.32	950.89	753.63	0.58
Mahannon	329	NFF 50-year	1610.00	512.83	516.60	516.60	516.76	0.005831	5.32	950.88	753.63	0.58
Mahannon	229	NFF 50-year	1610.00	511.13	514.90	514.90	515.06	0.005831	5.32	950.90	753.63	0.58
Mahannon	129	NFF 50-year	1610.00	509.43	513.20	513.20	513.36	0.005831	5.32	950.90	753.63	0.58
Mahannon	29	NFF 50-year	1610.00	507.73	511.50	511.50	511.66	0.005838	5.32	950.50	753.63	0.58

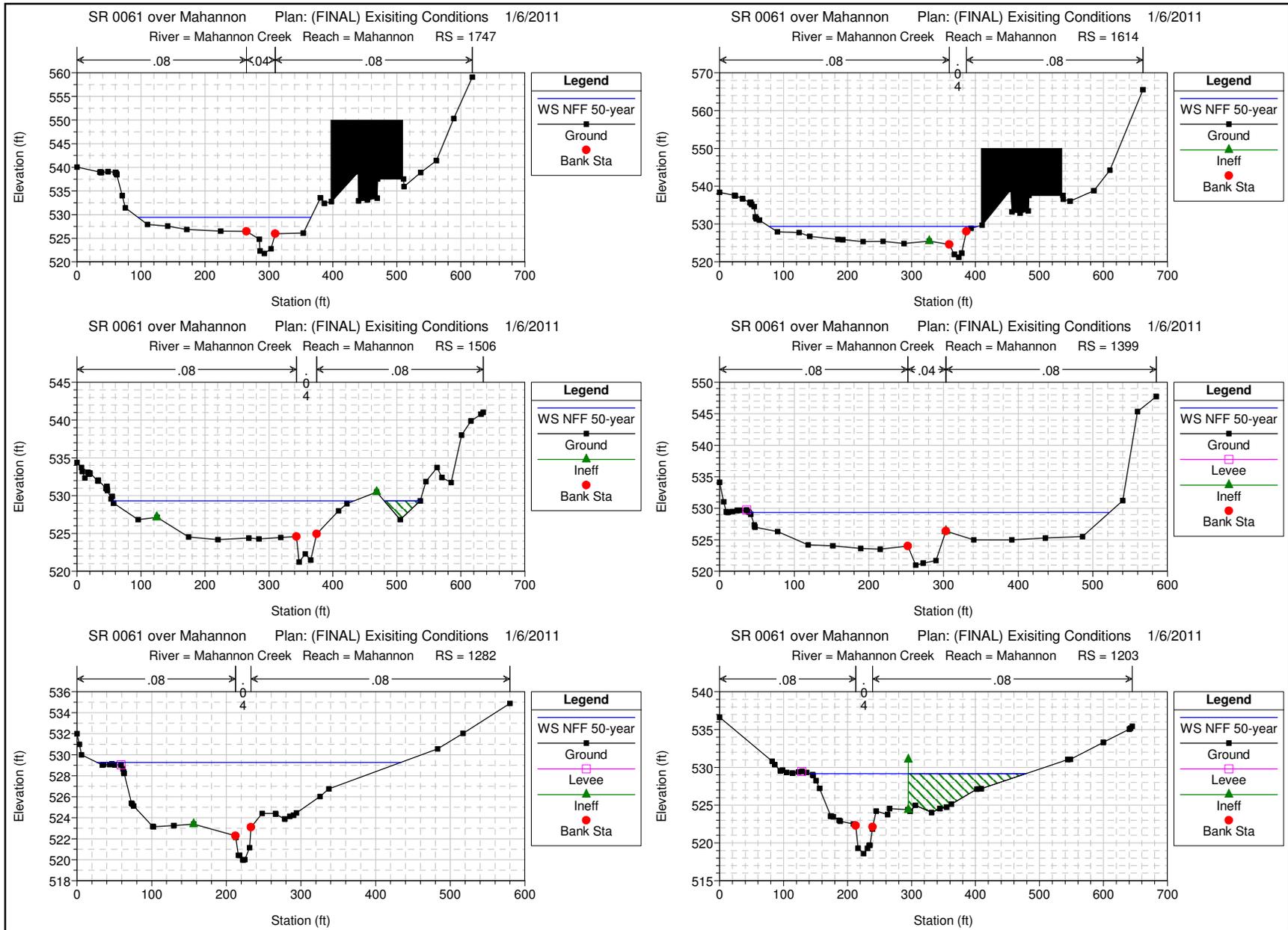
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

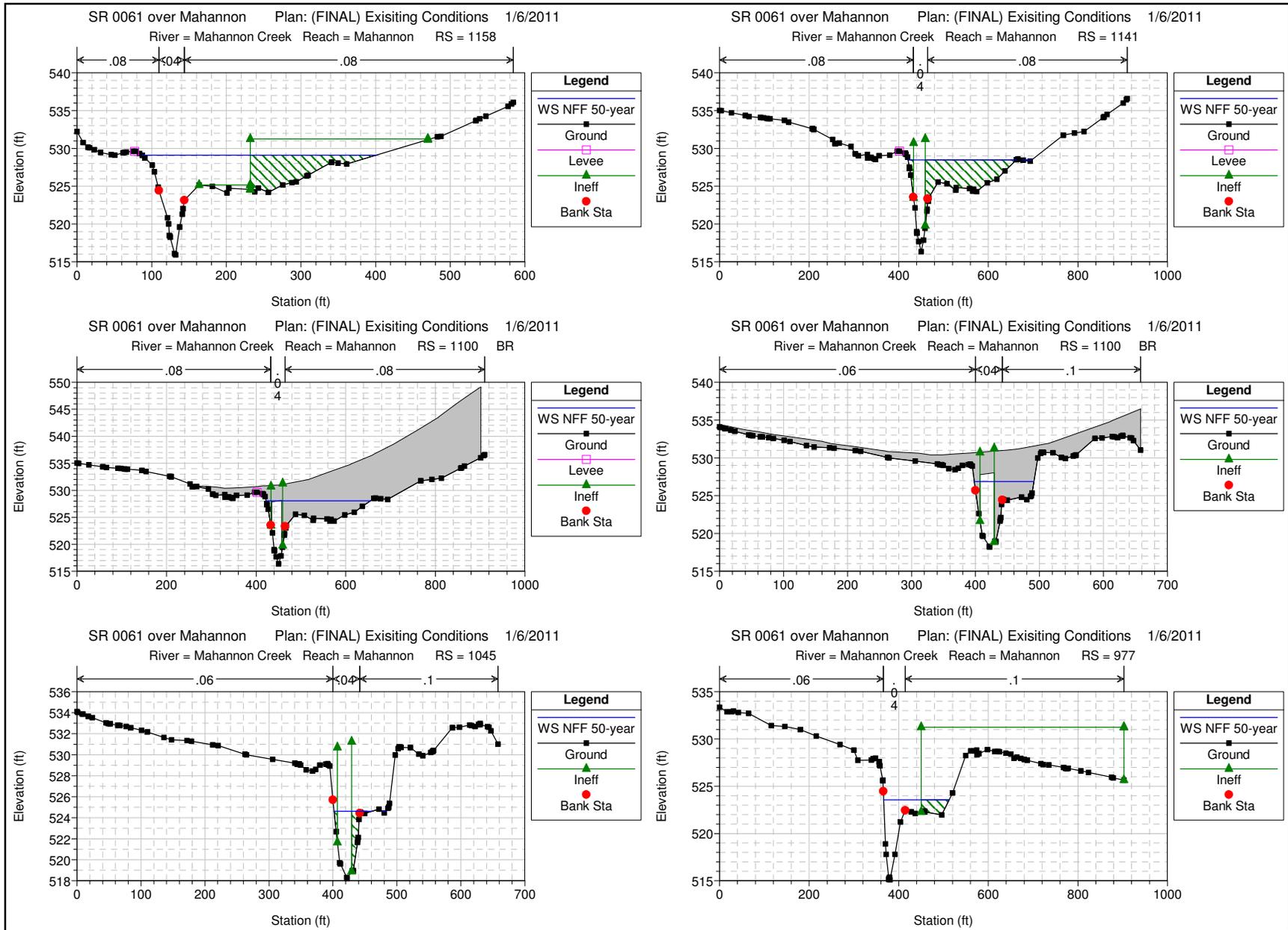
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	NFF 50-year	529.55	529.40	0.14	0.10	0.02	453.69	927.72	228.59	269.83
Mahannon	1614	NFF 50-year	529.43	529.36	0.07	0.05	0.01	1059.91	547.23	2.86	325.63
Mahannon	1506	NFF 50-year	529.36	529.32	0.04	0.02	0.01	1001.68	548.96	59.36	433.06
Mahannon	1399	NFF 50-year	529.33	529.32	0.02	0.02	0.00	609.21	573.69	427.10	482.11
Mahannon	1282	NFF 50-year	529.31	529.28	0.04	0.02	0.01	767.40	449.55	393.05	407.60
Mahannon	1203	NFF 50-year	529.29	529.16	0.12	0.02	0.01	365.80	907.02	337.18	337.19
Mahannon	1158	NFF 50-year	529.26	529.12	0.14	0.01	0.14	20.07	1104.79	485.14	314.17
Mahannon	1141	NFF 50-year	529.10	528.48	0.62	0.04	0.15		1610.00		263.31
Mahannon	1100	Bridge									
Mahannon	1045	NFF 50-year	527.33	524.62	2.72	0.56	1.01		1610.00		64.44
Mahannon	977	NFF 50-year	524.25	523.55	0.70	0.22	0.32		1555.21	54.79	146.23
Mahannon	872	NFF 50-year	523.71	523.65	0.05	0.06	0.00	8.15	607.54	994.32	671.77
Mahannon	729	NFF 50-year	523.65	523.59	0.06	0.05	0.00	81.16	525.98	1002.86	652.58
Mahannon	660	NFF 50-year	523.59	523.53	0.07				534.79	1075.21	741.96
Mahannon	650	Bridge									
Mahannon	624	NFF 50-year	522.97	522.95	0.02	0.01	0.00		251.52	1358.48	791.73
Mahannon	592.50'	NFF 50-year	522.96	522.94	0.01	0.01	0.00	6.66	313.23	1290.11	816.26
Mahannon	560.50'	NFF 50-year	522.95	522.94	0.01	0.05	0.38	14.99	300.91	1294.11	840.25
Mahannon	529	NFF 50-year	522.51	521.22	1.29	0.86	0.56	6.52	1425.70	177.78	782.96
Mahannon	429	NFF 50-year	518.46	518.30	0.16	0.58	0.00		528.78	1081.22	753.63
Mahannon	329	NFF 50-year	516.76	516.60	0.16	0.58	0.00		528.79	1081.21	753.63
Mahannon	229	NFF 50-year	515.06	514.90	0.16	0.58	0.00		528.79	1081.21	753.63
Mahannon	129	NFF 50-year	513.36	513.20	0.16	0.58	0.00		528.79	1081.22	753.63
Mahannon	29	NFF 50-year	511.66	511.50	0.16				528.93	1081.07	753.63

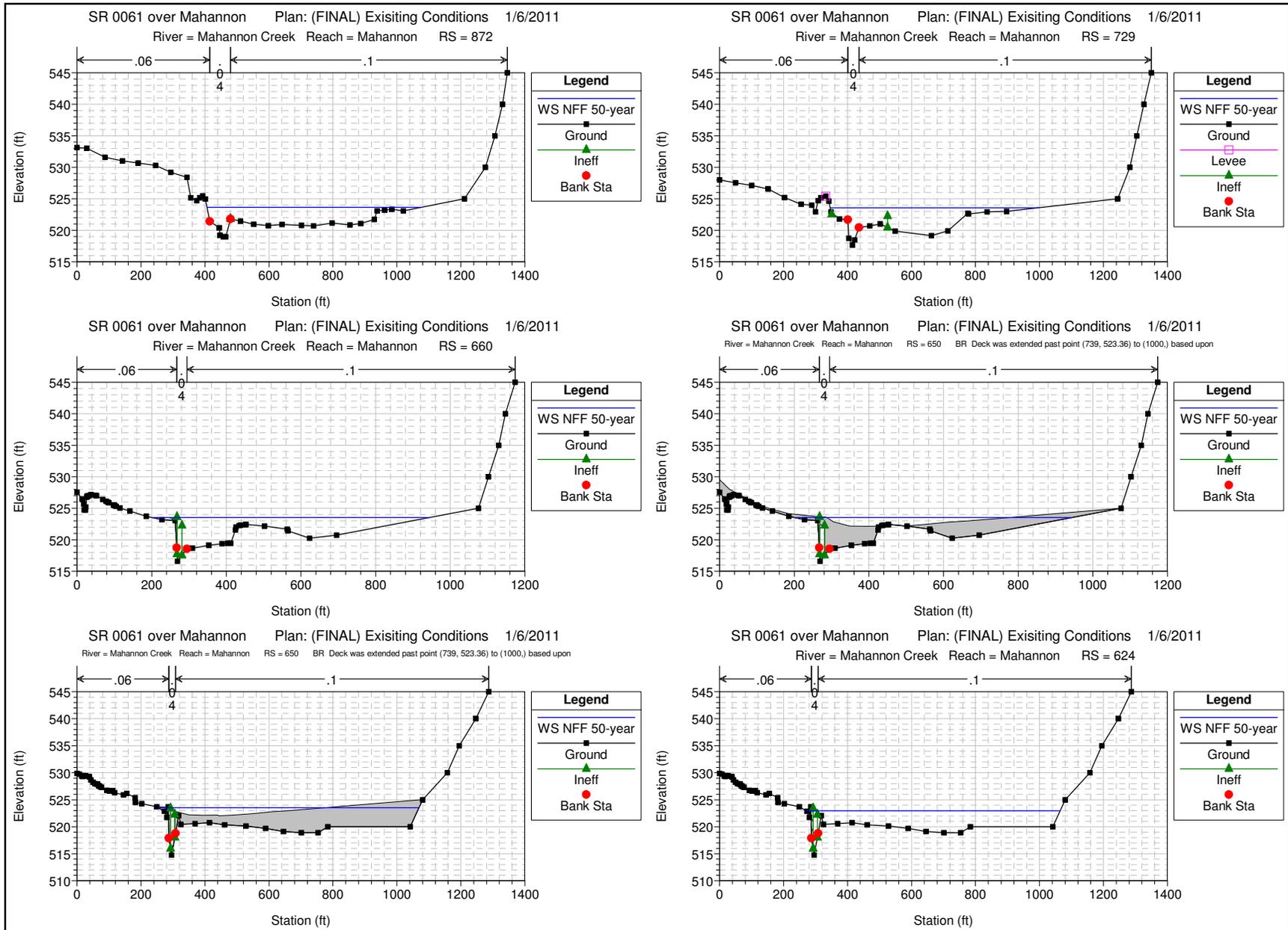
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

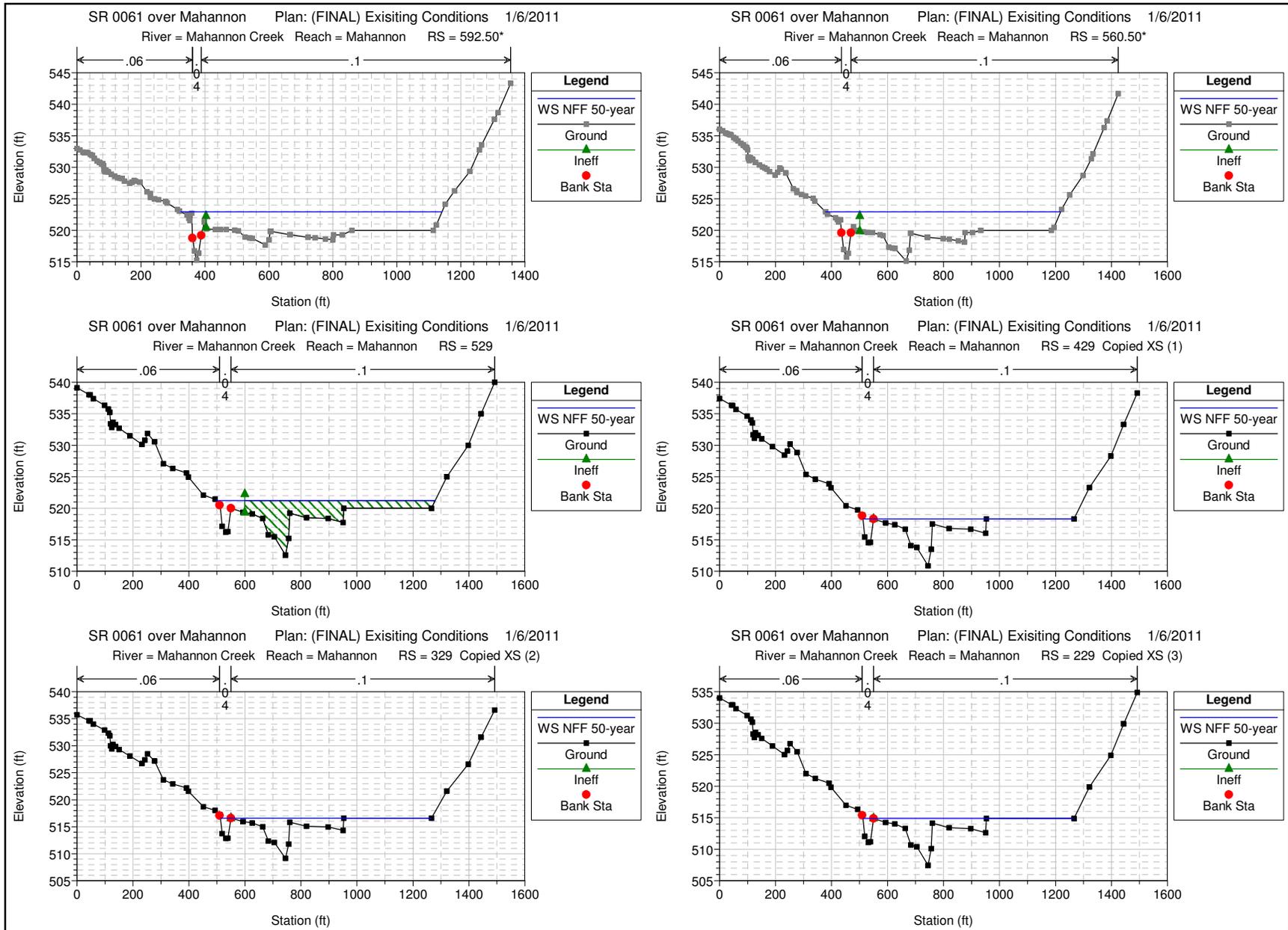
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	NFF 50-year	529.26	529.12	524.21	0.01	0.14	314.17	20.07	1104.79	485.14	3.58
Mahannon	1141	NFF 50-year	529.10	528.48	523.65	0.04	0.15	263.31		1610.00		6.32
Mahannon	1100 BR U	NFF 50-year	528.91	528.04	523.81	0.39	0.29	5.15		1610.00		7.51
Mahannon	1100 BR D	NFF 50-year	528.24	526.88	524.62	0.09	0.81	22.36		1610.00		9.36
Mahannon	1045	NFF 50-year	527.33	524.62	524.62	0.56	1.01	64.44		1610.00		13.23
Mahannon	977	NFF 50-year	524.25	523.55	521.85	0.22	0.32	146.23		1555.21	54.79	6.82
Mahannon	729	NFF 50-year	523.65	523.59	522.25	0.05	0.00	652.58	81.16	525.98	1002.86	3.16
Mahannon	660	NFF 50-year	523.59	523.53	522.25			741.96		534.79	1075.21	3.40
Mahannon	650 BR U	NFF 50-year	523.59	523.53	523.61			486.16		368.45	1241.44	5.07
Mahannon	650 BR D	NFF 50-year	523.59	523.53	523.54			486.16		368.45	1241.44	4.07
Mahannon	624	NFF 50-year	522.97	522.95	522.25	0.01	0.00	791.73		251.52	1358.48	2.44
Mahannon	592.50*	NFF 50-year	522.96	522.94	521.76	0.01	0.00	816.26	6.66	313.23	1290.11	1.87

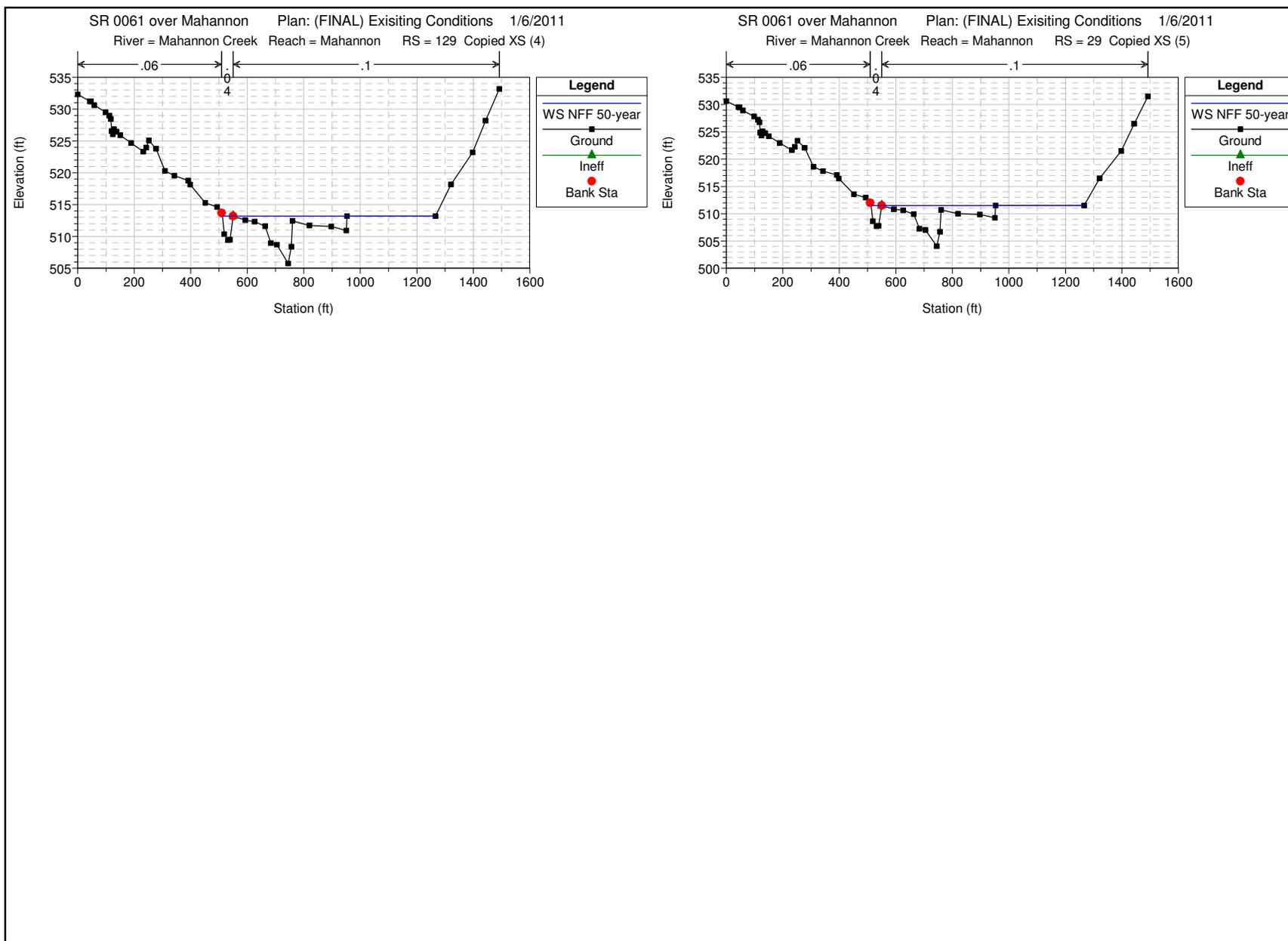








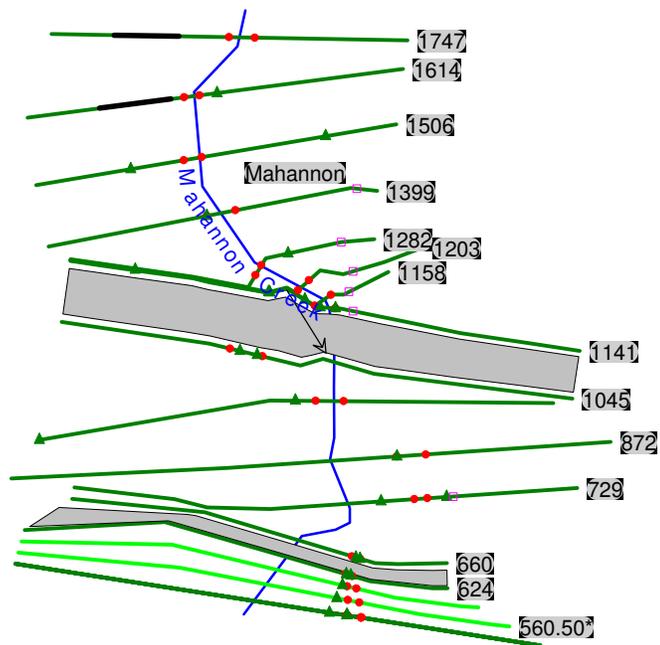




APPENDIX B-3

Existing Conditions HEC-RAS Modeling

**Appendix Includes: 100-Year Water Surface Profile, Cross Sections (US to DS),
Hydraulic Properties Tables**



HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

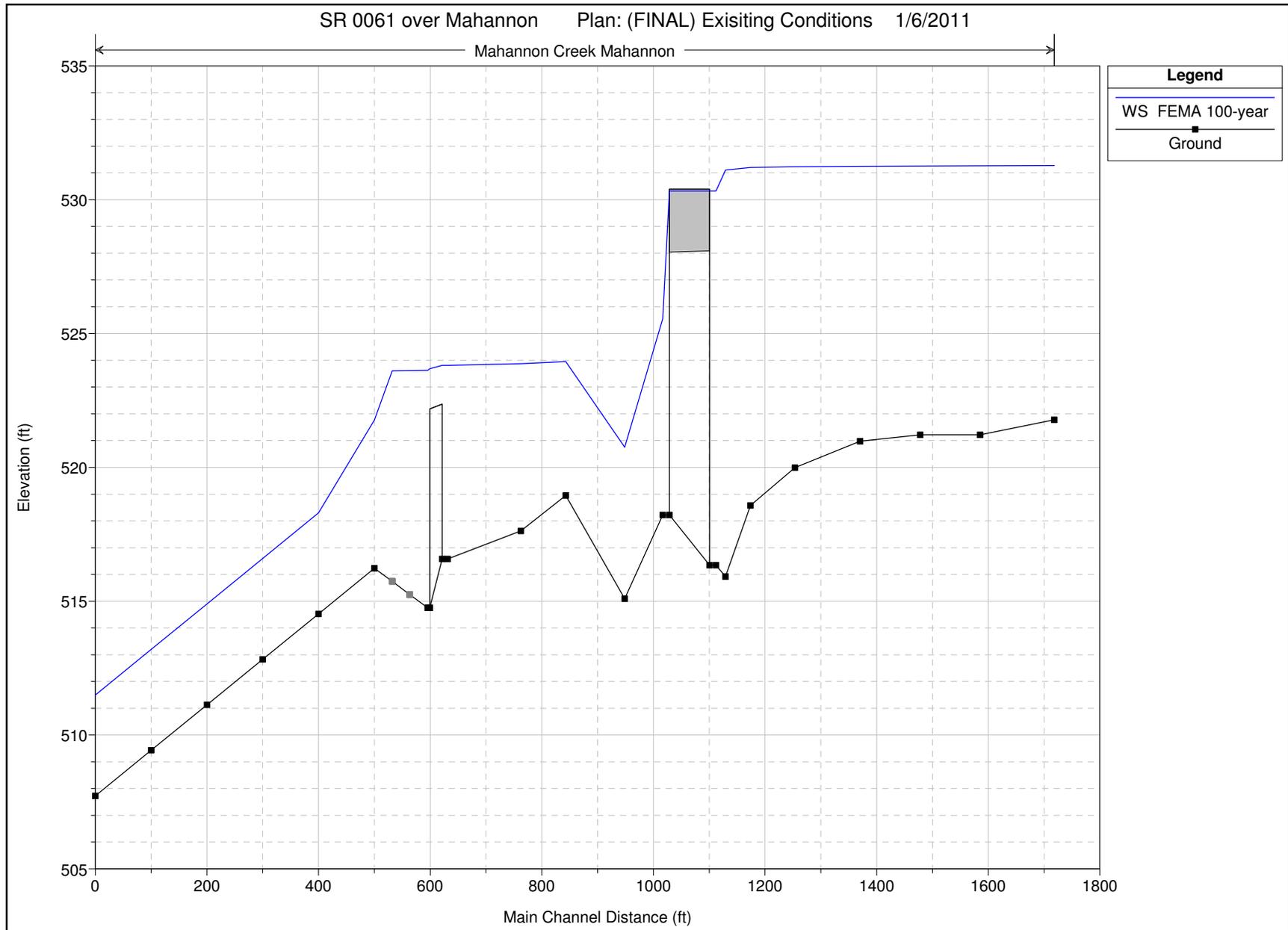
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	FEMA 100-year	2040.00	521.78	531.28	527.86	531.36	0.000508	3.02	1329.63	295.02	0.20
Mahannon	1614	FEMA 100-year	2040.00	521.22	531.27	527.20	531.31	0.000323	2.55	1763.20	349.70	0.16
Mahannon	1506	FEMA 100-year	2040.00	521.22	531.26	526.12	531.28	0.000162	1.95	2448.88	500.79	0.12
Mahannon	1399	FEMA 100-year	2040.00	520.98	531.25	525.41	531.26	0.000079	1.40	3158.75	535.07	0.08
Mahannon	1282	FEMA 100-year	2040.00	519.99	531.23	525.35	531.25	0.000155	2.12	2541.82	496.07	0.12
Mahannon	1203	FEMA 100-year	2040.00	518.58	531.20	525.36	531.24	0.000185	2.48	2230.57	474.97	0.13
Mahannon	1158	FEMA 100-year	2040.00	515.92	531.11	525.55	531.22	0.000361	3.25	1153.80	461.87	0.17
Mahannon	1141	FEMA 100-year	2040.00	516.35	530.32	524.50	531.03	0.001416	6.73	302.97	448.16	0.35
Mahannon	1100	Bridge										
Mahannon	1045	FEMA 100-year	2040.00	518.22	525.55	525.55	528.73	0.012918	14.32	142.48	88.59	1.00
Mahannon	977	FEMA 100-year	2040.00	515.09	520.75	522.78	526.19	0.057864	18.72	108.99	33.37	1.83
Mahannon	872	FEMA 100-year	2040.00	518.95	523.95	522.09	524.01	0.001219	3.09	1683.63	702.42	0.28
Mahannon	729	FEMA 100-year	2040.00	517.63	523.87	522.25	523.95	0.001162	3.62	1709.15	703.33	0.28
Mahannon	660	FEMA 100-year	2040.00	516.58	523.81	522.25	523.88	0.000920	3.73	1892.64	787.65	0.26
Mahannon	650	Bridge										
Mahannon	624	FEMA 100-year	2040.00	514.76	523.62	522.25	523.64	0.000304	2.29	2940.48	817.19	0.15
Mahannon	592.50*	FEMA 100-year	2040.00	515.25	523.62	522.25	523.63	0.000220	1.91	3252.97	841.76	0.13
Mahannon	560.50*	FEMA 100-year	2040.00	515.74	523.61	522.14	523.62	0.000167	1.61	3570.40	862.74	0.11
Mahannon	529	FEMA 100-year	2040.00	516.23	521.76	521.76	523.16	0.011805	10.22	290.73	813.14	0.88
Mahannon	429	FEMA 100-year	2040.00	514.53	518.30	518.30	518.56	0.009371	6.74	950.57	753.63	0.73
Mahannon	329	FEMA 100-year	2040.00	512.83	516.60	516.60	516.86	0.009371	6.75	950.56	753.63	0.73
Mahannon	229	FEMA 100-year	2040.00	511.13	514.90	514.90	515.16	0.009370	6.74	950.58	753.63	0.73
Mahannon	129	FEMA 100-year	2040.00	509.43	513.20	513.20	513.46	0.009371	6.74	950.57	753.63	0.73
Mahannon	29	FEMA 100-year	2040.00	507.73	511.50	511.50	511.76	0.009371	6.75	950.55	753.63	0.73

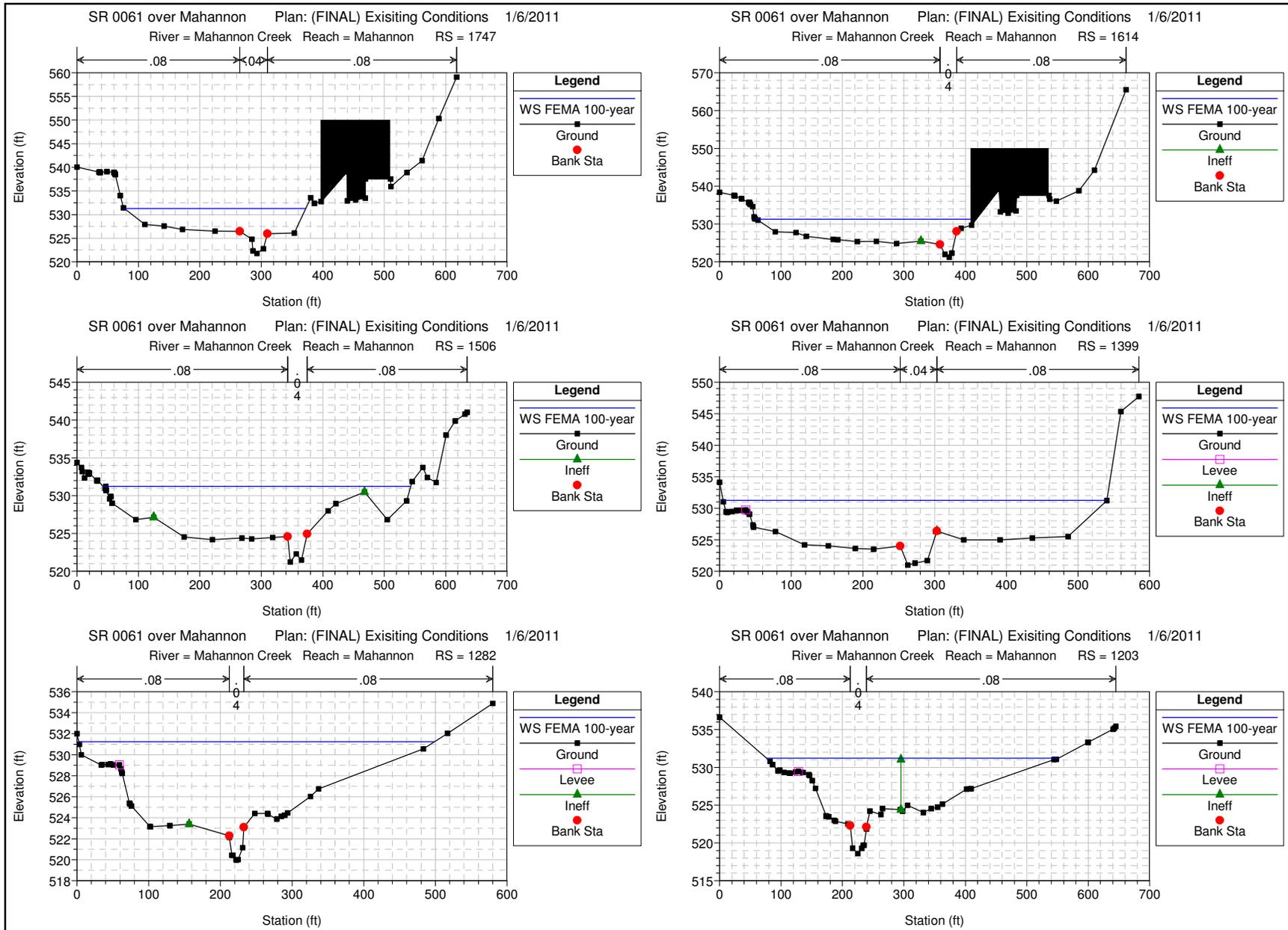
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

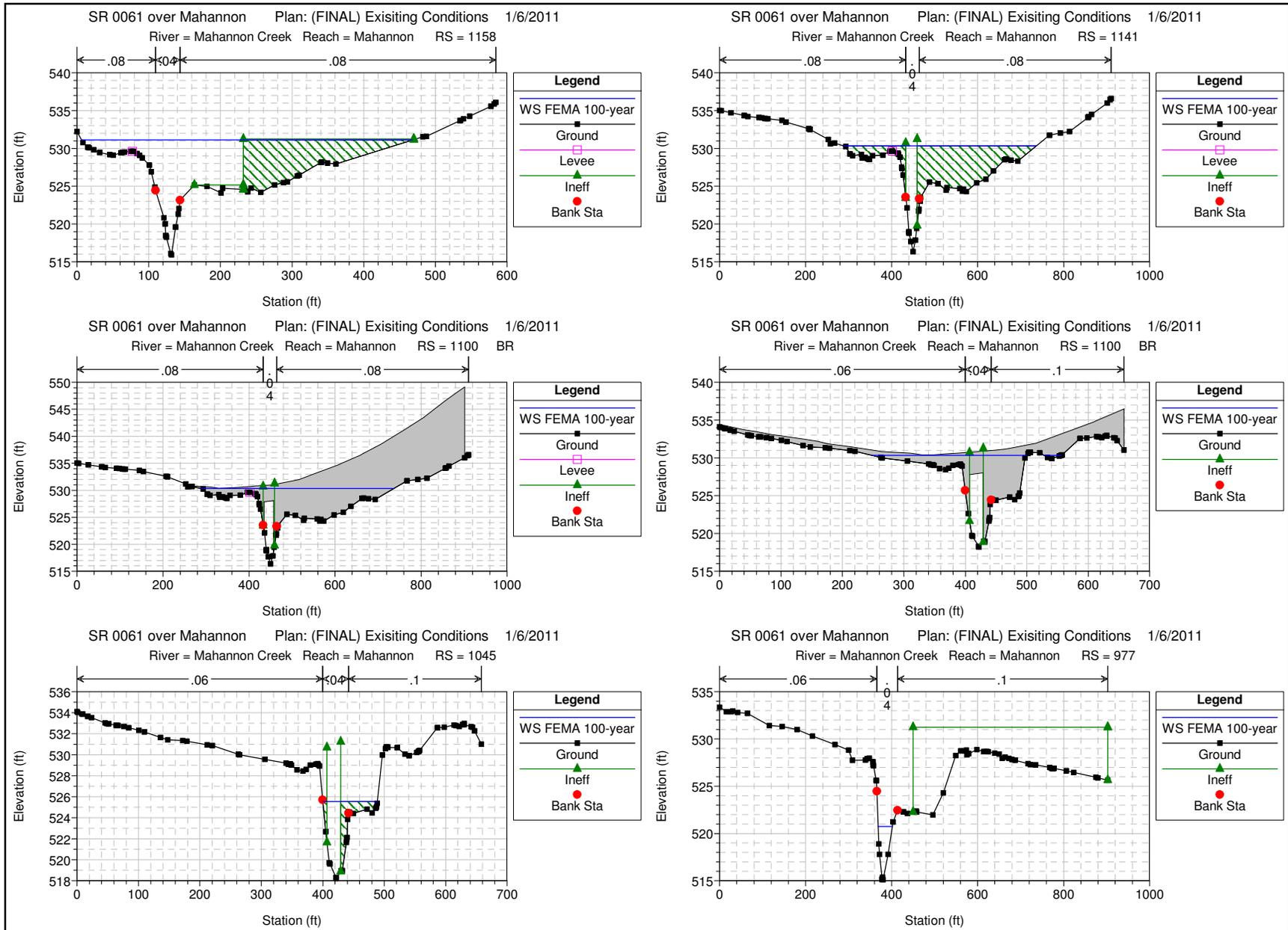
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	FEMA 100-year	531.36	531.28	0.08	0.04	0.01	751.64	975.08	313.28	295.02
Mahannon	1614	FEMA 100-year	531.31	531.27	0.04	0.02	0.00	1449.82	561.67	28.52	349.70
Mahannon	1506	FEMA 100-year	531.28	531.26	0.02	0.01	0.00	1268.85	549.64	221.51	500.79
Mahannon	1399	FEMA 100-year	531.26	531.25	0.01	0.01	0.00	778.82	639.54	621.64	535.07
Mahannon	1282	FEMA 100-year	531.25	531.23	0.02	0.01	0.00	964.03	459.57	616.41	496.07
Mahannon	1203	FEMA 100-year	531.24	531.20	0.04	0.01	0.02	370.89	758.53	910.58	474.97
Mahannon	1158	FEMA 100-year	531.22	531.11	0.11	0.01	0.18	111.73	1221.19	707.09	461.87
Mahannon	1141	FEMA 100-year	531.03	530.32	0.70				2040.00		448.16
Mahannon	1100	Bridge									
Mahannon	1045	FEMA 100-year	528.73	525.55	3.18	0.64	1.09		2040.00		88.59
Mahannon	977	FEMA 100-year	526.19	520.75	5.44	1.86	0.68		2040.00		33.37
Mahannon	872	FEMA 100-year	524.01	523.95	0.06	0.07	0.00	12.09	742.53	1285.38	702.42
Mahannon	729	FEMA 100-year	523.95	523.87	0.07	0.06	0.00	118.55	638.23	1283.22	703.33
Mahannon	660	FEMA 100-year	523.88	523.81	0.07			27.10	635.64	1377.27	787.65
Mahannon	650	Bridge									
Mahannon	624	FEMA 100-year	523.64	523.62	0.02	0.01	0.00	9.59	339.99	1690.41	817.19
Mahannon	592.50*	FEMA 100-year	523.63	523.62	0.01	0.01	0.00	19.45	355.85	1664.70	841.76
Mahannon	560.50*	FEMA 100-year	523.62	523.61	0.01	0.05	0.42	35.24	351.54	1653.22	862.74
Mahannon	529	FEMA 100-year	523.16	521.76	1.40	1.05	0.57	25.08	1735.05	279.87	813.14
Mahannon	429	FEMA 100-year	518.56	518.30	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	329	FEMA 100-year	516.86	516.60	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	229	FEMA 100-year	515.16	514.90	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	129	FEMA 100-year	513.46	513.20	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	29	FEMA 100-year	511.76	511.50	0.26				670.18	1369.82	753.63

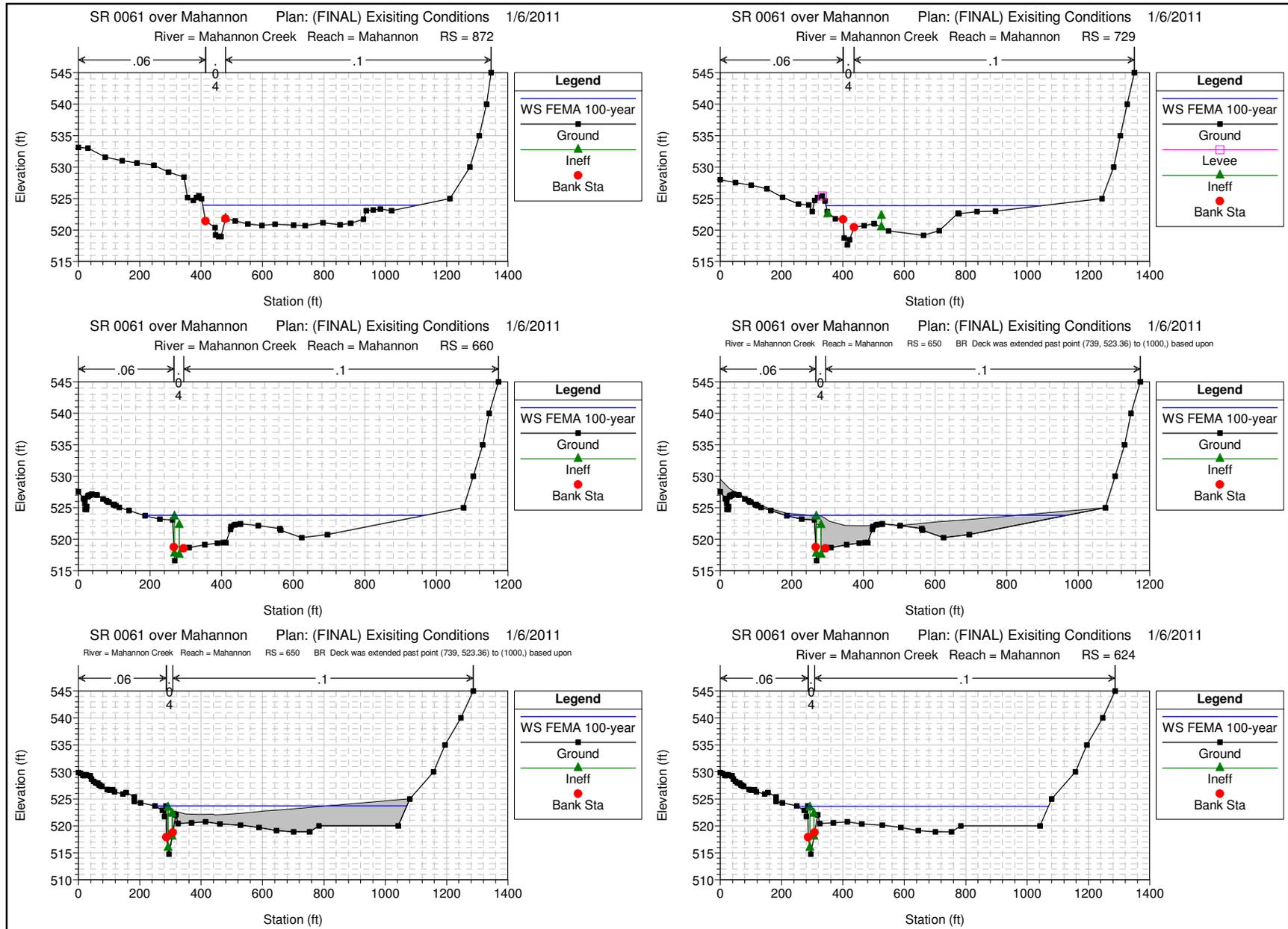
HEC-RAS Plan: (FINAL) Existing River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

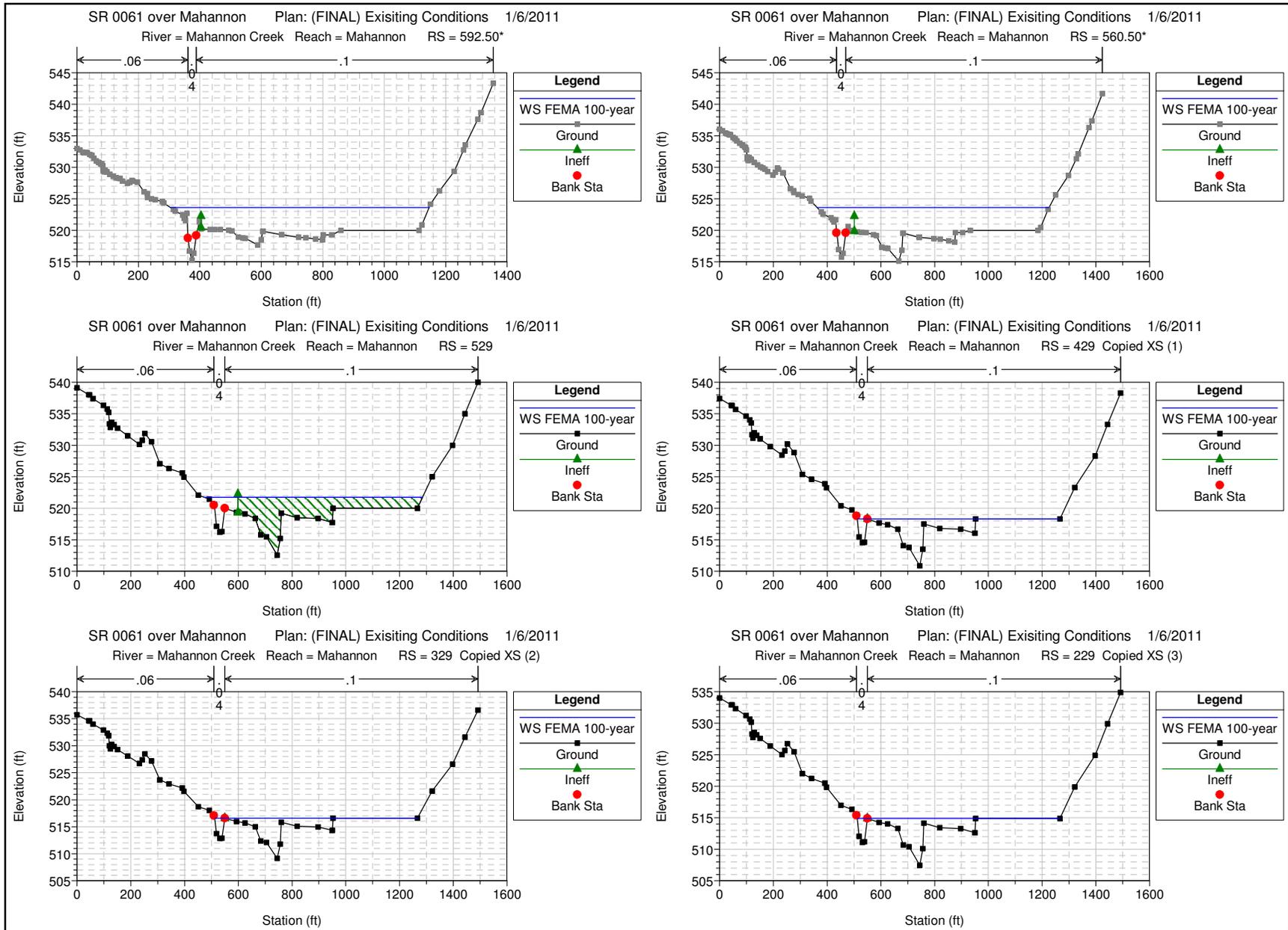
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	FEMA 100-year	531.22	531.11	525.55	0.01	0.18	461.87	111.73	1221.19	707.09	3.25
Mahannon	1141	FEMA 100-year	531.03	530.32	524.50			448.16		2040.00		6.73
Mahannon	1100 BR U	FEMA 100-year	531.03	530.32	524.73				117.93	1923.82		8.90
Mahannon	1100 BR D	FEMA 100-year	531.00	530.32	525.55				117.93	1923.82		9.55
Mahannon	1045	FEMA 100-year	528.73	525.55	525.55	0.64	1.09	88.59		2040.00		14.32
Mahannon	977	FEMA 100-year	526.19	520.75	522.78	1.86	0.68	33.37		2040.00		18.72
Mahannon	729	FEMA 100-year	523.95	523.87	522.25	0.06	0.00	703.33	118.55	638.23	1283.22	3.62
Mahannon	660	FEMA 100-year	523.88	523.81	522.25			787.65	27.10	635.64	1377.27	3.73
Mahannon	650 BR U	FEMA 100-year	523.89	523.81	523.63			590.68	5.21	244.86	1795.34	3.04
Mahannon	650 BR D	FEMA 100-year	523.89	523.69	523.69			546.62	5.21	244.86	1795.34	2.53
Mahannon	624	FEMA 100-year	523.64	523.62	522.25	0.01	0.00	817.19	9.59	339.99	1690.41	2.29
Mahannon	592.50*	FEMA 100-year	523.63	523.62	522.25	0.01	0.00	841.76	19.45	355.85	1664.70	1.91

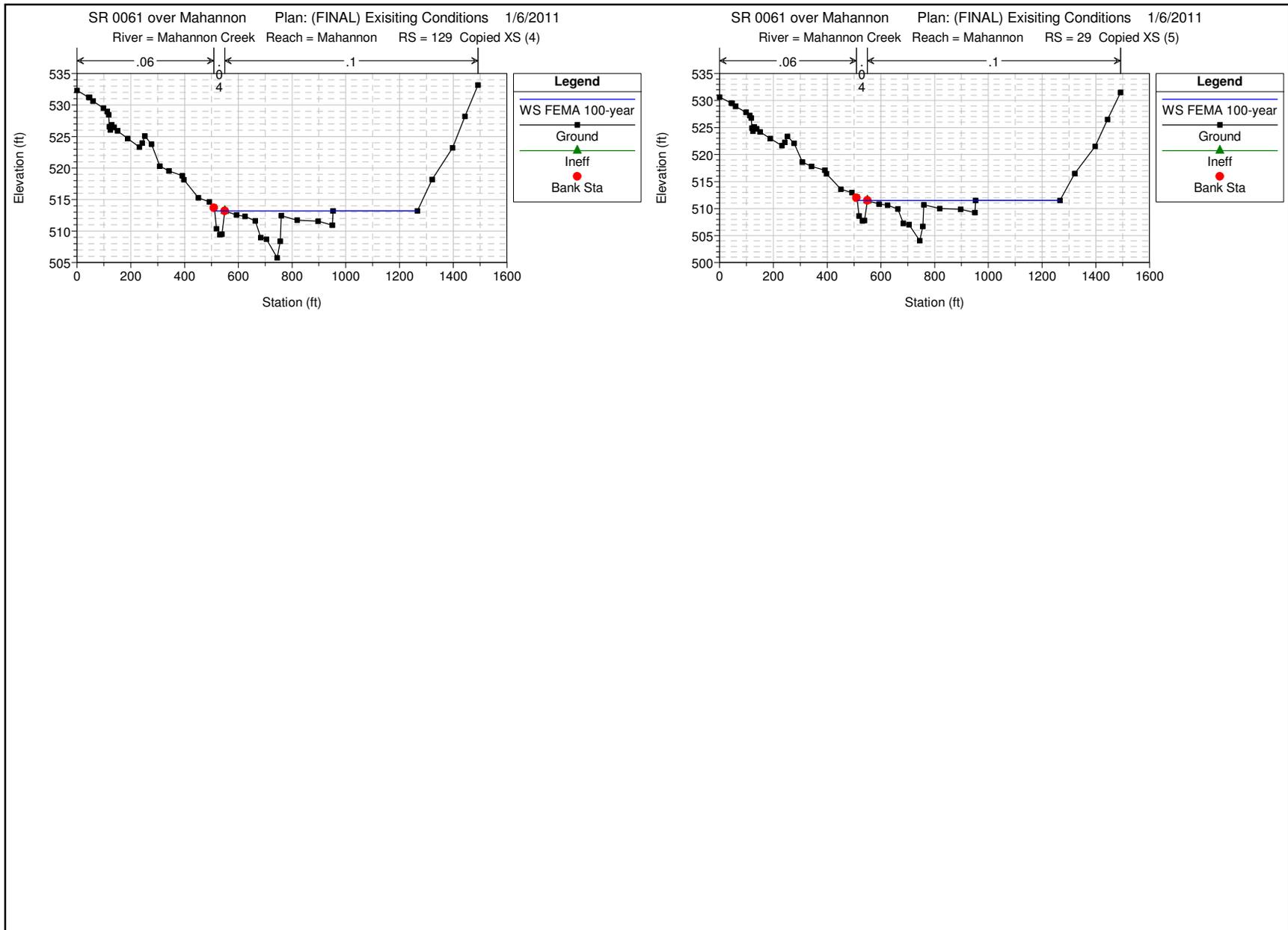








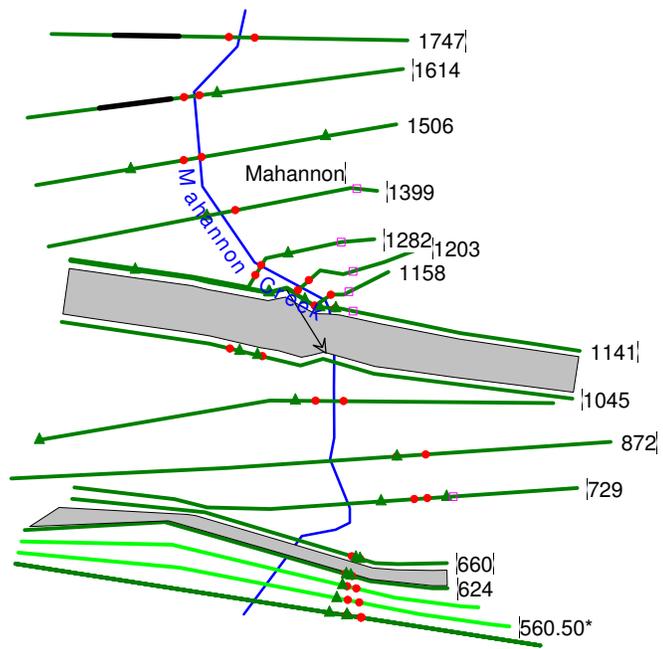




APPENDIX C-1

Proposed Conditions HEC-RAS Modeling

**Appendix Includes: 25-Year Water Surface Profile, Cross Sections (US to DS),
Hydraulic Properties Tables**



HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

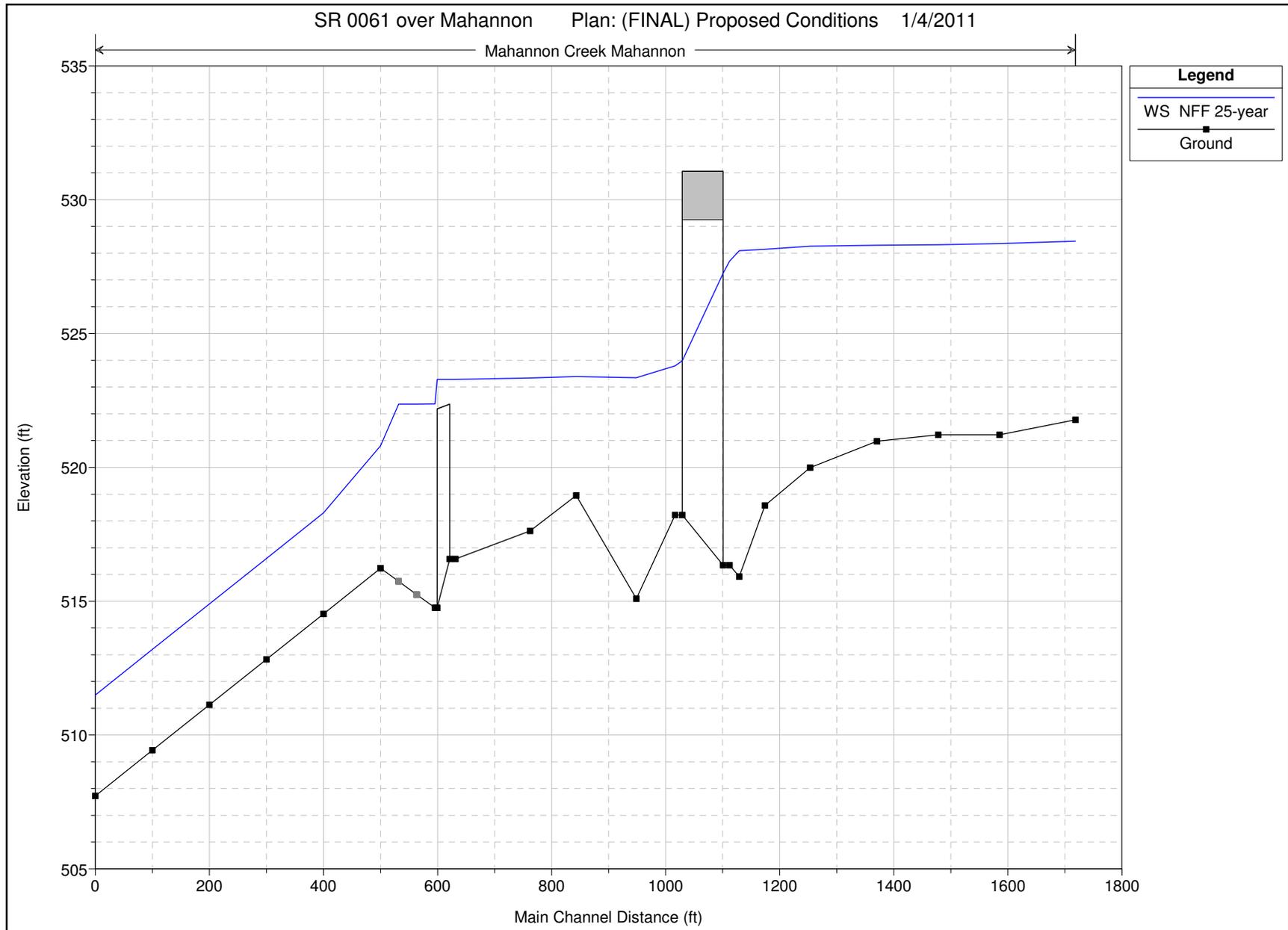
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	NFF 25-year	1290.00	521.78	528.45	527.23	528.66	0.002085	4.39	549.43	257.07	0.37
Mahannon	1614	NFF 25-year	1290.00	521.22	528.36	526.64	528.46	0.001205	3.67	803.22	301.86	0.28
Mahannon	1506	NFF 25-year	1290.00	521.22	528.31	525.60	528.36	0.000513	2.65	1096.08	377.19	0.19
Mahannon	1399	NFF 25-year	1290.00	520.98	528.30	524.84	528.32	0.000190	1.67	1671.88	468.43	0.12
Mahannon	1282	NFF 25-year	1290.00	519.99	528.26	524.76	528.30	0.000316	2.44	1276.26	332.28	0.16
Mahannon	1203	NFF 25-year	1290.00	518.58	528.15	524.11	528.27	0.000527	3.42	705.11	291.75	0.21
Mahannon	1158	NFF 25-year	1290.00	515.92	528.10	523.48	528.24	0.000629	3.47	600.12	259.92	0.22
Mahannon	1141	NFF 25-year	1290.00	516.35	527.70	522.83	528.14	0.001258	5.31	244.73	225.98	0.31
Mahannon	1100			Bridge								
Mahannon	1045	NFF 25-year	1290.00	518.22	523.80	523.80	526.09	0.014417	12.14	106.23	37.52	1.00
Mahannon	977	NFF 25-year	1290.00	515.09	523.35	521.14	523.85	0.003503	5.75	256.80	143.93	0.47
Mahannon	872	NFF 25-year	1290.00	518.95	523.40	521.81	523.44	0.000964	2.47	1309.19	645.31	0.24
Mahannon	729	NFF 25-year	1290.00	517.63	523.34	522.25	523.39	0.000790	2.77	1360.88	608.73	0.23
Mahannon	660	NFF 25-year	1290.00	516.58	523.29	522.25	523.34	0.000657	3.01	1481.20	702.11	0.22
Mahannon	650			Bridge								
Mahannon	624	NFF 25-year	1290.00	514.76	522.37	522.26	522.40	0.000467	2.53	1913.53	780.25	0.18
Mahannon	592.50*	NFF 25-year	1290.00	515.25	522.37	521.03	522.38	0.000274	1.86	2231.68	789.69	0.14
Mahannon	560.50*	NFF 25-year	1290.00	515.74	522.36	520.94	522.37	0.000193	1.50	2517.54	816.88	0.12
Mahannon	529	NFF 25-year	1290.00	516.23	520.80	520.80	521.97	0.013086	9.04	189.01	771.20	0.89
Mahannon	429	NFF 25-year	1290.00	514.53	518.30	518.30	518.40	0.003748	4.27	950.52	753.63	0.46
Mahannon	329	NFF 25-year	1290.00	512.83	516.60	516.60	516.70	0.003748	4.27	950.52	753.63	0.46
Mahannon	229	NFF 25-year	1290.00	511.13	514.90	514.90	515.00	0.003747	4.27	950.53	753.63	0.46
Mahannon	129	NFF 25-year	1290.00	509.43	513.20	513.20	513.30	0.003748	4.27	950.53	753.63	0.46
Mahannon	29	NFF 25-year	1290.00	507.73	511.50	511.50	511.60	0.003748	4.27	950.50	753.63	0.46

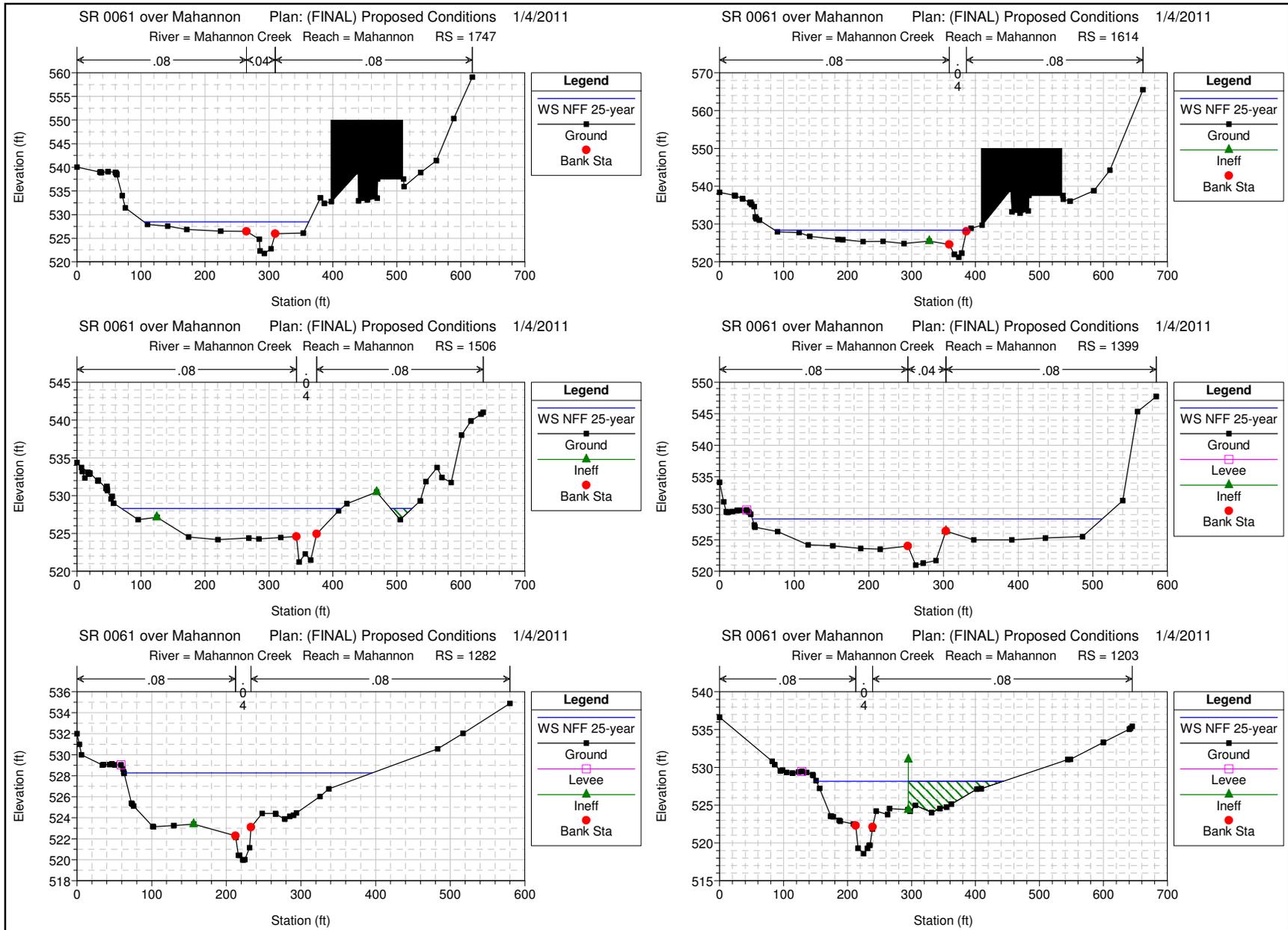
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

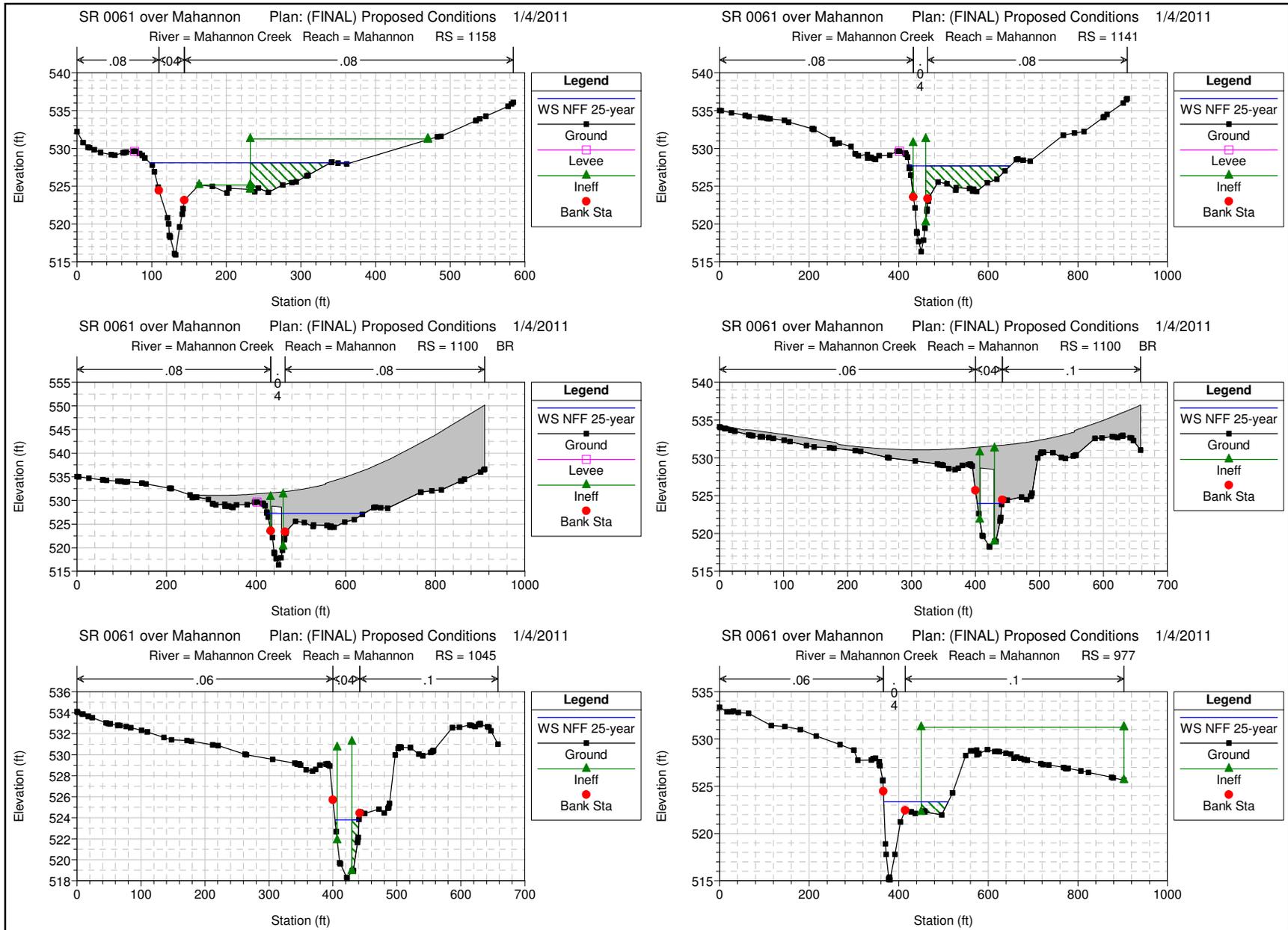
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	NFF 25-year	528.66	528.45	0.21	0.17	0.03	260.79	861.98	167.23	257.07
Mahannon	1614	NFF 25-year	528.46	528.36	0.10	0.08	0.01	770.06	519.87	0.07	301.86
Mahannon	1506	NFF 25-year	528.36	528.31	0.05	0.03	0.01	753.26	499.85	36.89	377.19
Mahannon	1399	NFF 25-year	528.32	528.30	0.02	0.02	0.00	476.42	511.48	302.10	468.43
Mahannon	1282	NFF 25-year	528.30	528.26	0.04	0.02	0.01	655.95	378.97	255.08	332.28
Mahannon	1203	NFF 25-year	528.27	528.15	0.12	0.02	0.01	282.49	770.93	236.58	291.75
Mahannon	1158	NFF 25-year	528.24	528.10	0.14	0.01	0.09	9.87	948.08	332.05	259.92
Mahannon	1141	NFF 25-year	528.14	527.70	0.44	0.02	0.16	3.85	1286.15		225.98
Mahannon	1100		Bridge								
Mahannon	1045	NFF 25-year	526.09	523.80	2.29	0.49	0.90		1290.00		37.52
Mahannon	977	NFF 25-year	523.85	523.35	0.50	0.18	0.23		1254.49	35.51	143.93
Mahannon	872	NFF 25-year	523.44	523.40	0.04	0.05	0.00	5.56	503.83	780.61	645.31
Mahannon	729	NFF 25-year	523.39	523.34	0.05	0.04	0.00	55.21	436.97	797.82	608.73
Mahannon	660	NFF 25-year	523.34	523.29	0.05				454.88	835.12	702.11
Mahannon	650		Bridge								
Mahannon	624	NFF 25-year	522.40	522.37	0.02	0.01	0.00		237.37	1052.63	780.25
Mahannon	592.50'	NFF 25-year	522.38	522.37	0.01	0.01	0.00	2.87	282.01	1005.12	789.69
Mahannon	560.50'	NFF 25-year	522.37	522.36	0.01	0.05	0.35	4.82	262.94	1022.24	816.88
Mahannon	529	NFF 25-year	521.97	520.80	1.17	0.70	0.53	0.69	1181.03	108.28	771.20
Mahannon	429	NFF 25-year	518.40	518.30	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	329	NFF 25-year	516.70	516.60	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	229	NFF 25-year	515.00	514.90	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	129	NFF 25-year	513.30	513.20	0.10	0.37	0.00		423.80	866.20	753.63
Mahannon	29	NFF 25-year	511.60	511.50	0.10				423.80	866.20	753.63

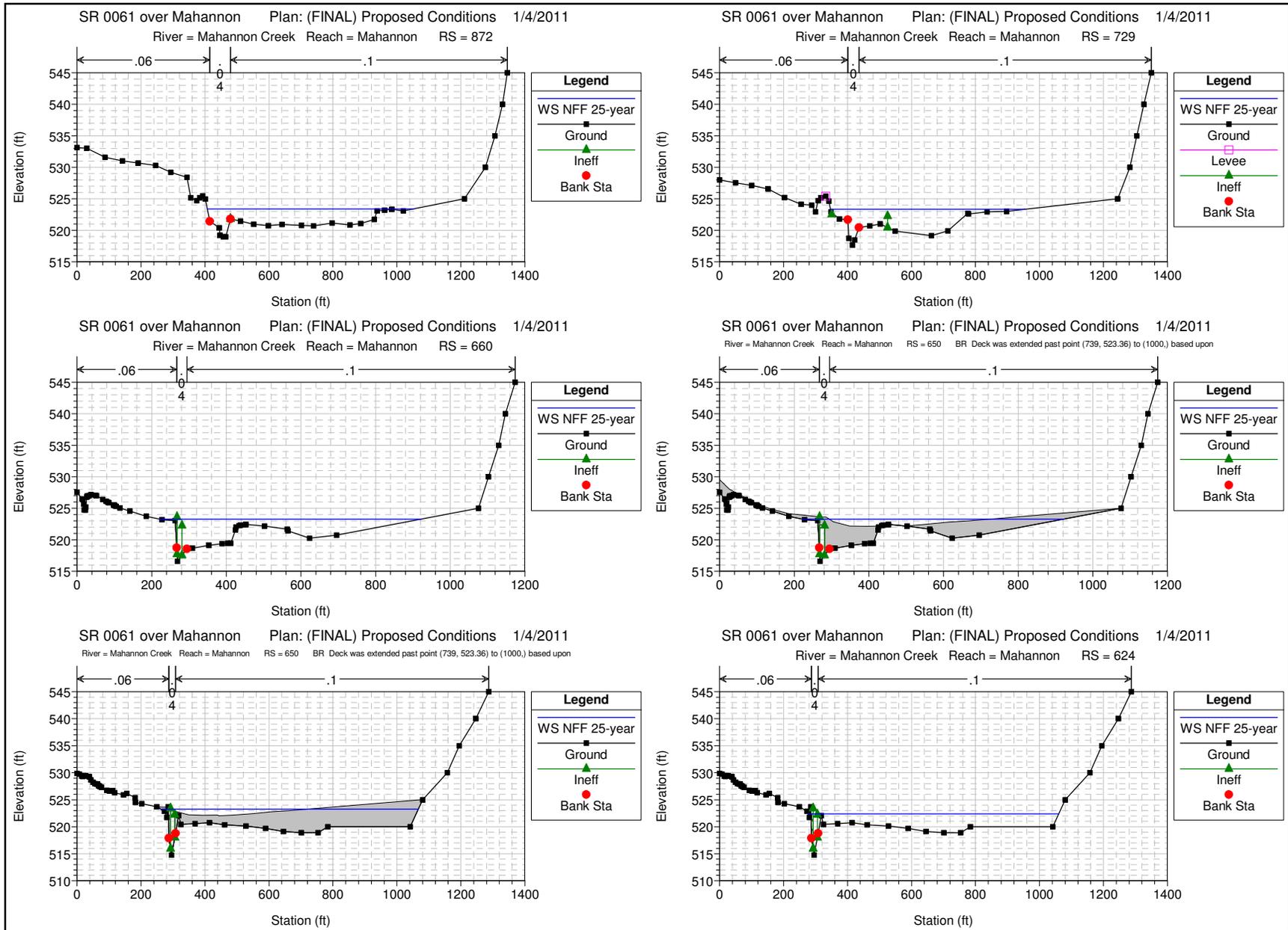
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 25-year

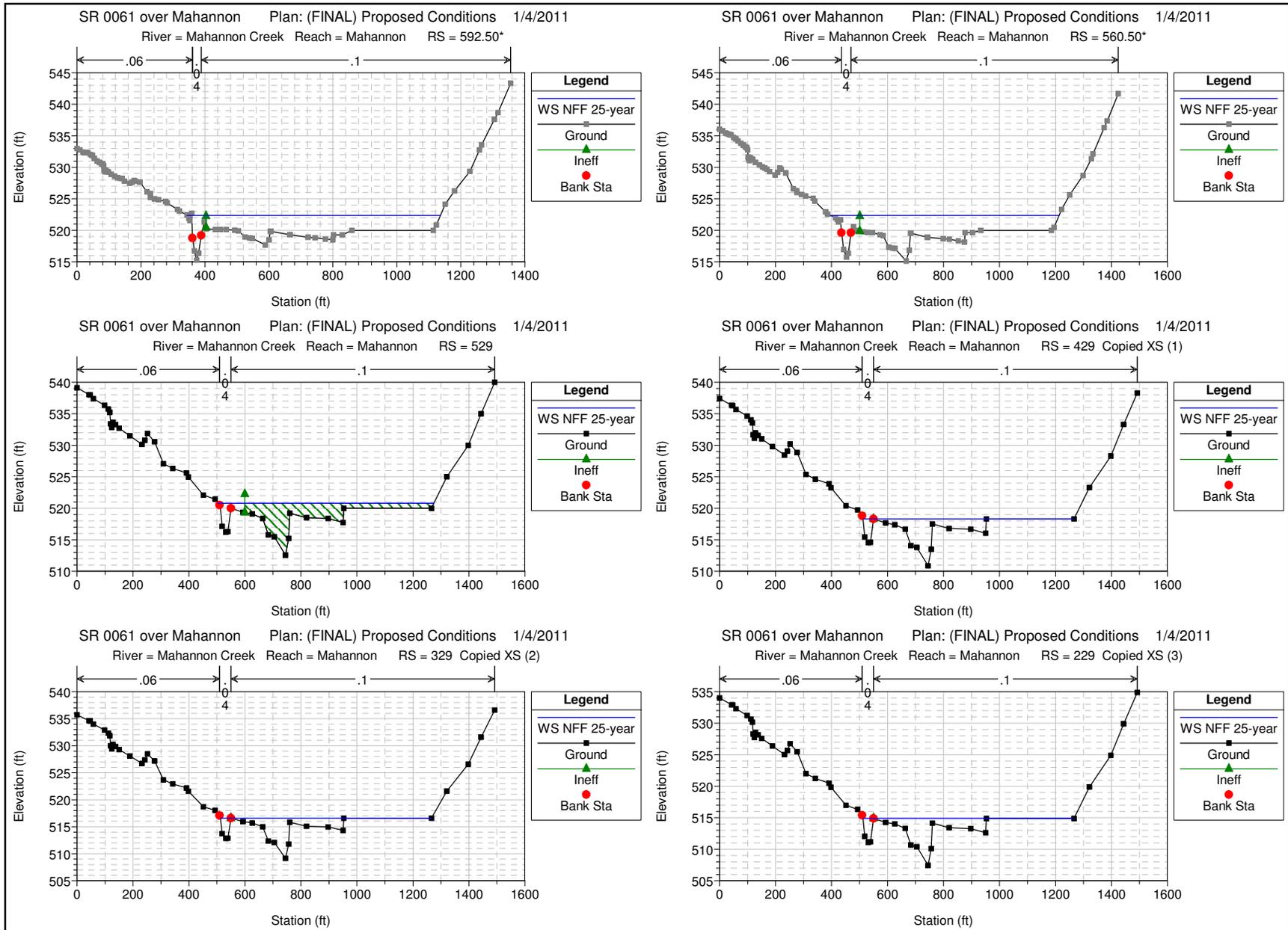
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	NFF 25-year	528.24	528.10	523.48	0.01	0.09	259.92	9.87	948.08	332.05	3.47
Mahannon	1141	NFF 25-year	528.14	527.70	522.83	0.02	0.16	225.98	3.85	1286.15		5.31
Mahannon	1100 BR U	NFF 25-year	527.96	527.25	523.11	0.59	1.01	21.26		1290.00		6.72
Mahannon	1100 BR D	NFF 25-year	526.36	523.98	523.94	0.20	0.07	21.27		1290.00		12.39
Mahannon	1045	NFF 25-year	526.09	523.80	523.80	0.49	0.90	37.52		1290.00		12.14
Mahannon	977	NFF 25-year	523.85	523.35	521.14	0.18	0.23	143.93		1254.49	35.51	5.75
Mahannon	729	NFF 25-year	523.39	523.34	522.25	0.04	0.00	608.73	55.21	436.97	797.82	2.77
Mahannon	660	NFF 25-year	523.34	523.29	522.25			702.11		454.88	835.12	3.01
Mahannon	650 BR U	NFF 25-year	523.34	523.29	523.60			430.60		451.32	838.13	6.32
Mahannon	650 BR D	NFF 25-year	523.34	523.29	523.44			430.12		451.32	838.13	5.25
Mahannon	624	NFF 25-year	522.40	522.37	522.26	0.01	0.00	780.25		237.37	1052.63	2.53
Mahannon	592.50*	NFF 25-year	522.38	522.37	521.03	0.01	0.00	789.69	2.87	282.01	1005.12	1.86

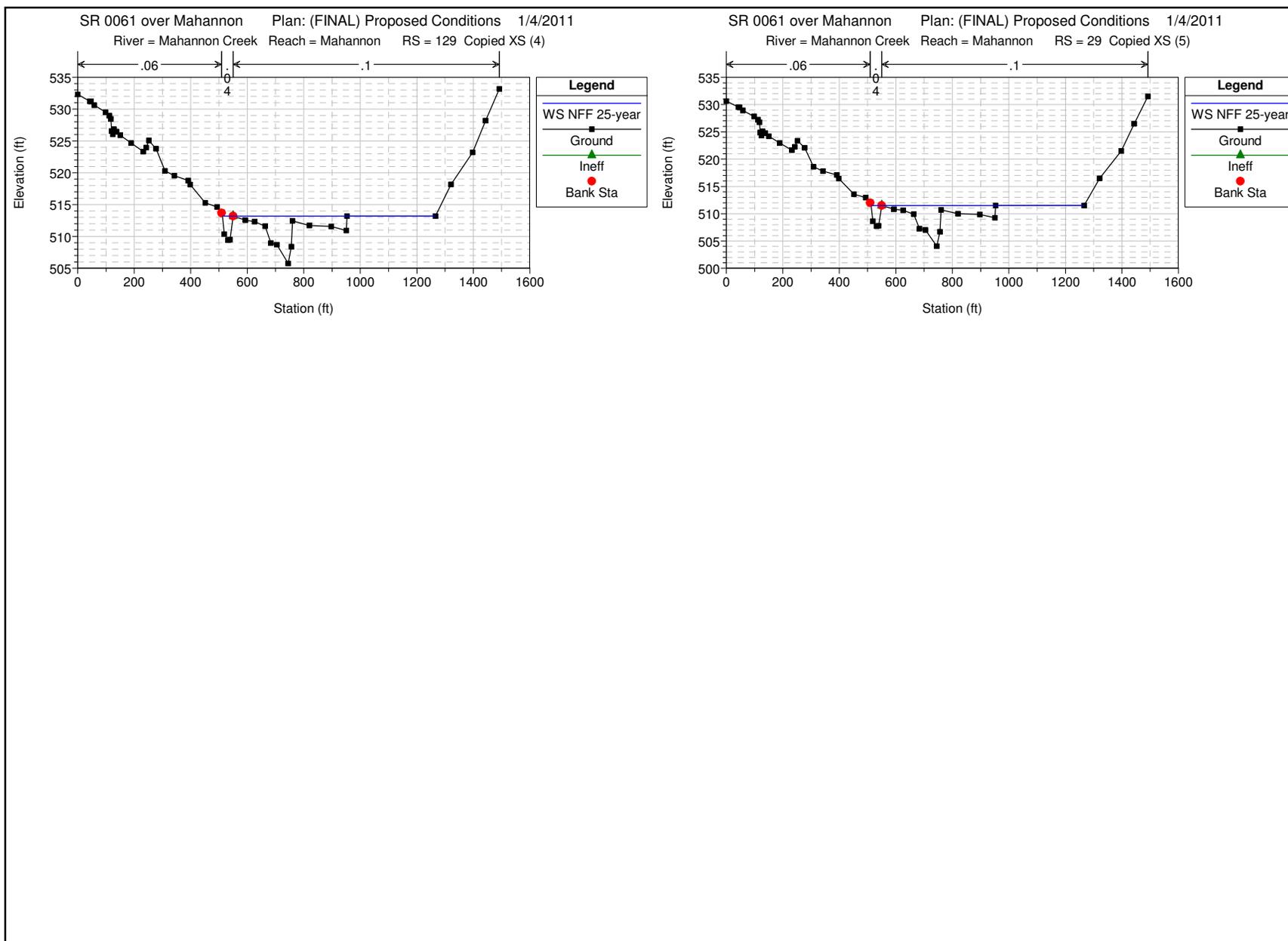








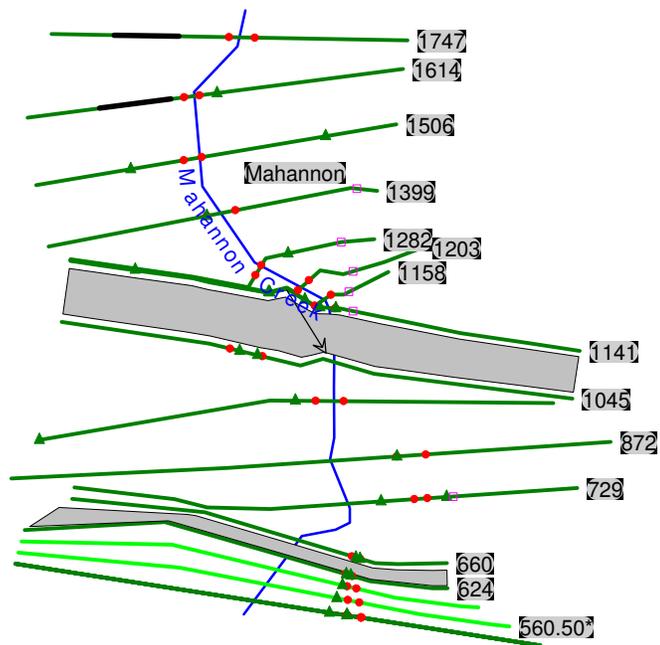




APPENDIX C-2

Proposed Conditions HEC-RAS Modeling

**Appendix Includes: 50-Year Water Surface Profile, Cross Sections (US to DS),
Hydraulic Properties Tables**



HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

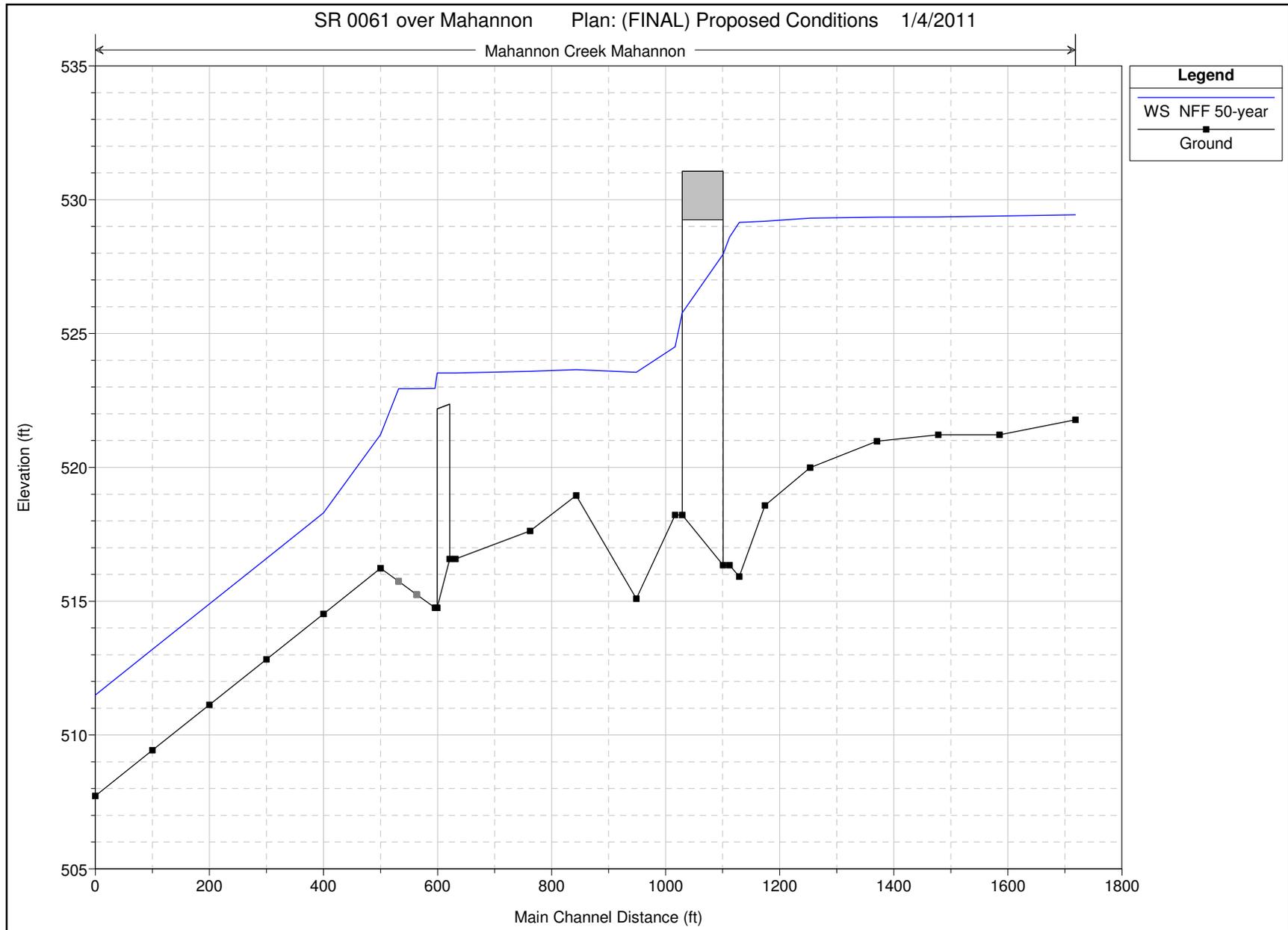
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	NFF 50-year	1610.00	521.78	529.44	527.53	529.58	0.001220	3.84	808.54	270.26	0.29
Mahannon	1614	NFF 50-year	1610.00	521.22	529.39	526.92	529.46	0.000727	3.21	1125.28	326.65	0.23
Mahannon	1506	NFF 50-year	1610.00	521.22	529.36	525.85	529.40	0.000358	2.47	1472.56	434.73	0.16
Mahannon	1399	NFF 50-year	1610.00	520.98	529.35	525.10	529.37	0.000139	1.59	2170.31	482.71	0.11
Mahannon	1282	NFF 50-year	1610.00	519.99	529.31	525.03	529.35	0.000287	2.53	1656.49	409.98	0.15
Mahannon	1203	NFF 50-year	1610.00	518.58	529.20	524.83	529.32	0.000497	3.58	859.55	339.64	0.20
Mahannon	1158	NFF 50-year	1610.00	515.92	529.16	524.21	529.30	0.000563	3.56	747.88	315.97	0.21
Mahannon	1141	NFF 50-year	1610.00	516.35	528.60	523.60	529.16	0.001419	6.01	269.84	279.00	0.34
Mahannon	1100			Bridge								
Mahannon	1045	NFF 50-year	1610.00	518.22	524.51	524.51	527.19	0.013921	13.13	122.62	53.87	1.00
Mahannon	977	NFF 50-year	1610.00	515.09	523.55	521.85	524.25	0.004691	6.82	273.74	146.23	0.55
Mahannon	872	NFF 50-year	1610.00	518.95	523.65	521.95	523.71	0.001079	2.75	1478.73	671.77	0.26
Mahannon	729	NFF 50-year	1610.00	517.63	523.59	522.25	523.65	0.000959	3.16	1516.08	652.58	0.26
Mahannon	660	NFF 50-year	1610.00	516.58	523.53	522.25	523.59	0.000793	3.40	1640.24	741.96	0.24
Mahannon	650			Bridge								
Mahannon	624	NFF 50-year	1610.00	514.76	522.95	522.25	522.97	0.000384	2.44	2356.91	791.73	0.17
Mahannon	592.50*	NFF 50-year	1610.00	515.25	522.94	521.76	522.96	0.000243	1.87	2694.21	816.26	0.13
Mahannon	560.50*	NFF 50-year	1610.00	515.74	522.94	521.46	522.95	0.000177	1.54	2996.43	840.25	0.11
Mahannon	529	NFF 50-year	1610.00	516.23	521.22	521.22	522.51	0.012659	9.65	230.53	782.96	0.89
Mahannon	429	NFF 50-year	1610.00	514.53	518.30	518.30	518.46	0.005831	5.32	950.89	753.63	0.58
Mahannon	329	NFF 50-year	1610.00	512.83	516.60	516.60	516.76	0.005831	5.32	950.88	753.63	0.58
Mahannon	229	NFF 50-year	1610.00	511.13	514.90	514.90	515.06	0.005831	5.32	950.90	753.63	0.58
Mahannon	129	NFF 50-year	1610.00	509.43	513.20	513.20	513.36	0.005831	5.32	950.90	753.63	0.58
Mahannon	29	NFF 50-year	1610.00	507.73	511.50	511.50	511.66	0.005838	5.32	950.50	753.63	0.58

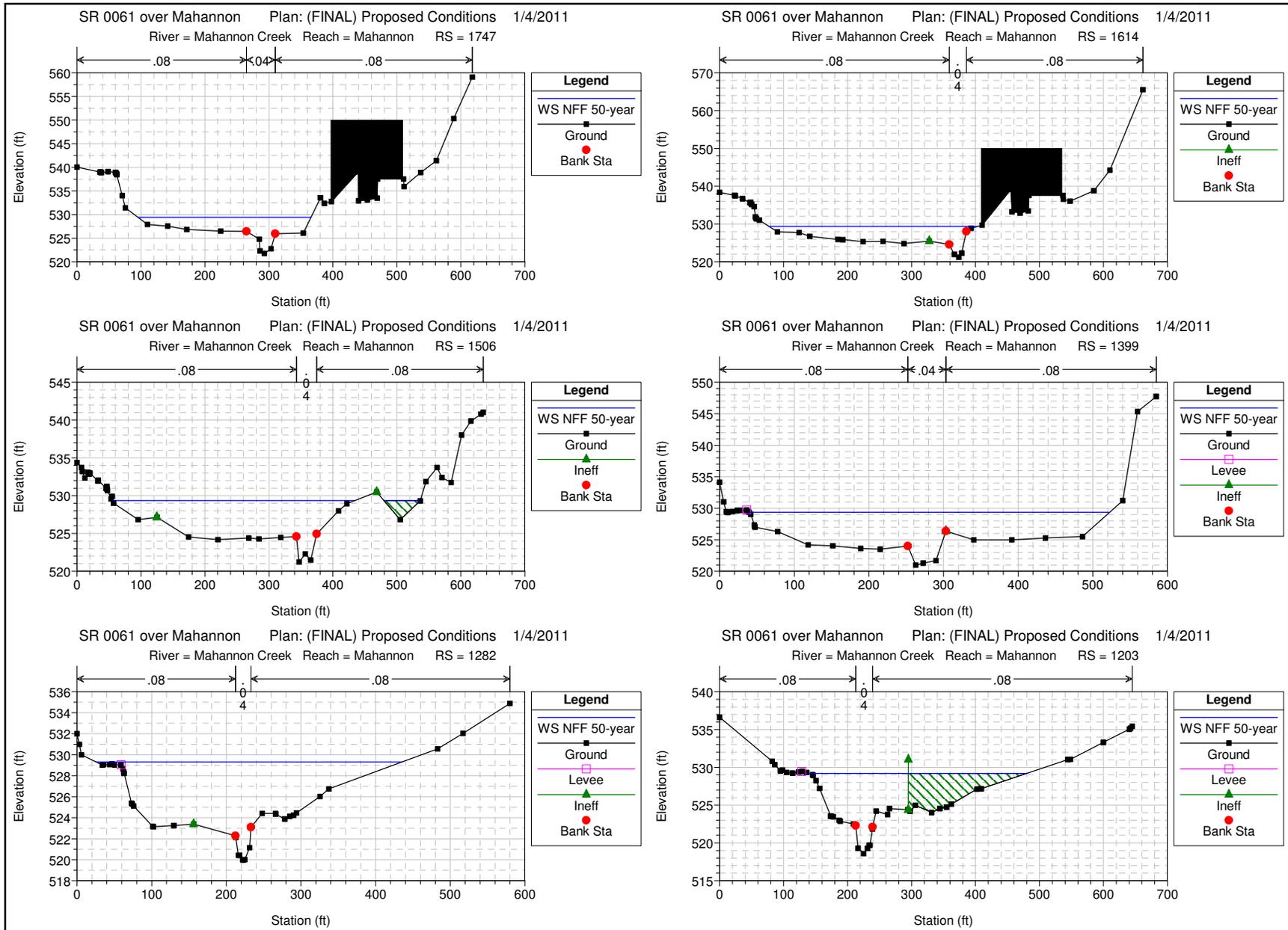
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

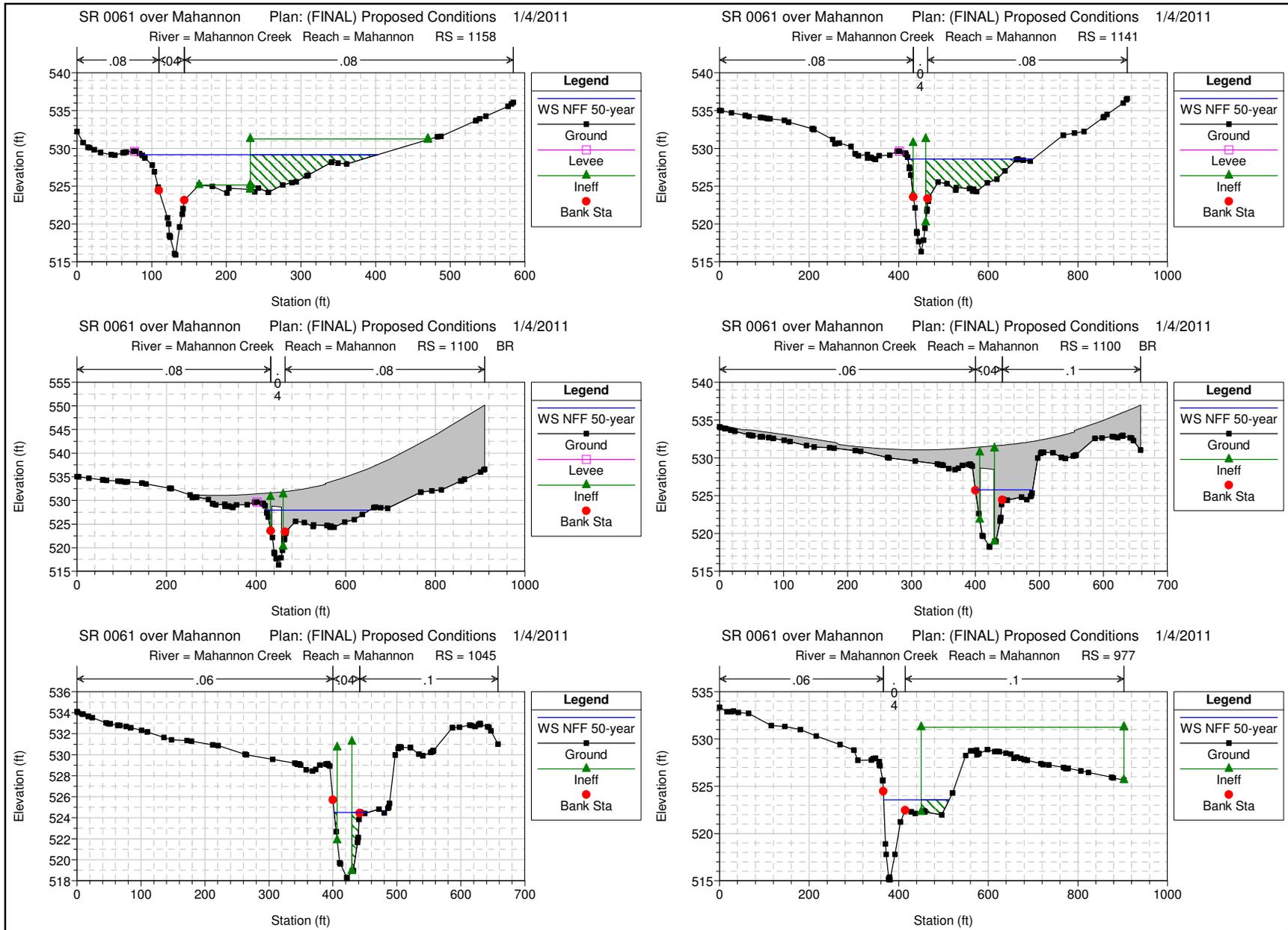
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	NFF 50-year	529.58	529.44	0.14	0.10	0.02	457.10	923.83	229.07	270.26
Mahannon	1614	NFF 50-year	529.46	529.39	0.07	0.05	0.01	1062.33	544.61	3.06	326.65
Mahannon	1506	NFF 50-year	529.40	529.36	0.04	0.02	0.01	1003.59	546.67	59.74	434.73
Mahannon	1399	NFF 50-year	529.37	529.35	0.02	0.02	0.00	609.45	571.98	428.57	482.71
Mahannon	1282	NFF 50-year	529.35	529.31	0.04	0.02	0.01	766.69	448.15	395.17	409.98
Mahannon	1203	NFF 50-year	529.32	529.20	0.12	0.02	0.01	364.37	906.63	339.00	339.64
Mahannon	1158	NFF 50-year	529.30	529.16	0.14	0.01	0.13	20.44	1102.17	487.39	315.97
Mahannon	1141	NFF 50-year	529.16	528.60	0.56	0.03	0.23	5.73	1604.27		279.00
Mahannon	1100	Bridge									
Mahannon	1045	NFF 50-year	527.19	524.51	2.68	0.56	0.99		1610.00		53.87
Mahannon	977	NFF 50-year	524.25	523.55	0.70	0.22	0.32		1555.21	54.79	146.23
Mahannon	872	NFF 50-year	523.71	523.65	0.05	0.06	0.00	8.15	607.54	994.32	671.77
Mahannon	729	NFF 50-year	523.65	523.59	0.06	0.05	0.00	81.16	525.98	1002.86	652.58
Mahannon	660	NFF 50-year	523.59	523.53	0.07				534.79	1075.21	741.96
Mahannon	650	Bridge									
Mahannon	624	NFF 50-year	522.97	522.95	0.02	0.01	0.00		251.52	1358.48	791.73
Mahannon	592.50'	NFF 50-year	522.96	522.94	0.01	0.01	0.00	6.66	313.23	1290.11	816.26
Mahannon	560.50'	NFF 50-year	522.95	522.94	0.01	0.05	0.38	14.99	300.91	1294.11	840.25
Mahannon	529	NFF 50-year	522.51	521.22	1.29	0.86	0.56	6.52	1425.70	177.78	782.96
Mahannon	429	NFF 50-year	518.46	518.30	0.16	0.58	0.00		528.78	1081.22	753.63
Mahannon	329	NFF 50-year	516.76	516.60	0.16	0.58	0.00		528.79	1081.21	753.63
Mahannon	229	NFF 50-year	515.06	514.90	0.16	0.58	0.00		528.79	1081.21	753.63
Mahannon	129	NFF 50-year	513.36	513.20	0.16	0.58	0.00		528.79	1081.22	753.63
Mahannon	29	NFF 50-year	511.66	511.50	0.16				528.93	1081.07	753.63

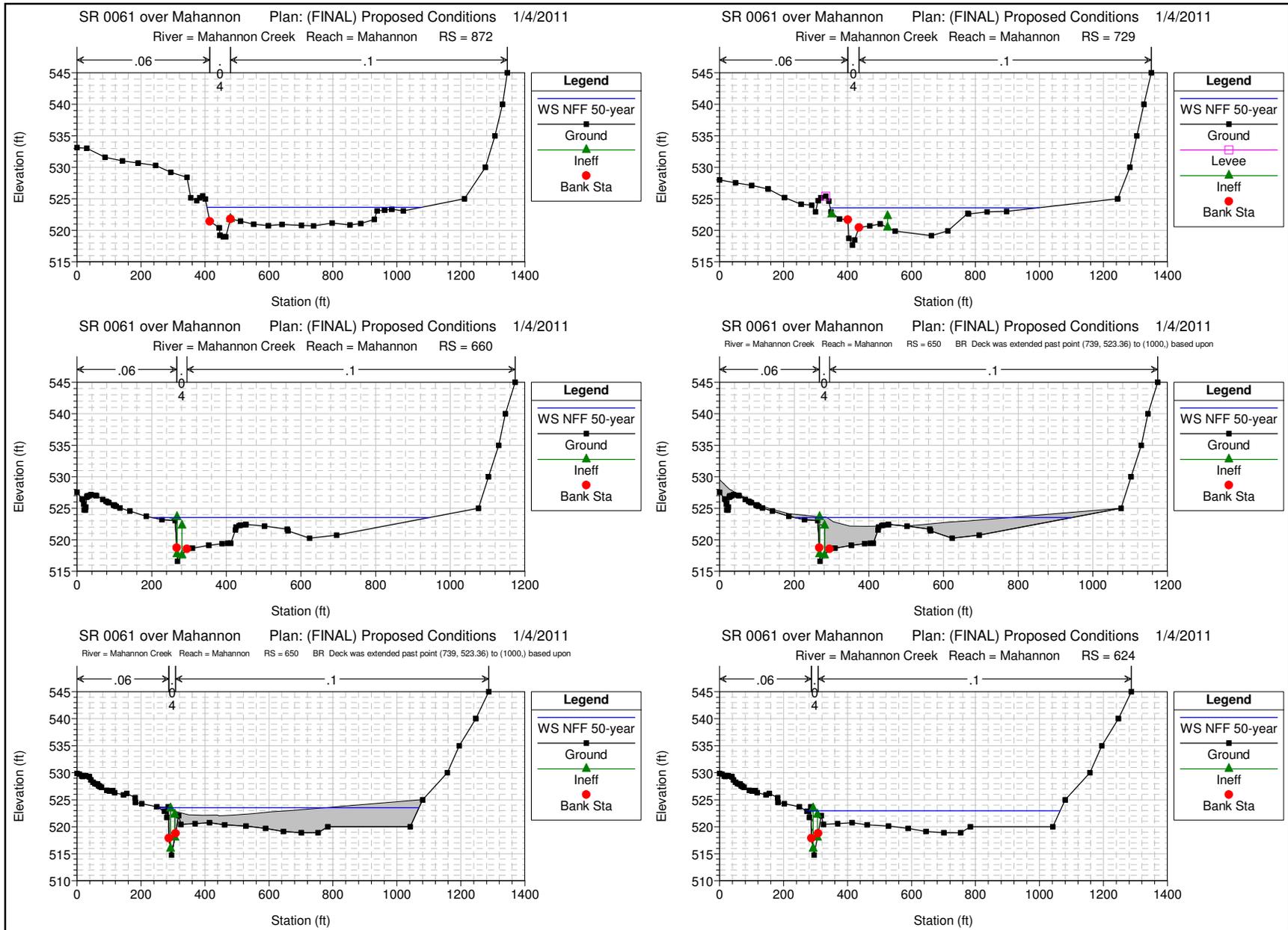
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: NFF 50-year

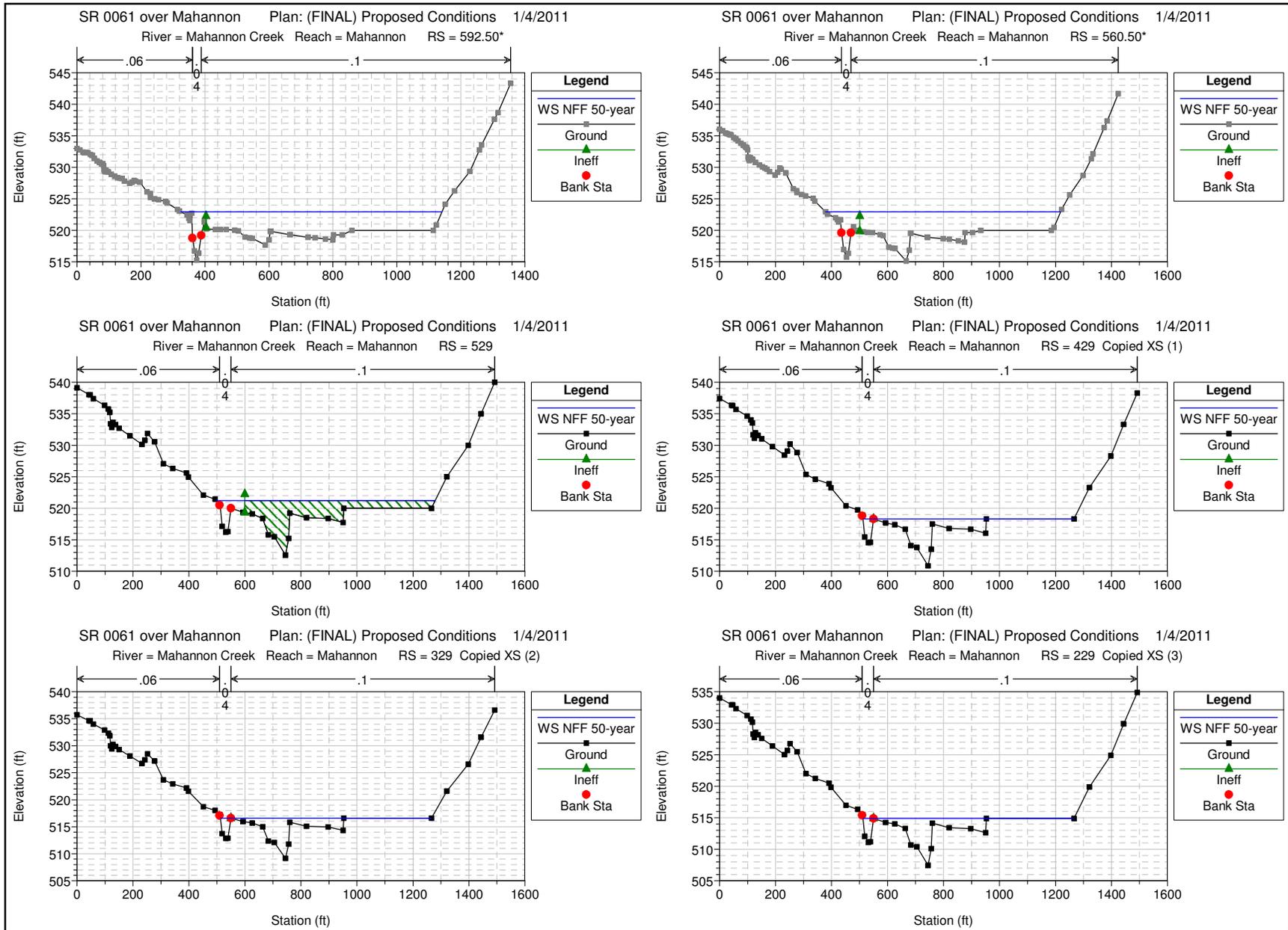
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	NFF 50-year	529.30	529.16	524.21	0.01	0.13	315.97	20.44	1102.17	487.39	3.56
Mahannon	1141	NFF 50-year	529.16	528.60	523.60	0.03	0.23	279.00	5.73	1604.27		6.01
Mahannon	1100 BR U	NFF 50-year	528.90	527.96	523.87	0.51	0.63	21.24		1610.00		7.77
Mahannon	1100 BR D	NFF 50-year	527.76	525.78	524.70	0.15	0.42	21.25		1610.00		11.30
Mahannon	1045	NFF 50-year	527.19	524.51	524.51	0.56	0.99	53.87		1610.00		13.13
Mahannon	977	NFF 50-year	524.25	523.55	521.85	0.22	0.32	146.23		1555.21	54.79	6.82
Mahannon	729	NFF 50-year	523.65	523.59	522.25	0.05	0.00	652.58	81.16	525.98	1002.86	3.16
Mahannon	660	NFF 50-year	523.59	523.53	522.25			741.96		534.79	1075.21	3.40
Mahannon	650 BR U	NFF 50-year	523.59	523.53	523.61			486.16		368.45	1241.44	5.07
Mahannon	650 BR D	NFF 50-year	523.59	523.53	523.54			486.16		368.45	1241.44	4.07
Mahannon	624	NFF 50-year	522.97	522.95	522.25	0.01	0.00	791.73		251.52	1358.48	2.44
Mahannon	592.50*	NFF 50-year	522.96	522.94	521.76	0.01	0.00	816.26	6.66	313.23	1290.11	1.87

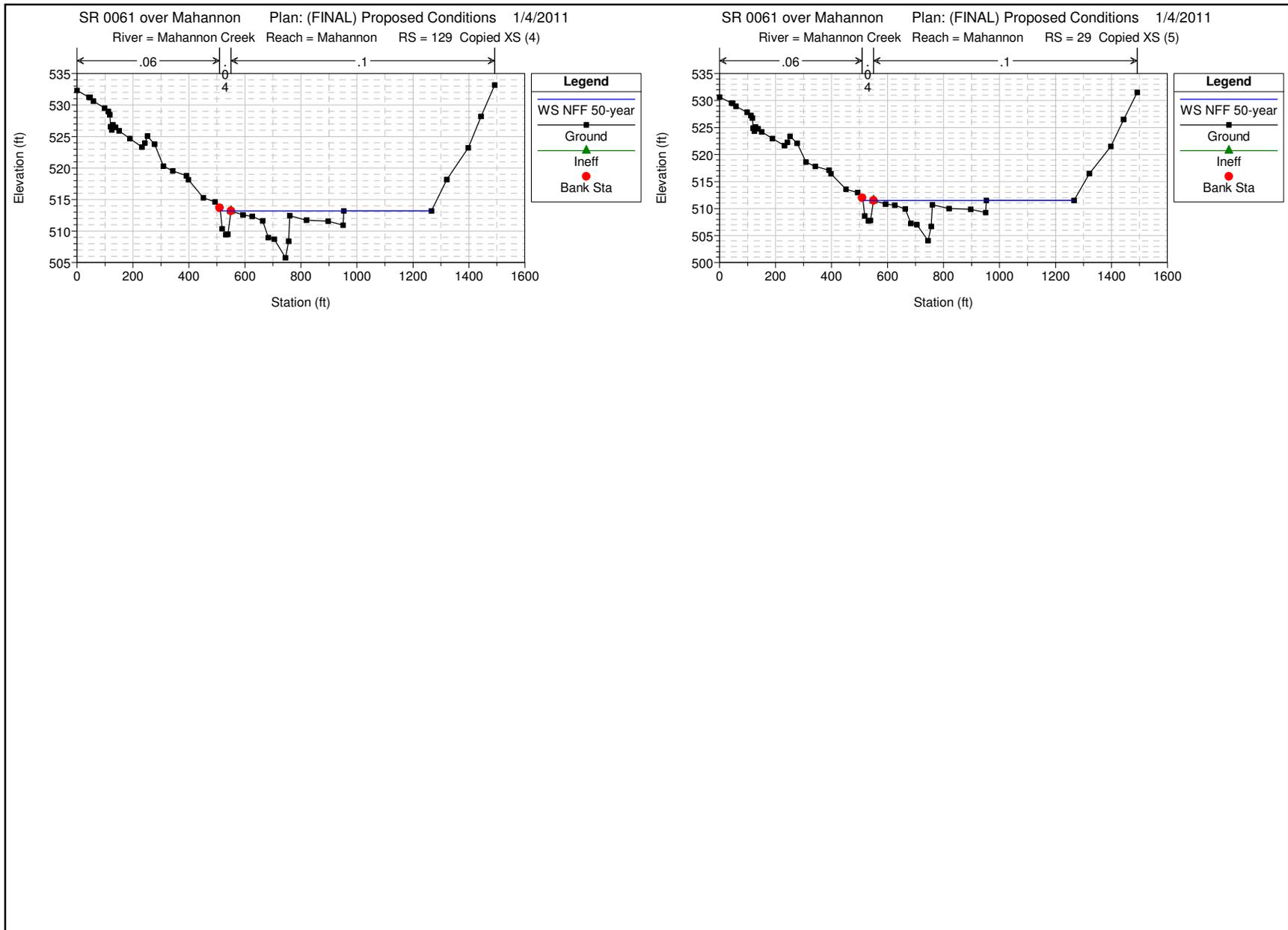








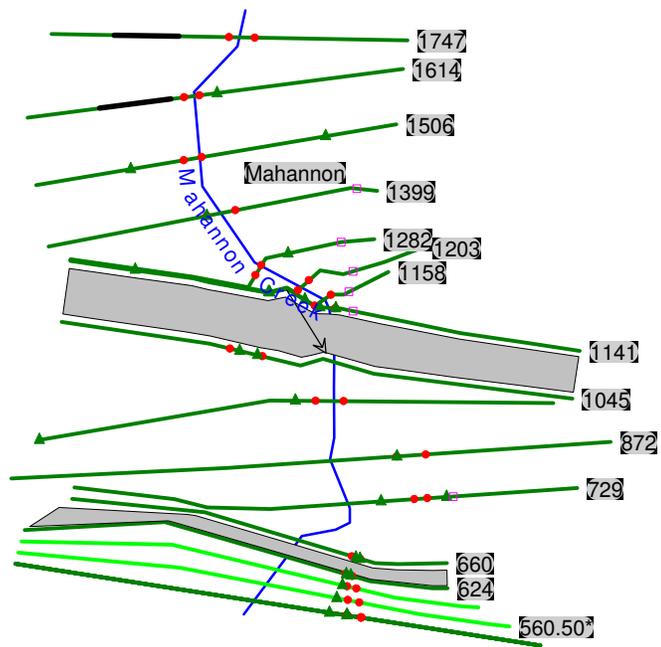




APPENDIX C-3

Proposed Conditions HEC-RAS Modeling

Appendix Includes: 100-Year Water Surface Profile, Cross Sections (US to DS)



HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

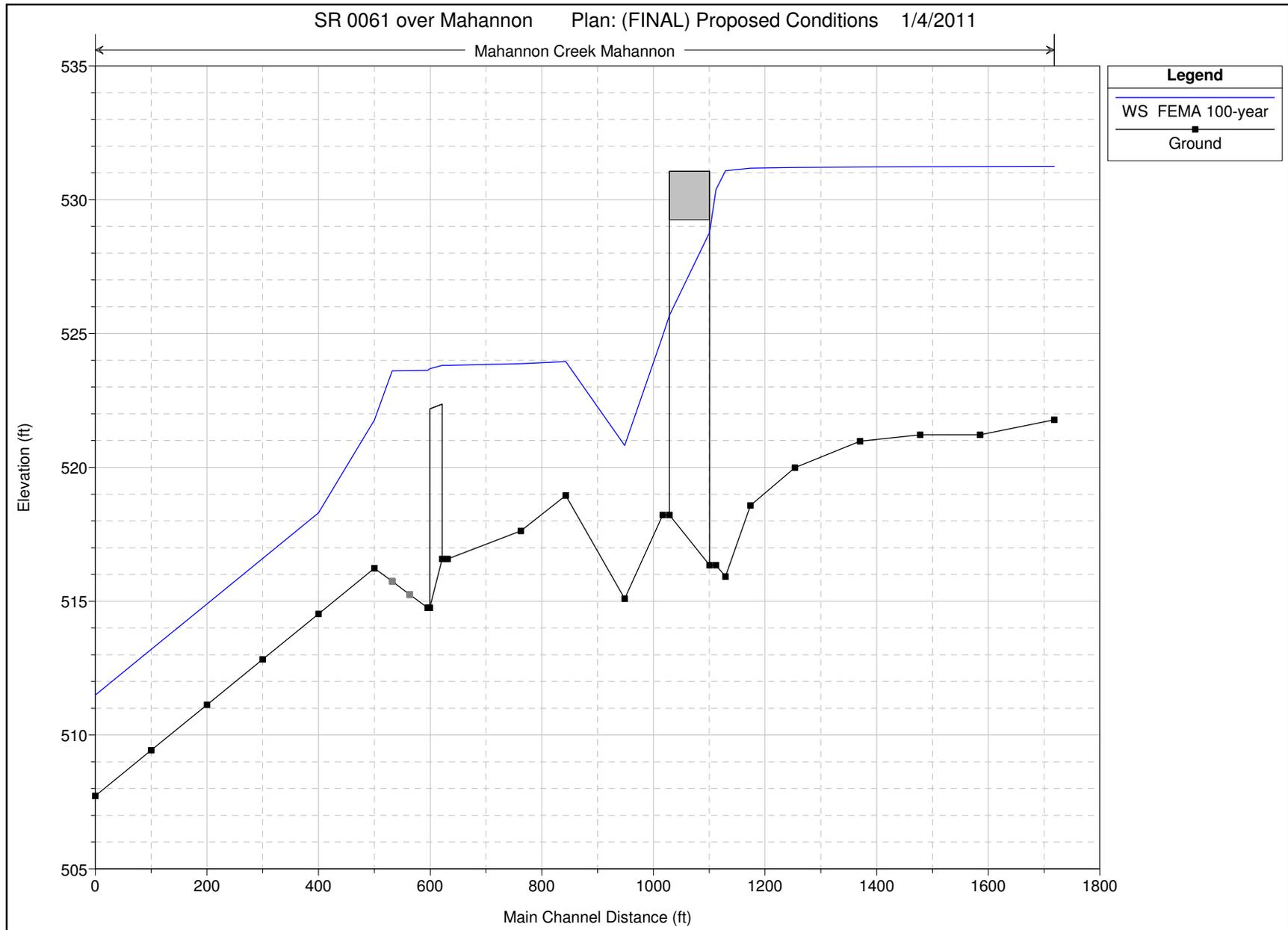
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mahannon	1747	FEMA 100-year	2040.00	521.78	531.25	527.86	531.33	0.000516	3.04	1321.75	294.66	0.20
Mahannon	1614	FEMA 100-year	2040.00	521.22	531.24	527.20	531.28	0.000328	2.56	1753.77	349.41	0.16
Mahannon	1506	FEMA 100-year	2040.00	521.22	531.23	526.12	531.25	0.000163	1.95	2435.40	500.39	0.12
Mahannon	1399	FEMA 100-year	2040.00	520.98	531.22	525.41	531.24	0.000080	1.41	3144.29	534.85	0.08
Mahannon	1282	FEMA 100-year	2040.00	519.99	531.20	525.35	531.22	0.000157	2.14	2528.26	495.36	0.12
Mahannon	1203	FEMA 100-year	2040.00	518.58	531.18	525.36	531.22	0.000188	2.49	2217.39	473.94	0.13
Mahannon	1158	FEMA 100-year	2040.00	515.92	531.08	525.55	531.19	0.000366	3.26	1147.35	460.73	0.17
Mahannon	1141	FEMA 100-year	2040.00	516.35	530.38	524.44	531.02	0.001300	6.44	319.63	452.34	0.33
Mahannon	1100	Bridge										
Mahannon	1045	FEMA 100-year	2040.00	518.22	524.93	525.44	528.62	0.017401	15.43	132.18	84.89	1.13
Mahannon	977	FEMA 100-year	2040.00	515.09	520.81	522.78	526.06	0.055042	18.38	111.00	33.62	1.78
Mahannon	872	FEMA 100-year	2040.00	518.95	523.95	522.09	524.01	0.001219	3.09	1683.63	702.42	0.28
Mahannon	729	FEMA 100-year	2040.00	517.63	523.87	522.25	523.95	0.001162	3.62	1709.15	703.33	0.28
Mahannon	660	FEMA 100-year	2040.00	516.58	523.81	522.25	523.88	0.000920	3.73	1892.64	787.65	0.26
Mahannon	650	Bridge										
Mahannon	624	FEMA 100-year	2040.00	514.76	523.62	522.25	523.64	0.000304	2.29	2940.48	817.19	0.15
Mahannon	592.50*	FEMA 100-year	2040.00	515.25	523.62	522.25	523.63	0.000220	1.91	3252.97	841.76	0.13
Mahannon	560.50*	FEMA 100-year	2040.00	515.74	523.61	522.14	523.62	0.000167	1.61	3570.40	862.74	0.11
Mahannon	529	FEMA 100-year	2040.00	516.23	521.76	521.76	523.16	0.011805	10.22	290.73	813.14	0.88
Mahannon	429	FEMA 100-year	2040.00	514.53	518.30	518.30	518.56	0.009371	6.74	950.57	753.63	0.73
Mahannon	329	FEMA 100-year	2040.00	512.83	516.60	516.60	516.86	0.009371	6.75	950.56	753.63	0.73
Mahannon	229	FEMA 100-year	2040.00	511.13	514.90	514.90	515.16	0.009370	6.74	950.58	753.63	0.73
Mahannon	129	FEMA 100-year	2040.00	509.43	513.20	513.20	513.46	0.009371	6.74	950.57	753.63	0.73
Mahannon	29	FEMA 100-year	2040.00	507.73	511.50	511.50	511.76	0.009371	6.75	950.55	753.63	0.73

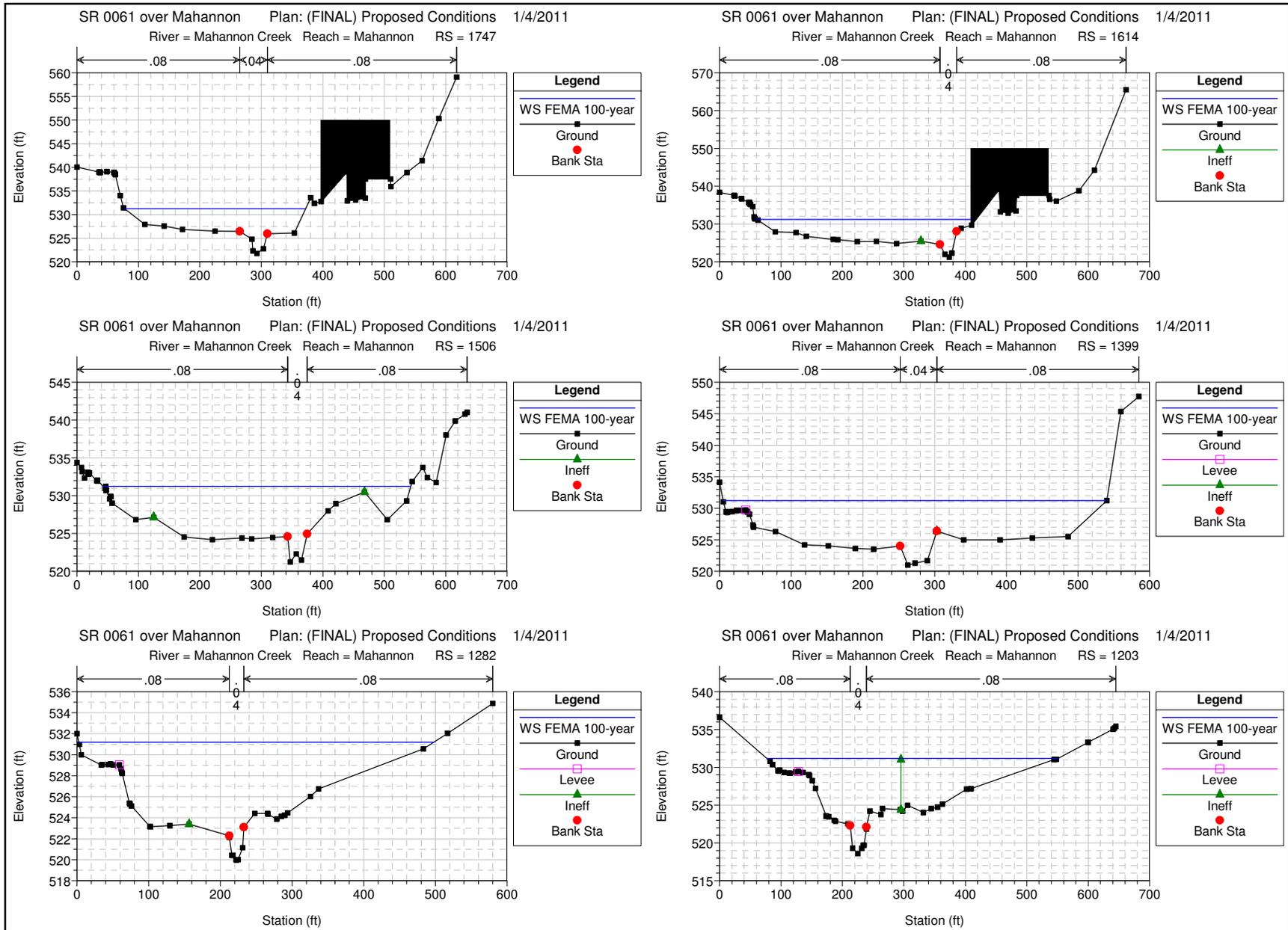
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

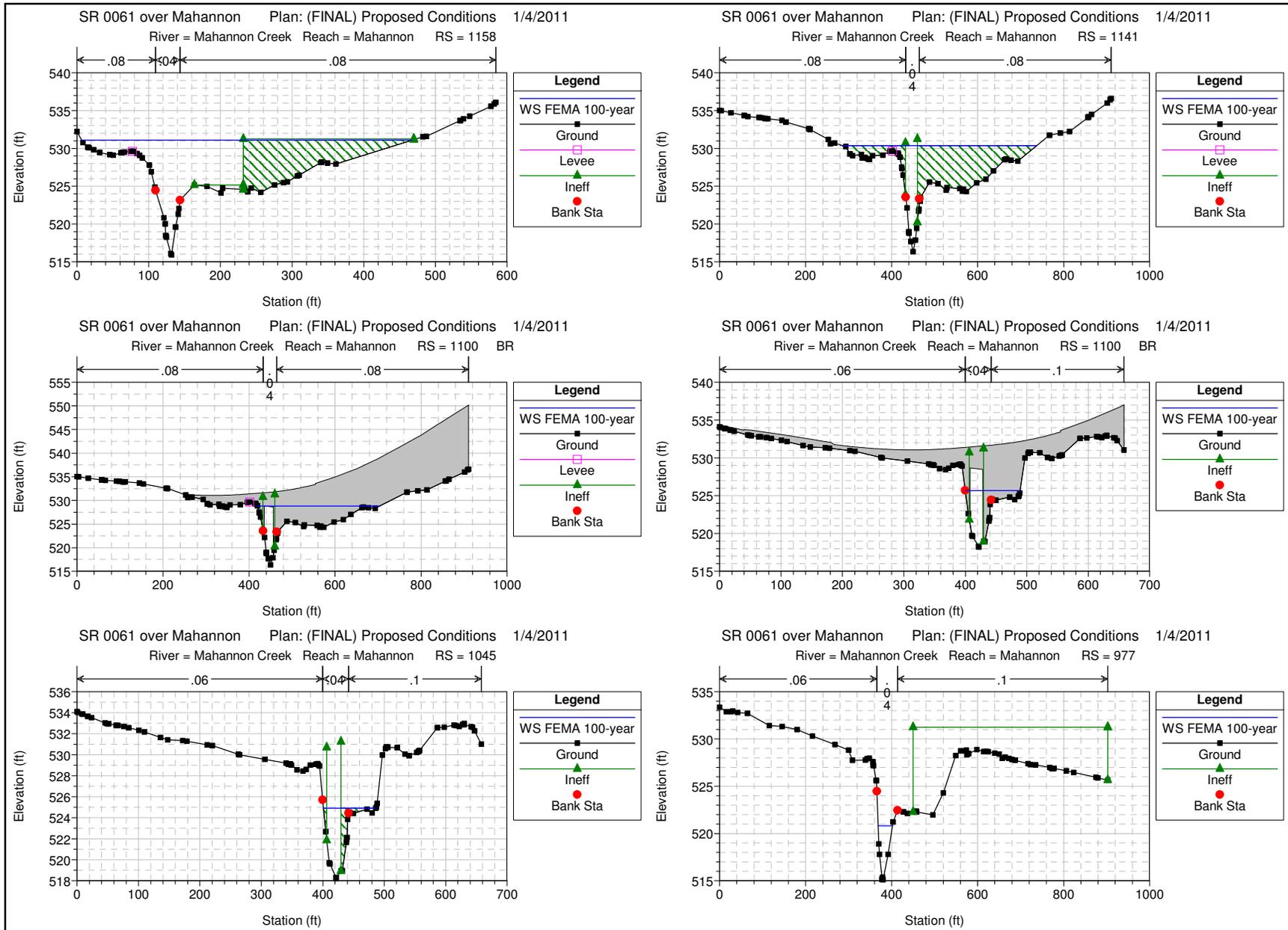
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1747	FEMA 100-year	531.33	531.25	0.08	0.04	0.01	749.88	977.07	313.05	294.66
Mahannon	1614	FEMA 100-year	531.28	531.24	0.04	0.02	0.01	1448.89	562.92	28.19	349.41
Mahannon	1506	FEMA 100-year	531.25	531.23	0.02	0.01	0.00	1273.43	548.04	218.53	500.39
Mahannon	1399	FEMA 100-year	531.24	531.22	0.01	0.01	0.00	778.34	640.74	620.92	534.85
Mahannon	1282	FEMA 100-year	531.22	531.20	0.02	0.01	0.00	964.13	460.98	614.89	495.36
Mahannon	1203	FEMA 100-year	531.22	531.18	0.04	0.01	0.02	370.19	761.06	908.75	473.94
Mahannon	1158	FEMA 100-year	531.19	531.08	0.11	0.01	0.16	109.85	1223.73	706.43	460.73
Mahannon	1141	FEMA 100-year	531.02	530.38	0.64			9.21	2030.79		452.34
Mahannon	1100	Bridge									
Mahannon	1045	FEMA 100-year	528.62	524.93	3.70				2040.00		84.89
Mahannon	977	FEMA 100-year	526.06	520.81	5.25	2.10	0.46		2040.00		33.62
Mahannon	872	FEMA 100-year	524.01	523.95	0.06	0.07	0.00	12.09	742.53	1285.38	702.42
Mahannon	729	FEMA 100-year	523.95	523.87	0.07	0.06	0.00	118.55	638.23	1283.22	703.33
Mahannon	660	FEMA 100-year	523.88	523.81	0.07			27.10	635.63	1377.27	787.65
Mahannon	650	Bridge									
Mahannon	624	FEMA 100-year	523.64	523.62	0.02	0.01	0.00	9.59	339.99	1690.41	817.19
Mahannon	592.50*	FEMA 100-year	523.63	523.62	0.01	0.01	0.00	19.45	355.85	1664.70	841.76
Mahannon	560.50*	FEMA 100-year	523.62	523.61	0.01	0.05	0.42	35.24	351.54	1653.22	862.74
Mahannon	529	FEMA 100-year	523.16	521.76	1.40	1.05	0.57	25.08	1735.05	279.87	813.14
Mahannon	429	FEMA 100-year	518.56	518.30	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	329	FEMA 100-year	516.86	516.60	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	229	FEMA 100-year	515.16	514.90	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	129	FEMA 100-year	513.46	513.20	0.26	0.94	0.00		670.17	1369.83	753.63
Mahannon	29	FEMA 100-year	511.76	511.50	0.26				670.18	1369.82	753.63

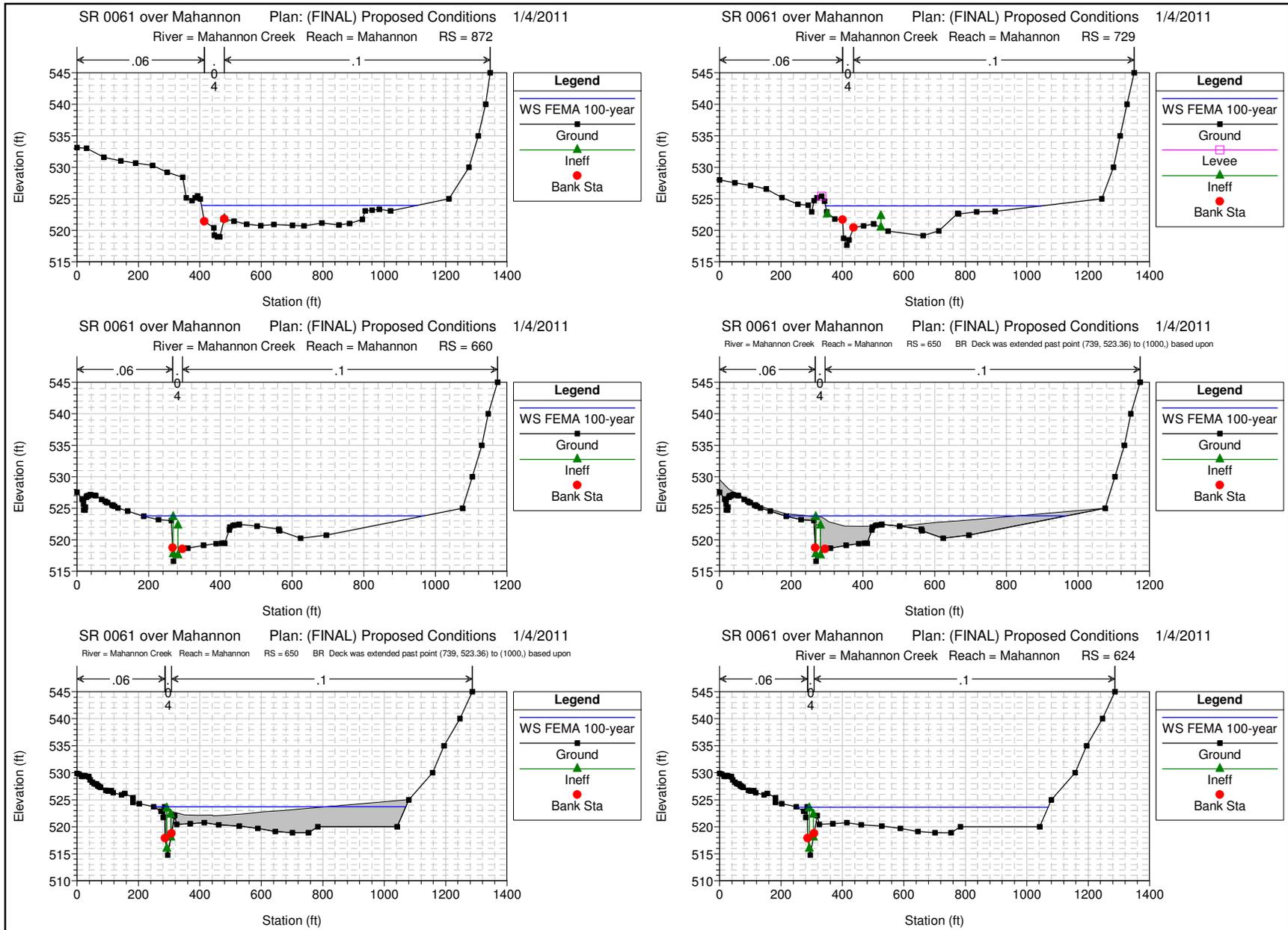
HEC-RAS Plan: (FINAL) Proposed River: Mahannon Creek Reach: Mahannon Profile: FEMA 100-year

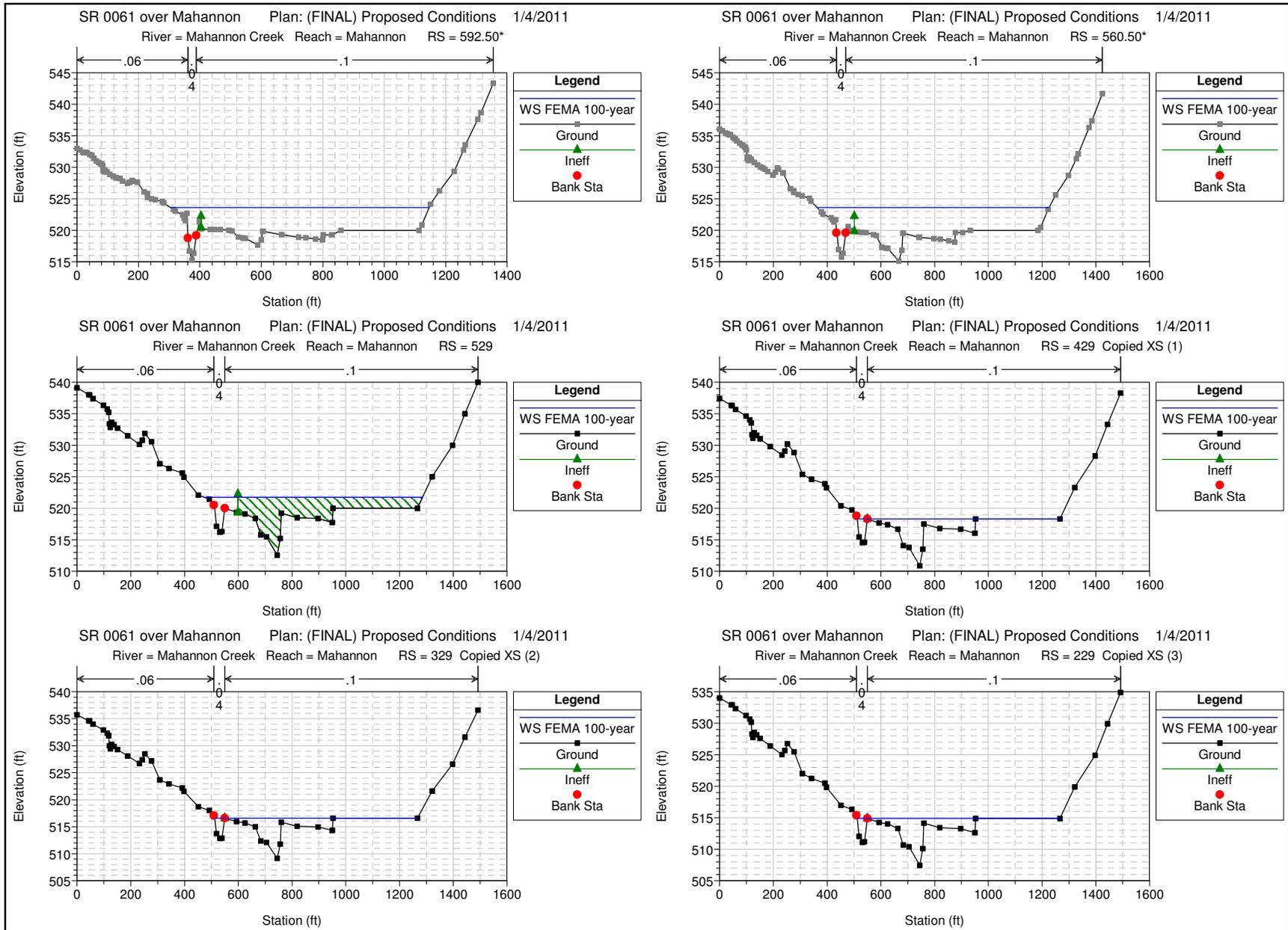
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	1158	FEMA 100-year	531.19	531.08	525.55	0.01	0.16	460.73	109.85	1223.73	706.43	3.26
Mahannon	1141	FEMA 100-year	531.02	530.38	524.44			452.34	9.21	2030.79		6.44
Mahannon	1100 BR U	FEMA 100-year	531.02	528.78	524.84					2040.00		9.16
Mahannon	1100 BR D	FEMA 100-year	528.96	525.68	525.68			21.25		2040.00		14.55
Mahannon	1045	FEMA 100-year	528.62	524.93	525.44			84.89		2040.00		15.43
Mahannon	977	FEMA 100-year	526.06	520.81	522.78	2.10	0.46	33.62		2040.00		18.38
Mahannon	729	FEMA 100-year	523.95	523.87	522.25	0.06	0.00	703.33	118.55	638.23	1283.22	3.62
Mahannon	660	FEMA 100-year	523.88	523.81	522.25			787.65	27.10	635.63	1377.27	3.73
Mahannon	650 BR U	FEMA 100-year	523.89	523.81	523.63			590.68	5.21	244.86	1795.34	3.04
Mahannon	650 BR D	FEMA 100-year	523.89	523.69	523.69			546.62	5.21	244.86	1795.34	2.53
Mahannon	624	FEMA 100-year	523.64	523.62	522.25	0.01	0.00	817.19	9.59	339.99	1690.41	2.29
Mahannon	592.50*	FEMA 100-year	523.63	523.62	522.25	0.01	0.00	841.76	19.45	355.85	1664.70	1.91

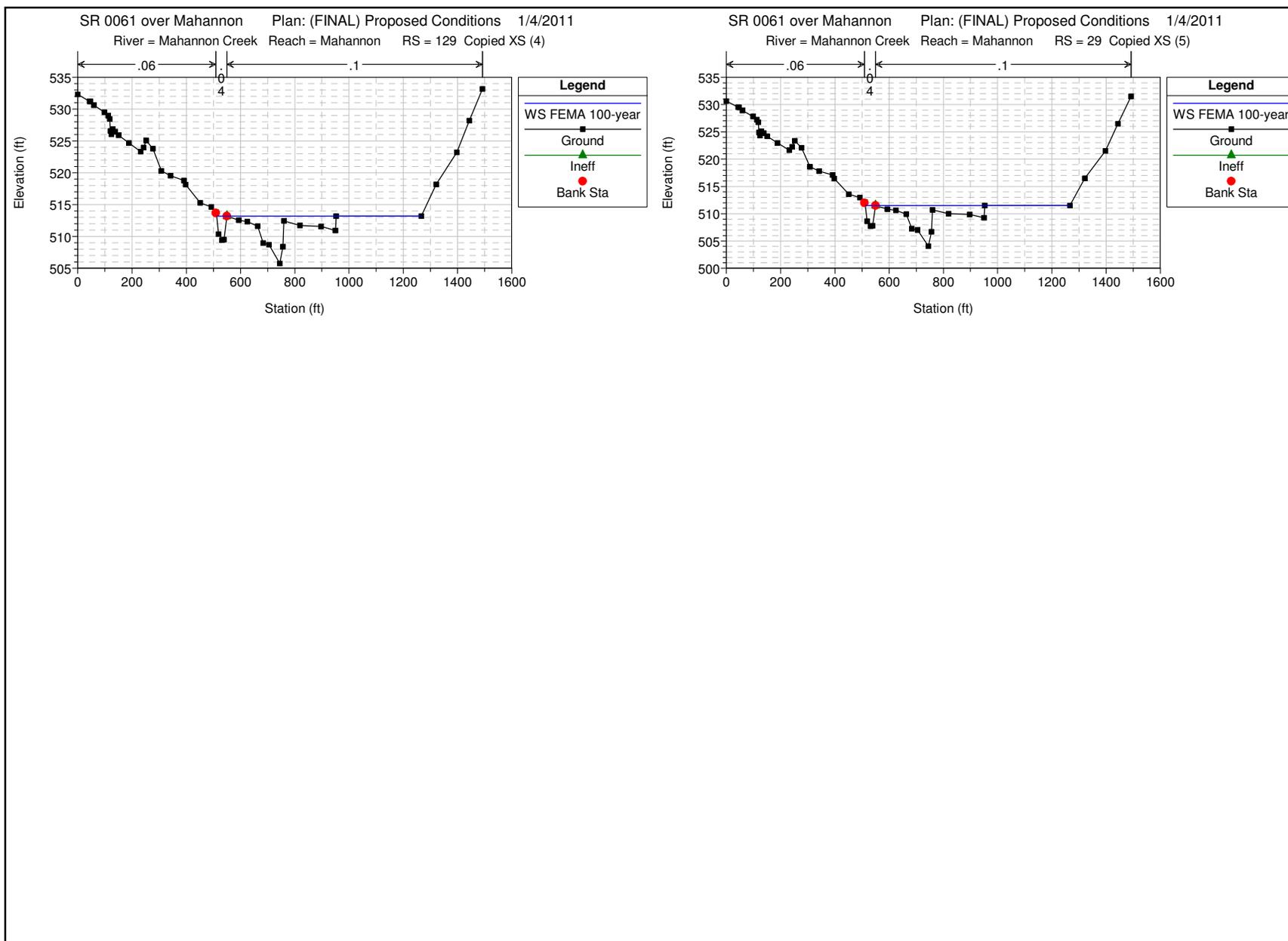








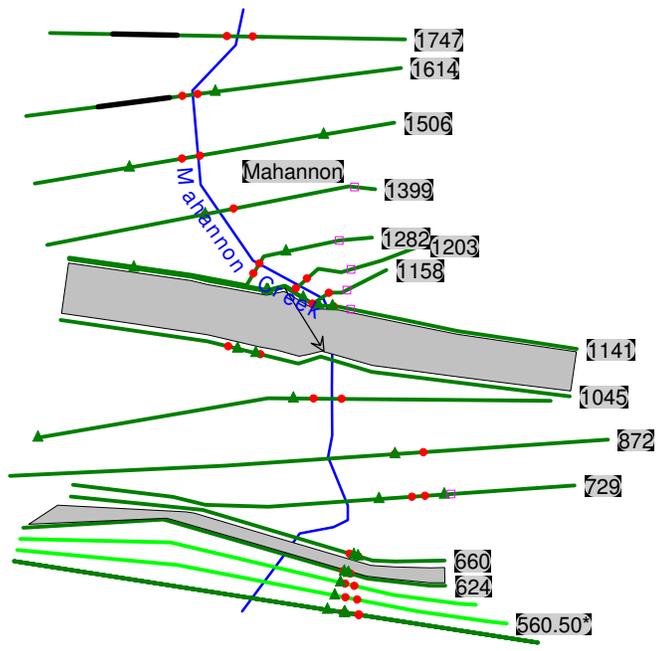




APPENDIX C-4

Temporary Conditions HEC-RAS Modeling

Appendix Includes: Base Flow, and 2.33-Year Water Surface Profiles, Cross Sections (US to DS), Hydraulic Properties Tables



HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon

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
Mahannon	1747	NFF 1-year	100.00	521.78	524.25	523.22	524.36	0.002459	2.61	38.26	21.07	0.34
Mahannon	1747	NFF 2.33-year	400.00	521.78	526.29	524.71	526.53	0.004012	3.97	110.71	87.59	0.46
Mahannon	1747	NFF 10-year	914.00	521.78	528.43	526.65	528.53	0.001078	3.14	542.71	256.72	0.27
Mahannon	1747	NSS Base Flow	4.21	521.78	522.39	522.17	522.40	0.003539	1.02	4.11	12.94	0.32
Mahannon	1614	NFF 1-year	100.00	521.22	523.74	522.97	523.91	0.004537	3.32	30.12	18.78	0.46
Mahannon	1614	NFF 2.33-year	400.00	521.22	525.65	524.60	525.98	0.004349	4.89	138.73	178.49	0.50
Mahannon	1614	NFF 10-year	914.00	521.22	528.38	526.25	528.43	0.000592	2.58	809.64	302.25	0.20
Mahannon	1614	NSS Base Flow	4.21	521.22	522.16	521.70	522.17	0.000899	0.71	5.93	11.48	0.17
Mahannon	1506	NFF 1-year	100.00	521.22	523.19	522.70	523.35	0.005869	3.19	31.33	25.26	0.51
Mahannon	1506	NFF 2.33-year	400.00	521.22	525.61	523.97	525.68	0.001008	2.48	325.67	228.23	0.24
Mahannon	1506	NFF 10-year	914.00	521.22	528.36	525.28	528.38	0.000248	1.85	1112.11	379.70	0.13
Mahannon	1506	NSS Base Flow	4.21	521.22	521.91	521.72	521.93	0.005230	1.15	3.67	12.73	0.38
Mahannon	1399	NFF 1-year	100.00	520.98	522.88	522.08	522.94	0.002059	2.02	49.46	37.18	0.31
Mahannon	1399	NFF 2.33-year	400.00	520.98	525.57	523.09	525.60	0.000385	1.64	420.10	370.94	0.16
Mahannon	1399	NFF 10-year	914.00	520.98	528.36	524.46	528.37	0.000092	1.16	1696.43	469.07	0.08
Mahannon	1399	NSS Base Flow	4.21	520.98	521.54	521.31	521.55	0.002403	0.73	5.74	22.40	0.26
Mahannon	1282	NFF 1-year	100.00	519.99	522.61	521.44	522.70	0.002001	2.51	42.08	36.13	0.32
Mahannon	1282	NFF 2.33-year	400.00	519.99	525.54	523.15	525.57	0.000327	1.84	510.84	243.22	0.15
Mahannon	1282	NFF 10-year	914.00	519.99	528.34	524.33	528.35	0.000151	1.70	1300.66	335.63	0.11
Mahannon	1282	NSS Base Flow	4.21	519.99	520.31	520.31	520.42	0.037999	2.57	1.64	7.69	0.98
Mahannon	1203	NFF 1-year	100.00	518.58	522.60	520.03	522.62	0.000287	1.26	80.49	36.25	0.13
Mahannon	1203	NFF 2.33-year	400.00	518.58	525.49	521.42	525.54	0.000295	1.99	340.59	205.16	0.14
Mahannon	1203	NFF 10-year	914.00	518.58	528.28	523.15	528.34	0.000247	2.36	724.12	297.12	0.14
Mahannon	1203	NSS Base Flow	4.21	518.58	519.32	518.99	519.33	0.001525	0.75	5.62	15.05	0.22
Mahannon	1158	NFF 1-year	100.00	515.92	522.59	518.44	522.61	0.000202	1.09	91.67	27.24	0.10
Mahannon	1158	NFF 2.33-year	400.00	515.92	525.47	520.47	525.53	0.000369	2.04	262.07	180.51	0.15
Mahannon	1158	NFF 10-year	914.00	515.92	528.26	522.48	528.33	0.000289	2.38	621.90	275.73	0.15
Mahannon	1158	NSS Base Flow	4.21	515.92	519.32	516.55	519.32	0.000009	0.16	26.67	13.83	0.02
Mahannon	1141	NFF 1-year	100.00	516.35	522.59	518.49	522.60	0.000124	1.02	97.67	28.91	0.09
Mahannon	1141	NFF 2.33-year	400.00	516.35	525.42	520.10	525.51	0.000363	2.42	165.44	154.36	0.16
Mahannon	1141	NFF 10-year	914.00	516.35	528.01	521.88	528.26	0.000654	4.01	227.70	232.43	0.23
Mahannon	1141	NSS Base Flow	4.21	516.35	519.32	516.95	519.32	0.000007	0.14	30.90	18.61	0.02
Mahannon	1100		Culvert									
Mahannon	1045	NFF 1-year	100.00	518.22	520.64	519.77	520.76	0.002857	2.79	35.84	27.08	0.38
Mahannon	1045	NFF 2.33-year	400.00	518.22	522.25	521.20	522.72	0.005282	5.53	72.38	33.95	0.56
Mahannon	1045	NFF 10-year	914.00	518.22	522.79	522.79	524.57	0.015931	10.71	85.33	35.28	1.00
Mahannon	1045	NSS Base Flow	4.21	518.22	519.26	518.64	519.26	0.000303	0.45	9.26	18.22	0.10
Mahannon	977	NFF 1-year	100.00	515.09	520.65	517.08	520.66	0.000152	0.95	105.44	32.91	0.09
Mahannon	977	NFF 2.33-year	400.00	515.09	522.30	518.68	522.39	0.000781	2.37	170.85	110.12	0.22
Mahannon	977	NFF 10-year	914.00	515.09	523.10	520.28	523.39	0.002135	4.34	236.04	141.11	0.37
Mahannon	977	NSS Base Flow	4.21	515.09	519.26	515.57	519.26	0.000001	0.07	63.95	26.97	0.01
Mahannon	872	NFF 1-year	100.00	518.95	520.23	519.98	520.46	0.010936	3.84	26.02	26.08	0.68
Mahannon	872	NFF 2.33-year	400.00	518.95	522.28	521.23	522.29	0.000520	1.35	697.84	521.28	0.17
Mahannon	872	NFF 10-year	914.00	518.95	523.12	521.81	523.14	0.000618	1.86	1142.13	547.32	0.19
Mahannon	872	NSS Base Flow	4.21	518.95	519.21	519.15	519.24	0.014573	1.39	3.03	17.55	0.59
Mahannon	729	NFF 1-year	100.00	517.63	519.73	519.13	519.86	0.004598	2.87	34.86	155.97	0.45
Mahannon	729	NFF 2.33-year	400.00	517.63	522.26	520.38	522.27	0.000216	1.21	835.21	401.98	0.11
Mahannon	729	NFF 10-year	914.00	517.63	523.08	521.67	523.11	0.000520	2.16	1208.01	562.20	0.18
Mahannon	729	NSS Base Flow	4.21	517.63	518.17	518.05	518.21	0.011050	1.62	2.60	9.71	0.55
Mahannon	660	NFF 1-year	100.00	516.58	518.79	518.26	519.08	0.006820	4.30	23.26	55.70	0.58
Mahannon	660	NFF 2.33-year	400.00	516.58	521.02	520.09	521.89	0.006894	7.51	53.26	290.25	0.67
Mahannon	660	NFF 10-year	914.00	516.58	523.04	522.25	523.08	0.000436	2.38	1322.96	637.76	0.18
Mahannon	660	NSS Base Flow	4.21	516.58	517.30	517.05	517.32	0.004116	1.18	3.57	9.91	0.35
Mahannon	650		Bridge									
Mahannon	624	NFF 1-year	100.00	514.76	518.19	517.17	518.39	0.003937	3.63	27.58	19.32	0.45
Mahannon	624	NFF 2.33-year	400.00	514.76	519.59	519.15	520.74	0.011007	8.59	46.55	197.91	0.82
Mahannon	624	NFF 10-year	914.00	514.76	522.28	522.25	522.29	0.000264	1.88	1840.22	778.66	0.14
Mahannon	624	NSS Base Flow	4.21	514.76	516.68	515.42	516.68	0.000122	0.42	10.08	11.22	0.07
Mahannon	592.50*	NFF 1-year	100.00	515.25	518.12	517.13	518.24	0.002875	2.73	36.69	45.71	0.37
Mahannon	592.50*	NFF 2.33-year	400.00	515.25	519.73	518.71	520.13	0.004930	5.09	79.37	355.58	0.53
Mahannon	592.50*	NFF 10-year	914.00	515.25	520.97	520.16	521.95	0.007514	8.01	122.06	760.64	0.70
Mahannon	592.50*	NSS Base Flow	4.21	515.25	516.68	515.78	516.68	0.000183	0.41	10.39	14.04	0.08

HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon (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
Mahannon	560.50*	NFF 1-year	100.00	515.74	518.01	517.24	518.14	0.003517	2.80	35.71	107.41	0.41
Mahannon	560.50*	NFF 2.33-year	400.00	515.74	519.57	518.63	519.96	0.005767	5.02	79.74	358.31	0.56
Mahannon	560.50*	NFF 10-year	914.00	515.74	520.84	520.14	521.62	0.007091	7.19	149.51	765.31	0.67
Mahannon	560.50*	NSS Base Flow	4.21	515.74	516.66	516.16	516.67	0.000508	0.53	7.91	56.76	0.13
Mahannon	529	NFF 1-year	100.00	516.23	517.52	517.41	517.83	0.017025	4.48	22.30	113.35	0.83
Mahannon	529	NFF 2.33-year	400.00	516.23	518.74	518.65	519.53	0.016944	7.09	56.42	297.03	0.93
Mahannon	529	NFF 10-year	914.00	516.23	520.17	520.17	521.22	0.013513	8.38	131.63	755.85	0.88
Mahannon	529	NSS Base Flow	4.21	516.23	516.52	516.46	516.56	0.017188	1.70	2.48	91.86	0.66
Mahannon	429	NFF 1-year	100.00	514.53	515.82	515.71	516.13	0.017031	4.49	22.30	113.34	0.83
Mahannon	429	NFF 2.33-year	400.00	514.53	517.04	516.94	517.83	0.017035	7.10	56.32	296.56	0.93
Mahannon	429	NFF 10-year	914.00	514.53	518.30	518.30	519.61	0.017482	9.21	99.25	440.43	1.00
Mahannon	429	NSS Base Flow	4.21	514.53	514.82	514.76	514.86	0.016916	1.69	2.50	91.89	0.65
Mahannon	329	NFF 1-year	100.00	512.83	514.12	514.01	514.43	0.016999	4.48	22.31	113.35	0.83
Mahannon	329	NFF 2.33-year	400.00	512.83	515.34	515.24	516.13	0.016980	7.09	56.38	296.85	0.93
Mahannon	329	NFF 10-year	914.00	512.83	516.55	516.60	517.91	0.018324	9.36	97.62	437.18	1.02
Mahannon	329	NSS Base Flow	4.21	512.83	513.12	513.06	513.16	0.017093	1.69	2.49	91.87	0.66
Mahannon	229	NFF 1-year	100.00	511.13	512.42	512.31	512.73	0.017095	4.49	22.27	113.33	0.83
Mahannon	229	NFF 2.33-year	400.00	511.13	513.64	513.54	514.43	0.017013	7.10	56.34	296.67	0.93
Mahannon	229	NFF 10-year	914.00	511.13	514.90	514.90	514.95	0.001881	3.02	950.53	753.63	0.33
Mahannon	229	NSS Base Flow	4.21	511.13	511.42	511.36	511.46	0.016897	1.69	2.50	91.89	0.65
Mahannon	129	NFF 1-year	100.00	509.43	510.72	510.61	511.03	0.016979	4.48	22.32	113.36	0.83
Mahannon	129	NFF 2.33-year	400.00	509.43	511.94	511.84	512.73	0.016992	7.10	56.37	296.78	0.93
Mahannon	129	NFF 10-year	914.00	509.43	513.20	513.20	513.25	0.001881	3.02	950.53	753.63	0.33
Mahannon	129	NSS Base Flow	4.21	509.43	509.72	509.66	509.76	0.017062	1.69	2.49	91.88	0.66
Mahannon	29	NFF 1-year	100.00	507.73	509.02	508.91	509.33	0.017005	4.48	22.31	113.35	0.83
Mahannon	29	NFF 2.33-year	400.00	507.73	510.24	510.14	511.03	0.017005	7.10	56.35	296.71	0.93
Mahannon	29	NFF 10-year	914.00	507.73	511.50	511.50	511.55	0.001881	3.02	950.53	753.63	0.33
Mahannon	29	NSS Base Flow	4.21	507.73	508.02	507.96	508.06	0.016999	1.69	2.49	91.88	0.65

HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon

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)
Mahannon	1747	NFF 1-year	524.36	524.25	0.11	0.44	0.01		100.00		21.07
Mahannon	1747	NFF 2.33-year	526.53	526.29	0.24	0.54	0.01		394.68	5.32	87.59
Mahannon	1747	NFF 10-year	528.53	528.43	0.11	0.08	0.02	182.24	613.70	118.05	256.72
Mahannon	1747	NSS Base Flow	522.40	522.39	0.02	0.24	0.00		4.21		12.94
Mahannon	1614	NFF 1-year	523.91	523.74	0.17	0.56	0.00		100.00		18.78
Mahannon	1614	NFF 2.33-year	525.98	525.65	0.33	0.22	0.08	46.39	353.61		178.49
Mahannon	1614	NFF 10-year	528.43	528.38	0.05	0.04	0.01	547.20	366.74	0.06	302.25
Mahannon	1614	NSS Base Flow	522.17	522.16	0.01	0.23	0.00		4.21		11.48
Mahannon	1506	NFF 1-year	523.35	523.19	0.16	0.37	0.03		100.00		25.26
Mahannon	1506	NFF 2.33-year	525.68	525.61	0.06	0.06	0.01	143.89	255.42	0.69	228.23
Mahannon	1506	NFF 10-year	528.38	528.36	0.02	0.02	0.00	535.57	351.87	26.56	379.70
Mahannon	1506	NSS Base Flow	521.93	521.91	0.02	0.38	0.00		4.21		12.73
Mahannon	1399	NFF 1-year	522.94	522.88	0.06	0.24	0.00		100.00		37.18
Mahannon	1399	NFF 2.33-year	525.60	525.57	0.03	0.04	0.00	123.98	276.02		370.94
Mahannon	1399	NFF 10-year	528.37	528.36	0.01	0.01	0.00	338.17	360.04	215.79	469.07
Mahannon	1399	NSS Base Flow	521.55	521.54	0.01	1.12	0.01		4.21		22.40
Mahannon	1282	NFF 1-year	522.70	522.61	0.10	0.06	0.02	0.62	99.38		36.13
Mahannon	1282	NFF 2.33-year	525.57	525.54	0.03	0.02	0.00	179.57	183.44	36.99	243.22
Mahannon	1282	NFF 10-year	528.35	528.34	0.02	0.01	0.00	464.54	266.47	183.00	335.63
Mahannon	1282	NSS Base Flow	520.42	520.31	0.10	0.60	0.03		4.21		7.69
Mahannon	1203	NFF 1-year	522.62	522.60	0.02	0.01	0.00	0.04	99.93	0.03	36.25
Mahannon	1203	NFF 2.33-year	525.54	525.49	0.05	0.01	0.00	61.30	310.60	28.10	205.16
Mahannon	1203	NFF 10-year	528.34	528.28	0.05	0.01	0.00	202.03	541.05	170.91	297.12
Mahannon	1203	NSS Base Flow	519.33	519.32	0.01	0.01	0.00		4.21		15.05
Mahannon	1158	NFF 1-year	522.61	522.59	0.02	0.00	0.00		100.00		27.24
Mahannon	1158	NFF 2.33-year	525.53	525.47	0.06	0.01	0.01	0.26	374.70	25.04	180.51
Mahannon	1158	NFF 10-year	528.33	528.26	0.07	0.01	0.06	7.46	664.04	242.50	275.73
Mahannon	1158	NSS Base Flow	519.32	519.32	0.00	0.00	0.00		4.21		13.83
Mahannon	1141	NFF 1-year	522.60	522.59	0.02				100.00		28.91
Mahannon	1141	NFF 2.33-year	525.51	525.42	0.09				400.00		154.36
Mahannon	1141	NFF 10-year	528.26	528.01	0.25				914.00		232.43
Mahannon	1141	NSS Base Flow	519.32	519.32	0.00				4.21		18.61
Mahannon	1100		Culvert								
Mahannon	1045	NFF 1-year	520.76	520.64	0.12	0.04	0.05		100.00		27.08
Mahannon	1045	NFF 2.33-year	522.72	522.25	0.47	0.14	0.19		400.00		33.95
Mahannon	1045	NFF 10-year	524.57	522.79	1.78	0.40	0.75		914.00		35.28
Mahannon	1045	NSS Base Flow	519.26	519.26	0.00	0.00	0.00		4.21		18.22
Mahannon	977	NFF 1-year	520.66	520.65	0.01	0.14	0.06		100.00		32.91
Mahannon	977	NFF 2.33-year	522.39	522.30	0.09	0.06	0.04		399.83	0.17	110.12
Mahannon	977	NFF 10-year	523.39	523.10	0.29	0.11	0.13		896.13	17.87	141.11
Mahannon	977	NSS Base Flow	519.26	519.26	0.00	0.01	0.01		4.21		26.97
Mahannon	872	NFF 1-year	520.46	520.23	0.23	0.57	0.03		100.00		26.08
Mahannon	872	NFF 2.33-year	522.29	522.28	0.01	0.02	0.00	0.44	177.93	221.63	521.28
Mahannon	872	NFF 10-year	523.14	523.12	0.02	0.03	0.00	2.97	346.06	564.97	547.32
Mahannon	872	NSS Base Flow	519.24	519.21	0.03	1.02	0.00		4.21		17.55
Mahannon	729	NFF 1-year	519.86	519.73	0.13	0.73	0.05		100.00		155.97
Mahannon	729	NFF 2.33-year	522.27	522.26	0.01	0.12	0.26	3.28	144.55	252.17	401.98
Mahannon	729	NFF 10-year	523.11	523.08	0.03	0.03	0.00	30.91	320.97	562.12	562.20
Mahannon	729	NSS Base Flow	518.21	518.17	0.04	0.88	0.01		4.21		9.71
Mahannon	660	NFF 1-year	519.08	518.79	0.29	0.13	0.09		100.00		55.70
Mahannon	660	NFF 2.33-year	521.89	521.02	0.88	0.11	0.19		400.00		290.25
Mahannon	660	NFF 10-year	523.08	523.04	0.04				344.57	569.43	637.76
Mahannon	660	NSS Base Flow	517.32	517.30	0.02	0.12	0.03		4.21		9.91
Mahannon	650		Bridge								
Mahannon	624	NFF 1-year	518.39	518.19	0.20	0.11	0.04		100.00		19.32
Mahannon	624	NFF 2.33-year	520.74	519.59	1.15	0.23	0.37		400.00		197.91
Mahannon	624	NFF 10-year	522.29	522.28	0.01	0.05	0.29		173.62	740.38	778.66
Mahannon	624	NSS Base Flow	516.68	516.68	0.00	0.00	0.00		4.21		11.22
Mahannon	592.50*	NFF 1-year	518.24	518.12	0.12	0.10	0.00		100.00		45.71

HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon (Continued)

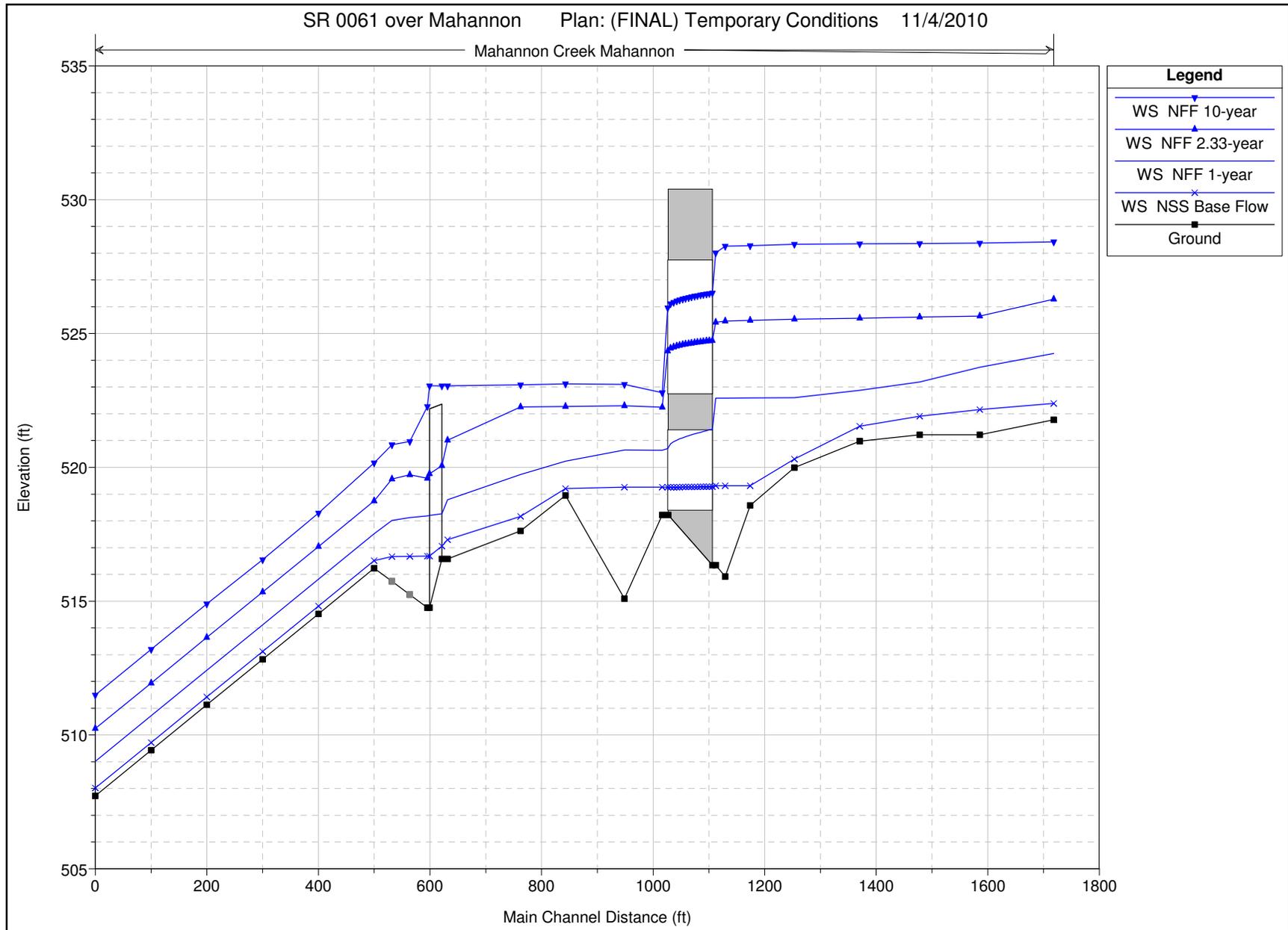
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	592.50*	NFF 2.33-year	520.13	519.73	0.40	0.17	0.01	0.22	399.51	0.27	355.58
Mahannon	592.50*	NFF 10-year	521.95	520.97	0.98	0.23	0.10	2.48	903.01	8.51	760.64
Mahannon	592.50*	NSS Base Flow	516.68	516.68	0.00	0.01	0.00		4.21		14.04
Mahannon	560.50*	NFF 1-year	518.14	518.01	0.12	0.25	0.06		100.00		107.41
Mahannon	560.50*	NFF 2.33-year	519.96	519.57	0.39	0.31	0.12		400.00		358.31
Mahannon	560.50*	NFF 10-year	521.62	520.84	0.78	0.31	0.08	1.48	885.80	26.72	765.31
Mahannon	560.50*	NSS Base Flow	516.67	516.66	0.00	0.09	0.01		4.21		56.76
Mahannon	529	NFF 1-year	517.83	517.52	0.31	1.70	0.00		100.00		113.35
Mahannon	529	NFF 2.33-year	519.53	518.74	0.78	1.70	0.00		400.00		297.03
Mahannon	529	NFF 10-year	521.22	520.17	1.06	0.50	0.50		884.68	29.32	755.85
Mahannon	529	NSS Base Flow	516.56	516.52	0.04	1.71	0.00		4.21		91.86
Mahannon	429	NFF 1-year	516.13	515.82	0.31	1.70	0.00		100.00		113.34
Mahannon	429	NFF 2.33-year	517.83	517.04	0.78	1.70	0.00		400.00		296.56
Mahannon	429	NFF 10-year	519.61	518.30	1.32	1.54	0.08		914.00		440.43
Mahannon	429	NSS Base Flow	514.86	514.82	0.04	1.70	0.00		4.21		91.89
Mahannon	329	NFF 1-year	514.43	514.12	0.31	1.70	0.00		100.00		113.35
Mahannon	329	NFF 2.33-year	516.13	515.34	0.78	1.70	0.00		400.00		296.85
Mahannon	329	NFF 10-year	517.91	516.55	1.36	1.75	0.00		914.00		437.18
Mahannon	329	NSS Base Flow	513.16	513.12	0.04	1.70	0.00		4.21		91.87
Mahannon	229	NFF 1-year	512.73	512.42	0.31	1.70	0.00		100.00		113.33
Mahannon	229	NFF 2.33-year	514.43	513.64	0.78	1.70	0.00		400.00		296.67
Mahannon	229	NFF 10-year	514.95	514.90	0.05	0.19	0.00		300.27	613.73	753.63
Mahannon	229	NSS Base Flow	511.46	511.42	0.04	1.70	0.00		4.21		91.89
Mahannon	129	NFF 1-year	511.03	510.72	0.31	1.70	0.00		100.00		113.36
Mahannon	129	NFF 2.33-year	512.73	511.94	0.78	1.70	0.00		400.00		296.78
Mahannon	129	NFF 10-year	513.25	513.20	0.05	0.19	0.00		300.27	613.73	753.63
Mahannon	129	NSS Base Flow	509.76	509.72	0.04	1.70	0.00		4.21		91.88
Mahannon	29	NFF 1-year	509.33	509.02	0.31				100.00		113.35
Mahannon	29	NFF 2.33-year	511.03	510.24	0.78				400.00		296.71
Mahannon	29	NFF 10-year	511.55	511.50	0.05				300.27	613.73	753.63
Mahannon	29	NSS Base Flow	508.06	508.02	0.04				4.21		91.88

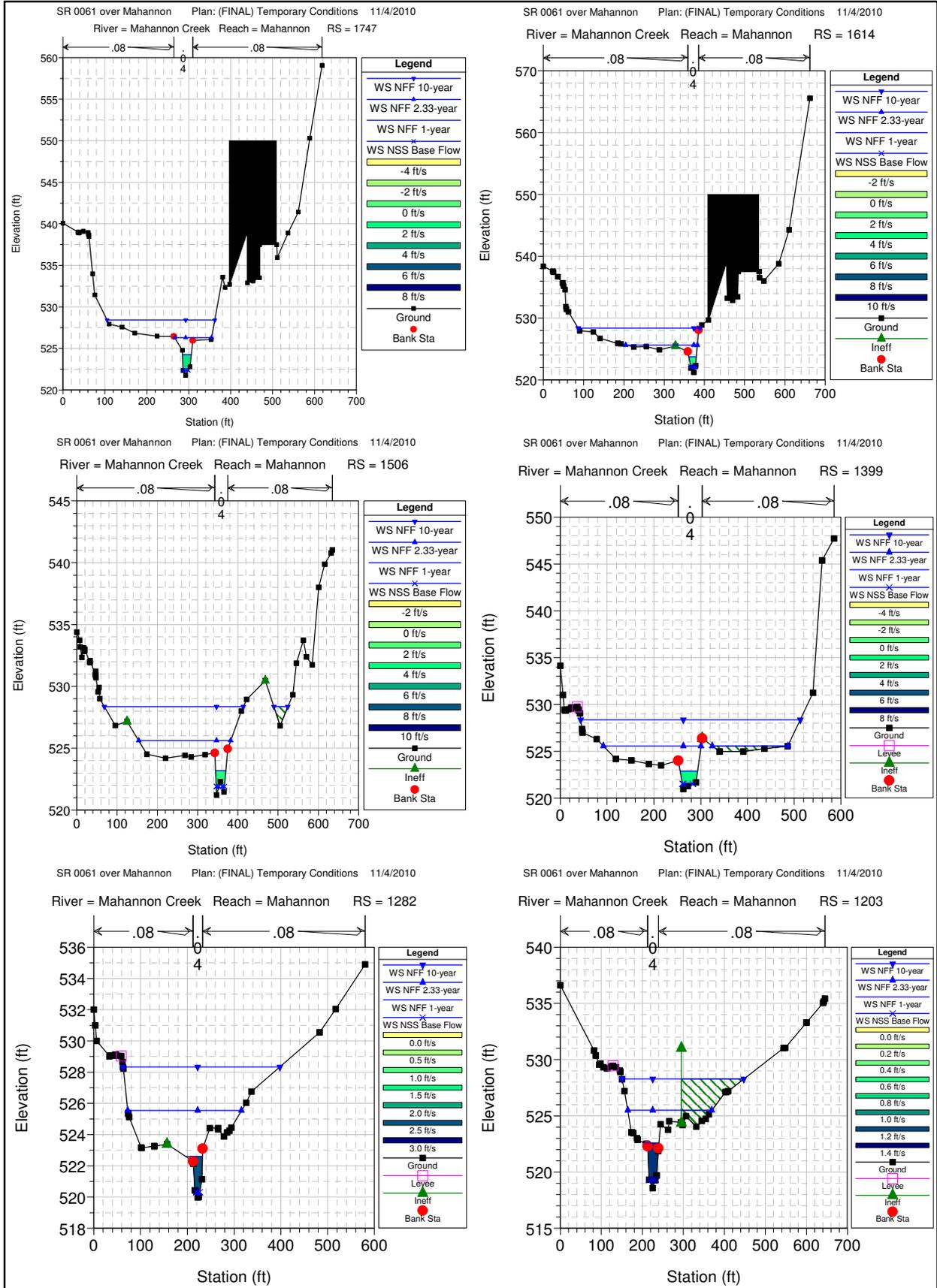
HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon

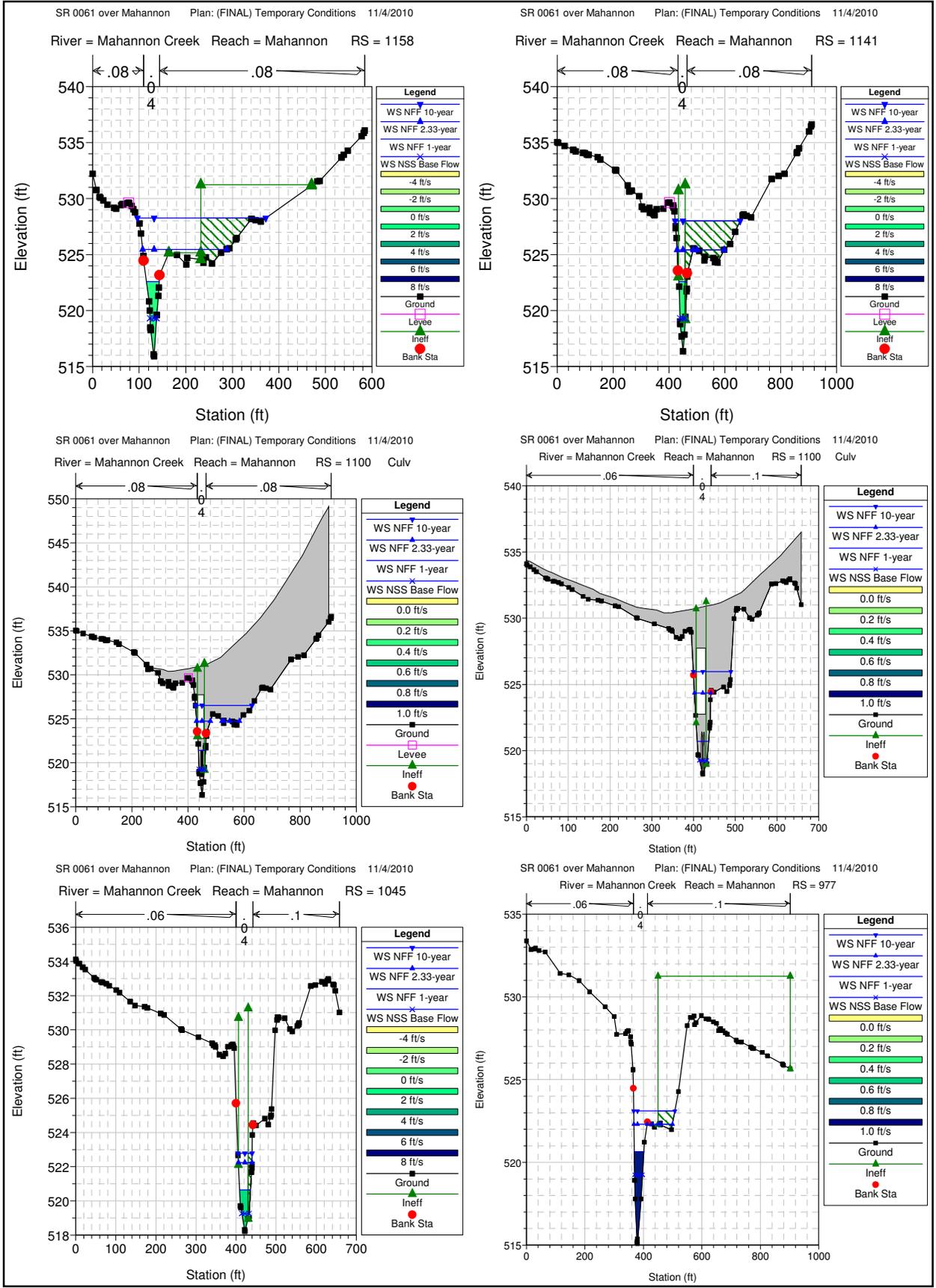
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mahannon	1158	NFF 1-year	522.61	522.59	0.02	0.00	0.00		100.00		27.24
Mahannon	1158	NFF 2.33-year	525.53	525.47	0.06	0.01	0.01	0.26	374.70	25.04	180.51
Mahannon	1158	NFF 10-year	528.33	528.26	0.07	0.01	0.06	7.46	664.04	242.50	275.73
Mahannon	1158	NSS Base Flow	519.32	519.32	0.00	0.00	0.00		4.21		13.83
Mahannon	1141	NFF 1-year	522.60	522.59	0.02				100.00		28.91
Mahannon	1141	NFF 2.33-year	525.51	525.42	0.09				400.00		154.36
Mahannon	1141	NFF 10-year	528.26	528.01	0.25				914.00		232.43
Mahannon	1141	NSS Base Flow	519.32	519.32	0.00				4.21		18.61
Mahannon	1100		Culvert								
Mahannon	1045	NFF 1-year	520.76	520.64	0.12	0.04	0.05		100.00		27.08
Mahannon	1045	NFF 2.33-year	522.72	522.25	0.47	0.14	0.19		400.00		33.95
Mahannon	1045	NFF 10-year	524.57	522.79	1.78	0.40	0.75		914.00		35.28
Mahannon	1045	NSS Base Flow	519.26	519.26	0.00	0.00	0.00		4.21		18.22
Mahannon	977	NFF 1-year	520.66	520.65	0.01	0.14	0.06		100.00		32.91
Mahannon	977	NFF 2.33-year	522.39	522.30	0.09	0.06	0.04		399.83	0.17	110.12
Mahannon	977	NFF 10-year	523.39	523.10	0.29	0.11	0.13		896.13	17.87	141.11
Mahannon	977	NSS Base Flow	519.26	519.26	0.00	0.01	0.01		4.21		26.97

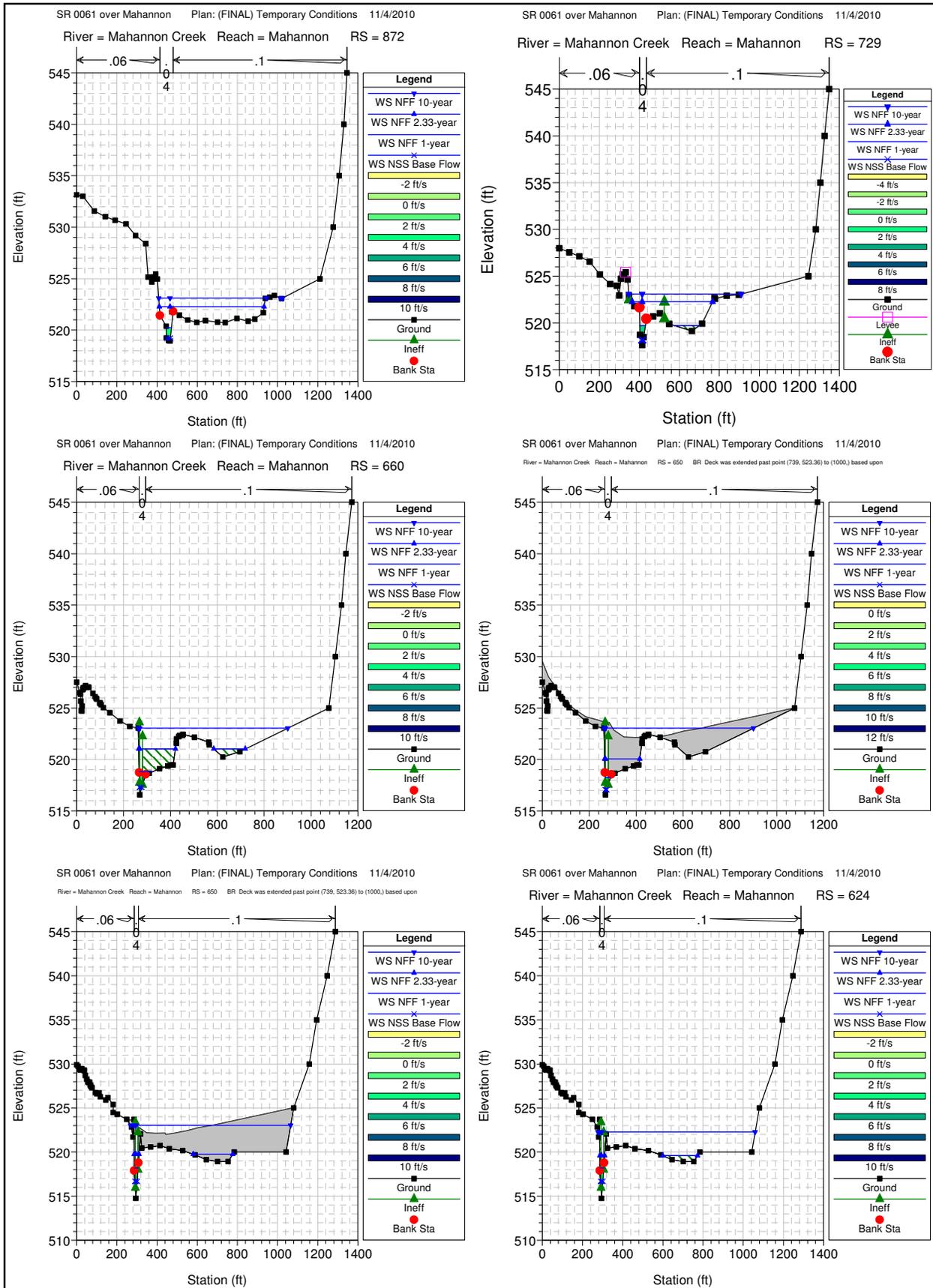
HEC-RAS Plan: (final) Temp River: Mahannon Creek Reach: Mahannon

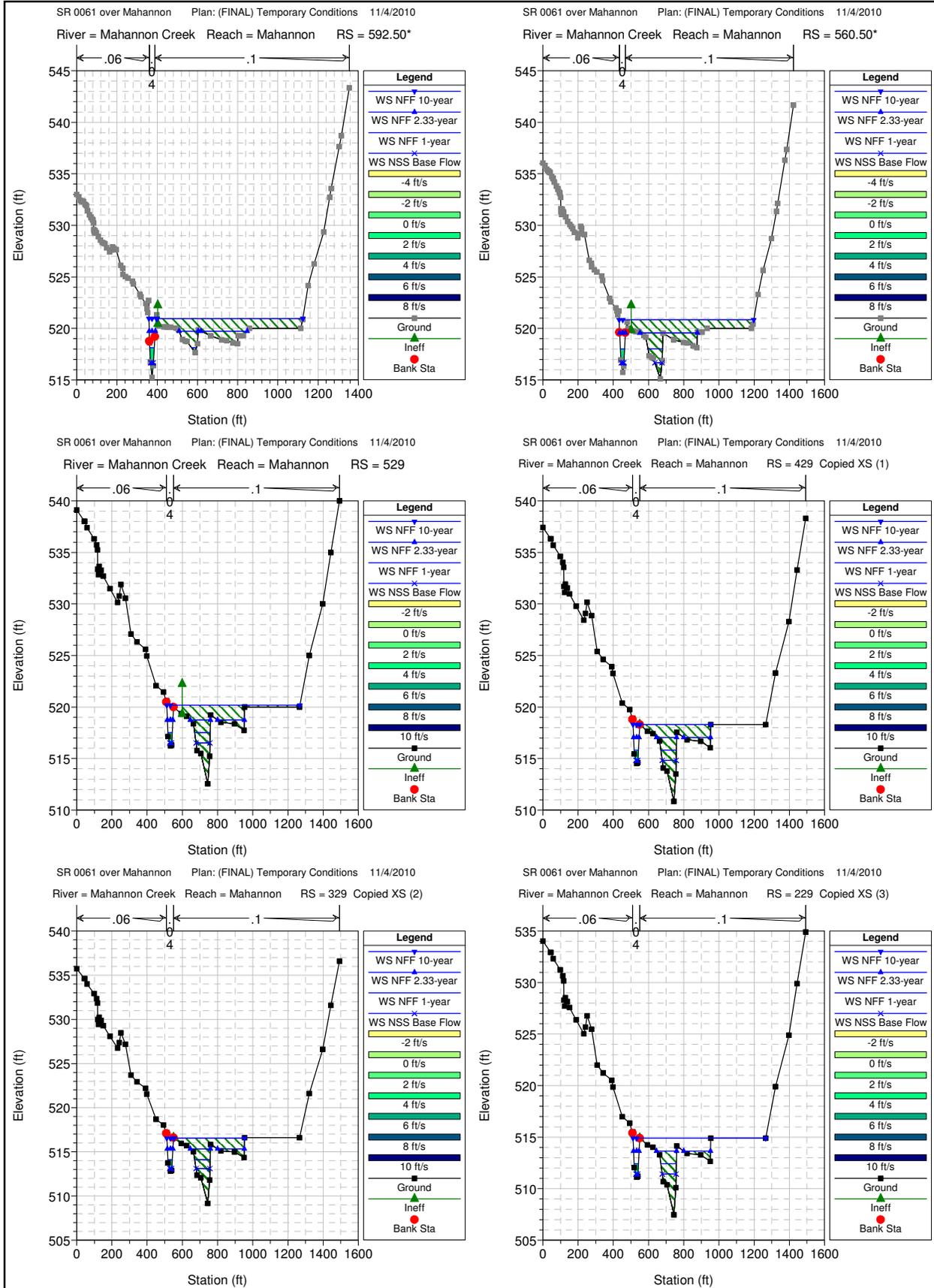
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Mahannon	729	NFF 1-year	519.86	519.73	519.13	0.73	0.05	155.97		100.00		2.87
Mahannon	729	NFF 2.33-year	522.27	522.26	520.38	0.12	0.26	401.98	3.28	144.55	252.17	1.21
Mahannon	729	NFF 10-year	523.11	523.08	521.67	0.03	0.00	562.20	30.91	320.97	562.12	2.16
Mahannon	729	NSS Base Flow	518.21	518.17	518.05	0.88	0.01	9.71		4.21		1.62
Mahannon	660	NFF 1-year	519.08	518.79	518.26	0.13	0.09	55.70		100.00		4.30
Mahannon	660	NFF 2.33-year	521.89	521.02	520.09	0.11	0.19	290.25		400.00		7.51
Mahannon	660	NFF 10-year	523.08	523.04	522.25			637.76		344.57	569.43	2.38
Mahannon	660	NSS Base Flow	517.32	517.30	517.05	0.12	0.03	9.91		4.21		1.18
Mahannon	650 BR U	NFF 1-year	518.86	518.27	518.27	0.21	0.20	13.50		100.00		6.20
Mahannon	650 BR U	NFF 2.33-year	521.59	520.06	520.06	0.28	0.24	13.50		400.00		9.91
Mahannon	650 BR U	NFF 10-year	523.08	523.04	523.35			374.90		411.08	502.72	5.76
Mahannon	650 BR U	NSS Base Flow	517.17	517.06	517.06	0.05	0.06	6.55		4.21		2.70
Mahannon	650 BR D	NFF 1-year	518.41	518.21	517.17	0.71	0.16	13.62		100.00		3.59
Mahannon	650 BR D	NFF 2.33-year	520.80	519.76	519.16	0.53	0.21	13.62		400.00		8.19
Mahannon	650 BR D	NFF 10-year	523.08	523.04	523.22			374.21		411.08	502.72	4.95
Mahannon	650 BR D	NSS Base Flow	516.68	516.68	515.42	1.41	0.08	9.29		4.21		0.42
Mahannon	624	NFF 1-year	518.39	518.19	517.17	0.11	0.04	19.32		100.00		3.63
Mahannon	624	NFF 2.33-year	520.74	519.59	519.15	0.23	0.37	197.91		400.00		8.59
Mahannon	624	NFF 10-year	522.29	522.28	522.25	0.05	0.29	778.66		173.62	740.38	1.88
Mahannon	624	NSS Base Flow	516.68	516.68	515.42	0.00	0.00	11.22		4.21		0.42
Mahannon	592.50*	NFF 1-year	518.24	518.12	517.13	0.10	0.00	45.71		100.00		2.73
Mahannon	592.50*	NFF 2.33-year	520.13	519.73	518.71	0.17	0.01	355.58	0.22	399.51	0.27	5.09
Mahannon	592.50*	NFF 10-year	521.95	520.97	520.16	0.23	0.10	760.64	2.48	903.01	8.51	8.01
Mahannon	592.50*	NSS Base Flow	516.68	516.68	515.78	0.01	0.00	14.04		4.21		0.41











APPENDIX C-5

Scour Calculations

Appendix Includes: Scour Calculations, Cross Section Data Tables, Bridge Data Tables, and Upstream Cross Section



BORTON-LAWSON
LEHIGH VALLEY OFFICE
 3893 ADLER PLACE, SUITE 100
 BETHLEHEM, PA 18017
 (484) 821-0470
 FAX (484) 821-0474

JOB S.R. 0061 over Mahannon Creek
 SHEET NO. _____ OF 1
 CALCULATED BY PAK DATE 5-Jan-11
 CHECKED BY LJS DATE 6-Jan-11
 SCALE Not Applicable

Contraction Scour Determination - Per HEC-18

- Upstream Cross Section (STA)
- Average Approach Depth, Y, (ft)
- Velocity, V (ft/s)
- D₅₀ of Bed Material, D (ft)
- Ku=constant from HEC-18 (page 5.2)
- Per Equation 5.1 of HEC-18, Calculate Critical Velocity, V_c (ft/s)

$$V_c = K_u Y^{1/6} D^{1/3}$$

- Scour Type

	<u>100-Year</u>	<u>500-Year</u>	<u>Comments</u>
Upstream Cross Section (STA)	12+03	12+03	Uncontracted Cross Section
Average Approach Depth, Y, (ft)	11.60	13.35	Channel Hydraulic Depth
Velocity, V (ft/s)	2.49	2.75	Average Channel Velocity
D ₅₀ of Bed Material, D (ft)	0.042	0.042	Visually estimated during field observation.
Ku=constant from HEC-18 (page 5.2)	11.17	11.17	
Per Equation 5.1 of HEC-18, Calculate Critical Velocity, V _c (ft/s)	5.842	5.980	
Scour Type	Since V _c > V Clear-Water	Since V _c > V Clear-Water	

Clear Water Contraction Scour

- Ku=constant from HEC-18 (page 5.12)
- Diameter of smallest nontransportable particle, D_m (ft)
- Discharge through bridge, Q (cfs)

	<u>100-Year</u>	<u>500-Year</u>	
Ku=constant from HEC-18 (page 5.12)	0.0077	0.0077	
Diameter of smallest nontransportable particle, D _m (ft)	0.0525	0.0525	D _m =1.25(D ₅₀)
Discharge through bridge, Q (cfs)	2,040.00	1,695.96	Q Bridge in Bridge Table.

- Top width of contracted section, W (ft)

	<u>100-Year</u>	<u>500-Year</u>	
Top width of contracted section, W (ft)	21.22	21.22	Distance between abutments

- Average depth in contracted section, Y_o (ft)

	<u>100-Year</u>	<u>500-Year</u>	
Average depth in contracted section, Y _o (ft)	9.50	1.95	Hydraulic Depth in BridgeTable (Upstream Value). Since the hydraulic depth was not calculated for the 100-year storm by HEC-RAS, Y ₀ 100=Bridge Open Area/Clear Span = (201.68)/(21.22) = 9.50 ft

- Average equilibrium depth in contracted section, Y₂ (ft)

$$Y_2 = \left[\frac{k_u Q^2}{D_m^{2/3} W^2} \right]^{3/7}$$

	<u>100-Year</u>	<u>500-Year</u>	
Average equilibrium depth in contracted section, Y ₂ (ft)	14.44	12.32	

- Average Contraction Scour Depth, Y_s (ft)

	<u>100-Year</u>	<u>500-Year</u>	
Average Contraction Scour Depth, Y _s (ft)	4.94	10.37	Y _s =Y ₂ -Y ₀

Although the average contraction scour calculated according to HEC-18 is positive for the 100-year and 500-year events, contraction scour is not expected to occur. According to historical bridge construction records, the bottom of the channel is at bedrock, and is not expected to scour further.

Abutment Scour

- Abutments will be protected by Rip-Rap.
- Rip-Rap is sized to protect abutments based on 1.8 times the bridge opening velocity for the 100-year design storm assuming the 500-year scour depth is above the bottom of the footing foundation.
- Since the 100-year event has the highest velocity, V₁₀₀ will be used for rip-rap design. The bridge opening V₁₀₀ is 9.87 ft/sec.
 $V_{Rip-Rap} = V_{100}(1.8) = (9.87 \text{ ft/sec})(1.8) = 17.76 \text{ ft/sec}$
- With the abutments armored with R-8 Rip-Rap to protect them from abutment scour the scour depths listed above are not anticipated to occur.

Plan: (FINAL) Proposed Mahannon Creek Mahannon RS: 1203 Profile: FEMA 100-year

E.G. Elev (ft)	531.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.080	0.040	0.080
W.S. Elev (ft)	531.18	Reach Len. (ft)	28.74	44.89	1.00
Crit W.S. (ft)	525.36	Flow Area (sq ft)	564.37	305.30	1347.73
E.G. Slope (ft/ft)	0.000188	Area (sq ft)	564.37	305.30	1347.73
Q Total (cfs)	2040.00	Flow (cfs)	370.19	761.06	908.75
Top Width (ft)	473.94	Top Width (ft)	135.73	26.32	311.88
Vel Total (ft/s)	0.92	Avg. Vel. (ft/s)	0.66	2.49	0.67
Max Chl Dpth (ft)	12.60	Hydr. Depth (ft)	4.16	11.60	4.32
Conv. Total (cfs)	148865.3	Conv. (cfs)	27014.1	55536.9	66314.4
Length Wtd. (ft)	25.61	Wetted Per. (ft)	136.42	28.17	312.57
Min Ch El (ft)	518.58	Shear (lb/sq ft)	0.05	0.13	0.05
Alpha	3.07	Stream Power (lb/ft s)	0.03	0.32	0.03
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.84	4.20	22.48
C & E Loss (ft)	0.02	Cum SA (acres)	0.59	0.96	12.11

Plan: (FINAL) Proposed Mahannon Creek Mahannon RS: 1203 Profile: NFF 500-year

E.G. Elev (ft)	532.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.080	0.040	0.080
W.S. Elev (ft)	532.92	Reach Len. (ft)	28.74	44.89	1.00
Crit W.S. (ft)	526.38	Flow Area (sq ft)	823.28	351.32	1928.28
E.G. Slope (ft/ft)	0.000190	Area (sq ft)	823.28	351.32	1928.28
Q Total (cfs)	3120.00	Flow (cfs)	624.36	966.10	1529.53
Top Width (ft)	538.93	Top Width (ft)	160.43	26.32	352.18
Vel Total (ft/s)	1.01	Avg. Vel. (ft/s)	0.76	2.75	0.79
Max Chl Dpth (ft)	14.34	Hydr. Depth (ft)	5.13	13.35	5.48
Conv. Total (cfs)	226641.6	Conv. (cfs)	45354.7	70179.2	111107.7
Length Wtd. (ft)	20.07	Wetted Per. (ft)	161.17	28.17	352.91
Min Ch El (ft)	518.58	Shear (lb/sq ft)	0.06	0.15	0.06
Alpha	2.73	Stream Power (lb/ft s)	0.05	0.41	0.05
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.15	4.81	23.44
C & E Loss (ft)	0.00	Cum SA (acres)	1.32	1.03	12.53

Plan: (FINAL) Proposed Mahannon Creek Mahannon RS: 1100 Profile: FEMA 100-year

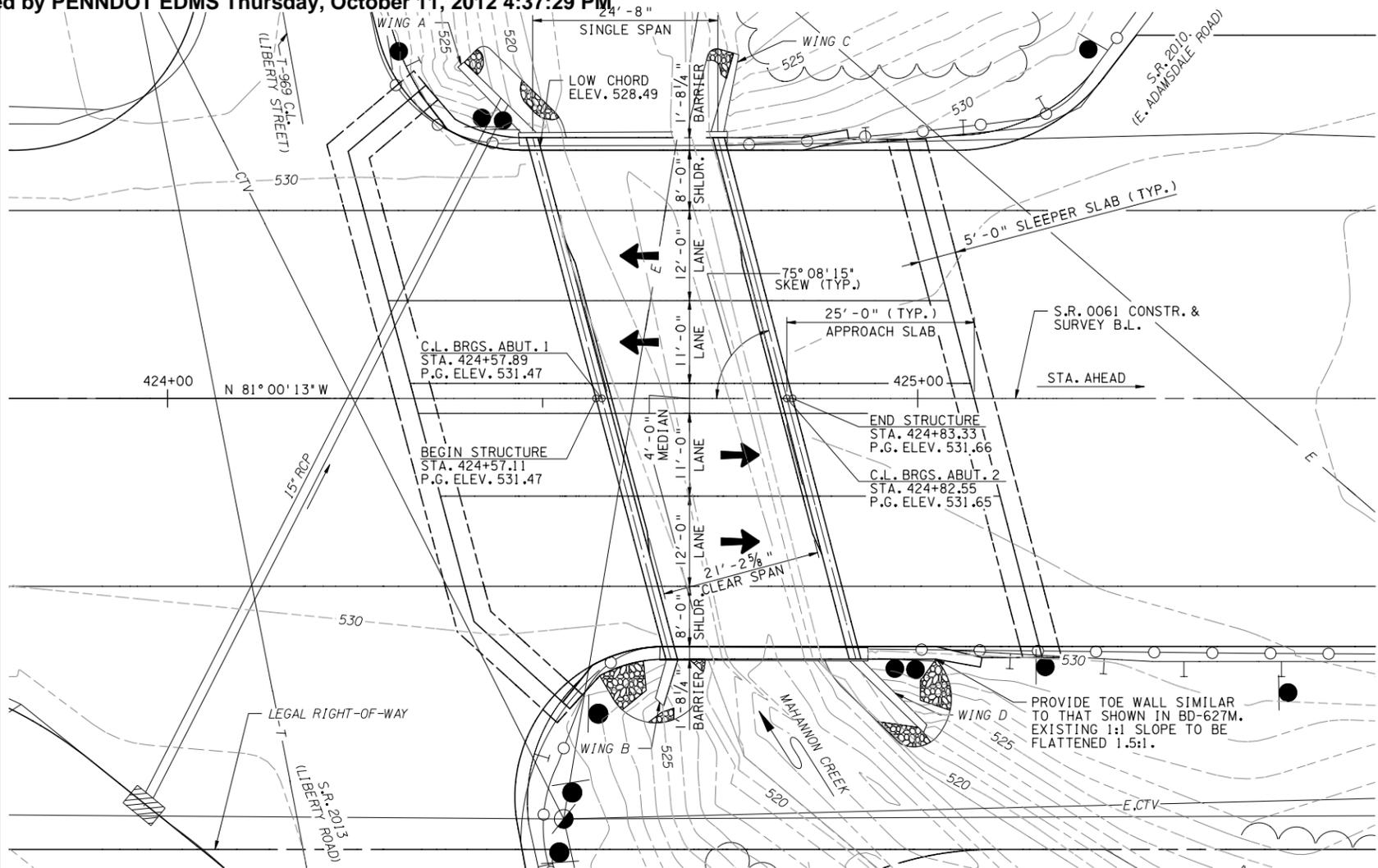
E.G. US. (ft)	531.02	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	530.38	E.G. Elev (ft)	531.02	528.96
Q Total (cfs)	2040.00	W.S. Elev (ft)	528.78	525.68
Q Bridge (cfs)	2040.00	Crit W.S. (ft)	524.84	525.68
Q Weir (cfs)		Max Chl Dpth (ft)	12.43	7.46
Weir Sta Lft (ft)		Vel Total (ft/s)	9.16	14.55
Weir Sta Rgt (ft)		Flow Area (sq ft)	222.63	140.22
Weir Submerg		Froude # Chl	0.46	0.94
Weir Max Depth (ft)		Specif Force (cu ft)	1790.91	1390.00
Min El Weir Flow (ft)	531.07	Hydr Depth (ft)		6.60
Min El Prs (ft)	529.25	W.P. Total (ft)	60.93	28.68
Delta EG (ft)	2.39	Conv. Total (cfs)	19619.0	15005.9
Delta WS (ft)	5.45	Top Width (ft)		21.25
BR Open Area (sq ft)	201.68	Frctn Loss (ft)		
BR Open Vel (ft/s)	10.11	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	2.47	5.64
Br Sel Method	Press Only	Power Total (lb/ft s)	22.60	82.07

Plan: (FINAL) Proposed Mahannon Creek Mahannon RS: 1100 Profile: NFF 500-year

E.G. US. (ft)	532.96	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	532.90	E.G. Elev (ft)	532.96	532.74
Q Total (cfs)	3120.00	W.S. Elev (ft)	532.90	532.29
Q Bridge (cfs)	1695.96	Crit W.S. (ft)	526.98	527.84
Q Weir (cfs)	1424.04	Max Chl Dpth (ft)	16.55	14.07
Weir Sta Lft (ft)	185.51	Vel Total (ft/s)	4.66	4.25
Weir Sta Rgt (ft)	534.29	Flow Area (sq ft)	669.37	733.37
Weir Submerg	0.04	Froude # Chl	0.21	0.31
Weir Max Depth (ft)	1.90	Specif Force (cu ft)	3072.32	2632.47
Min El Weir Flow (ft)	531.07	Hydr Depth (ft)	1.95	2.19
Min El Prs (ft)	529.25	W.P. Total (ft)	403.45	395.46
Delta EG (ft)	1.37	Conv. Total (cfs)		
Delta WS (ft)	1.65	Top Width (ft)	342.49	335.46
BR Open Area (sq ft)	201.68	Frctn Loss (ft)		
BR Open Vel (ft/s)	8.41	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

APPENDIX D-1

TS&L Drawings

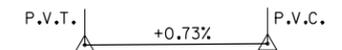


S.R. 0061 CONSTR. AND SURVEY B.L.
HORIZONTAL CURVE DATA
 TANGENT ACROSS STRUCTURE

S.R. 0061 CONSTR. AND SURVEY B.L.
VERTICAL CURVE DATA

PROPOSED STRUCTURE DATA
 S.R. 0061 B.L. STATION: 424+70.22
 TYPE: SINGLE SPAN P/S CONC. SPREAD BOX BEAM
 SPAN LENGTH: 24'-8"
 ROADWAY WIDTH: 69'-4 1/2" OUT-TO-OUT; 66'-0" CLEAR
 UNDERCLEARANCE: 12.14' +/- MIN.
 SKEW: 75°08'15"

EXISTING STRUCTURE DATA
 STATION: 424+60.10 @ NEAR ABUTMENT
 STRUCTURE: SINGLE SPAN REINFORCED CONC. T-BEAM
 SPAN: 22'-3 3/8" CLEAR
 UNDERCLEARANCE: 11.36' +/-
 SKEW: 75°00'00"
 CLEAR ROADWAY WIDTH: 66.5'
 YEAR BUILT: 1936



DESIGN ADT: 19,197
 ADTT: 1,728 (9%)
 DESIGN YEAR: 2032

BRIDGE LOAD RATINGS

24'-8" SINGLE SPAN	48/17 COMPOSITE P/S CONCRETE SPREAD BOX BEAM						
	H20	HS20	ML-80	PHL-93	P-82	TK527	
INVENTORY RATING (IR)	DISTRIBUTION FACTOR	0.994	0.994	0.994	0.994	-	0.994
	LOCATION	0.25L	0.25L	0.25L	0.25L	-	0.25L
	LIMIT STATE	STR-I	STR-I	STR-I	STR-I	-	STR-I
OPERATING RATING (OR)	RATING FACTOR	1.96 S	1.67 S	1.37 S	1.11 S	-	1.47 S
	DISTRIBUTION FACTOR	0.994	0.994	0.994	0.994	0.994	0.994
	LOCATION	0.25L	0.25L	0.25L	0.25L	0.25L	0.25L
OPERATING RATING (OR)	LIMIT STATE	STR-II	STR-II	STR-II	STR-IA	STR-II	STR-II
	RATING FACTOR	2.54 S	2.17 S	1.77 S	1.76 S	1.31 S	1.90 S
	CRITICAL MEMBER	INTERIOR					
MAXIMUM FACTORED MOMENT CAPACITY	LOCATION	0.5L					
	LOCATION	0.20L & 0.80L					

RATING NOTES:
 FUTURE WEARING SURFACE (30 P.S.F.) INCLUDED IN RATINGS.
 S DENOTES THAT SHEAR CONTROLS THE RATING FACTOR.
 M DENOTES THAT MOMENT CONTROLS THE RATING FACTOR.
 DISTANCES FOR CRITICAL MOMENT AND SHEAR ARE FROM C.L. BEARING.

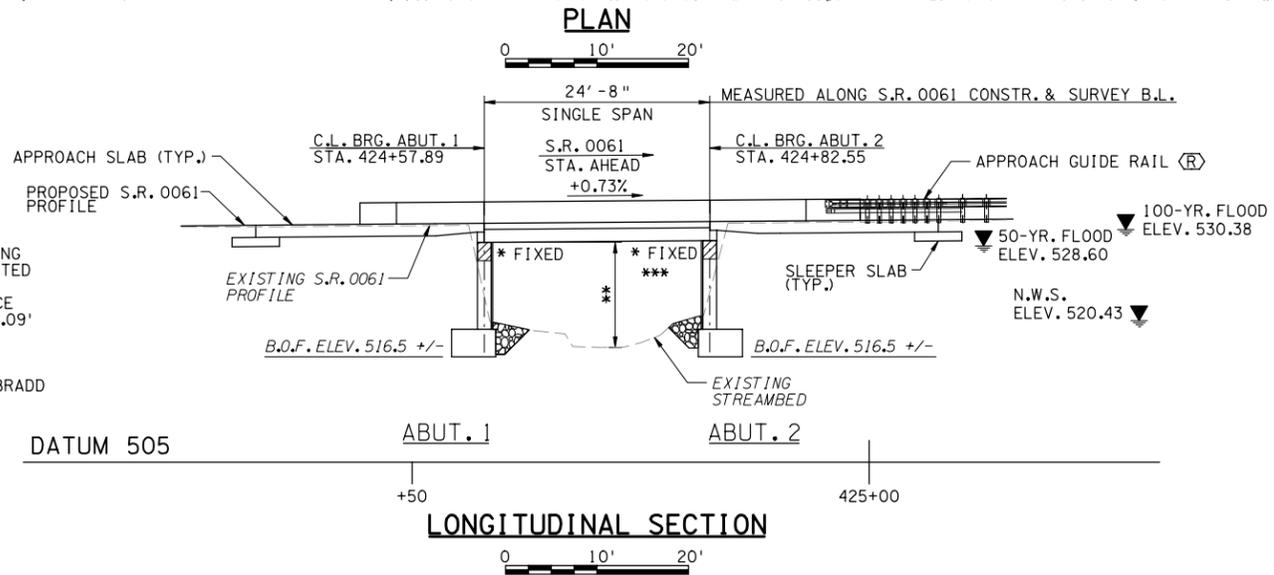
- PROPOSED CONSTRUCTION:**
- FULL SUPERSTRUCTURE REPLACEMENT WITH P/S CONCRETE SPREAD BOX BEAMS AND ALTERNATE CONCRETE BARRIERS.
 - REPLACE BEARINGS AT ABUTMENT 1 AND 2.
 - REPAIR CONCRETE AREAS OF ABUTMENTS AND WINGS.
 - PARTIAL REPLACEMENT OF ABUTMENTS 1 & 2, MINIMUM OF 43'-0" MEASURED HORIZONTALLY ALONG ABUTMENT FRONT FACE.
 - CONSTRUCT APPROACH SLABS WITH ATTACHED BARRIERS AT BOTH ABUTMENTS.

HYDRAULIC DATA - MAHANNON CREEK

DRAINAGE AREA	5.61 SQ. MI.
WATERWAY OPENING	201.68 SQ. FT.
50-YR. DESIGN FLOOD:	
MAGNITUDE	1,610 C.F.S.
WATER SURFACE ELEVATION	528.60
WATERWAY OPENING VELOCITY	6.01 F.P.S.
100-YR. FLOOD:	
MAGNITUDE	2,040 C.F.S.
WATER SURFACE ELEVATION	530.38
WATERWAY OPENING VELOCITY	6.44 F.P.S.

NOTE:
 * HYDROLOGICAL AND HYDRAULIC INFORMATION IS BASED ON THE CREEK STATION 11+41.

Mark	Description	By	Chk'd.	App'd.	Date
REVISIONS					



- * ELASTOMERIC BEARING PADS ARE ANTICIPATED
- ** MIN. UNDERCLEARANCE MIN. REQUIRED = 12.09'
EXISTING = 11.36'
PROPOSED = 12.14'
- *** HOLD TO EXP. FOR BRADD FINAL DESIGN.

- LEGEND:**
- EXISTING CONTOUR
 - PROPOSED CONTOUR
 - ➔ DIRECTION OF TRAFFIC
 - (R) ROADWAY ITEM
 - [Pattern] R-8 SCOUR PROTECTION (R) CHOKED WITH R-4
 - [Pattern] BEAM SEAT ADJUSTMENTS

PREPARED BY:
 BORTON-LAWSON
 613 BALTIMORE DRIVE SUITE 300
 WILKES-BARRE, PA 18702-7903

REG. PROF. ENGINEER

 _____ 20 _____

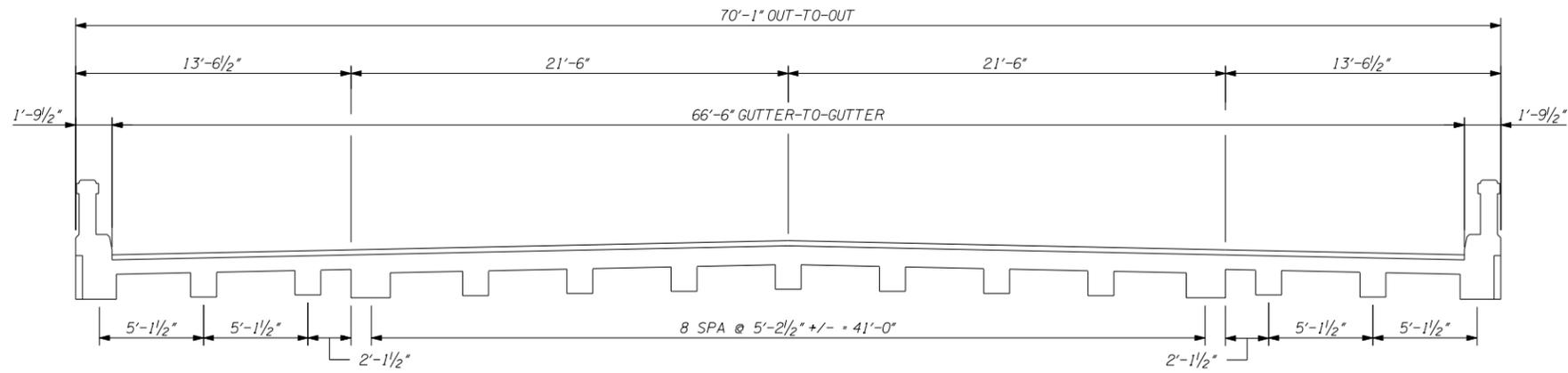
DESCRIPTION	DWG. NO.	APP. DATE
SUPPLEMENTAL DRAWINGS		

S.R. 0061 PREVIOUSLY KNOWN AS L.R. 00141

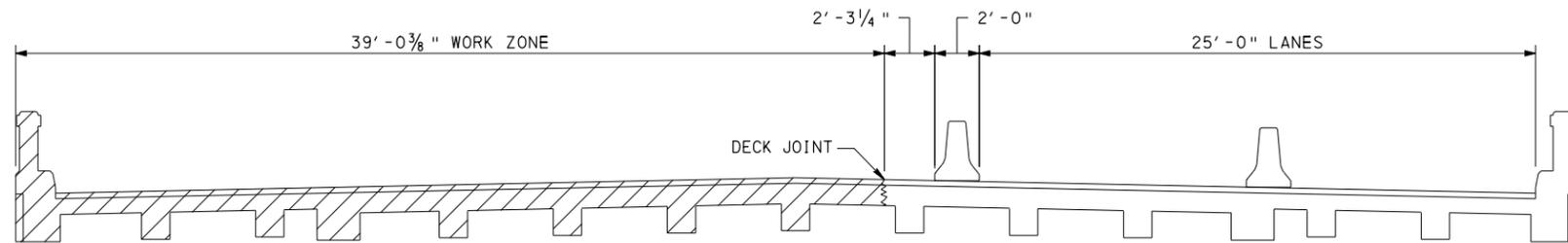
COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION

SCHUYLKILL COUNTY
 S.R. 0061 SECTION 03B
 SEGMENT 0170, OFFSET 0030
 S.R. 0061 STA. 424+70.22
 OVER MAHANNON CREEK
 SINGLE SPAN P/S CONC. SPREAD BOX BEAM BRG.
 TS&L PLAN

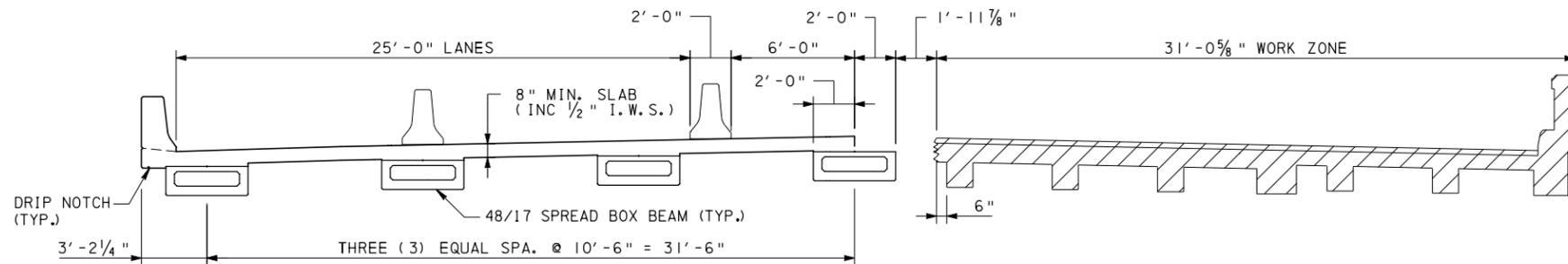
RECOMMENDED _____	SHEET <u>1</u> OF <u>3</u> & SUPPLEMENTAL DRAWINGS
BRIDGE ENGINEER	S-PENDING



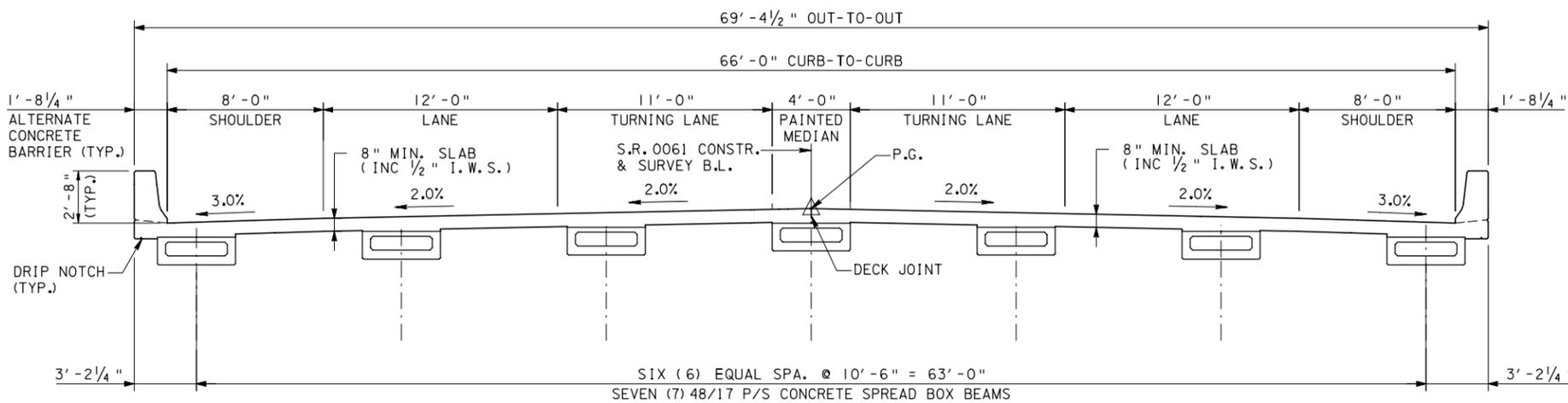
CONSTRUCTION PHASE 1 - EXISTING CONDITION



CONSTRUCTION PHASE 2 - DEMO LT

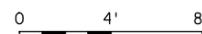


CONSTRUCTION PHASE 3 - DEMO RT



CONSTRUCTION PHASE 4 - PROPOSED TYPICAL SECTION

TYPICAL SECTION



LIMITS OF BRIDGE REMOVAL

Mark	Description	By	Chk'd.	App'd.	Date
REVISIONS					

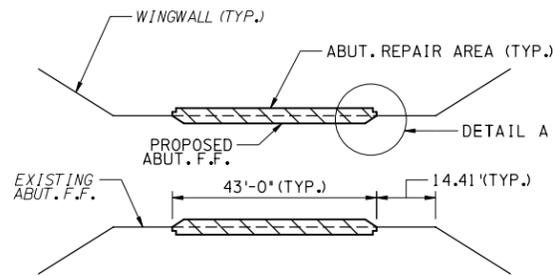
S.R. 0061 PREVIOUSLY KNOWN AS L.R. 00141

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

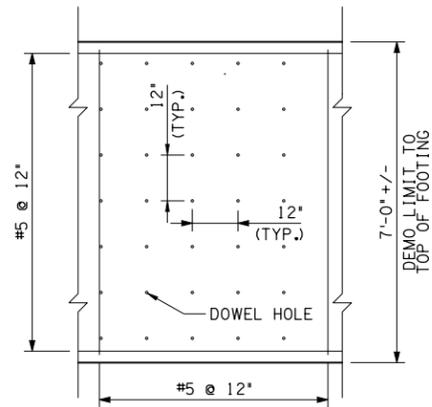
SCHUYLKILL COUNTY
S.R. 0061 SECTION 03B
SEGMENT 0170, OFFSET 0030
S.R. 0061 STA. 424+70.22
OVER MAHANNON CREEK
SINGLE SPAN P/S CONC. SPREAD BOX BEAM BRG.
TS&L PLAN

GENERAL NOTES:

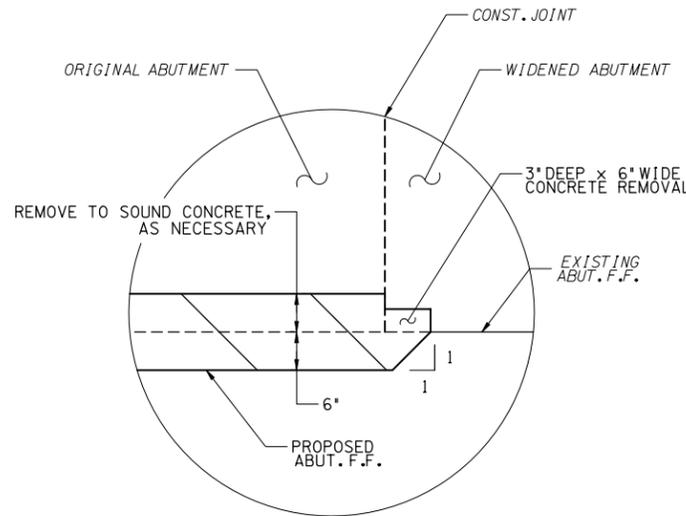
- DESIGN SPECIFICATIONS:
 - AASHTO LRFD DESIGN SPECIFICATIONS THIRD EDITION, 2004 AND AS SUPPLEMENTED BY DESIGN MANUAL, PART 4, SEPTEMBER 2007 (INCLUDING LATEST REVISIONS).
 - PROVIDE MATERIALS AND PERFORM WORK IN ACCORDANCE WITH SPECIFICATIONS, PUB. 408/2007, ANSI/AASHTO/AWS D1.5 2002 BRIDGE WELDING CODE (USE AASHTO/AWS D1.1/D1.1M: 2002 FOR WELDING NOT COVERED IN AASHTO/AWS D1.5M/D1.5: 2002) AND CONTRACT SPECIAL PROVISIONS.
- LIVE LOAD DISTRIBUTION TO GIRDERS IS BASED UPON DM-4 DISTRIBUTION FACTORS.
- DESIGN IN ACCORDANCE WITH THE LRFD METHOD.
- LIVE LOADS:
 - PHL-93 OR P-82 (204 K PERMIT LOAD) LOADINGS
 - PRESTRESSED CONCRETE: ADT 1728 (2032)
 - MAXIMUM ALLOWABLE TENSILE STRESS IN PRECOMPRESSED TENSILE ZONE: $0.0948\sqrt{f'c}$
- DEAD LOADS:
 - INCLUDES SURFACE AREA DENSITY OF 0.030 KSF FOR FUTURE WEARING SURFACE ON THE DECK SLAB.
 - INCLUDES 15 PSF FOR PERMANENT METAL DECK FORMS WHICH TAKES INTO ACCOUNT WEIGHT OF THE FORM, PLUS THE WEIGHT OF THE CONCRETE IN THE VALLEY OF THE FORMS.



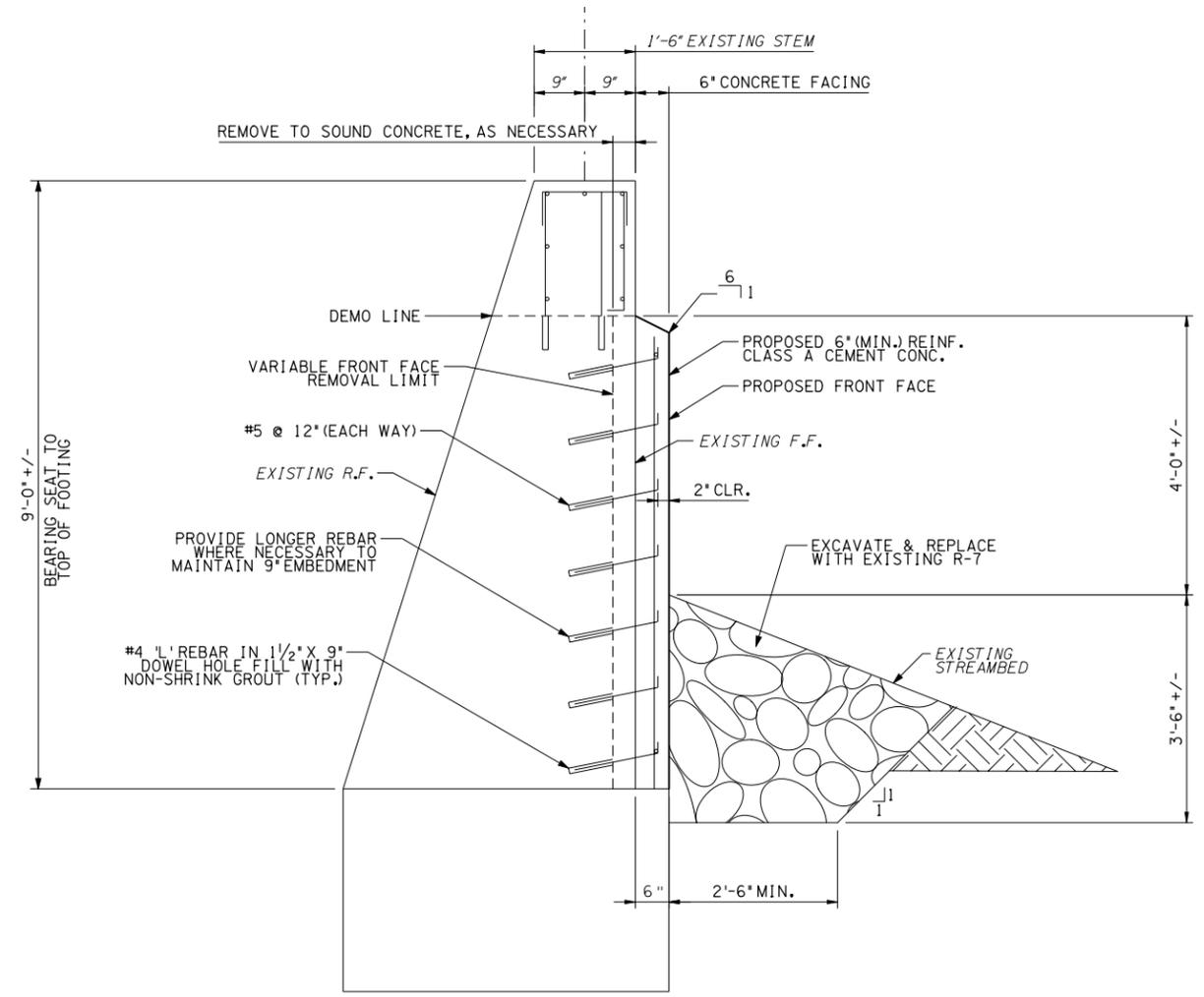
ABUT. REPAIR LAYOUT
N.T.S.



FRONT FACE SUBSTRUCTURE REPAIR
N.T.S.



DETAIL A
N.T.S.



ABUT. REPAIR SECTION
N.T.S.

Mark	Description	By	Chk'd.	App'd.	Date
REVISIONS					

S.R. 0061 PREVIOUSLY KNOWN AS L.R. 00141

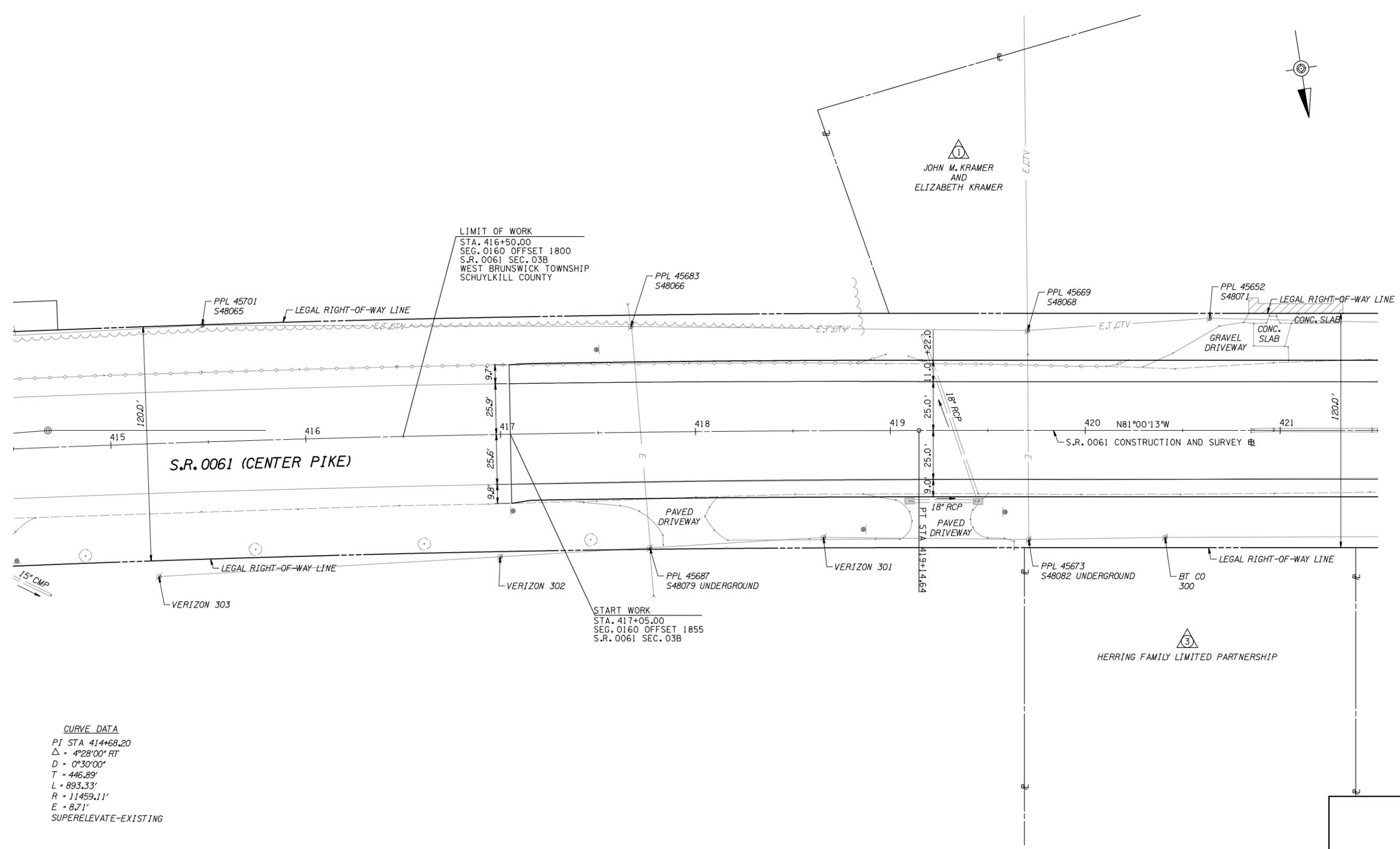
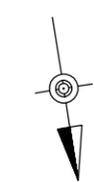
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SCHUYLKILL COUNTY
S.R. 0061 SECTION 03B
SEGMENT 0170, OFFSET 0030
S.R. 0061 STA. 424+70.22
OVER MAHANNON CREEK
SINGLE SPAN P/S CONC. SPREAD BOX BEAM BRG.
TS&L PLAN

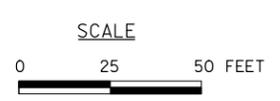
APPENDIX D-2

Roadway Plan and Profile

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	6 OF 11
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	



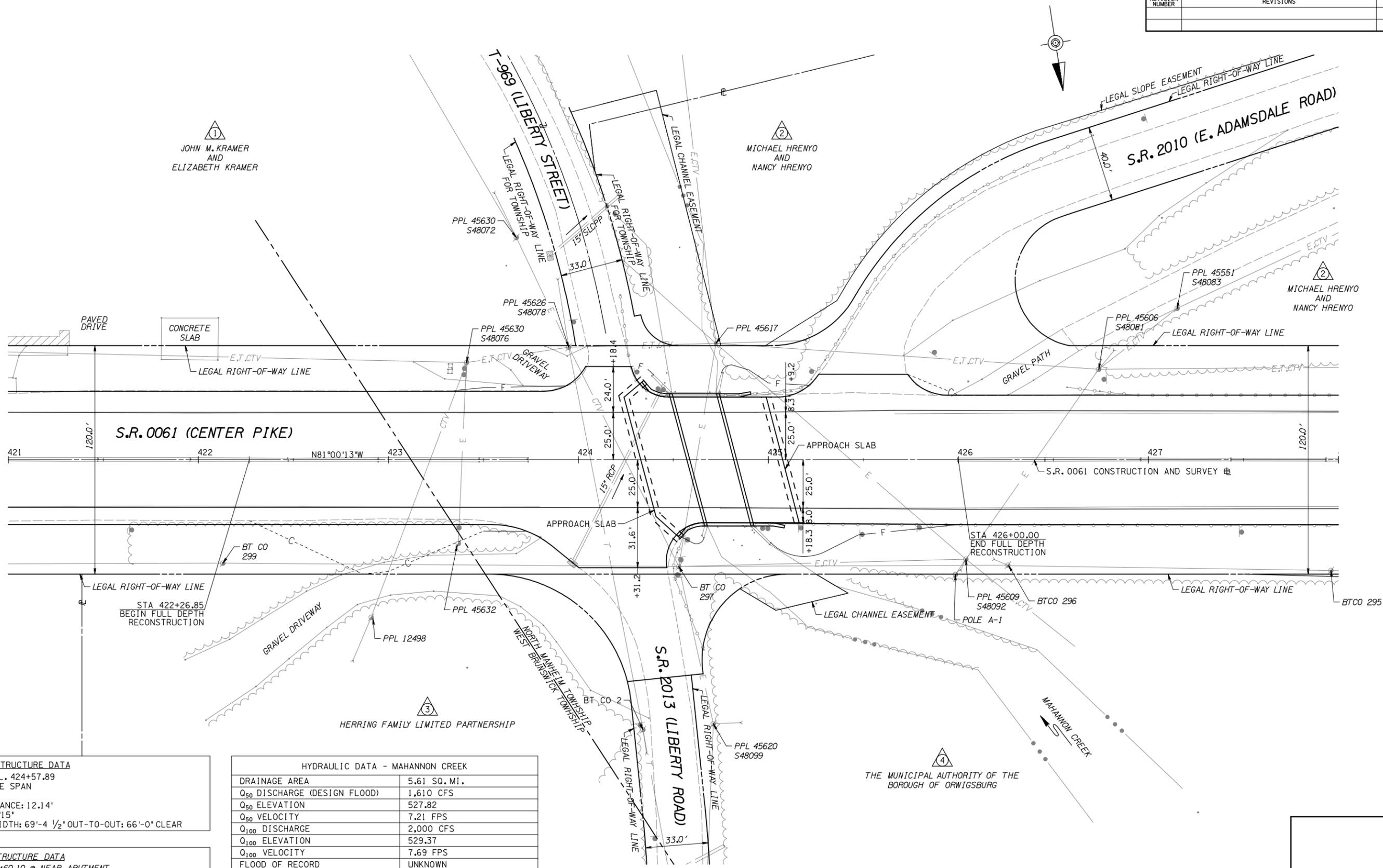
CURVE DATA
 PI STA 414+68.20
 $\Delta = 4^{\circ}28'00''$ RT
 $D = 0^{\circ}30'00''$
 $T = 446.89'$
 $L = 893.33'$
 $R = 11459.11'$
 $E = 8.71'$
 SUPERELEVATE-EXISTING



SEE SHEET 7

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DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	7 OF 11
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	



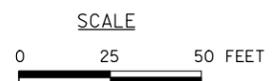
SEE SHEET 6

SEE SHEET 8

PROPOSED STRUCTURE DATA	
STATION:	B.L. 424+57.89
TYPE:	SINGLE SPAN
SPAN:	
UNDERCLEARANCE:	12.14'
SKEW:	75°08'15"
ROADWAY WIDTH:	69'-4 1/2" OUT-TO-OUT: 66'-0" CLEAR

EXISTING STRUCTURE DATA	
STATION:	424+60.10 @ NEAR ABUTMENT
TYPE:	SINGLE SPAN
SPAN:	22'-3 5/8" CLEAR
UNDERCLEARANCE:	11.42' +/-
SKEW:	75°00'00"
CLEAR ROADWAY WIDTH:	66.5'

HYDRAULIC DATA - MAHANNON CREEK	
DRAINAGE AREA	5.61 SQ. MI.
Q ₅₀ DISCHARGE (DESIGN FLOOD)	1,610 CFS
Q ₅₀ ELEVATION	527.82
Q ₅₀ VELOCITY	7.21 FPS
Q ₁₀₀ DISCHARGE	2,000 CFS
Q ₁₀₀ ELEVATION	529.37
Q ₁₀₀ VELOCITY	7.69 FPS
FLOOD OF RECORD	UNKNOWN

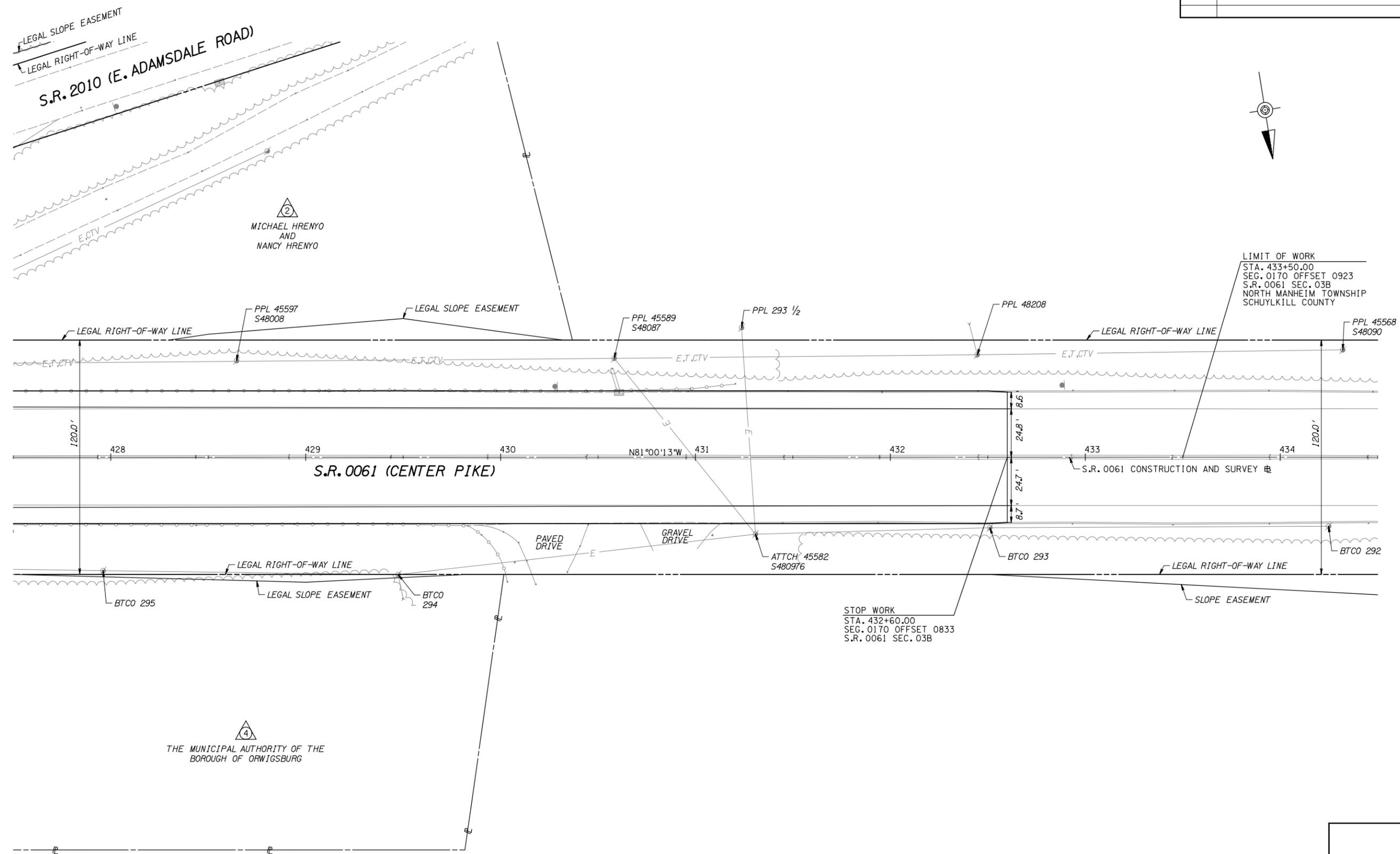


FOR PROFILE, SEE SHEET 10

SURVEY BOOK NO.

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DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	8 OF 11
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	

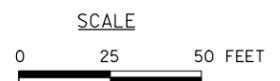


LIMIT OF WORK
 STA. 433+50.00
 SEG. 0170 OFFSET 0923
 S.R. 0061 SEC. 03B
 NORTH MANHEIM TOWNSHIP
 SCHUYLKILL COUNTY

STOP WORK
 STA. 432+60.00
 SEG. 0170 OFFSET 0833
 S.R. 0061 SEC. 03B

SEE SHEET 7

THE MUNICIPAL AUTHORITY OF THE
 BOROUGH OF ORWIGSBURG

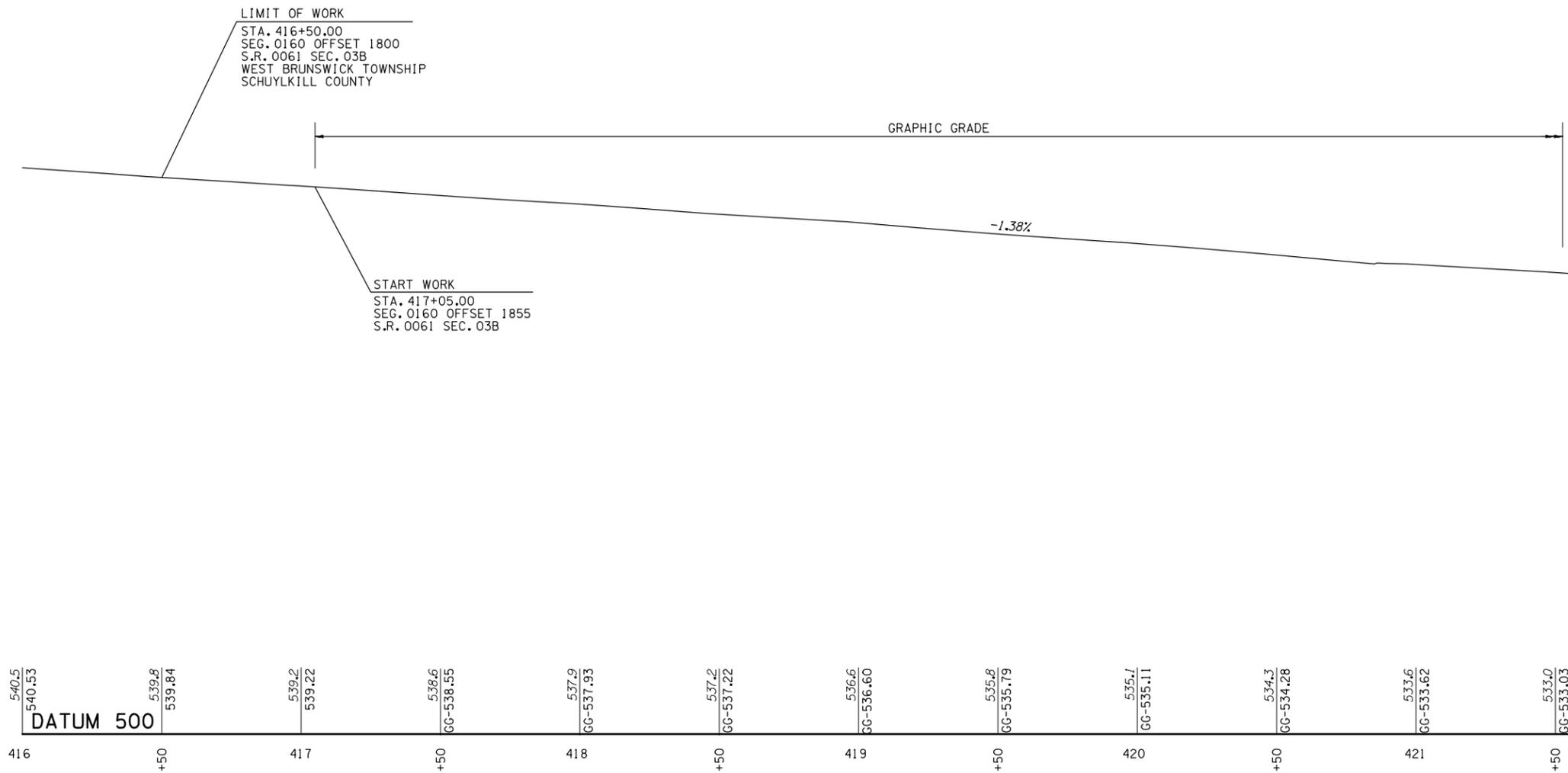


FOR PROFILE, SEE SHEET 11

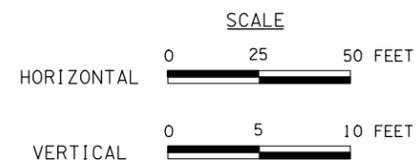
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 3/20/2010 11:14:52 AM

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	9 OF 11
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	



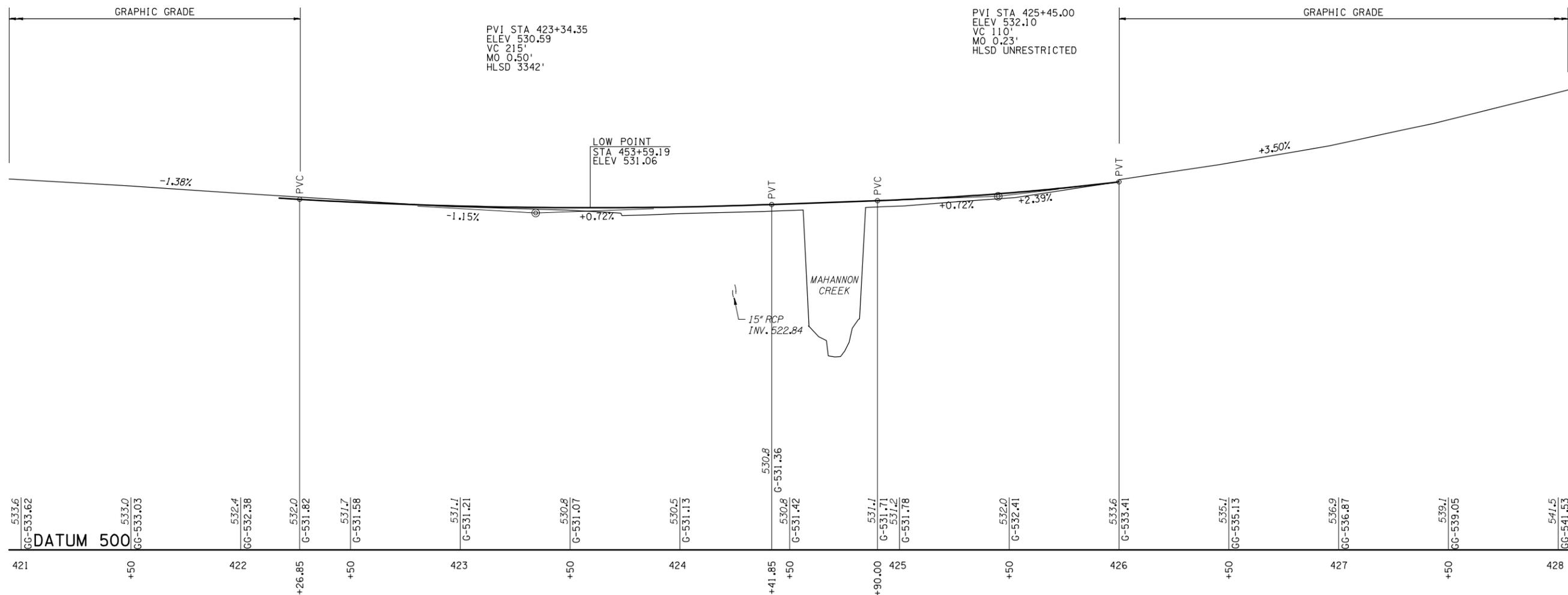
S.R. 0061 (CENTER PIKE)



SEE SHEET 10

FOR PLAN, SEE SHEET 6

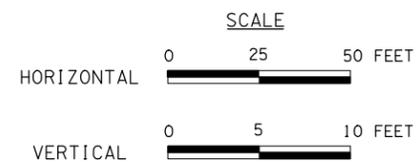
DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	10 OF 11
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	



SEE SHEET 9

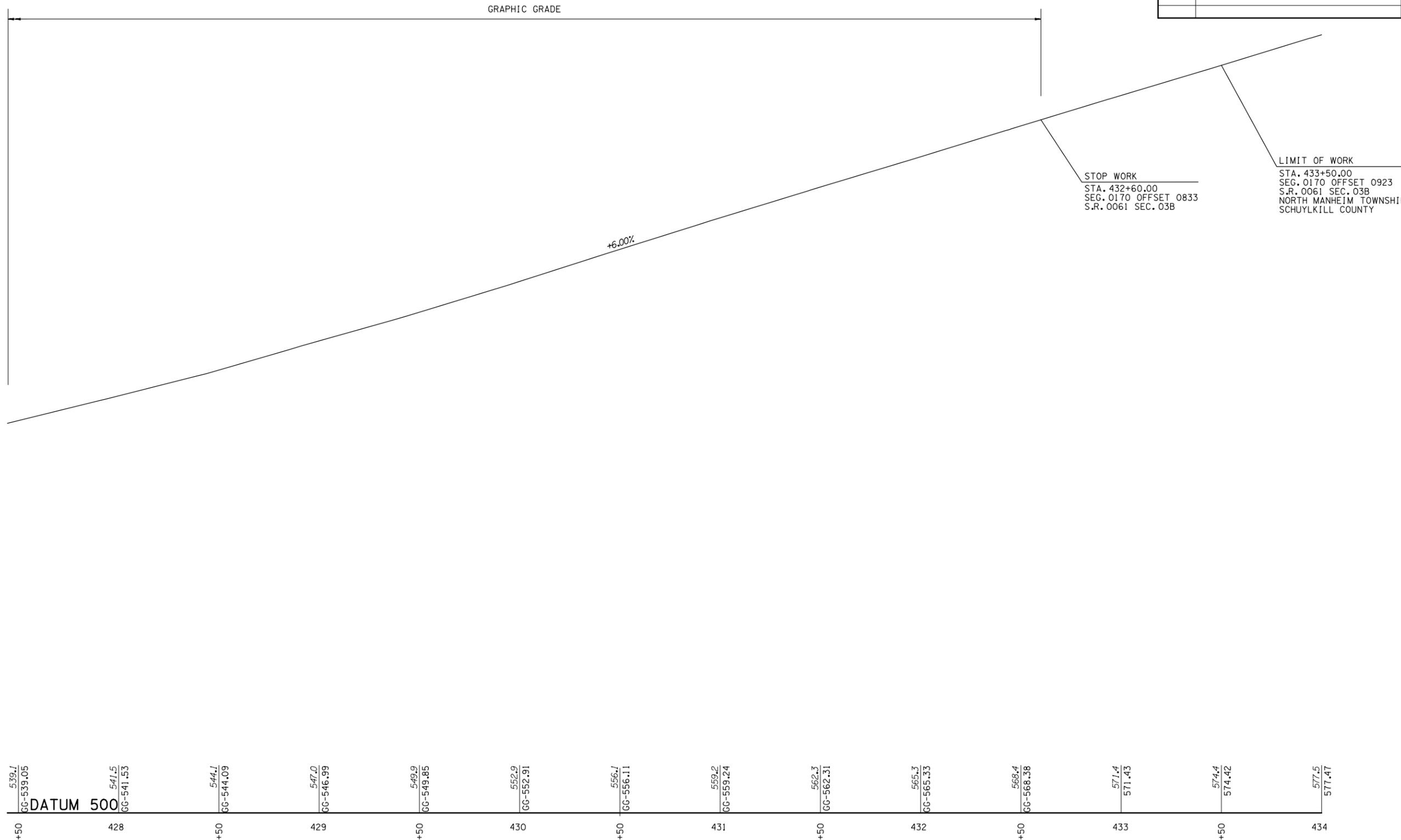
SEE SHEET 11

S.R. 0061 (CENTER PIKE)



FOR PLAN, SEE SHEET 7

DISTRICT	COUNTY	ROUTE	SECTION	SHEET	
5-0	SCHUYLKILL	0061	03B	11 OF 11	
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP					
REVISION NUMBER	REVISIONS			DATE	BY



SEE SHEET 10

S.R. 0061 (CENTER PIKE)

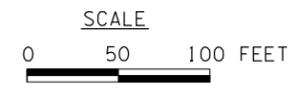
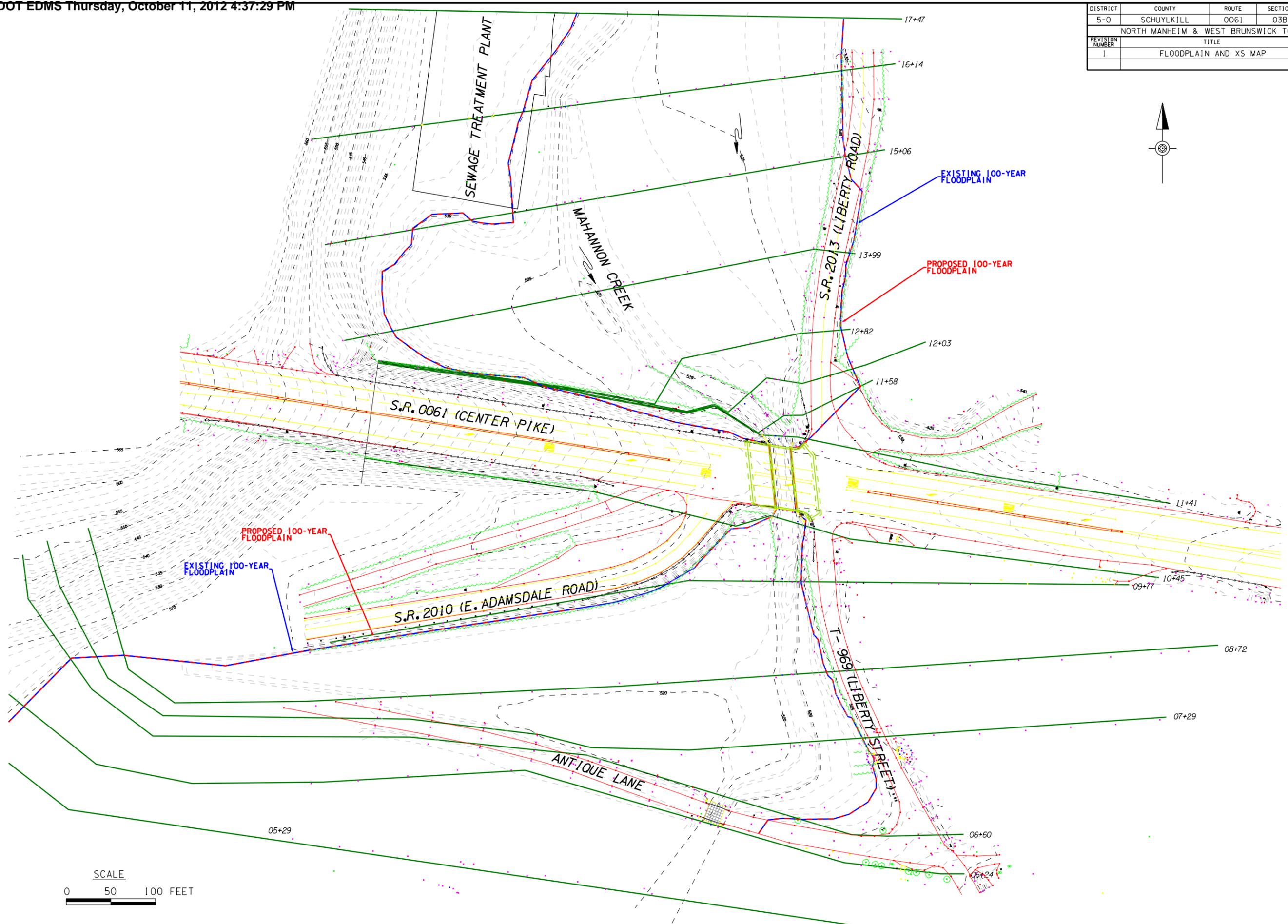
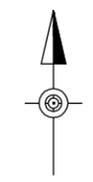


FOR PLAN, SEE SHEET 8

APPENDIX D-3

Floodplain Drawing

DISTRICT	COUNTY	ROUTE	SECTION	SHEET	
5-0	SCHUYLKILL	0061	03B	1 OF 1	
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP					
REVISION NUMBER	TITLE			DATE	BY
1	FLOODPLAIN AND XS MAP			08/10	PAK



FILES AT 8:15 AM

APPENDIX D-4

Temporary Conditions Drawing

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	SCHUYLKILL	0061	03B	1 OF 1
NORTH MANHEIM & WEST BRUNSWICK TOWNSHIP				
REVISION NUMBER	REVISIONS	DATE	BY	
1	TEMPORARY CONDITIONS SKETCH	8/10	PAK	

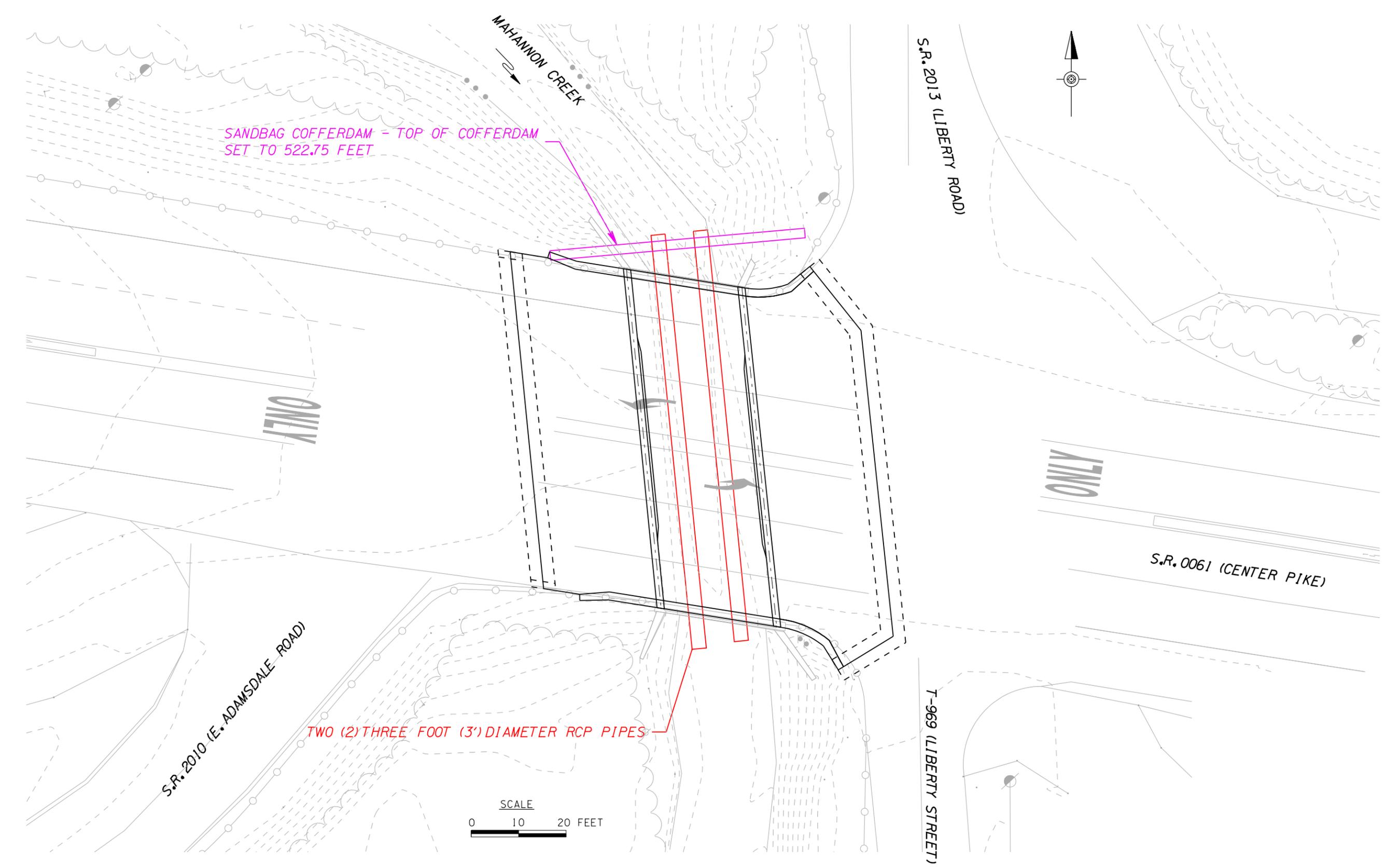


TABLE 1
MITIGATION TRACKING SYSTEM MATRIX

Project Name: S.R. 61, Section 038 Bridge Improvement Project

Project Location: West Brunswick Township and North Mannheim Township, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	PART 1 OF 5: PRELIMINARY ENGINEERING MITIGATION COMMITMENT			
				BEGIN STATION	END STATION	IMPACT	
NATURAL RESOURCES							
Streams, Rivers, and Watercourses	Mahannon Creek	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	Mahannon Creek is designated as a Naturally Reproducing Trout Stream; therefore, in-stream construction activities are restricted from Oct. 1 thru Dec 31.
Streams, Rivers, and Watercourses	Mahannon Creek	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	Plan notes and specifications have been incorporated to address debris removal associated with the bridge work.
Wetlands	Various	Design Team	2010 Wetland Investigation Report	N/A	N/A	N/A	Wetland identification and delineation conducted 20c109. No wetlands are located within the project limits.
Groundwater Resources	Wells	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	According to the PA Groundwater Information System, there are several wells within 0.5 miles of the project area. Based on the project scope (superstructure replacement) no impacts to groundwater resources are anticipated.
LAND RESOURCES							
Hazardous Waste	Waste	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	Based on historical data and the on-site investigation, one (1) inactive leaking underground storage tank site, the former John Kramer Mobile Service was identified in close proximity to the project area. According to PADEP, no information or files exist on the status of remediation or clean closure of the underground storage tanks at this facility.
CULTURAL RESOURCES							
Cultural Resources	Archaeology	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	The proposed project includes the replacement of the superstructure and repair of the substructure concrete abutments of the bridge built in 1936 and modified in 1955. The bridge has been determined not eligible for listing in the National Register of Historic Places through the AG Lichtenstein bridge survey. There are no other historic properties near the bridge and the bridge does not contribute to any potential or recorded historic districts. Additionally, there are no previously recorded archaeological sites near the bridge and the project has a low potential for affecting any archaeological resources.
Section 4(f) Resources	Various	Design Team	2010 Phase 1 ESA	N/A	N/A	N/A	No section 4(f) resources are present within the project area.
AIR AND NOISE RESOURCES							
Air Quality and Noise	Noise Quality	Design Team	2010 Phase 1 ESA	#REF!	#REF!	#REF!	The proposed project is located in an attainment area for the PM 2.5/PM 10 standards. The project does not require a project level conformity determination. According to the PM 2.5 and PM 10 hot spot analysis requirements established in the March 10, 2006, Final Transportation Conformity Rule (71 FR 12468) no further project level air quality analysis for these pollutants is required. Because the project is a superstructure replacement, impacts are anticipated to be minimal or negligible.

**TABLE 2
MITIGATION TRACKING SYSTEM MATRIX TEMPLATE**

Project Name: S.R. 61, Section 11S Improvements Project

Project Location: West Brunswick Township and Deer Lake Borough, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	NATURAL RESOURCES			MITIGATION COMMITMENT
				BEGIN STATION	END STATION	IMPACT	
LAND RESOURCES							
Streams, Rivers, and Watercourses	Mahamnon Creek	Design Team	2011 CEE B-A-1	N/A	N/A	N/A	Mahamnon Creek is designated as a Naturally Reproducing Trout Stream; therefore, in-stream construction activities are restricted from Oct 1 thru Dec 31.
Vegetation	Vegetation	Design Team	2011 CEE B-A-2	0	0	0	Field reconnaissance revealed no productive agricultural land within the immediate vicinity of the proposed bridge rehabilitation project. As such, there will be no taking of Primary Agricultural Land as part of the project. If impacts to vegetation should occur, all disturbed
Hazardous Waste	Waste	Design Team	2011 CEE B-A-1	N/A	N/A	N/A	A Phase I Environmental Site Assessment was conducted for the S.R. 0061 bridge over the Mahamnon Creek by ASC Group, Inc. Lead-based paint and asbestos sampling were not performed at the directive of PennDOT District 5-0. Based on historical data and the on-site investigation, one (1) Inactive Leaking Underground Storage Tank site, former John Kramer Mobil Service was identified in close proximity to the project area. According to the PADDP, no information or files exist on the status of remediation or clean closure of the underground storage tanks at this facility. During the preparation of the environmental document, the former Kramer Mobil Service facility, located in the southeastern quadrant of the project, was sold, the new owner, Paul Bedway, Jr. was present at the public plans display meeting and indicated that a Phase III Environmental Site Assessment (Phase III) was completed for the property as part of the real estate transaction. Mr. Bedway offered a copy of the document to PennDOT for review and use as part of the transportation project. The Phase III was completed by Light-Heigel & Assoc. of Schuylkill Haven, PA in December 2009 and January 2010. According to the Phase III report, the assessment included a site walk over, along with collection of soil and water samples for laboratory analysis. The soil and water samples were obtained from three silt trenches that were located across the property with one trench being excavated in the location of the former fuel underground storage tanks (UST), which according to the report were removed in and around 1993, but the PADDP has no documentation of this. Each trench was approximately 6' long by 2 1/2' wide by 8' deep, and excavated using a standard backhoe machine. Samples were obtained from virgin material, as close to the bottom of the trench as possible. The samples were immediately transported to the Pennsylvania Environmental Laboratory, located approximately 5 miles north of the site. Laboratory results for Trenches #1 and #2 indicated that the required parameters tested were all below allowable limits. Laboratory results for Trench #3 located in the area of the former fuel UST's indicated that the water and soil sampling events of December 2009 and January 2010 did not indicate any violation of the PADDP/USDEP parameters. It was also stated that as part of the site assessment, four water samples from the unnamed tributary to the Mahamnon Creek, located on the property, were taken to determine fecal coliform concentrations; an indication of possible sewage contamination since the property is serviced by an on-hot disposal system. The geometric mean average (a PADDP requirement) of the four samples was 62, well below the typical allowable fecal coliform concentration for a wastewater treatment facility. Additionally, the report indicates that in March 9, 2010 a 1000-gallon waste oil UST was removed from the property in accordance with PADDP standards by Environmental Products & Services of Vermont, Inc. of Old Forge, PA. During the removal of this UST, no environmental concerns were observed relative to the UST. Based on the findings of the Phase III Environmental Site Assessment performed by Light-Heigel & Associates, Inc., it can be concluded that the former Kramer Mobil service facility would likely have no environmental impact upon this transportation project.

TABLE 3
MITIGATION TRACKING SYSTEM MATRIX TEMPLATE

Project Name: S.R. 61, Section 038 Bridge Improvement Project

Project Location: West Brunswick Township and North Manheim Township, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	NATURAL RESOURCES			PART 3 OF 5: FINAL DESIGN MITIGATION COMMITMENT	PROJECT MANAGER DATE/INITIALS
				BEGIN STATION	END STATION	IMPACT		
LAND RESOURCES								
Streams, Rivers, and Watercourses	Mahamnon Cr.	Design Team	2011 CEE B- A-1	N/A	N/A	N/A	Mahamnon Creek is designated as a Naturally Reproducing Trout Stream, therefore, in-stream construction activities are restricted from Oct 1 thru Dec 31.	ASB 8/1/12
Vegetation	Vegetation	Design Team	2011 CEE B- A-2	N/A	N/A	N/A	Field reconnaissance revealed no productive agricultural land within the immediate vicinity of the proposed bridge rehabilitation project. As such, there will be no taking of Primary Agricultural Land as part of the project. If impacts to vegetation should occur, all disturbed areas will be regraded and reseeded. Reseeding activities will be in accordance with Pennsylvania Seed Act and PennDOT Specifications (804.2-.3) From PUB 4082011.	ASB 8/1/12
Hazardous Waste	Waste	Design Team	2011 CEE B- A-2	N/A	N/A	N/A	A Phase I Environmental Site Assessment was conducted for the S.R. 0061 bridge over the Mahamnon Creek by ASC Group, Inc. Lead-based paint and asbestos sampling were not performed at the directive of PennDOT District 5-0. Based on historical data and the on-site investigation, one (1) inactive Leaking Underground Storage Tank site, former John Kramer Mobil Service was identified in close proximity to the project area. According to the PADDP, no information or files exist on the status of remediation or clean closure of the underground storage tanks at this facility. During the preparation of the environmental document, the former Kramer Mobil Service facility, located in the southeastern quadrant of the project was sold, the new owner, Paul Bedway, Jr. was present at the public plans display meeting and indicated that a Phase III Environmental Site Assessment (Phase III) was completed for the property as part of the real estate transaction. Mr. Bedway offered a copy of the document to PennDOT for review and use as part of the transportation project. The Phase III was completed by Light-Heigel & Assoc. of Schuylkill Haven, PA in December 2009 and January 2010. According to the Phase III report, the assessment included a site walk over, along with collection of soil and water samples for laboratory analysis. The soil and water samples were obtained from three silt trenches that were located across the property with one trench being excavated in the location of the former fuel underground storage tanks (UST), which according to the report were removed in and around 1993, but the PADDP has no documentation of this. Each trench was approximately 6' long by 2 1/2' wide by 8' deep, and excavated using a standard backhoe machine. Samples were obtained from virgin material, as close to the bottom of the trench as possible. The samples were immediately transported to the Pottsville Environmental Laboratory, located approximately 5 miles north of the site. Laboratory results for Trenches #1 and #2 indicated that the required parameters tested were all below allowable limits. Laboratory results for Trench #3 located in the area of the former fuel UST's indicated that the water and soil sampling events of	ASB 8/1/12

TABLE 3
MITIGATION TRACKING SYSTEM MATRIX TEMPLATE

Project Name: S.R. 61, Section 03B Bridge Improvement Project

Project Location: West Brunswick Township and North Manheim Township, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	PART 3 OF 5: FINAL DESIGN			MITIGATION COMMITMENT	PROJECT MANAGER DATE/INITIALS
				BEGIN STATION	END STATION	IMPACT		
Hazardous Waste	Waste	Design Team	2011 CEE B: A-2	N/A	N/A	N/A	December 2009 and January 2010 did not indicate any violation of the PADEPUSDEP parameters. It was also stated that as part of the site assessment, four water samples from the unnamed tributary to the Mahannon Creek, located on the property, were taken to determine fecal coliform concentrations, an indication of possible sewage contamination since the property is serviced by an on-lot disposal system. The geometric mean average (a PADEP requirement) of the four samples was 62, well below the typical allowable fecal coliform concentration for a wastewater treatment facility. Additionally, the report indicates that in March 9, 2010 a 1000-gallon waste oil UST was removed from the property in accordance with PADEP standards by Environmental Products & Services of Vermont, Inc. of Old Forge, PA. During the removal of this UST, no environmental concerns were observed relative to the UST. Based on the findings of the Phase I/II Environmental Site Assessment performed by Light-Heygel & Associates, Inc., it can be concluded that the former Kramer Mobil service facility would likely have no environmental impact upon this transportation project.	

District Project Manager: _____
 Final Design Consultant: _____
 Final Design Consultant Project Manager: _____

TABLE 4
MITIGATION TRACKING SYSTEM MATRIX TEMPLATE

Project Name: S.R. 61, Section 03B Bridge Improvement Project

Project Location: West Brunswick Township and North Mainline Township, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	PART 4 OF 5:	
				MITIGATION COMMITMENT	CONSTRUCTION CONTRACTOR ² , ³ DATE/INITIALS
NATURAL RESOURCES					
Streams, Rivers, and Watercourses	Mahamont Creek	Contractor	Permit	Pine Creek is designated as a stocked trout stream; therefore, construction activities are restricted from Mar 1 thru Jun 15. Construct Stream Mitigation Plan as developed.	
LAND RESOURCES					
Vegetation	Vegetation	Contractor	CEE, Part B, Section A-2	Reseeding activities will be conducted in accordance with Section 804.2 (b) of PennDOT's Specifications Manual (Publication 408).	
Hazardous Waste	Waste	Contractor		Should the Contractor elect to rent this property as part of his construction operations, any earth disturbing activities need to be monitored for the presence of hazardous materials. Should testing determine the presence of hazardous materials, the contractor shall take appropriate mitigation measures to contain and properly dispose of said hazardous materials.	

² Contractor Name

³ Contractor Responsible Individual:

² The Contractor is to initialize the matrix for a given mitigation line-item immediately after the individual line-item has been implemented and/or completed. The Contractor is to coordinate with the Construction Project Manager (or Environmental Monitor) to review the individual mitigation line items and to receive concurrence (PM or EM initials) for completed line items. This coordination is to be on a regular basis (such as periodic site inspections or status meetings, as determined for the project.

TABLE 5
MITIGATION TRACKING SYSTEM MATRIX TEMPLATE

Project Name: S.R. 61, Section 03B Improvements Project

Project Location: West Brunswick Township and North Mannheim Township, Schuylkill County, PA

MITIGATION CATEGORY	RESOURCE/ REFERENCE NUMBER	RESPONSIBLE PARTY	SOURCE DOCUMENTS	PART 5 OF 5: MAINTENANCE AND OPERATIONS	
				MITIGATION COMMITMENT	ENVIRONMENTAL MANAGER DATE/INITIALS
NATURAL RESOURCES					
Streams, Rivers, and Watercourses	Mahannon Cr.	Department		Post construction monitoring of stream mitigation in accordance with PA DEP 105 and USACE 404 permit requirements.	
LAND RESOURCES					
Vegetation	Not Applicable	Department		Verify acceptable establishment of ground cover for disturbed areas. Direct reseeding per 804.3 of PUB 408/2011.	

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

(See reverse for public burden disclosure.)

1. Type of Federal Action: <input type="checkbox"/> a. contract <input type="checkbox"/> b. grant <input type="checkbox"/> c. cooperative agreement <input type="checkbox"/> d. loan <input type="checkbox"/> e. loan guarantee <input type="checkbox"/> f. loan insurance	2. Status of Federal Action: <input type="checkbox"/> a. bid/offer/application <input type="checkbox"/> b. initial award <input type="checkbox"/> c. post-award	3. Report Type: <input type="checkbox"/> a. initial filing <input type="checkbox"/> b. material change For Material Change Only: year _____ quarter _____ date of last report _____
4. Name and Address of Reporting Entity: <input type="checkbox"/> Prime <input type="checkbox"/> Subawardee Tier _____, <i>if known</i> : Congressional District, <i>if known</i> : 4c	5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime: Congressional District, <i>if known</i> :	
6. Federal Department/Agency:	7. Federal Program Name/Description: CFDA Number, <i>if applicable</i> : _____	
8. Federal Action Number, if known:	9. Award Amount, if known: \$ _____	
10. a. Name and Address of Lobbying Registrant <i>(if individual, last name, first name, MI):</i>	b. Individuals Performing Services <i>(including address if different from No. 10a)</i> <i>(last name, first name, MI):</i>	
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.	Signature: _____ Print Name: _____ Title: _____ Telephone No.: _____ Date: _____	
Federal Use Only:		Authorized for Local Reproduction Standard Form LLL (Rev. 7-97)

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

(b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).
11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB Control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503.



**Borton
Lawson**

**ENGINEERING
ARCHITECTURE**

May 7, 2012

Ms. Cathy Longenecker, E.I.T.
Erdman Anthony
One Sterling Place
100 Sterling Parkway, Suite 212
Mechanicsburg, PA 17050

**RE: S.R. 0061 , Section 03B Superstructure Replacement over Mahannon Creek;
Segment 0170, Offset 0030
Schuylkill County – North Manheim Township
Streamlined Final TS&L Submission**

BL No.: 2009-2515-01

Dear Ms. Longenecker:

The Streamlined Final Type, Size and Location Submission for the S.R. 0061 Superstructure Replacement is enclosed. The Submission is in accordance with Chapter 1.11.3.2 of the Design Manual, Part 4, Part A.

Existing Structure Data

Station at Near Abutment	424+60.10
Type	Reinforced Concrete T-Beam Bridge
Structure Length	24'-0"
Underclearance	11.36' ±
Skew	75°
Roadway	66'-6" Clear
Year Built	1936 (Widened 1955)

Proposed Structure Data

Location: S.R. 0061 over Mahannon Creek, Station 424+70.22

<u>Type of Superstructure:</u>	Single Span Composite P/S Concrete Spread Box Beam
Beam Size	48/17
Beam Spacing	7 Beams @ 10'-6" C-C
Maximum Overhang	3'-2¼" to Beam Centerline; 1'-4¾" to Web Centerline
Continuous for Live Load	Not Applicable – Single Span

Bethlehem
Nazareth
Pittsburgh
State College
Towanda
Wilkes-Barre

BETHLEHEM

3893 Adler Place
Suite 100

Bethlehem, PA 18017

Phone: 484.821.0470

Fax: 484.821.0474

<u>Span:</u>	24'-8" Centerline Abutment 1 Bearings to Centerline Abutment 2 Bearings
<u>Roadway Width:</u>	66'-0" Curb-to-Curb 69'-4½" Out-to-Out No Sidewalks
<u>Skew Angle:</u>	75°-08'-15" Right
<u>Vertical Clearance:</u>	
Minimum Required	12.09 ft.
Actual Provided	12.14 ft.
<u>Horizontal Clearance:</u>	Not Applicable
<u>Substructure:</u>	Not Applicable – Superstructure Replacement
<u>Deck Joints:</u>	Not Applicable – No Backwalls Required
<u>Bearing Type:</u>	Laminated Elastomeric Bearing Pads
<u>Drainage:</u>	Deck Drainage Not Required
<u>Design Methodology:</u>	Load & Resistance Factor Design
<u>Live Loading:</u>	PHL-93, ML-80, TK527, and P-82
<u>Deck Protective System:</u>	Epoxy Coated Reinforcement, Penetrating Sealer

Additional Information (1.11.3.2.1)

- a) S-32529 – Schuylkill County, North Manheim Township
S.R. 0061, Section 03B
Limits of Work: Segment 0160, Offset 1800 to Segment 0170, Offset 0923
- b) Designer: Borton-Lawson – Bethlehem Office
- c) Design Traffic Data: Current ADT (2012) – 17,688
Design Year ADT (2032) – 19,197
9% Trucks
Class of Highway – Rural Principal Arterial
- d) Line & Grade Approval: 8/04/2010
Design Speed = 55 mph
- e) Waterway Approval: 4/01/2011



- f) Potential Problem Areas: Unforeseen bridge repair
- g) Q/A Forms: Attached

The information satisfies the requirements specified in the Design Manual, Part 4, Part A, Chapter 1.9.3.3(a), TS&L Submission Letter. The remaining requirements of 1.9.3.3. (b) through (f) are contained in the attached submission. If you should have any questions please contact me at 821-0470, ext. 2140.

Sincerely,



Ken M. McClain,
Transportation Division Manager
Bethlehem Office
KMM/lmw

APPROVED



Acting District Bridge Engineer

5/16/2012

Date



August 16, 2011

Mr. Christopher Kufro, P.E.
Pennsylvania Department of Transportation
Engineering District 5-0
1002 Hamilton Street
Allentown, PA 18101-1013

Re: General Permit Acknowledgement
DEP Application No. GP115412405
APS No. 779646
S.R. 61, Section 03B Bridge Replacement
N. Manheim & W. Brunswick Townships, Schuylkill County

Dear Mr. Kufro:

This will acknowledge receipt of your notification to use and registers your use of General Permit No. 11 to remove the existing structure and construct and maintain a spread box beam bridge in Buck Mountain Creek (CWF,MF) (Latitude: 40° 38' 29", Longitude: -76° 6' 20"). You are responsible for assuring the work is done in accordance with the drawings and conditions contained in the General Permit, as well as plans and specifications contained within your submission. You may proceed with your project after making the required notifications stipulated in the General Permit and securing all other approvals that may be necessary.

The Erosion and Sediment (E&S) Pollution Control Plan, 21 sheets 7/20/2012, adequately addresses erosion and sediment pollution control and meets the minimum requirements of the Department of Environmental Protection's (DEP) rules and regulations, Chapter 102, Erosion and Sediment Control and The Clean Streams Law, provided all Best Management Practices (BMPs) are properly implemented and maintained until the project has been permanently stabilized. Any proposed changes to the aforementioned E&S plans must be submitted in writing to the Department at least 60 days prior to the planned commencement of construction.

Please notify the Schuylkill County Conservation District at (570) 622-3742, and the Pennsylvania Fish and Boat Commission's Southeast Regional Office at (717) 626-0228 at least seven (7) working days prior to commencing earth disturbance activities. The E&S plan referenced above must be fully implemented and available on-site at all times.

Also enclosed is your Federal Clean Water Act Section 404 authorization in the form of the Pennsylvania State Programmatic General Permit (PASPGP-4).

Any person aggrieved by this action may appeal, pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa. C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market Street, P.O. Box 8457, Harrisburg, PA 17105-8457, (717) 787-3483. TDD users may contact the Board through the Pennsylvania Relay Service, (800) 654-5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this action unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the Board. The appeal form and the Board's rules of practice and procedure are also available in Braille or on audiotape from the Secretary to the Board at (717) 787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST REACH THE BOARD WITHIN 30 DAYS. YOU DO NOT NEED A LAWYER TO FILE AN APPEAL WITH THE BOARD.

IMPORTANT LEGAL RIGHTS ARE AT STAKE, HOWEVER, SO YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD AT (717) 787-3483 FOR MORE INFORMATION.

If you should have any questions, please call me at (570) 820-4920.

Sincerely,



Pamela Dobbins, P.E.

Watershed Management Program

cc: Michelle Morekin, PennDOT 5-0
Pa. Fish & Boat Commission, Division of Environmental Services
U.S. Army Corps of Engineers, Philadelphia District
Schuylkill County Conservation District

PENNSYLVANIA STATE PROGRAMMATIC GENERAL PERMIT – 4
(PASPGP-4)
July 1, 2011

Please note: the full text of the PASPGP-4 may be viewed on the Baltimore District web site at <http://www.nab.usace.army.mil/Wetlands%20Permits/> or by calling the Corps at 814-235-0570

Applicant:

State Authorization(s):

Corps District:

Philadelphia

U.S. Army Corps of Engineers,
Philadelphia District
Regulatory Branch
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390

Baltimore

U.S. Army Corps of Engineers,
Baltimore District
Regulatory Branch
1631 South Atherton Street
Suite 101
State College, PA 16801-6260

Pittsburgh

U.S. Army Corps of Engineers,
Pittsburgh District
Regulatory Branch
Federal Building, 20th floor
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

It has been determined that your proposed project, which includes the discharge of dredged and/or fill material and/or the placement of structures into waters of the United States, including wetlands, qualifies for Federal authorization under the provisions of Section 404 of the Clean Water Act and /or Section 10 of the River and Harbor Act of 1899, under the terms and conditions of the PASPGP-4.

All activities authorized under PASPGP-4 must comply with all conditions of the authorization, including General, Procedural, and Special Conditions. Failure to comply with all the conditions of the authorization, including project special conditions, will constitute a permit violation and may be subject to criminal, civil, or administrative penalties, and /or restoration.

The authorized activity must be performed in compliance with the following General Conditions to be authorized under PASPGP-4:

General Conditions:

1. **Permit Conditions:** The permittee shall comply with all terms and conditions set forth in the PADEP authorization for use of this permit, including all conditions of Section 401 Water Quality Certification, and any subsequent amendment or modification to such authorization. The permittee shall conduct all work and activities in strict compliance with all approved maps, plans, profiles, and specifications used by PADEP and/or the Corps as the basis for its authorization or subsequent modification of authorization.

2. **Aquatic Life Movements:** No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be appropriately depressed to maintain aquatic life movement and low flow conditions.

3. **Threatened and Endangered Species:** If an activity is authorized under the PASPGP-4, and a Federally listed threatened or endangered species, or proposed species or critical habitat, is subsequently found to be present, all work must cease, and the Corps and USFWS (or NMFS) must be notified. The PASPGP-4 verification is suspended and will not be re-issued until consultation pursuant to Section 7 of the ESA is concluded and adverse effects to Federally listed threatened, endangered, and proposed species and critical habitat are avoided.

Furthermore, persons have an independent responsibility under Section 9 of ESA to not engage in any activity that could result in the “take” of a Federally listed species.

4. **Spawning Areas:** The permittee shall comply with all time-of-year restrictions as set forth by the PFBC or other designated agency. Discharges or structures in spawning or nursery areas shall not occur during spawning seasons, unless written approval is obtained by the PFBC or other designated agency. In addition, work in areas used for other time sensitive life span activities of fish and wildlife (such as hibernation or migration) may necessitate the use of seasonal restrictions for avoidance of adverse impacts to vulnerable species. Impacts to these areas shall be avoided or minimized to the maximum extent practicable during all other times of the year.

5. **Waterfowl Breeding and Wintering Areas:** Activities including discharges of dredged or fill material or the placement of structures in breeding and wintering areas of migratory waterfowl must be avoided to the maximum extent practicable.

6. **Shellfish Production:** No discharge of dredged or fill material and/or the placement of structures may occur in areas of concentrated shellfish production, unless the discharge is directly related to an authorized shellfish harvesting activity.

7. **Adverse Effects From Impoundments:** If the activity, including the discharge of dredged or fill material or the placement of a structure, creates an impoundment of water, the adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, including impacts to wetlands, shall be minimized to the maximum extent practicable.

8. **Obstruction of High Flows:** To the maximum extent practicable, the activity must be designed to maintain pre-construction downstream flow conditions (i.e., location, capacity, and flow rates). Furthermore, the activity must not permanently restrict or impede the passage of normal or expected high flows (unless the primary purpose of the fill is to impound waters), and the structure or discharge of dredged and/or fill material shall be designed to withstand expected high flows.

9. **Erosion and Sediment Controls:** During construction, appropriate erosion and siltation controls must be used and maintained in effective operating condition in accordance with State regulations. All exposed soil and other fill material must be permanently stabilized.

10. **Suitable Material:** No activity, including discharges of dredged and/or fill material or the placement of structures, may consist of unsuitable material (i.e., asphalt, trash, debris, car bodies, etc.). No material discharged shall contain toxic pollutants in amounts that would violate the effluent limitation standards of § 307 of the CWA.

11. **Temporary Fill:** Temporary fill in waters and wetlands authorized by the PASPGP-4 (i.e., access roads and cofferdams) shall be properly constructed and stabilized during use to prevent erosion and accretion. Temporary fill in wetlands shall be placed on geotextile fabric laid on existing wetland grade. Whenever possible, rubber or wooden mats should be used for equipment access through wetlands to the project area. Temporary fills shall be removed, in their entirety, to an upland site, and suitably contained to prevent erosion and transport to a waterway or wetland. Temporary fill areas shall be restored to their preconstruction contours, elevations, and hydrology and revegetated with non-invasive, native species.

12. **Equipment Working in Wetlands:** Measures must be taken to minimize soil disturbance when heavy equipment is used in wetland areas. These measures include, but are not limited to, avoiding the use of such equipment, use of timber mats or geotextile fabric, and the use of low pressure tire vehicles.

13. **Installation and Maintenance:** Any structure or fill authorized shall be properly installed and maintained to ensure public safety.

14. **PASPGP-4 Verification:**

- a. The PASPGP-4 expires June 30, 2016, unless suspended or revoked.

b. Activities authorized under a project specific PASPGP-4 expire June 30, 2016, unless suspended, revoked, or the PADEP authorization expires, whichever date occurs sooner. Activities authorized under the project specific PASPGP-4 that have commenced construction or are under contract to commence construction will remain authorized provided the activity is completed within 12 months of the date of the PASPGP-4's expiration, modification, or revocation; or until the expiration date of the project specific verification, whichever is sooner.

15. **One-Time Use:** A PASPGP-4 authorization is valid to construct the project, or perform the activity, one time only, except for PASPGP-4 authorizations specifically issued for reoccurring maintenance activities.

16. **Water Supply Intakes:** No activity, including discharges of dredged and/or fill material and/or the placement of structures, may occur in the proximity of a public water supply intake and adversely impact the public water supply.

17. **Cultural Resources:** For all activities verified under a PASPGP-4, upon the discovery of the presence of previously unknown Historic Properties (historic or archaeological), all work must cease and the permittee must notify the SHPO and the Corps of Engineers. The PASPGP-4 authorization is not valid until it is determined, through the Section 106 consultation process, whether the activity will have an effect on the Historic Property. The PASPGP-4 may be reverified and special conditions added if necessary, after an effects determination on the Historic Property is made. The PASPGP-4 authorization may be suspended and/or revoked in accordance with 33 CFR 325.7 for the specific activity if an adverse affect on the Historic Property cannot be avoided or mitigated.

18. **Tribal Rights:** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

19. **Corps Civil Works Projects:** The PASPGP-4 does not authorize any work which will interfere with an existing or proposed Corps Civil Works project (i.e., flood control projects, dams, reservoirs, and navigation projects). The permittee understands and agrees that, if future operations by the United States require removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal, relocation, or alteration.

20. **Navigation:** No activity authorized under PASPGP-4 may cause more than a minimal adverse affect on navigation. No attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein. In addition, activities that require temporary causeways that prohibit continued navigational use of a waterway (i.e., temporary causeways extending greater than $\frac{3}{4}$ the width across the waterway) shall be removed in their entirety upon completion of their use. Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

21. **Inspections:** The permittee shall allow a District Engineer or his authorized representative(s) to make periodic inspections at any time deemed necessary in order to ensure that the work is being performed in accordance with all the terms and conditions of the PASPGP-4. The District Engineer may also require post-construction engineering drawings (as-built plans) for completed work.

22. **PASPGP-4 Permit Compliance Self Certification Form:** A Self Certification Form, regarding the PASPGP-4 authorized work and required mitigation, will be forwarded to each permittee with the PASPGP-4 verification. Every permittee, who receives a written PASPGP-4 verification, shall submit the signed Self Certification Form upon completion of the authorized work and required mitigation. The completed form shall be returned to the appropriate Corps District.

23. **Permit Modifications:** Any proposed modification of the authorized overall project that results in a change in the authorized impact to, or use of waters of the United States, including jurisdictional wetlands, must be approved by PADEP. Corps approval is also required if the overall project had been previously reviewed by the Corps as a Category III activity, or the proposed modification causes the overall project impacts to exceed 1.0 acre of waters of the United States, including jurisdictional wetlands, or 250 linear feet of streams, rivers, other watercourses and open water areas. Project modifications that cause the overall project impacts to exceed 1.0 acre of waters of the United States, including wetlands, may not be eligible for PASPGP-4 and will be forwarded to the Corps for review.

24. **Recorded Conservation Instruments:** As per Part IV.A.26 and Part IV.B.4 and Part IV.C.8 of this permit, proposed Draft Conservation Instruments may be submitted by the applicant as part of the permit application package for review and approval. **When such proposed Conservation Instruments are submitted by the applicant, verification of the recorded deed restriction, conservation easement, or deed restricted open space area shall be forwarded to the appropriate Corps District and appropriate PADEP offices, prior to the initiation of any permitted work.**

25. **Property Rights:** This PASPGP-4 does not convey any property rights, either in real estate or material, or any exclusive privileges; nor does it authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

26. **Navigable Waters of the United States (Section 10 Waters):** In addition to the conditions referenced above, the following conditions are applicable for navigable waters of the United States eligible for the PASPGP-4. The PASPGP-4 may be used to authorize work in the following navigable waters of the United States:

a. Codorus Creek – from the confluence with the Susquehanna River 11.4 miles upstream to the Indian Rock Dam in York, Pennsylvania;

b. Main Stem Susquehanna River – from the confluence with the Chesapeake Bay upstream to Athens, Pennsylvania (approximately 4 miles south from the New York State line);

c. West Branch of the Susquehanna River – from the confluence with the main stem Susquehanna River upstream to the dam at Lock Haven, Pennsylvania;

d. Chester Creek – from the confluence with the Delaware River 2 miles upstream;

e. Crum Creek – from the confluence with the Delaware River 1 mile upstream to the upstream side of the dam at Eddystone;

f. Darby Creek – from the confluence with the Delaware River 5 miles upstream to the upstream side of 84th Street Bridge in Philadelphia;

g. Delaware River – from the Morrisville-Trenton Railroad Bridge in Morrisville, Pennsylvania, including the West Branch of the Delaware River, upstream to the Pennsylvania/New York border at the 42nd parallel;

h. Lehigh River – from the confluence with the Delaware River 72 miles upstream to the downstream side of PA Route 940 Bridge;

i. Neshaminy Creek – from the confluence with the Delaware River, including the Neshaminy State Park Harbor Project at the mouth of Neshaminy creek, 4 miles upstream to the downstream side of the Newportville Bridge;

j. Pennypack Creek – from the confluence with the Delaware River 2 miles upstream to the downstream side of Frankford Avenue Bridge in Philadelphia;

k. Ridley Creek – from the confluence with the Delaware River 1 mile upstream to the upstream side of the Baltimore and Ohio Railroad Bridge in Chester, Pennsylvania;

l. Schuylkill River – from the Fairmont Dam, 104 miles upstream to Port Carbon, Pennsylvania; and

m. Schuylkill Navigation Channel (Manayunk Canal) – along the Schuylkill River for two miles from the Flat Rock Dam to Lock Street in the Manayunk Section of Philadelphia, Pennsylvania.

27. For Aerial Transmission Lines Across Navigable Waters:

a. The following minimum clearances are required for aerial electric power transmission lines crossing navigable waters of the United States. These clearances are related to the clearances over the navigable channel provided by existing fixed bridges, or the clearances which would be required by the United States Coast Guard for new fixed bridges, in the vicinity of the proposed aerial transmission line. These clearances are based on the low point of the line under conditions producing the greatest sag, taking into consideration temperature, load, wind, length of span, and type of supports as outlined in the National Electrical Safety Code:

NOMINAL SYSTEM VOLTAGE (kV)	Minimum additional clearance (ft.) above clearance required for bridges.
115 and below	20
138	22
161	24
230	26
350	30
500	35
700	42
750-765	45

i. Clearances for communication lines, stream gauging cables, ferry cables, and other aerial crossings must be a minimum of ten feet above clearances required for bridges, unless specifically authorized otherwise by the District Engineer.

ii. Corps of Engineer regulation ER 1110-2-4401 prescribes minimum vertical clearances for power communication lines over Corps lake projects. In instances where both this regulation and ER 1110-2-4401 apply, the greater minimum clearance is required.

b. **Encasement:** The top of the cable, encasement, or pipeline shall be located a minimum of three feet below the existing bottom elevation of the streambed and shall be backfilled with suitable heavy material to the preconstruction bottom elevation. Where the cable, encasement, or pipeline is placed in rock, a minimum depth of one foot from the lowest point in the natural contour of the streambed shall be maintained. When crossing a maintained navigation channel, the requirements are a minimum of eight feet

between the top of the cable, encasement, or pipeline and the authorized depth of the navigation channel. For maintained navigational channels, where the utility line is placed in rock, a minimum depth of two feet from the authorized depth of the navigation channel shall be maintained.

c. **As-built drawings:** Within 60 days of completing an activity that involves an aerial transmission line, submerged cable, or submerged pipeline across a navigable water of the United States (i.e., Section 10 waters), the permittee shall furnish the Corps and the National Oceanic and Atmospheric Administration, Nautical Data Branch, N/CS26, Station 7317, 1315 East-West Highway, Silver Spring, Maryland, 20910 with professional, certified as-built drawings, to scale, with control (i.e., latitude/longitude, state plane coordinates), depicting the alignment and minimum clearance of the aerial wires above the mean high water line at the time of survey or depicting the elevations and alignment of the buried cable or pipeline across the navigable waterway.

d. **Aids to Navigation:** The permittee must prepare and provide for United States Coast Guard (USCG) approval, a Private Aids To Navigation Application (CG-2554). The form can be found at: http://www.uscg.mil/forms/cg/CG_2554.pdf. Within 30 days of the date of receipt of the USCG approval, the permittee must provide a copy to the applicable Corps District

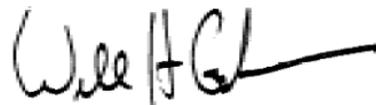
By Authority of the Secretary of the Army:



David E. Anderson
Colonel, Corps of Engineers
District Engineer, Baltimore



Philip M. Secrist, III
Lieutenant Colonel, Corps of Engineers
District Engineer, Philadelphia



William H. Graham
Colonel, Corps of Engineers
District Engineer, Pittsburgh

PASPGP-4 PERMIT COMPLIANCE, SELF-CERTIFICATION FORM

Project Name: _____ Applicant Name: _____

PADEP Permit No.: _____ Date of Issuance: _____

Corps Permit No. (if available) : _____ Date of Issuance: _____

Waterway: _____ County: _____

Dear Permittee:

In accordance with the compliance certification condition of your PASPGP-4 authorization, you are required to complete and sign this certification form and return it to the appropriate Corps of Engineers District in which the work is located:

- | | | |
|---|---|--|
| <input type="checkbox"/> U.S. Army Corps of Engineers,
Philadelphia District
Regulatory Branch
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107-3390 | <input type="checkbox"/> U.S. Army Corps of Engineers,
Baltimore District
1631 South Atherton Street
Suite 101
State College, PA 16801-6260 | <input type="checkbox"/> U.S. Army Corps of Engineers,
Pittsburgh District
Regulatory Branch
Federal Building, 20 th floor
1000 Liberty Avenue
Pittsburgh, PA 15222-4186 |
|---|---|--|

Please note that the permitted activity is subject to compliance inspections by U.S. Army Corps of Engineers representatives. As a condition of this permit, failure to return this notification form, provide the required information below, or to perform the authorized work in compliance with the permit, can result in suspension, modification or revocation of your authorization in accordance with 33 CFR Part 325.7 and/or administrative, civil, and/or criminal penalties, in accordance with 33 CFR part 326.

Please provide the following information:

- Date authorized work commenced: _____
- Date authorized work completed: _____
- Was all work, including any required mitigation, completed in accordance with your PASPGP-4 authorization?
 YES NO
- Explain any deviations (use additional sheets if necessary)

- Was mitigation accomplished through an approved in-lieu fee program?
 YES NO (if **YES** please provide documentation, if **NO** complete Nos. 6 and 7 below).
- Wetland Mitigation: Required? YES NO Required Completion Date _____
Completed? YES NO Mitigation Monitoring Reports Required? Yes No
- Attach labeled photographs showing completed work including mitigation area(s) (**not required for PADEP GP's/Waivers**)

I hereby certify that, except as noted above, that all work, including mitigation, has been completed in accordance with the terms and conditions, including special conditions of the above referenced permit.

<i>Applicants Signature:</i>	<i>Consultant/Agents Signature:</i>
<i>Address:</i>	<i>Address:</i>
<i>Telephone:</i>	<i>Telephone:</i>
<i>Email:</i>	<i>Email:</i>

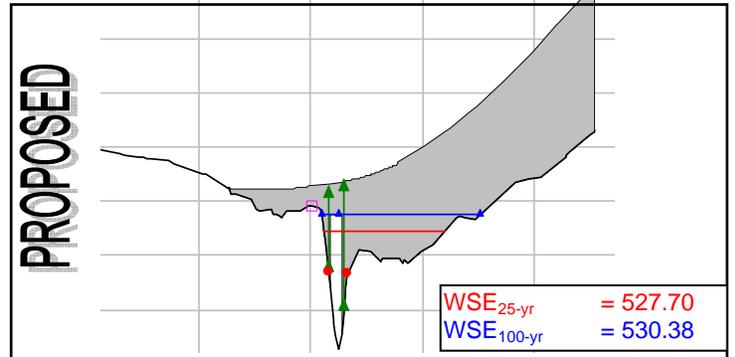
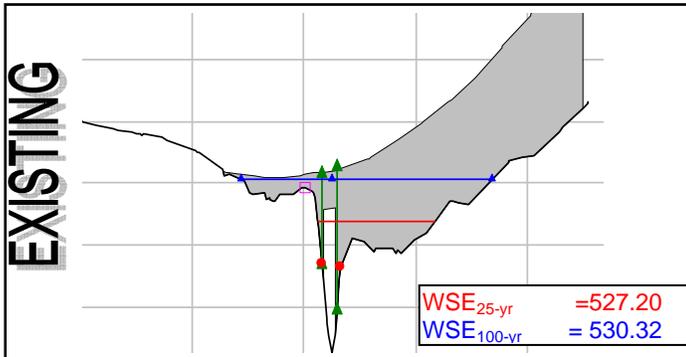
SR 0061 / SECT 03B / SEG 0170 / OFF 0030
DEP General Permit File No.: GP115412405

N. Manheim & W. Brunswick Twps, Schuylkill County
APS No.: 779646

General Info:

Stream: Buck Mountain Creek Drainage Area: 5.61 sq mi Floodway Delineated by FEMA? YES NO

Replacement of an existing single span reinforced concrete T-Beam bridge having a normal clear span of 22' and a minimum under-clearance of 12 feet with a spread concrete box beam bridge having a normal clear span of 21' and a minimum under-clearance of 12.2 feet over Mahannon Creek for SR 61 Section 03B in N. Manheim & W. Brunswick Twps, Schuylkill County.



Note: Elevations taken from upstream station 1141

Hydrology:

Return Period	NFF	FEMA (@DA = 5.5)	PSU-IV
Q ₁₀	914	NA	586
Q ₂₅	1,290	NA	855
Q ₅₀	1,610	NA	1,103
Q ₁₀₀	2,000	2,040	1,397

Assumptions and Comments:

Applicant used the NF method to compute design flows. FEMA flows were used to compare 100 year WSE since that was the most conservative. The hydrologic method is acceptable for this application.

Hydraulics:

Assumptions and Comments:

Applicant used HEC-RAS. All input values reviewed were appropriate; no major errors were noted. The proposed bridge will pass the 100-year storm event and the 100-year WSE will increase that the first upstream cross section by .06 but will then decrease. Temporary construction conditions were modeled; the proposed bypass will pass the 1 year storm and any increases in the 2 year storm will not affect any structures.

P.E. Seal Required? YES NO
 Risk Assessment Required? YES NO
 Flowage Easement Required? YES NO

Overall Comments:

Applicant's hydrologic and hydraulic analyses are acceptable; all conditions of GP-11 have been satisfactorily met.

Pamela Dobbins

ENGINEERING RECORD OF DECISION

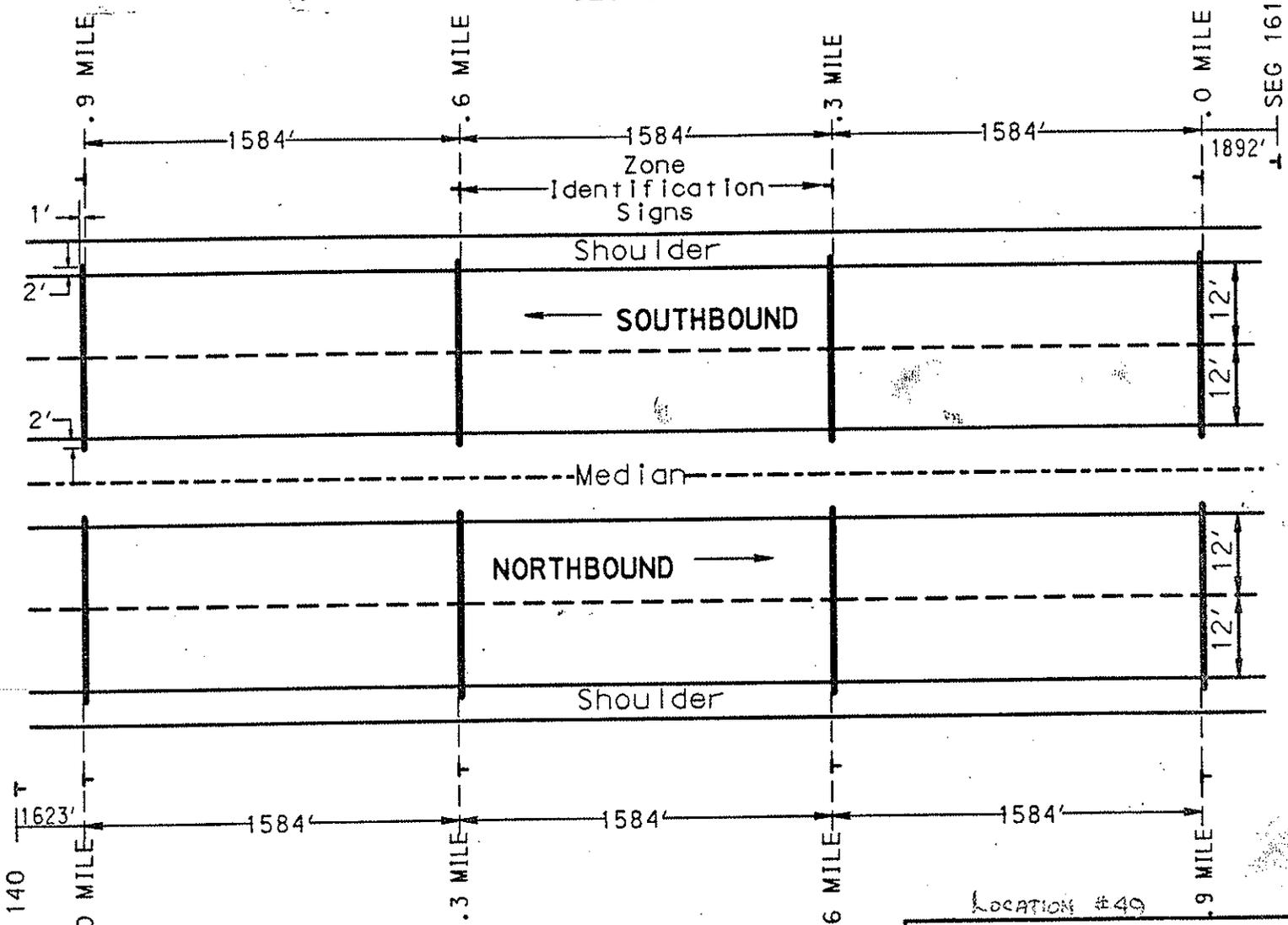
Recommendation: Acknowledge use of GP-11

Reviewing Eng Signature: _____

6/25/12

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
 MEASURED ZONE FOR AERIAL SURVEILLANCE
 AND TRAFFIC SPEED ENFORCEMENT

County SCHUYLKILL
 Township WEST BRUNSWICK
 Traffic Route 0061
 Location - from SEGMENT 0140 OFFSET 1623 NB
 SEGMENT 0161 OFFSET 1892 SB



FIELD LAYOUT

Philip J. Navitsky
 SURVEYOR II



APPROVED 8/14, 1995
Walter E. Bortner
 DISTRICT ENGINEER

SCR 552,553