Stormwater Pollution Prevention Plan for the Construction of the Marble River Wind Farm

Marble River Wind Farm Project
Clinton County, New York

Prepared for:

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Amended July 2012

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AMENDED
STORMWATER POLLUTION PREVENTION PLAN
FOR THE CONSTRUCTION OF THE
MARBLE RIVER WIND FARM – ACCESS ROADS AND TOWER SITES

FOR:

SPDES GENERAL PERMIT FOR STORMWATER
DISCHARGES FROM CONSTRUCTION ACTIVITY
PERMIT GP-02-01

PREPARED FOR:

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APPENDICES

1.0 INTRODUCTION

Marble River, LLC (the Owner) is currently developing a wind-powered electric generating facility in the Towns of Clinton and Ellenburg, in Clinton County, New York. The project will consist of the following components which are to be located on private leased land:

- 70 wind turbines.
- 2 Permanent meteorological towers.
- 4 Temporary meteorological towers.
- 25.3-Miles of gravel access road.
- 66-Miles of electrical collection cables to convey power from the turbines to an electrical substation.
- An electrical substation and interconnect.
- An operation and maintenance building.
- A laydown yard.

Each turbine will have a generating capacity of 3.0 megawatts (MW). Figure 1 in Appendix A illustrates the location of the Project, local road network, as well as the overall proposed project layout. It should be noted that in addition to the above referenced improvement on private property, improvements to local roads and intersections will be conducted to facilitate project construction.

The original SWPPP and associated Notice of Intent (NOI) were submitted to the New York State Department of Environmental Conservation (NYSDEC) on April 16, 2008 for construction of the access roads and tower sites (the majority of the project). Separate SWPPPs and NOIs were also submitted in 2008 to the NYSDEC for construction of the electrical substation/interconnect and laydown yard.

This SWPPP was initially developed under New York State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges Associated with Construction Activity, GP-02-01. The original SWPPP and NOI were based on discussions and decisions made during the project kick-off meeting conducted on December 11, 2007 at the Marble River office in Ellenburg, New York. The original SWPPP was considered approved on July 9, 2008 after a 60 day period passed without receiving any comments from the NYSDEC.

The NYSDEC assigned permit No. NYR10P542 to the SWPPP prepared for construction of access roads and tower sites.

Subsequent to issuing the original SWPPP in 2008, a significant portion of the project was deleted and the number of turbines was reduced from 109 to 70. In addition, a constructability walkover was conducted in the fall of 2010 which resulted in modifications to the proposed approach to stormwater management techniques. Construction was initiated in 2010 and the project is approximately 25 percent complete (construction has been largely suspended for the winter). As a result of the reduction in the project size, as well as modifications to the stormwater management techniques, Marble River determined that an amendment to the initial SWPPP was required. This amended SWPPP along with the SWPPP drawings have been delivered to the construction site and are maintained in the construction trailer (the original SWPPP will no longer be used once superseded by this document). Inspections are being performed in accordance with requirements in Section 8.0 of this SWPPP. This amended SWPPP incorporates the following:

1. Reduced project size and impacts due to the elimination of 39 turbines, their associated access roads, electrical collection system in the northeast quadrant.
2. Reduced project size and impacts due to elimination of the overhead transmission line from the northeast quadrant to the substation.
3. Revised stormwater management techniques based on the constructability walkover and those recommended and implemented by the contractor during construction.

All such changes were reviewed and approved by URS prior to their implementation. This amended SWPPP has also been updated to conform with the requirements of the current SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-10-001. Figure 2 in Appendix A illustrates the project layout for the initial SWPPP submitted in 2008 and the final project layout which is currently under construction. As indicated in Figure 2, the majority of the changes between the 2008 and the current layout consist of deletion of the infrastructure planned for the northeastern area as well as the overhead transmission line connecting the northeast turbines to the substation. The alignment of most of the remaining access roads is the same as in the original 2008 SWPPP.

As discussed with NYSDEC Region 5 personnel during the project kick-off meeting, this project will require only erosion and sediment controls; post-construction water quality and

quantity management will not be required. This approach, which varies from the NYSDEC's technical standards, is acceptable because the project impacts are dispersed over a large area, and therefore are *de minimus* within any given watershed. The intent of the permit will be met by the Owner through ensuring that the water quality in the project area is not impacted and the following occurs during the entire life of the project:

1. There shall be no increase in turbidity that will cause substantial visible contrast to the natural conditions;
2. There shall be no increase in suspended, colloidal, and settleable solids that will cause deposition or impair the waters for their best usages; and
3. There shall be no residue from oil and floating substances, nor visible film, nor globules of grease on surface waters.

As this approach varies from the NYSDEC's technical standards (set forth in the New York State Standards and Specifications for Erosion and Sediment Control, and the New York State Stormwater Management Design Manual), the certified SWPPP and a completed NOI were submitted to the NYSDEC for a 60-day review and approval. Certification by a licensed inspector is included in Section 2.2 and a more detailed description of the deviation and how the project will meet the intent of the permit is included in Section 7.1.

This amended SWPPP also includes a request for a waiver from the requirement that soil disturbances not exceed five acres at any one time.

This amended SWPPP will continue to be updated, as necessary, based on the results of the weekly site inspections or revisions to the sequence of construction. Inspections conducted in accordance with GP-0-10-001 may indicate changed field conditions or techniques that are not performing adequately. The SWPPP shall be updated to reflect field changes or revisions to the erosion control measures. Then, the contractor shall implement corrective measures/revisions as soon as practical. Upon completion of construction and complete stabilization of the site, coverage under the General Permit shall be terminated by submitting a Notice of Termination (NOT) Form. The NOT Form will require that the Owner certify that the construction was performed in general accordance with this document and any subsequent amendments to the SWPPP.

2.0 SIGNATORY AND CERTIFICATION REQUIREMENTS

2.1 Contractor Certification

All contractors and subcontractors that will disturb soils, or will be responsible for installing, constructing, repairing, and maintaining the erosion and sediment control practices included in the SWPPP, or will be responsible for the construction of any post-construction stormwater management practices included in the SWPPP, must sign the following contractor certification statement prior to *commencement of any construction activity*. Each signed contractor certification statement must be keep with the SWPPP on-site.

> "I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the Owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings".

_____ _____ _____

Name Title Date

_____

Signature

_____ _____

Name of Firm Telephone Number

_____

Address

_____.

Soil Disturbance Activities / Area of Responsibility

A copy of this form is located in Appendix C.

2.2 Variations from Technical Standards

The proposed project does not include post construction water quality and quantity controls. Although there will be new gravel roads constructed which will alter the hydrology of the site, the effect of the project will be widespread over an area of almost 30,000 acres, and will therefore be *de-minimus* over the watersheds that are within the project area. In addition, the roads will be low-use roads, with a somewhat permeable gravel cover, and will generally discharge what little runoff is generated into vegetated areas, reducing the potential impact to surface waters even further. Lastly, the potential for pollution on these low use roads is minimal and will be addressed through the use of administrative controls as described in Sections 5.0 and 7.0 of this report. The NYSDEC Region 5 has approved this approach in a meeting held on December 11, 2007 at the project site.

For the same reasons, it is proposed that the project be permitted to disturb more than 5 acres of land at any given time. The work will still be subject to the other requirements of this SWPPP and the SPDES permit program, which include appropriate construction sequencing, installation of perimeter and other controls, and the rapid establishment of vegetation after the completion of disturbance.

Based on these considerations, this SWPPP has been developed in a manner which will ensure compliance with the water quality standards and with the substantive intent of the General Permit GP-02-01.

Jack E. Wilcox	Vice President	4/16/08
Name	Title	Date

Signature

URS Corporation	716-856-5636
Name of Firm	Telephone Number

77 Goodell St., Buffalo, NY 14203

Address

2.3 Notice of Intent

To obtain coverage under a General Permit to discharge stormwater from construction activities, Marble River, LLC (the Owner) must submit a Notice of Intent (NOI) to the New York State Department of Environmental Conservation (NYSDEC) prior to commencement of any construction activity.

For this project, construction may begin after acceptance of the SWPPP by the NYSDEC, which will not occur until a minimum of 60 business days after receipt of the NOI by the NYSDEC. The owner will receive a letter of acknowledgement from NYSDEC issuing a permit identification number for this project. A copy of this letter along with the NOI shall be kept with the on-site SWPPP. The NOI was submitted to the following address:

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

A copy of the completed NOI signed by Marble River management on April 14, 2008 is located in Appendix D. The NOI was not updated for the amended SWPPP.

2.4 Notice Of Termination

Once the construction is completed and the site has undergone "Final Stabilization" to the Qualified Inspector's satisfaction, a Notice of Termination (NOT) shall be filled out and mailed to the same address as the NOI.

A copy of a NOT has been enclosed in Appendix D.

3.0 GENERAL PROJECT INFORMATION

3.1 Project Area

The Marble River Wind Farm will be located the Towns of Clinton and Ellenburg, Clinton County, New York. The regional location of the Project is depicted in Figure 1, in Appendix A. The project area is located on the Churubusco plateau generally around the Hamlet of Churubusco in the Town of Clinton NY. The southern boundary of the project area runs east to west 1 mile south of the Village of Ellenburg Center in Ellenburg, New York. The northern boundary of the Project area runs east to west along the Canadian border (see Figure 1). The general project area is uplands that extend between the Chateugay River to the west and the Chazy River to the South East. The bulk of the site (approximately 90%) occurs in the township of Clinton. The smaller portion (approximately 10%) occurs in the northwestern portion of the township of Ellenburg, north of the blue line that delineates the northern outskirts of the Adirondack Park.

3.2 Existing Site Conditions

The Project Area is located on a plateau with limited relief in topography. Site elevations range from 800 feet above mean sea level (MSL) in the northern portion of the site and 1,640 feet MSL in the southern portion of the site. Brandy Brook, Crystal Creek and the English River drain the eastern portion of the Site. Tributaries to the Great Chazy River drain the southern portion of the Site and Hinchinbrook, Dry Brook and the Marble River drain the Western portion of the Site. Highways that bisect the project area include US Route 11 and State Highways 189 and 190. Major local roads including Frontier, Liberty Pole, Merchia, Whalen, Looby, Lagree, Campbell, Gagnier, Brandy Brook, Sancomb, Ryan Number 5, Bohon, Clinton Mills, and Jones Roads and seasonal use roads including Soucia, Robare Pond Road, Patnode and Jones Road occur within the Project boundaries. Project facilities will be located on individual leased land parcels totaling approximately 10,940 acres located within a larger project area of approximately 28,630 acres. A total of 70 wind turbines will be constructed on approximately 130 parcels of leased private land. Land use in the Project area is dominated by agricultural, with farms and single family rural residences occurring along road frontage.

Major soil series mapped within the overall Project area were identified from the NRCS web site, and are shown in relation to the project limits on the figures in Appendix B and are listed on Table 1, in Appendix A with key characteristics pertaining to construction from NRCS's Official Soil Series Descriptions. The Clinton County Soil Survey, originally published in 1914, is now out of print, and no paper copies, CD-ROMs or web surveys are available for the county from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). NRCS is currently converting the published soil survey information into an electronic format for each county across the Unites States but has not completed Clinton County. However, some information is available from NRCS. In summary, there are acidic soils within the Project area developed primarily from thin deposits of glacial till or outwash over sandstone bedrock, with occasional patches of bedrock rubble scattered on the surface and intermittent exposed bedrock ledges. Soils are poorly drained (especially over till in level areas) to moderately well drained. Erosion risk is largely dependent on the terrain, with soils on slopes presenting a higher erosion risk than soils in level areas.

3.3 Proposed Site Conditions/Construction Activities

Access Roads

The Project will include approximately 25.3 miles of gravel access road construction. Wherever possible, existing roads and farm drives will be upgraded for use as project access roads in order to minimize impacts to both active agricultural areas and wetland/stream areas. Where an existing road or farm drive is unavailable or unsuitable, new gravel-surfaced access roads will be constructed. Road construction will typically involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration.

For the purposes of this SWPPP, it is assumed that access road construction will generally disturb an area of soils of less than 70 feet wide. The actual disturbance will vary based on the actual road width (which will vary between 12- and 34-feet wide), the grades at the site, and the presence of utility installations. Any grubbed stumps or cleared trees will be chipped and properly spread on-site or hauled to an off-site location for disposal or further processing. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with a minimum of 12 inches of gravel or crushed stone. The typical access road will be 16 feet in width, with

wider cross-sections at turns and for occasional wider pull-offs on narrow roads to accommodate passing vehicles.

For purposes of the SWPPP, it is assumed that the maximum permanent road width will be 20 feet. The majority of the access roads will be constructed at a width of 34-feet wide, on a temporary basis, to allow delivery of the wind turbine components. Upon completion of the turbine construction, the roads will be reduced in size (as shown on the construction drawings in Appendix G) and the disturbed ground stabilized. Appropriately sized culverts will be placed in any wetland/stream crossings and in other locations so that the roads do not impede cross drainage.

Overhead Electric Access

All but approximately 0.4 miles of overhead electrical lines have been eliminated from the Project. That remaining length will be located adjacent to the proposed substation and will not cross or impact any existing drainage ways or wetlands. Access to the proposed overhead electric lines will be over the existing vegetated cover. In areas where the existing cover does not provide adequate support for work operations, gravel will be placed. The thickness of the gravel will depend on the conditions of the ground during construction operations. Thicker gravel will need to be installed in areas were the existing ground provides no structural support. The gravel will provide a stabilized area to work and/or travel on. No formal roadway will be constructed as part of the overhead electric work.

Once the work associated with the overhead electric has been completed, all disturbed areas will be stabilized by re-grading these areas to restore the pre-existing drainage patterns. Then, topsoil will be applied and all areas will be seeded and mulched to establish a vegetative cover. All disturbed areas shall be inspected for erosion or areas on which seed has not germinated. These areas shall be re-seeded and mulched as soon as practicable. This restoration activity applies to the gravel areas as well.

Turbine Areas

Once the roads are complete for a particular array of turbine sites, construction of turbine foundations will commence at the turbines located on that completed access road section.

Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of disturbed areas. Wind turbine installation typically involves varying degrees of disturbance within a 200-foot radius around each tower as shown on the typical detail shown on drawing DT-003 in Appendix G (maximum area of disturbance of 2.9 acres). The following sequence of construction is anticipated at each turbine location:

- At each turbine location, the areas of the tower foundation, crane pad, and gravel access ring will be cleared, stripped of topsoil, and graded as necessary for the construction.
- On generally flat areas, the blade assembly area will be created by clearing vegetation as necessary to avoid conflict with the blades.
- On steeper areas, the blade assembly area will be created by filling or cutting existing grade. In such cases, the vegetation will be cleared and grubbed, topsoil will be stripped and stockpiled, and the land graded as necessary.
- Once the areas are cleared and graded, excavation for the turbine foundations will occur. Spread foundations will be constructed requiring a circular excavation measuring approximately 60-feet in diameter and 8-feet deep.
- Excavated soils will be stockpiled; silt fence will be installed in accordance with protocols described in Section 6.0.
- Excessive dust generated during excavation and grading activities will be controlled by applying water using a water truck.
- In the event pumping of groundwater or precipitation water from the excavation is required a filter bag assembly will be employed to minimize energy and the release of sediment laden water to the environment. The filter bag assembly is illustrated on drawing ES-006 in Appendix G. Pumped water will not be discharged to wetlands or streams.
- Concrete truck washout activities will be permitted at designated areas and controlled to avoid a release of concrete wash water to sensitive environmental receptors.
- The limits of disturbance of the turbine areas are shown on the construction drawings in Appendix G.

The erosion and sediment (E&S) control measures implemented at each turbine location shall include as necessary silt fences and vegetated buffer zones at the downslope perimeter of the

disturbed area, diversion berms on the upslope limits of the disturbed area, and rapid stabilization, with gravel or vegetation, of all disturbed areas. In agricultural areas excavated subsoil and rock will be segregated from stockpiled topsoil. Specific E&S control measures are discussed in detail in Section 6.0.

Turbine Assembly

The wind turbine generally consists of three main components: the tower sections, the nacelle, and the rotor/blade assembly. Turbine assembly and erection involves mainly the use of large track mounted cranes, smaller rough terrain cranes, boom trucks and rough terrain fork-lifts for loading and off-loading materials. The erection crane(s) will move from one tower to another along the designated construction access roads or public roads.

Upon departure of the crane and other assembly equipment from each tower site, all required site restoration activities will be undertaken. In agricultural fields, restoration will also include subsoil decompaction (as necessary) and rock removal, spreading of stockpiled topsoil, seeding, and reestablishing pre-construction contours.

Electrical Utilities

Power from the wind turbines will be transported through underground cables. The underground collection cables will be installed at a minimum depth of 36 inches in wetland areas, all other locations will be installed at 48 inches. The underground collection lines will connect directly to the project substation through a total of eight circuits.

Underground electrical interconnects will generally follow project access roads, but will also follow the edge of agricultural fields and, where necessary, cut directly across fields. Where buried cable is proposed to cross active agricultural fields, the location of any subsurface drainage (tile) lines will be determined prior to construction (through consultation with the landowner) to assure that these lines are not damaged during cable installation. Cables will be buried four feet below grade through agricultural areas.

Direct burial methods via cable plow, rock saw and/or trencher will be used during the installation of underground interconnect lines whenever possible:

1. Direct burial via a cable plow will involve the installation of bundled cable (electrical and fiber optic bundles) directly into the ground via a "rip" created by the plow blade. Should surface restoration be required, it will follow shortly after the installation, and will consist of equipment such as a Bobcat or small bulldozer that will ride over the rip, smoothing the area.

2. Direct burial via a trencher or rock saw involves the installation of bundled cable in a similar fashion to cable plow installation. The trencher or rock saw uses a large circular blade or "saw" to excavate a small open trench. The trencher blade creates a 14-inch-wide trench with a sidecast area immediately adjacent to the trench. . In active agricultural land that is dry and can support all equipment without causing 4" ruts, up to two parallel cables can be installed by trenching without the need to strip and segregate topsoil (in accordance with NYS Department of Agriculture and Markets guidance).

3. Where three or more cables run parallel through active agricultural fields, the topsoil will be stripped and stockpiled prior to cable installation, and replaced, re-graded, and stabilized by seeding and mulching following installation. Installation of utility lines via an open trench will be used only in areas where the previously described direct burial methods are not practicable. Open trench installation will be performed with a backhoe and will generally result in a disturbed trench up to three feet wide. Replacement of spoil material (if generated) will occur immediately after installation of the buried utility. Sub-grade soil will be replaced around the cable, and topsoil will be replaced at the surface. All areas adjacent to the open trench will be restored to original grades and surface condition.

Restoration of utility areas will be completed through seeding and mulching of all exposed soils using weed free seed mix as approved by the owner. All utility installation areas will be returned to pre-construction grades, vegetated, and restoration efforts will be as described above for cable plow installation.

Construction drawings are located in Appendix G. These plans show the access road layout, turbine locations and utility line corridors. The details that are included in the

construction drawings illustrate all proposed erosion and sediment control measures along with the proposed culverts. Locations and sizes of culverts and erosion control measures may vary slightly from the Construction Documents to account for actual field conditions and most effectively minimize environmental impacts.

4.0 CONSTRUCTION ACTIVITY SEQUENCING

Construction of the project will generally be sequenced by access road or access point. That is, several access roads will be started throughout the project and the turbine sites associated with each access road will be constructed as the road progresses. The general sequence of construction activities (by access point) shall be as follows:

- Construct a stabilized construction entrance off of the public access point/road.
- Install perimeter erosion and sediment control measures, such as silt fence. The silt fence limits are delineated on the construction drawings, however erosion control measures may be adjusted in the field to better account for actual field conditions to prevent the discharge of sediment from disturbed areas.
- Establish appropriate limits of Vegetative Buffer Strips.
- Install diversion berms along designated areas upslope of construction areas to prevent clean stormwater runoff from entering the construction area and coming in contact with disturbed soils.
- The topsoil shall be stripped in an area then stockpiled in windrows within the limits of disturbance.
- Complete cuts and fills in an area to establish final sub-base road grades and/or turbine assembly pad subgrades.
- Once an area has reached the sub-base grade, the gravel section shall be placed as soon as practical in this area to limit the duration of exposed soil.
- During the earthwork operations, the contractor shall inspect and maintain all erosion control measures per the requirements of this SWPPP and GP-0-10-001 (or current General Permit).
- Seed and mulch all disturbed areas outside of areas to receive gravel within seven days of reaching final grade, or within 14 days if the area will not be worked within the next 21 days.
- Upon completion of the utility line construction, the temporary access shall be removed and the ground restored to its original grade and ground cover.
- Upon completion of the turbine installation, the 34-foot-wide access roads shall be reduced in width. The disturbed areas where the road width is reduced shall be stabilized with appropriate vegetative measures.

- Remove all temporary erosion and sediment control measures once revegetation and restabilization is complete.

A project schedule indicating how the erosion and sediment control features are to be implemented is illustrated on Table 2 in Appendix A.

5.0 POLLUTION PREVENTION MEASURES

5.1 Good Housekeeping

In addition to the other measures identified in this SWPPP, the following good housekeeping practices will be adhered to in all construction activities covered by this SWPPP.

- All stored materials will be placed in a neat orderly manner in their appropriate containers (i.e. paints, fertilizers) and if possible, within an enclosure.
- All equipment will be properly maintained and kept in good working condition.
- Manufacturer's recommendations for proper use and disposal of materials shall be followed.
- The site superintendent or his designee (i.e. grading contractor-grading foreman, utility contractor-utility foreman) will inspect the site daily during construction activities to ensure proper use and disposal of materials.
- As a general procedure, equipment will not be stored on-site. However, when on-site storage is required, equipment will be located such that any leaks or spills will drain to protected sump areas (i.e. pumped sump locations).
- The site superintendent will ensure that personnel have received the proper training and that the operators are familiar with the requirements of this SWPPP.
- All litter (i.e. coffee cups, wrappers) and construction refuse (i.e. cardboard, containers) shall be collected and placed in a sealed dumpster/garbage can. This waste shall be removed from the site on a regular schedule.
- Grading and regular maintenance of work areas shall be performed such that there is no concentrated flow from the construction areas unless appropriate erosion and sediment control measure are in place (i.e., swales and check dams). Silt fence and vegetated buffer strips shall not be subjected to concentrated flow.
- On-site operational vehicles will be inspected for leaks and receive regular preventative maintenance to reduce the chance of leakage. The contractor shall have provisions onsite to report all spills immediately to EDPR and appropriate regulatory agencies, as well as clean up any spilled materials and dispose of them off-site in a legal manner.

5.2 Fueling and Maintenance

All fueling and routine normal maintenance will be performed in an area where spills or releases of product will be contained. Applicable Federal Spill Plan (40CFR112) regulations will be followed where appropriate.

Equipment maintenance and fueling processes will be closely observed by the operator to prevent spills and releases to the environment. The operator will inspect the equipment maintenance and/or fueling process for any signs of leakage. In the event the operator observes any leakage or spillage from the fueling or maintenance activity, the operator will immediately inform the site superintendent. The site superintendent shall organize and direct the appropriate cleanup efforts. The site superintendent shall document the nature of the spill and clean up measures that were undertaken and file reports as necessary.

6.0 EROSION AND SEDIMENT CONTROL

6.1 General

The erosion and sediment control features are shown in plan view on the construction drawings sheets C-001 through C-084. Details and notations related to erosion and sediment control are contained on sheets DT-001 through DT-006 and sheets ES-001 through ES-008. These drawings are part of this SWPPP and are contained in Appendix G.

The general approach to erosion and sediment control will be to minimize the area of disturbed soil exposed to runoff from upslope areas, and to utilize the existing flat, vegetated areas downslope of disturbed soils as buffer strips for the control of any sediment-laden runoff that may be generated. Silt fences will be used to prevent sediment-laden runoff from reaching any wetlands or steams. Diversion berms will be used to divert significant upslope runoff around larger areas of disturbed soil.

This SWPPP will continue to be updated during construction to reflect any revisions to the erosion and sediment control measures or if specified measures are not working effectively.

6.2 Wetland Protection

Construction within the wetlands shall be in accordance with the requirements set forth in the conditions of the permit that was obtained for disturbing the wetlands. Wetland construction conditions established for this SWPPP are shown on construction drawings ES-001 through ES-004 in Appendix G. Where a conflict exists between the wetland permit conditions and this SWPPP, the more stringent conditions shall govern.

To maintain hydraulic conductivity between the wetlands that are bisected by a road, either a stone bridge or a culvert shall be installed. The stone bridge shall consist of a 20-foot long by 24-inch deep stone layer beneath the access road. The stone material shall consist of six-inch diameter clean crushed stone. The pervious stone fill shall be located below the access road crusher run stone. A detail of this crossing is illustrated on construction drawing ES-008 in Appendix G.

6.3 Excavation Dewatering

Dewatering of turbine foundation excavations may be required if groundwater or undesirable precipitation accumulates in the excavation. Accumulated water will be pumped to a sediment filter bag to reduce sediment levels and dissipate energy levels prior to discharging to surrounding terrain. Filtered water will not be discharged to wetlands or streams. The sediment filter bag detail is presented on construction drawing ES-006 in Appendix G.

6.4 Stockpiles and Windrows

Proposed topsoil stockpile locations are not shown on the plans for clarity, however, topsoil shall generally be stockpiled within the limits of disturbed area in windrow fashion. Silt fence shall be installed along the downstream toe of slope of each stockpile as needed to prevent migration of soils and discharge to wetlands and waterways.

6.5 Diversion Berms

Most of the upslope diversion berms along the access roads have been eliminated from the project. In such cases, runoff from upslope will be allowed to sheet-flow over the road. In this way the runoff will have less impact on the patterns of surface water flow than it would using diversion berms to direct the runoff to centralized locations, where it will be conveyed under the road through a culvert. Since the runoff will not be collected and concentrated, it will have less erosive power once beyond (down slope of) the Project.

Diversion berms are still required to divert significant upslope runoff around larger areas of disturbed soils, such as those created during the construction of crane pads. The diversion berm, which can be seen in a detail on construction drawing ES-007, shall be constructed with compacted on-site material, and immediately seeded upon installation to stabilize the upslope areas. The locations of the diversion berms are called out on the construction drawings contained in Appendix G. Additional locations may be required depending upon field conditions. The diversion berms must be inspected/maintained by the Contractor for signs of erosion and adjusted as necessary in the field to prevent overtopping.

6.6 Silt Fence

Silt fence shall be installed, as shown on the construction drawings, up slope of any wetland prior to any soil disturbance in the immediate upslope area. Silt fence will provide temporary sediment barriers when placed at the limit of disturbance. The purpose of the silt fence is to reduce the velocity of the runoff to promote settling of sediment. When silt fence is used on a side slope, it will be installed at least 10 feet from the toe of slope to allow for maintenance and roll down. A silt fence is designed for sheet flows; therefore no concentrated flows shall be directed to a silt fence. See the silt fence detail on construction drawing ES-005 in Appendix G.

Accumulated silt and debris will be removed from behind the face of the silt fence when the site deposits reach approximately one-half the height of the fence. Clogged or damaged fabric will be immediately replaced.

6.7 Vegetated Buffer Strips

Vegetated buffer strips are areas of natural vegetation used to protect water quality from sediment-laden water that sheet flows off of construction areas. Vegetated buffer strips are not shown on the construction drawings for clarity, but shall be maintained in all areas without silt fence where run-off from disturbed areas sheet flows toward undisturbed areas. The intent is that the vegetation will slow down the runoff and trap/retain the sediment. Vegetated buffer strips shall be used only as follows:

- The area must have established vegetation with 80% coverage.
- The vegetation must extend for a minimum of 75-feet downstream of the disturbed area without any interruption (i.e., wetland, stone wall, hedge row, etc.).
- The buffer strip area must have a slope of less than 20%.
- The disturbed upstream flow area must not extend more than 100 feet upstream of the buffer strip.
- Concentrated flow must not be directed toward the buffer strip. A buffer strip cannot be used in wetland areas or when wetlands or streams are present within 75 feet of the disturbed area.

The vegetation must be maintained during the life of the project and sediment must be removed on an as needed basis. Sediment removal may require removal of the vegetation, installation of silt fencing, and re-establishment of the vegetation.

6.8 Stabilized Construction Entrance

Stabilized construction entrances shall be constructed at the entrance of all access roads off of paved, public roads. The stabilized construction entrances shall consist of a stabilized pad of aggregate underlain by a separation geotextile located at the point where traffic will be entering or leaving the construction site. The minimum length of a stabilized construction entrance is 50-feet. If the entrance is not functioning adequately (i.e., there is deposition of sediment on the paved road), the Owner is required to increase the length to provide a longer travel path for trucks.

A 12-inch thick crushed stone section will be placed over a 10-ounce non-woven separation geotextile to construct the stabilized construction entrance. The entrance shall be maintained in a condition that will prevent tracking, or flowing of sediment onto the public roads. A detail of the Stabilized Construction Entrance is illustrated on construction drawing ES-006 in Appendix G.

6.9 Stone Check Dam

Check dams shall be constructed as temporary stone dams across drainage ways to reduce erosion in the channel by restricting the velocity of flow. Stone will be placed on a woven or non-woven separation geotextile as shown on the Check Dam detail on construction drawing ES-005 in Appendix G.

6.10 Sediment Trap

Sediment traps have been eliminated from the project because the majority of the upslope diversion berms have been removed, and the design of the access roads has been changed to allow runoff from upslope to sheet flow over the road. There will be no point discharges upslope of wetlands or other sensitive receptors. Thus, the sediment traps originally specified are no longer required and have been eliminated from the project.

6.11 Culvert Outlet Protection

Culvert outlet protection will consist of a section of stone placed at the end section of culverts and/or channels. Culvert outlet protection is intended to reduce the depth, velocity, and energy of water such that the flow will not erode the receiving downstream reach or downslope area.

The subgrade for the culvert outlet protection will be prepared to the required lines and grades. Any fill required in the subgrade will be compacted to at least the same density as the surrounding undisturbed material, or according to the same requirements for the surrounding compacted fill. The 10-ounce geotextile specified shall be protected from punching, cutting, or tearing. Any damage will be repaired by placing another piece of geotextile over the damaged part or by completely replacing the geotextile. All overlaps, whether for repairs or for joining two pieces of geotextile, will be a minimum of one foot.

Stone fill will be placed to the full course thickness in one operation and in such a manner as to avoid displacement of the underlying materials. The stone will be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller stones and spalls filling the voids between the larger stones. Stone fill will be placed in a manner to prevent damage to the geotextile.

Culvert outlet protection will be placed at the end of the proposed culverts where shown on the construction drawings. See the Culvert Outlet Protection detail on construction drawing ES-005 in Appendix G.

6.12 Collection System Installation in Environmentally Sensitive Areas

Installation of the electrical collection system will cross various environmentally sensitive areas such as stream channels, drainage ways, and wetlands. In order to minimize impacts such as turbidity and sedimentation to these sensitive areas, the Contractor will be required to use different construction than those in upland areas. For example, prior to installing the collection system through a stream channel, the Contractor shall pump the up-stream flow to a discharge location downstream from the construction location. This system is depicted as the Temporary Cofferdam and Pump Bypass Around In-Channel Work Area detail and Sediment

Filter Bag detail on construction drawing ES-006 in Appendix G. The duration of dewatering shall be minimized and the collection system crossing will be perpendicular to the environmental sensitive area to the extent possible. After the collection system has been installed, the environmentally sensitive area will be restored to preconstruction conditions and the impacted areas stabilized with vegetation.

The Contractor will install permanent trench breakers in the collection system trench during backfilling where there is the potential for undesirable erosion of trench backfill material or development of excessive head pressure within the trench. The trench breaker will be placed within the collection system trench where the existing ground surface is five percent or more. The trench breaker will be constructed in accordance with the Permanent Trench Breaker detail on construction drawings DT-002 and ES-007 in Appendix G.

6.13 Temporary Access Crossing

This SWPPP identifies two crossings, or methods, by which the contractor can create temporary access through existing streams, drainage ways, wet areas, etc. to facilitate the proposed construction work. Currently, neither of the two temporary access crossing applications described below is proposed for the project construction. However, they have been included in this SWPPP to allow the contractor more options in the event the application of one or both crossings is appropriate.

The first crossing is a temporary ford. This type of crossing consists of an aggregate bed placed over a geotextile fabric. The aggregate bed/crossing shall be installed perpendicular to the drainage channel. The ford crossing allows equipment to pass through a waterway or channel on a stabilized layer of aggregate. The aggregate bed or other components of this crossing shall not impede the flow of water within the channel. Fords shall be prohibited when the stream banks are four feet or more in height above the invert of the drainage channel. Both sides of the approaching road at the cut banks shall be no steeper than 5 horizontal to 1 vertical.

The second type of proposed crossing is a culvert access. This access is constructed by placing a culvert or multiple culverts into the drainage way and then backfill over them. The size of culvert pipe shall be the largest diameter pipe that will fit into the existing channel without major excavation of the channel or major approach fills. If the channel width exceeds three feet,

additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The invert elevation of the proposed culvert(s) shall match the existing elevation of the streambed to minimize the interference with potential fish passage. This will provide a temporary access for various types of equipment and personnel.

Once the temporary culvert access is not required anymore, the culvert(s) and bedding material shall be removed and disposed of. The disturbed area shall be graded to ensure the flow of water is not impeded. Areas shall be stabilized by seeding/mulching, applying erosion control blankets or riprap on the channel banks.

Both of these practices shall be constructed in accordance to the New York State Standards and Specifications for Erosion and Sediment Control. Details of both of these temporary crossings are located on construction drawing ES-006.

6.14 Stone Bridge

Stone bridges will be installed as part of the access road construction in low-lying areas with wet soils (including wetlands) in order to maintain groundwater flow beneath the access road. They will take the place of the Pervious Stone Fill shown in the original SWPPP documents, and will be used in several locations in which culverts have been deemed a greater disturbance than the stone bridge. The proposed locations of stone bridges are shown on the construction drawings.

This practice involves placing 24-inches of 6-inch diameter clean crushed stone wrapped in a geotextile for a 20-foot length below the access road. A detail of the stone bridge is presented on construction drawing ES-008.

6.15 Vegetation

All disturbed areas shall be seeded with permanent vegetation and mulched within seven days of achieving final grade. If an area is not going to be worked (not at final conditions) in the next 21-days, a temporary seed/mulch will be applied to disturbed areas within 14-days. The appropriate seed mixture shall be applied uniformly over final grades. The following seed mixes shall be used:

TEMPORARY SEED MIX FOR TEMPORARY DISTURBANCE	
Botanical name	**Common Name**
Carex crinite	Fringed Sedge
Carex lurida	Shallow Sedge
Carex scoparia	Pointed Broom Sedge
Carex stricta	Tussock Sedge
Carex vulpinoidea	Fox Sedge
Scirpus atrovirens	Green Bulrush
Scirpus cyperinus	Woolgrass
Juncus effuses	Soft Rush

Temporary Stabilization:

Seed Mix	Variety	Rate (Pounds/Acre)	Rate (Pounds/1,000 Ft^2)
Ryegrass	Annual or Perennial	30	0.7
Winter Rye	Certified 'Aroostock'	100	2.5

(Apply Ryegrass in the spring, summer, and early fall. Apply Winter Rye in the late fall and winter.)

Permanent Stabilization:

Seed Mix	Rate (Pounds/Acre)	Rate (Pounds/1,000 Ft^2)
KY-31 Tall Fescue	20	0.45
Ensylva Creeping Red Fescue	20	0.45
Birdfoot Trefoil[1]	10	0.23
Perennial Ryegrass	5	0.10

[1)] Add inoculant immediately prior to seeding

The seed shall not be distributed on finished grade before the weather permits (minimum amount of precipitation and temperature greater than 40^0F). Seeding shall be performed after March 21st and after weather permits, and may continue through the end of November.

According to the New York State Standards and Specifications for Erosion and Sediment Control, "permanent seeding may be made any time of the year if properly mulched and adequate moisture is provided".

Temporary and permanent seeding and planting shall be inspected for bare spots, washouts, and health of growth. Repairs or replanting shall be conducted as soon as appropriate growing conditions/seasons allow.

Wetland Seeding & Stabilization:

In areas of temporary wetland impacts plant regrowth shall be inspected for bare spots, washouts, and health of growth. Repairs or replanting shall be conducted as soon as appropriate growing conditions/seasons allow. Supplemental seeding will be conducted with:

- Northeast Wetland Hummock Mix (as supplied by Southern Tier Consulting), or an approved equivalent, applied at a rate of 3.25 lbs/acre in emergent wetlands
- Northeast Wetland Diversity Seed Mix (as supplied by Southern Tier Consulting), approved equivalent, applied at a rate of 2 lbs/acre in scrub-shrub and forested wetlands

6.16 Mulching

Mulching used for soil stabilization shall consist of erosion control blankets, straw, and/or tackifiers. Prior to mulching, any specified or necessary erosion and sediment control practices shall be installed. Mulch shall not be applied more than 2-inches thick on seeded areas, unless it is incorporated into the soil by tracking, disking, or "punching in" techniques.

Erosion control blankets are typically made of straw, coconut fiber, aspen fiber, excelsior, or synthetic materials. Erosion control blankets are well suited for steep slopes, stream banks, and where vegetation is slow to establish. All blankets will be in uniform contact with the soil. Manufacturer's recommendations will be followed for securing the blankets to the soil surface.

Straw is highly effective in reducing the impact of raindrops and in moderating the temperature and moisture conditions at the soil surface and seed bed because of its length and

bulk. Straw used for mulch will be cleaned wheat, barley, oat, or rice straw without noxious weed seeds. Moldy, compacted straw is to be avoided due to difficulty with clumping and even distribution.

Tackifiers are organic or polymer liquid mulch binders that can be incorporated with the seed and fertilizer in hydroseeding operations. Application of tackifiers will be heavier at edges, in valleys, and at crests of banks and other areas where the mulch may be subject to more aggressive wind and water action. All other areas will have a uniform application of the tackifier.

After high winds, or significant rainstorms, mulched areas shall be inspected. Mulched areas will be checked for adequate coverage and re-mulched if necessary. Mulch will be maintained until a permanent vegetative erosion control cover is established.

7.0 WATER QUALITY AND QUANTITY CONTROL

7.1 Water Quality

As described in Section 2.2, based on discussions with NYSDEC Region 5 personnel, post-construction water quality controls are not required for this Project (beyond those identified above for erosion control, e.g., stone outlet protection). However, that does not relieve the Owner of the responsibility to ensure that the water quality in the Project area is not impacted and that the following occurs during the entire life of the project:

- There shall be no increase in turbidity that will cause substantial visible contrast to the natural conditions;
- There shall be no increase in suspended, colloidal, and settleable solids that will cause deposition or impair the waters for their best usages; and
- There shall be no residue from oil and floating substances, nor visible film, nor globules of grease on surface waters.

It is not anticipated that water quality at the site will be adversely impacted during the post-construction phase of the Project. Once construction is complete and the site is stabilized, the potential for water quality impacts is significantly reduced. The new access roads will have such limited use that the potential for pollution is de-minimus. Use will primarily consist of periodic inspections and maintenance at the turbine locations. The majority of the roads pass through areas of existing vegetation which will capture future runoff and provide an added degree of treatment. To minimize post-construction pollution, the Owner will perform the post-construction inspection and maintenance identified in Section 8 of this SWPPP until stabilization is confirmed complete and the NOT is submitted.

7.2 Water Quantity

For the same general reasons discussed in Section 7.1, pertaining to the quality of stormwater runoff, the impact of this Project on the quantity (peak rates) of stormwater runoff is expected to be negligible. This too, has been agreed to by personnel from Region 5 of the NYSDEC.

Although formal attenuation is not required, culverts will be installed throughout the project to manage stormwater flow where temporary and permanent roads cross existing streams and where road construction could create ponded water. Culverts will also be installed where wetlands are being crossed to maintain a hydraulic connection between the sections of wetland. The culverts have been designed using the following criteria:

- Culvert diameters (including temporary culverts) have been sized using the conditions listed below or the 10-year design storm - whichever resulted in the larger culvert size.
- At NYSDEC classified stream crossings, the total culvert diameter or span (i.e., sum of all culvert diameters used in the crossing) is a minimum of 1.25 times the channel bed width.
- All culverts at stream crossings were sized assuming that at least 20% of the culvert's height is embedded below the existing stream bed at the outlet end of the culvert.
- For NYSDEC classified streams, all of which have a slope of three percent (3%) or less at the Project area, the embedded culvert was designed with a zero percent slope.

The culvert locations, sizes, and slopes are shown on the construction drawings C-001 through C-084 and typical details on DT-002 and ES-008. The culvert installation information is also summarized in Table 3 in Appendix A. The sizing calculations for the culverts are located in Appendix F.

8.0 INSPECTION AND MAINTENANCE

8.1 Inspection

The Owner has a Qualified Inspector to conduct an assessment of the site prior to the commencement of construction and certify in an inspection report that the appropriate erosion and sediment controls described in the SWPPP and required by the general permit GP-0-10-001 have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Marble River, LLC has retained a Qualified Inspector to conduct site inspections in accordance with the General Permit, GP-0-10-001. The following is the definition of Qualified Inspector from the general permit:

*"**Qualified Inspector** - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).*

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the Qualified Professional qualifications in addition to the Qualified Inspector qualifications."

Following the commencement of construction, site inspections will be conducted by the Qualified Inspector as follows:

- Under normal conditions, at least every seven calendar days.

- On portions of the Project for which Marble River, LLC has received authorization to disturb greater than five acres of soil at one time, at least twice every seven calendar days, with the two inspections separated by at least two days.
- On portions of the Project where soil disturbance activities have been temporarily suspended (e.g. winter shut down), and temporary stabilization measures have been applied to all disturbed areas, and where the appropriate notifications have been made in accordance with GP-0-10-001, at least every 30 days.

During each inspection, the following will be recorded:

1. On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;
2. Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;
3. Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;
4. Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of the sediment storage volume (for example, 10 percent, 20 percent, 50 percent);
5. Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing). Identify any evidence of rill or gully erosion occurring on slopes and any loss of excessive deposition of sediment or ponding water along barrier or diversion systems; and
6. All discrepancies that are identified between the field conditions and what is presented in this SWPPP.

The following standard forms are located in Appendix E: Pre-Construction Meeting Documents, Construction Duration Inspections, Monthly Summary of Site Inspection Activities, and Quarterly Summary of SWPPP Status with Permit Compliance. Project specific inspection forms can be developed as needed. It is recommended that these forms, if desired, be developed with input from the Environmental Monitor (who must meet the qualifications of the Qualified Inspector) and the Contractor so that the forms work well with how construction is phased and

how it progresses. If these forms are modified, the appropriate certifications must be included in the forms.

Marble River, LLC maintains a record of all inspection reports in a site logbook. The site logbook is maintained on-site and be made available to the permitting authority upon request. Marble River, LLC has posted at the site, in a secure location, such as a job trailer, on-site construction office, or mailbox (that is accessible during normal working hours to a person performing a compliance inspection), the completed Notice of Intent (NOI), amended SWPPP, inspection reports/summaries, and a copy of the general permit.

Prior to filing the Notice of Termination, the Qualified Inspector will perform a final inspection and certify that all disturbed areas have achieved final stabilization. The Qualified Inspector shall certify that the site has undergone final stabilization using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fence) not needed for long-term erosion control have been removed. The Owner shall certify by singing the NOT Form that the Project was constructed in accordance to the General Permit and the SWPPP.

8.2 Construction Phase Maintenance

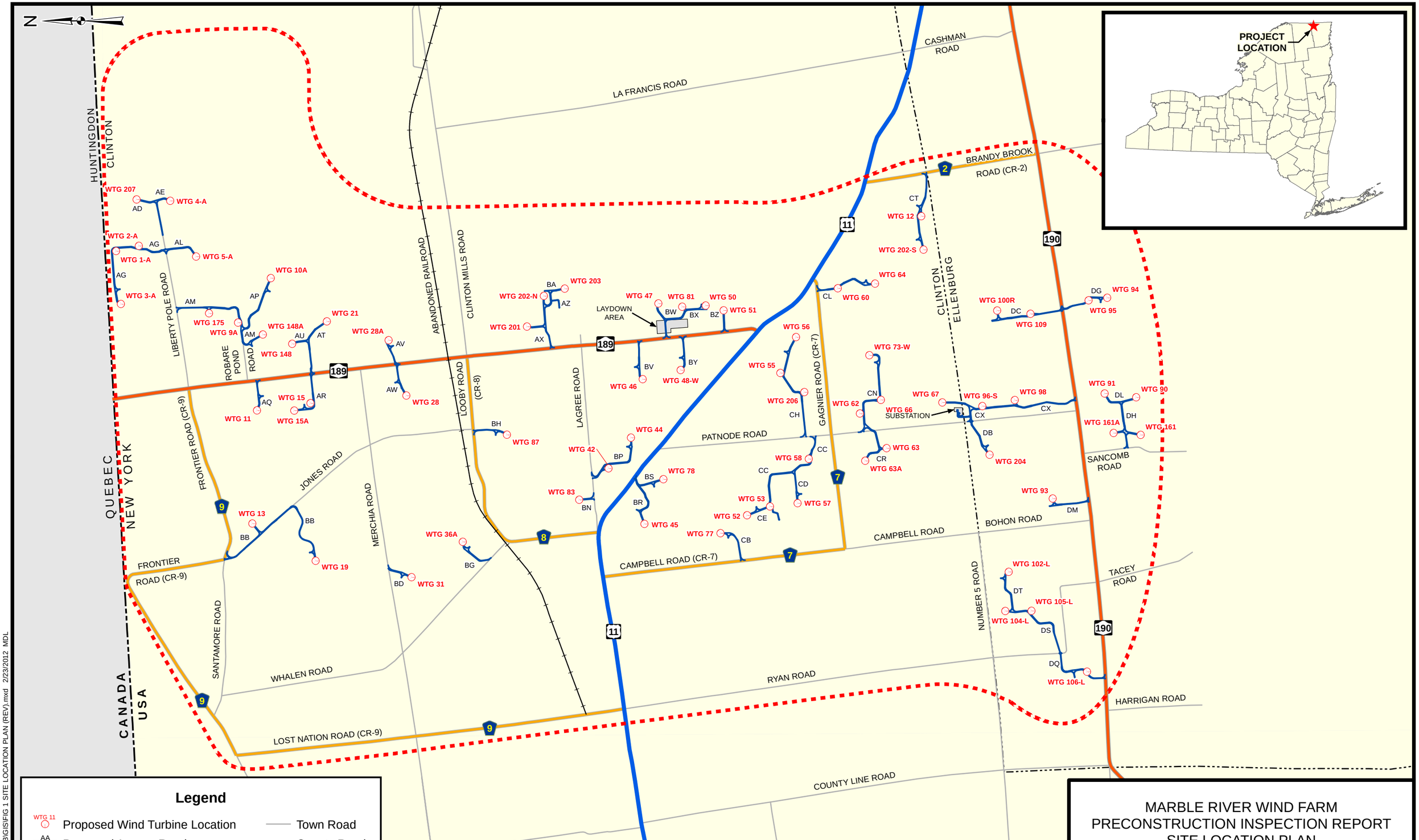
The Contractor is required to inspect and maintain all soil erosion and sediment control measures on a daily basis for the duration of the construction phase to prevent migration of sediment off properties controlled by the Owner or into waters of the State.

All temporary measures, including silt fence, will be replaced when they become clogged or ineffective as described in this SWPPP or on the construction drawings. The vegetative buffer strips will be inspected for signs of sediment build-up, the effectiveness of the vegetation that is present, and the presence of concentrated flow entering the vegetated buffer strip. Appropriate measures will be taken to either clean-out the built-up sediment, re-establish vegetation, or eliminate concentrated flow. If, for whatever reason, the vegetative buffer strips are deemed ineffective or not available due to maintenance, silt fence shall be installed.

8.3 Post-Construction Maintenance

Since there are no post-construction stormwater control practices, a maintenance schedule is not required. However, to minimize post-construction pollution, Marble River, LLC will perform the Good-Housekeeping Measures listed in Section 5.1 through the life of the Project. In addition, Marble River, LLC will regularly inspect the permanent features that have been constructed, such as the road surfaces, culvert crossings and fill areas, for signs of erosion, the presence of potential pollutants, as well as vegetative coverage. Marble River, LLC will ensure that appropriate steps are taken to remove a potential source of pollution if encountered.

APPENDIX A
FIGURES AND TABLES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PROJECT LOCATION
HUNTINGDON
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NEW YORK
CANADA
USA
LA FRANCIS ROAD
CASHMAN ROAD
BRANDY BROOK ROAD (CR-2)
ABANDONED RAILROAD
CLINTON MILLS ROAD
LOOBY ROAD (CR-8)
LAGREE ROAD
GAGNIER ROAD (CR-7)
CLINTON ELLENBURG
LIBERTY POLE ROAD
ROBARE POND ROAD
FRONTIER ROAD (CR-9)
JONES ROAD
MERCHIA ROAD
PATNODE ROAD
SANCOMB ROAD
FRONTIER ROAD (CR-9)
SANTAMORE ROAD
CAMPBELL ROAD (CR-7)
CAMPBELL ROAD
BOHON ROAD
NUMBER 5 ROAD
TACEY ROAD
WHALEN ROAD
RYAN ROAD
HARRIGAN ROAD
LOST NATION ROAD (CR-9)
COUNTY LINE ROAD
LAYDOWN AREA
SUBSTATION
WTG 207
WTG 4-A
WTG 2-A
WTG 1-A
WTG 5-A
WTG 3-A
WTG 10A
WTG 175
WTG 9A
WTG 148A
WTG 148
WTG 21
WTG 28A
WTG 28
WTG 11
WTG 15
WTG 15A
WTG 13
WTG 19
WTG 87
WTG 36A
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WTG 202-N
WTG 201
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WTG 46
WTG 48-W
WTG 44
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WTG 202-S
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WTG 73-W
WTG 62
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WTG 96-S
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WTG 204
WTG 100R
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WTG 161
WTG 93
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WTG 105-L
WTG 104-L
WTG 106-L
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DH
DM
DQ
DS
DT
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11
190
2
9
8
7
1
Legend
Proposed Wind Turbine Location
Proposed Access Road
Project Boundary
Railroad
Town Road
County Road
State Road
Federal Road
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0
4,000 Feet
MARBLE RIVER WIND FARM
PRECONSTRUCTION INSPECTION REPORT
SITE LOCATION PLAN
URS
FIGURE 1
L:\11174823.00000\DB\GIS\FIG 1 SITE LOCATION PLAN (REV).mxd 2/23/2012 MDL

Only copies from the original of this drawing that are marked with the original seal and signature of the Engineer, shall be considered as true valid copies.

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NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

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CONSTRUCTION DRAWINGS
FOR
MARBLE RIVER
WIND FARM
CLINTON COUNTY NEW YORK

COMPARISON OF PROJECT LAYOUT CONTAINED IN 2008 SWPPP AND 2012 SWPPP SHEET 1 OF 2

Scale: AS SHOWN | Date: JAN. 2012 | FIGURE 2

This drawing was computer generated. Any changes and/or revisions should be made to the CADD drawing file.

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N
WTG 1A
WTG 3A
WTG 2A
WTG 207
CULVERT AE1
CULVERT AG1
WTG 4A
CULVERT AL1
WTG 5-A
CULVERT AL2
LIBERTY POLE ROAD
FRONTIER ROAD
NYS RTE 189
ANTAMORE ROAD
WTG 175
CULVERT AM3
WTG 9A
CULVERT AP1
CULVERT AP2
CULVERT AP3
CULVERT DOTAQ1
WTG 11
WTG 13
WTG 148A
WTG 10A
CULVERT AM4
CULVERT BB4
CULVERT BB5
WTG 15A
WTG 148
JONES ROAD
WTG 19
CULVERT BB7
WTG 15
WTG 21
CULVERT DOTAR1
CULVERT AT1
MERCHIA ROAD
CULVERT AW4
CULVERT AW3
CULVERT AW2
WTG 28A
WTG 28
CULVERT DOTAV1
CULVERT AW1
WTG 31
ABANDONED RAILROAD
CLINTON MILLS ROAD
CULVERT BG2
WTG 36-A
WHALEN ROAD
LOOBY ROAD
WTG 87
WTG 201
CULVERT AX2
CULVERT AY1
WTG 202
CULVERT DOTAX1
MET TOWER 1
WTG 203
WTG 83
CULVERT BO1
CULVERT BP1
LAGREE ROAD
WTG 42
CLINTON MILLS ROAD
COLGAN ROAD
OVERHEAD TRANSMISSION LINE – DELETED FROM PROJECT
ABANDONED RAILROAD
BULL RUN ROAD
LEGEND
PROPOSED CULVERT JAN. 2012
WTG 12
WIND TURBINE GENERATOR AND CRANE PAD JAN. 2012
MET TOWER 1
MET TOWER JAN. 2012
ACCESS ROAD JAN. 2012
PROPOSED CULVERT OCT. 2008
WIND TURBINE GENERATOR AND CRANE PAD OCT. 2008
ACCESS ROAD OCT. 2008
OVERHEAD TRANSMISSION LINE OCT. 2008
ELECTRICAL COLLECTION SYSTEM OCT. 2008
ELECTRICAL COLLECTION SYSTEM JAN. 2012
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SCALE IN FEET

MATCHLINE SEE SHEET DWG. 1

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NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

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CONSTRUCTION DRAWINGS
FOR
MARBLE RIVER
WIND FARM
CLINTON COUNTY NEW YORK

COMPARISON OF PROJECT LAYOUT CONTAINED IN 2008 SWPPP AND 2012 SWPPP SHEET 2 OF 2

Scale: AS SHOWN | Date: JAN. 2012 | FIGURE 2

Table 1
MAJOR SOIL TYPES WITHIN PROJECT AREA
Marble River Wind Farm
Clinton, New York

Soil Series	Class and Parent Material	Percent Slope and Setting	Depth to Bedrock (inches)	Drainage and Permeability	Potential for Runoff	Typical Use	Other
Chazy	Loam over glacial till	0-8% on level or gently sloped uplands	20-40"	Somewhat poorly drained; Moderate	Negligible to very high	Woodland; pasture and hay if cleared of rocks	5-35% rock fragments
Conic	Loam over firm glacial till	2-35% on ground moraines	12-30" to firm till, 20-40" to bedrock	Well drained; Moderate (in friable soils) to slow (in till) saturated hydraulic conductivity	Medium to very high	In forests	2-20% rocks in upper layers; 15 to 35% rocks in firm till
Irona	Loamy over till and sandstone	0-15% on level to strongly sloping soils on ridges and hillsides	10 to 20"	Well drained; moderate permeability	Negligible to medium	Woodland; Pasture reverting to brush. Hay or silage corn if cleared of rocks.	2-35% rock fragments
Peasleeville	Coarse loamy over till	0-8% on level to gently sloping till uplands	>60"	Somewhat poorly drained; moderate permeability	Negligible to very high	Hayland often reverting to brush and forest	10-30% rock fragments
Rune-berg	Coarse loamy over till	0-2% in drumlin valleys and moraines	Not reported	Poorly to very poorly drained; moderately slow to slow permeability	Low to very low; Perched or standing water table	Pasture; grasslands	3 to 20% rock fragments
Suna-pee	Coarse loamy over till	0-60% in level to very steep slopes	Not reported	Moderately well drained; moderate permeability	Low to moderate	Forests; pasture or hay when cleared of rocks	5 to 55% rock fragments
Top-knot	Loamy over till	0-8%	10 to 20"	Somewhat poorly drained; moderate permeability	Negligible to very high	Woodland; pasture or hay when cleared of rocks	20-25% rock fragments

Source: Information on major soil series within Project Area obtained from Official Soil Series Descriptions (OSD) on National Soil Conservation Service website accessed January 13, 2006 at http://websoilsurvey.nrcs.usda.gov/app/

TABLE 2
MARBLE RIVER WIND FARM-
CONSTRUCTION MILESTONE DATES

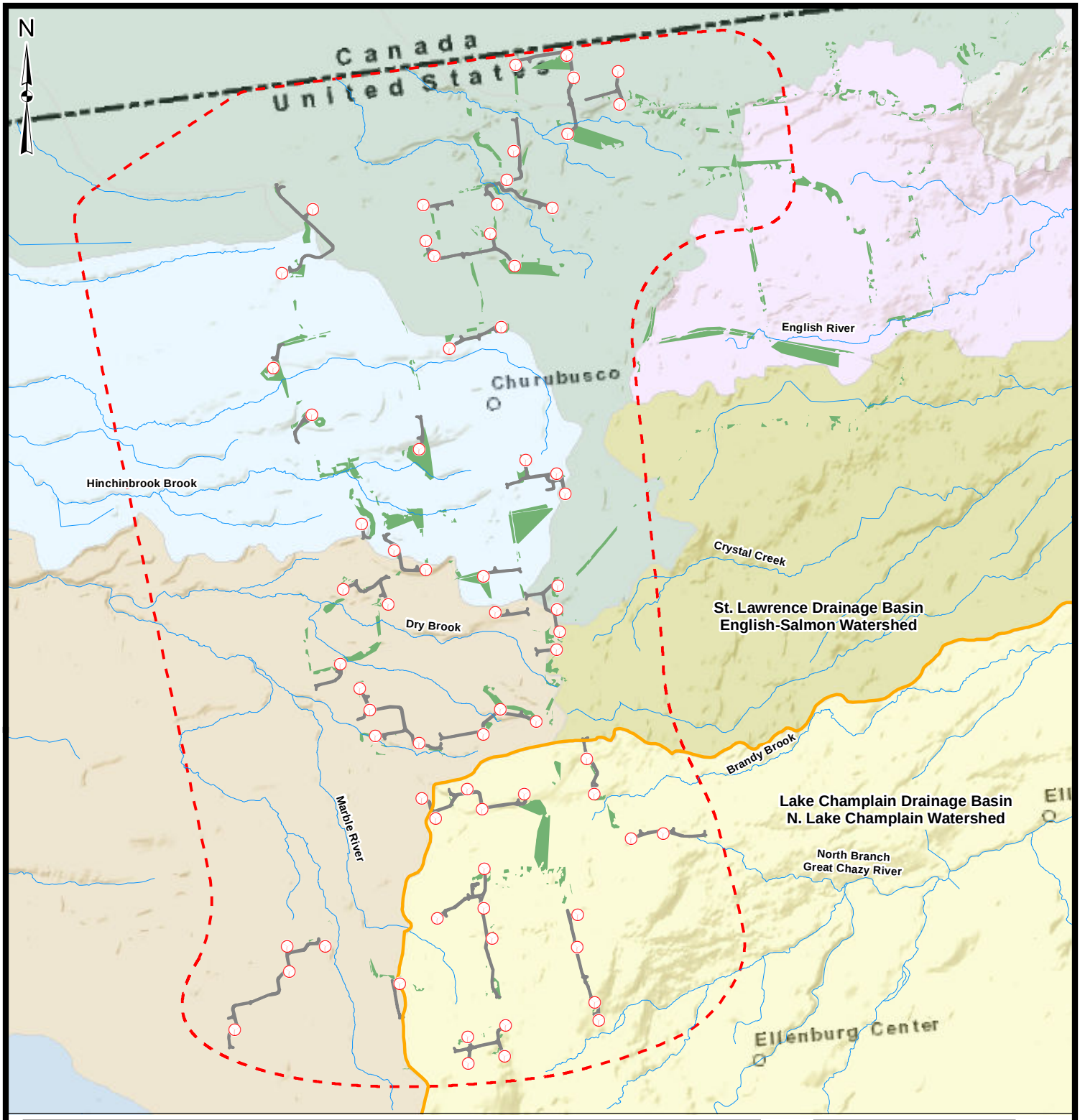
Type of Erosion & Sediment Control	Activity	Map Symbol	2011												2012												2013												Maintenance Actions/Comments
			Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
Pre-Construction Activity																																						
	Resource Protection	N/A				●																																
	Surface Water Protection	N/A				●																																
	Stabilized Construction Roads/Entrance					●																								●								Periodic top-dressing with aggregate. Remove spilled, dropped, or washed sediment from public ROW. If sediment is deposited on roadway, increase the length of stabilized entrance. Reinstall during the restoration of access roads
	Silt Fence	---SF---SF---SF---				●							●							●										●								Maintain as needed. Replace torn fabric as soon as practicable. Reinstall during the restoration of access roads
	Vegetative Buffer Strip	N/A				●							●							●										●								Maintain as needed. Replace torn fabric as soon as practicable. Reinstall during the restoration of access roads
Runoff & Drainage Control																																						
	Check Dam					●							●							●										●								Inspect after each storm event & correct damage immediately. Remove accumulated sediment to allow channel to drain through the check dam. Leave check dams in the swales until channels / site are stabilized.
	Rock Outlet Protection					●																								●								Inspect for scour and dislodged riprap after high flow
	Diversion Berm					●																								●								Periodic inspection & maintenance after rain events
	Clearing and Grubbing	N/A				●						●																										
	Temporary Water Crossings	N/A				●																								●								Inspect after a storm event to see if the temporary crossing has washed out or created a restriction in the drainage channel. Once the crossing is not needed, the crossing shall be removed and the area stabilized.
Grading																																						
	Grading	N/A					●					●																										
	Topsoil Spreading	N/A					●																							●								Spread topsoil on disturbed areas that are brought to final grade
	Temporary Vegetation	N/A					●						●																									Maintain temporary vegetation throughout the duration of the project. Reinstall as necessary during the tower construction
Sediment Control	Silt Fence	---SF---SF---SF---				●																								●								Repair any eroded areas as soon as practicable. Remove sediment once the capacity has reduced by 50%
Maintenance, Inspection & Plan Update		N/A																																				
	Inspections[1]	N/A				●																								●								Every 7-days and within 24-hours of the end of a storm event of 0.5" or greater
	Maintenance	N/A				●																								▶								Maintenance must occur within 72 hours of the completion of an inspection report. Protection of water must continue during entire life of project
	Plan Updates	N/A				●																								●								Update Plan as needed based on site observations
Finalize Grading																																						
	Final Stabilization	N/A																		●										●								Extend schedule as necessary to establish permanent vegetation
	Restore Access Roads	N/A																		●										●								Roadway width to be reduced to permanent width
	Removal of Sediment Traps	N/A																		●										●								Sediment traps can be removed once contributing area has reached final stabilization

Note: Sequence Scheduling Must Be Updated as appropriate for any changes to the construction schedule.

Table 3
Culvert Design
Marble River Wind Farm

Culvert ID	Number of Culverts Required	Culvert Diameter (inches)	Length (feet)	Culvert Type	Construction Drawings Number
AA1	3	24	100	Culvert at Wetland	C-084
AE1	1	12	80	Typical Culvert	C-081
AG1	1	24	135	Typical Culvert	C-078
AL1	1	24	160	Oversize at stream	C-078
AL2	2	42	48	Oversize at Stream	C-077
AM3	3	Arches 77 X 52	50	Oversize at stream	C-072
AM4	1	12	45	Typical Culvert	C-072
AP1	1	12	45	Typical Culvert	C-072
AP2	1	12	95	Typical culvert	C-072
AP3	1	12	60	Typical culvert	C-072
AT1	4	30	30	Oversize at Stream	C-067
AW1	1	12	30	Culvert at Wetland	C-066
AW2	1	12	30	Culvert at Wetland	C-065
AW3	1	12	30	Culvert at Wetland	C-066
AW4	1	12	30	Culvert at Wetland	C-066
AX2	2	Arches 49 X 33	35	Oversize at stream	C-046
AY1	3	12	44	Culvert at Wetland	C-046
BB4	1	12	30	Culvert at Wetland	C-061
BB5	1	12	86	Typical culvert	C-061
BB7	2	Arches 71 x 47	30	Oversize at stream	C-060
BG2	1	12	70	Typical Culvert	C-056
BO1	1	18	195	Typical Culvert	C-050
BP1	1	24	100	Typical culvert	C-050
BR1	1	18	50	Culvert at Wetland	C-037
BR2	1	18	50	Culvert at Wetland	C-037
BR3	1	15	50	Culvert at Wetland	C-037
BS1	1	12	50	Typical culvert	C-037
BS1A	1	12	50	Culvert at Wetland	C-037
BY1	1	12	42	Culvert at Wetland	C-042
BY2	1	24	55	Oversize at stream	C-042
BZ2	1	12	50	Typical Culvert	C-040
CC1	1	18	70	Typical Culvert	C-028
CC2A	1	12	50	Typical Culvert	C-028
CH1	1	18	55	Typical culvert	C-029
CH1A	1	12	190	Typical Culvert	C-028
CH2	3	30	50	Oversize at Stream	C-029
CH3	3	12	60	Culvert at Wetland	C-038
CL1	1	30	50	Culvert at Wetland	C-026
CL2	1	30	50	Culvert at Wetland	C-021
CL3	1	30	50	Culvert at Wetland	C-021
CN3	1	36	75	Typical culvert	C-020
CR1	1	30	70	Typical Culvert	C-018
CT1	1	12	125	Typical culvert	C-023
CT2	1	12	70	Typical culvert	C-023
CT3	1	12	50	Typical culvert	C-022
CX1	4	12	30	Culvert at Wetland	C-009
CX2	1	24	65	Typical Culvert	C-009
DC1	3	30	68	Oversize at stream	C-014
DG1	2	21	40	Culvert at wetland	C-016
DH1	1	12	26	Culvert at Wetland	C-007
DL1	1	12	45	Typical Culvert	C-008
DL2	1	15	44	Culvert at Wetland	C-008
DOTAQ1	1	24	160	Typical Culvert	C-070
DOTAR1	1	18	120	Typical Culvert	C-068
DOTAV1	1	18	105	Typical Culvert	C-066
DOTAX1	1	18	125	Typical Culvert	C-046
DOTBV1	1	21	160	Typical Culvert	C-042
DOTBY1	1	18	215	Typical Culvert	C-042
DOTBZ1	1	18	260	Typical Culvert	C-040
DOTDC1	1	18	170	Typical Culvert	C-015
DOTDG1	1	18	175	Typical Culvert	C-015
DS1	1	12	25	Typical Culvert	C-002
DS2	1	12	25	Typical Culvert	C-002
DS3A	1	30	30	Typical Culvert	C-002
DS3B	1	30	50	Typical Culvert	C-002
DT1	1	24	60	Typical culvert	C-003
TAL1	1	12	40	Typical culvert	C-023
DY1	1	12	37	Culvert at Wetland	C-063

APPENDIX B
EXISTING CONDITIONS INFORMATION

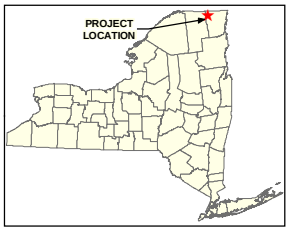


Legend

- Wind Turbine Location
- Project Boundary
- Access Road
- Streams / Rivers
- Drainage Basin Boundary
- Field Wetlands

SubWatersheds

- Allen Brook
- Chateaugay River
- Crystal Creek
- Direct Canadian Drainage
- Headwaters North Branch
- Hinchinbrook Brook
- Marble River
- Taylor Brook-English River

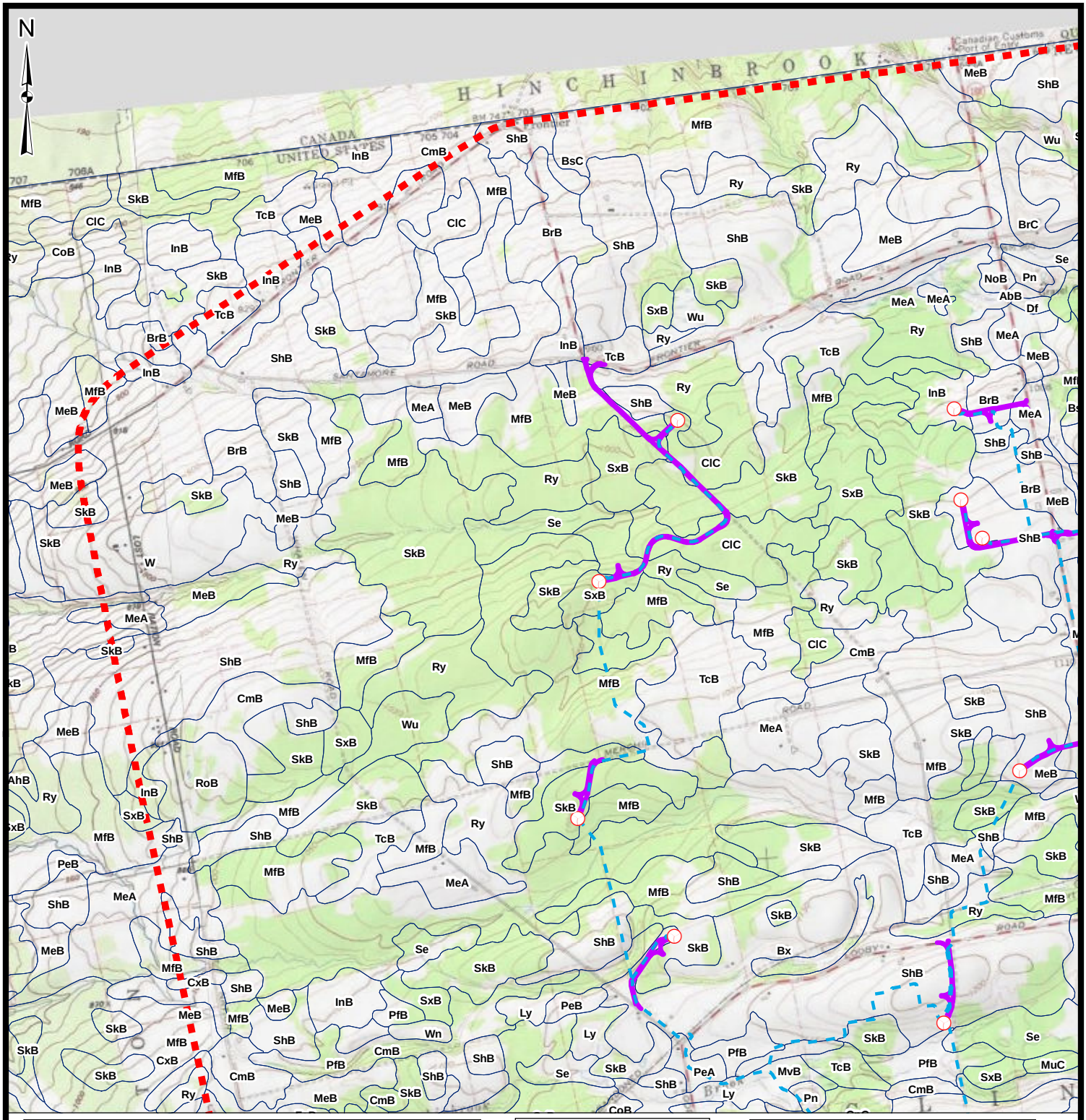


Miles
1.25 0 1.25

URS

MARBLE RIVER WIND FARM
HYDROGRAPHY AND DRAINAGE BOUNDARIES

FIGURE 3

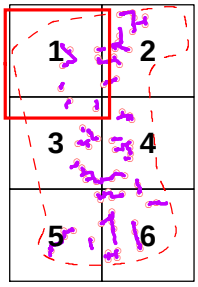


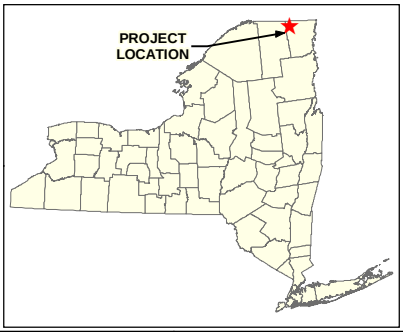
Legend

- Wind Turbine Location
- Access Road
- Project Boundary
- NRCS Soils (PeA)
- Underground Electric
- Substation

0.5 0 0.5 Miles

Index Map





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MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 1

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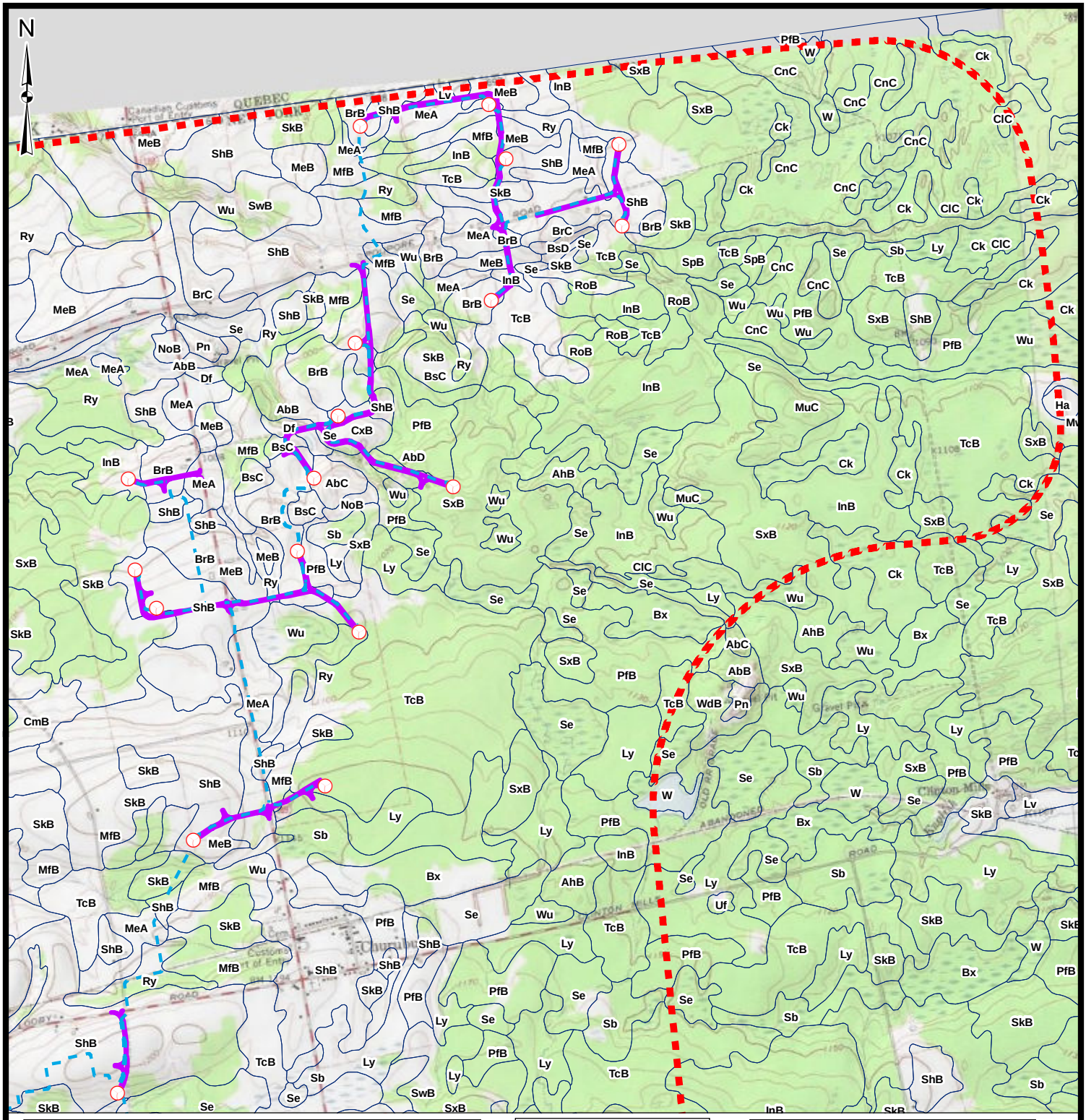

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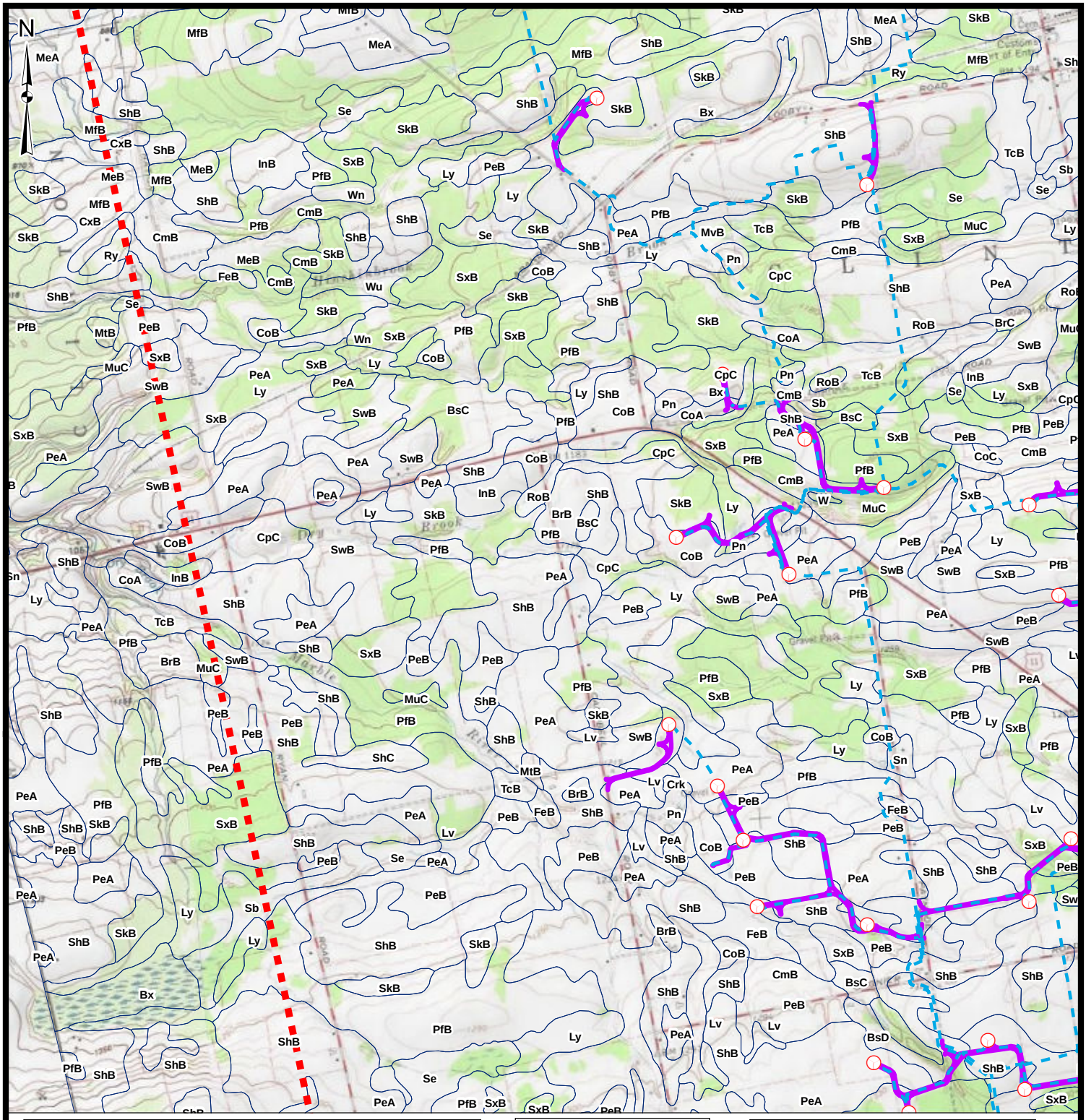
MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 2

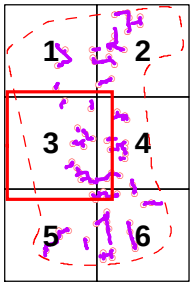


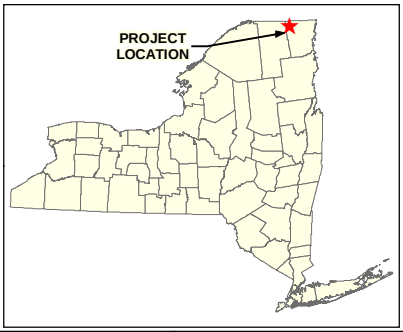
Legend

- Wind Turbine Location
- Access Road
- Project Boundary
- NRCS Soils (PeA)
- Underground Electric
- Substation

0.5 0 0.5 Miles

Index Map





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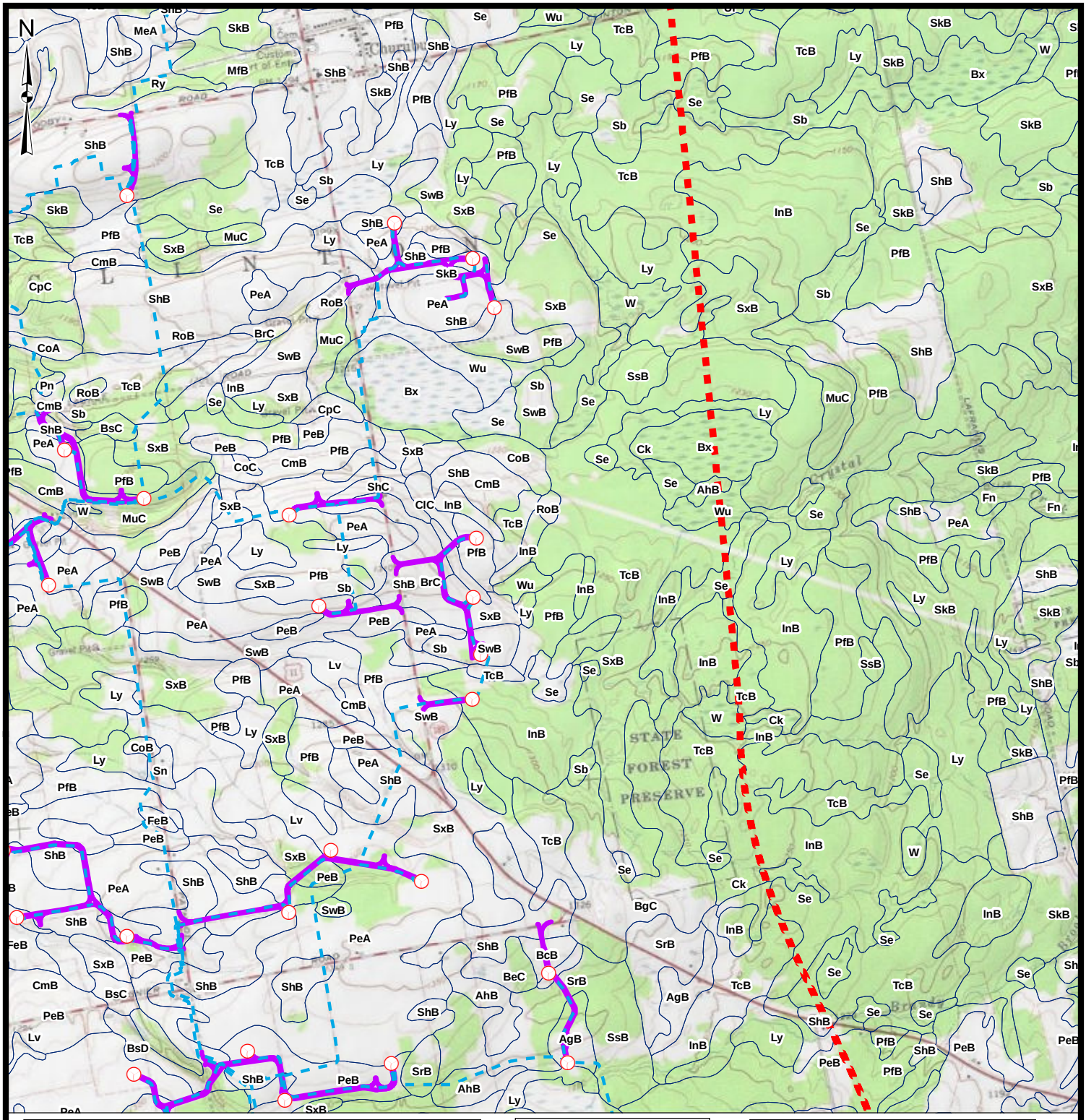
MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 3



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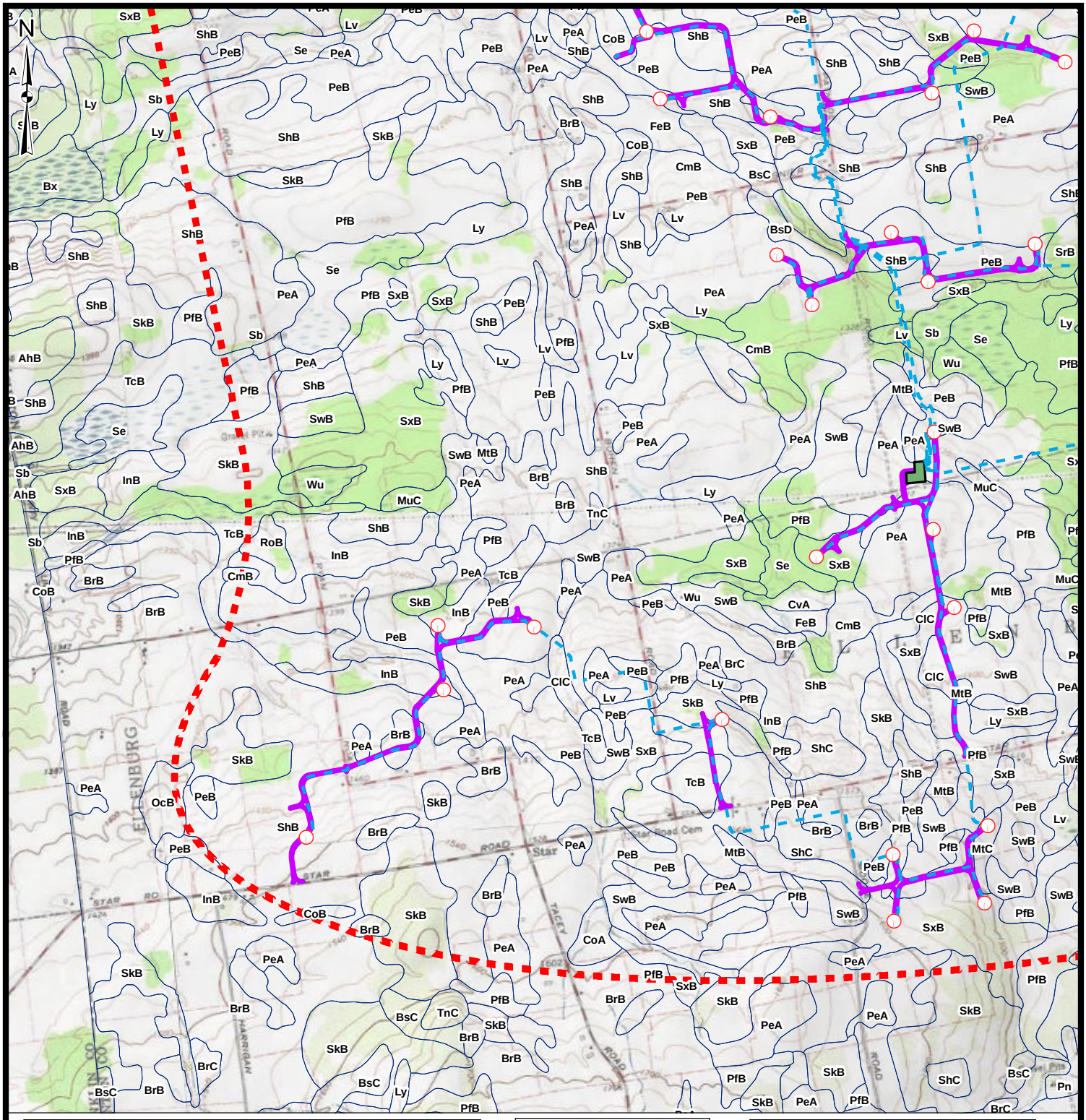
MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 4



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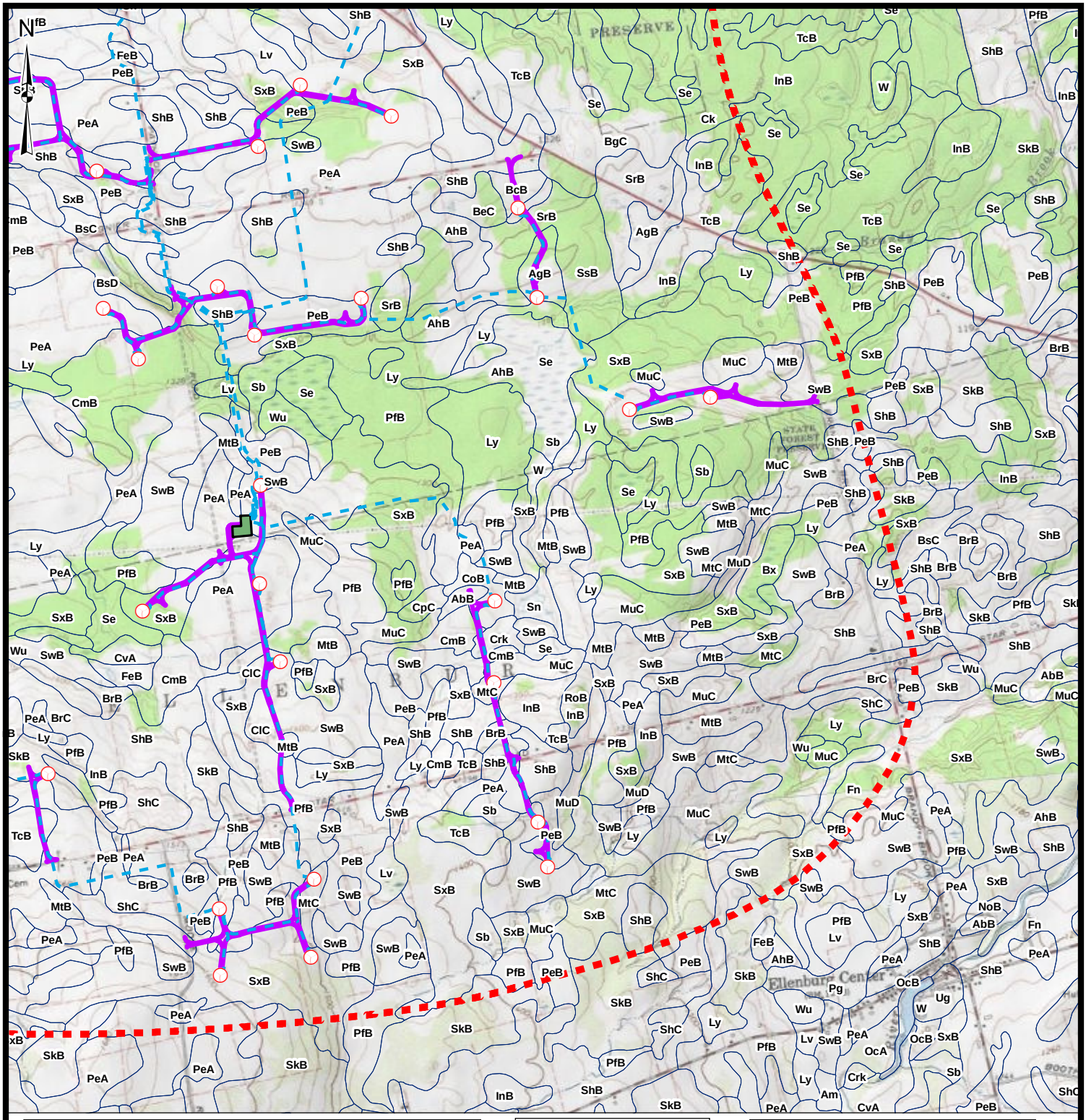
MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 5



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URS

MARBLE RIVER WIND FARM
NRCS SOIL SURVEY

FIGURE 4
MAP 6

APPENDIX C
CONTRACTOR'S CERTIFICATION

CONTRACTOR CERTIFICATION STATEMENT

Pursuant to the New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001)

Project: Marble River Wind Farm
Town of Clinton, New York
Town of Ellenburg, New York

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the Qualified Inspector during a site inspection. I also understand that the Owner or Operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings."

Name	Title	Date

Signature

Name of Contracting Firm	Telephone Number

Address of Contracting Firm

Soil Disturbance Activities / Area of Responsibility

APPENDIX D

NOTICE OF INTENT/NOTICE OF TERMINATION

1752059166

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR _____ (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-02-01

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required. To properly complete this form, please refer to the Instruction Manual which can be accessed at http://www.dec.ny.gov/docs/water_pdf/instr_man.pdf

-IMPORTANT-

THIS FORM FOR MACHINE PRINT ONLY
RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR **MUST SIGN FORM**

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
MARBLE RIVER, LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
DASH

Owner/Operator Contact Person First Name
GORDON

Owner/Operator Mailing Address
52 JAMES STREET

City
ALBANY

State
NY

Zip
12207-

Phone (Owner/Operator)
281-703-9224

Fax (Owner/Operator)
713-265-0365

Email (Owner/Operator)
GORDON.DASH@HORIZONWIND.COM

Location Information

Project Site Information

Project/Site Name
MARBLE RIVER WIND FARM

Street Address (NOT P.O. BOX)
0 NYS ROUTE 189

City/Town/Village (THAT ISSUES BUILDING PERMIT)
TOWN OF CLINTON AND TOWN OF ELLENBURG

State
NY

Zip
12923 -

County
CLINTON

DEC Region (if known)
5

Name of Nearest Cross Street
LAGREE ROAD

Distance to Nearest Cross Street (Feet)
0

Direction to Nearest Cross Street
● North ○ South ○ East ○ West

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site go to the dropdown menu on the left and choose "Get Coordinates". Click on the center of your site and a small window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)
584441

Y Coordinates (Northing)
4976726

2. What is the nature of this construction project?

● **New Construction**

○ **Redevelopment with increase in imperviousness**

○ **Redevelopment with no increase in imperviousness**

Project Site Information

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use	Post-Development Future Land Use
○ FOREST	○ SINGLE FAMILY HOME
● PASTURE/OPEN LAND	○ SINGLE FAMILY SUBDIVISION
○ CULTIVATED LAND	○ TOWN HOME RESIDENTIAL
○ SINGLE FAMILY HOME	○ MULTIFAMILY RESIDENTIAL
○ SINGLE FAMILY SUBDIVISION	○ INSTITUTIONAL/SCHOOL
○ TOWN HOME RESIDENTIAL	○ INDUSTRIAL
○ MULTIFAMILY RESIDENTIAL	○ COMMERCIAL
○ INSTITUTIONAL/SCHOOL	○ ROAD/HIGHWAY
○ INDUSTRIAL	○ RECREATIONAL/SPORTS FIELD
○ COMMERCIAL	○ BIKE PATH/TRAIL
○ ROAD/HIGHWAY	● LINEAR UTILITY (water, sewer, gas, etc.)
○ RECREATIONAL/SPORTS FIELD	○ PARKING LOT
○ BIKE PATH/TRAIL	○ OTHER
○ SUBSURFACE UTILITY	OTHER: PASTURE
○ PARKING LOT	Number of Lots:
○ OTHER	
OTHER:	

4. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law ? ● Yes ○ No

5. Is this a project which does not require coverage under the General Permit (e.g. Project done under an Individual SPDES Permit, or department approved remediation)? ○ Yes ● No

6. Is this property owned by a state authority, state agency or local government? ○ Yes ● No

7. In accordance with the larger common plan of development or sale; enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area. Round to the nearest tenth of an acre.

Total Site Acreage	Acreage To Be Disturbed	Existing Impervious Area Within Disturbed	Future Impervious Area Within Disturbed
9999.9	757.2	14.4	90.5

8. Will there be more than 5 acres disturbed at any given time? ● Yes ○ No

9. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	B	C	D
11 %	47 %	22 %	20 %

10. Is this a phased project? **(if yes, The SWPPP must address all planned phases)** ○ Yes * ● No

11. Enter the planned start and end dates of the disturbance activities

Start Date		End Date
05/01/2008	–	11/15/2010

Receiving System(s)

12. Provide the name of the nearest, natural, classified surface waterbody(ies) into which construction site runoff has the potential to discharge.

DRY BROOK MARBLE RIVER ENGLISH RIVER

CRYSTAL CREEK HINCHINBROOK

BRANDY BROOK

For Questions 13 and 14 refer to the Instruction Manual for a subset of 303(d) segments and TMDL watersheds subject to Condition A of the permit. These waterbodies and watersheds have been identified for regulation within the stormwater program due to some level of impairment by nutrients, silt or sediment. The Instruction Manual can be accessed at www.dec.state.ny.us/website/dow/toolbox/instr_man.pdf

13. Has the surface waterbody(ies) in question 12 been identified as a 303(d) segment? ○ Yes * ● No

14. Is this project located in a TMDL Watershed? ○ Yes * ● No

***NOTE:** If you answered Yes to either question 13 or 14, Pursuant to Part I.D.3.(b) of the permit, you must have your SWPPP prepared and certified by a licensed/certified professional and the SWPPP is subject to a 60-business day review.*

15. Does the site runoff enter a separate storm sewer system- including roadside drains, swales, ditches, culverts, etc? **(if no, skip question 16)** ● Yes ○ No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

NYS DOT

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ Yes ● No ○ Unknown

Stormwater Pollution Prevention Plan (SWPPP)

18. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book) ?

● Yes ○ No*

19. Does this construction activity require the development of a SWPPP that includes Water Quality and Quantity Control components (Post-Construction Stormwater Management Practices) **If no, Skip question 20**

○ Yes ● No

20. Have the Water Quality and Quantity Control components of the SWPPP been developed in comformance with the current NYS Stormwater Management Design Manual ?

○ Yes ● No*

NOTE: If you answered no to question 18 or 20, Pursuant to Part I.D.3.(b) of the permit, you must have your SWPPP prepared and certified by a licensed/certified professional and the SWPPP is subject to a 60-business day review. Please provide further details in the details/comment section on the last page of this form.

21. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ● **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer Information (if different from Owner/Operator info)

SWPPP Preparer: URS CORPORATION

Contact Name (Last, Space, First): HOLMES ROBERT

Mailing Address: 781 ELMGROVE ROAD BUILDING 1

City: ROCHESTER

State: NY

Zip: 14624-

Phone: 585-426-2120

Fax: 585-426-2161

Email: ROBERT HOLMES@URSCORP.COM

Stormwater Pollution Prevention Plan (SWPPP)

Erosion and Sediment Control Practices

22. Has a construction sequence schedule for the planned management practices been prepared?

● Yes ○ No

23. Select **all** of the erosion and sediment control practices that will be employed on the project site.

Temporary Structural

- ● Check Dams
- ○ Construction Road Stabilization
- ○ Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ● Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ● Sediment Traps
- ● Silt Fence
- ● Stabilized Construction Entrance
- ○ Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ● Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ● Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ○ Grassed Waterway
- ● Mulching
- ○ Protecting Vegetation
- ○ Recreation Area Improvement
- ● Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ● Topsoiling
- ○ Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ○ Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ● Rock Outlet Protection
- ○ Streambank Protection

Other

VEGETATIVE BUFFER AREA

Stormwater Pollution Prevention Plan (SWPPP)

Water Quality and Quantity Control

Important:Completion of Questions 24-30 is not required if the project:

Disturbs less than 5 acres and is planned for single-family residential homes(including subdivisions) or construction on agricultural property and does not have a discharge to a 303(d) water or is not located within a TMDL watershed.

Additionally, sites where there will be no future impervious area within the disturbed area and that do not have a change(pre to post development)in hydrology do not need to complete questions 24-30.

24. Indicate **all** the permanent Stormwater Management Practice(s) that will be installed on this site

Post Construction Stormwater Management Practices

Ponds

- ○ **Micropool Extended Detention (P-1)**
- ○ **Wet Pond (P-2)**
- ○ **Wet Extended Detention (P-3)**
- ○ **Multiple Pond System (P-4)**
- ○ **Pocket Pond (P-5)**

Filtering

- ○ **Surface Sand Filter (F-1)**
- ○ **Underground Sand Filter (F-2)**
- ○ **Perimeter Sand Filter (F-3)**
- ○ **Organic Filter (F-4)**
- ○ **Bioretention (F-5)**

Wetlands

- ○ **Shallow Wetland (W-1)**
- ○ **Extended Detention Wetland (W-2)**
- ○ **Pond/Wetland System (W-3)**
- ○ **Pocket Wetland (W-4)**

Infiltration

- ○ **Infiltration Trench (I-1)**
- ○ **Infiltration Basin (I-2)**
- ○ **Dry Well (I-3)**

Open Channels

- ○ **Dry Swale (O-1)**
- ○ **Wet Swale (O-2)**

- ○ **Other**

Describe other stormwater management practices not listed above or explain any deviations from the technicial standards. If the SWPPP does not conform to the technicial standards, the SWPPP must be prepared and certified by a licensed/certified professional and is subject to a 60-business day review.

Due to the dispersive nature of this project and the minimal impact from the low use gravel roads NYSDEC Region 5 personnel have indicated that water quality and water quantity controls are not required for this project
The Owner Marble River LLC will provide long term maintenance and inspection of the roads over the life of the project

Has a long term Operation and Maintenance plan for the post construction management practices been developed? ● **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

MARBLE RIVER LLC

Stormwater Pollution Prevention Plan (SWPPP)
Water Quality and Quantity Control

25. Provide the total water quality volume required and the total provided for the site.

Total Water Quality Volume (WQv)

WQv Required ___.___ **acre-feet**

WQv Provided ___.___ **acre-feet**

26. Provide the following Unified Stormwater Sizing Criteria for the site.

Total Channel Protection Storage Volume (CPv) - Extended detention of post-developed 1 year, 24 hour storm event

CPv Required ___.___ **acre-feet**

CPv Provided ___.___ **acre-feet**

The need to provide for channel protection has been waived because

○ **Site discharges directly to fourth order stream or larger**

Total Overbank Flood Control Criteria (Qp) - Peak discharge rate for the 10 year storm

Pre-Development ___.___ **CFS**

Post-development ___.___ **CFS**

Total Extreme Flood Control Criteria (Qf) - Peak discharge rate for the 100 year storm

Pre-Development ___.___ **CFS**

Post-development ___.___ **CFS**

The need to provide for flood control has been waived because

○ **Site discharges directly to fourth order stream or larger**

○ **Downstream analysis reveals that flood control is not required**

IMPORTANT: For questions 27 and 28 impervious area should be calculated considering the project site and all offsite areas that drain to the post-construction stormwater management practice(s) (Total Drainage Area = Project Site + Offsite areas)

27. Pre-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the existing impervious areas before construction begins. ___ %

28. Post-Construction Impervious Area - As a percent of the Total Drainage Area enter the percentage of the future impervious areas that will be created/remain on the site after completion of construction. ___ %

29. Indicate the total number of permanent stormwater management practices to be installed ___

30. Provide the total number of stormwater discharge points from the site (include discharges to either surface waters or to seperate storm sewer systems) ___

Other Permits

31. Select any other DEC permits that are required for this project or ○ None

DEC Permits

○ Air Pollution Control	● Stream Protection/Article 15
○ Coastal Erosion	○ Water Quality Certificate
○ Hazardous Waste	○ Dam Safety
○ Long Island Wells	○ Water Supply
○ Mined Land Reclamation	● Freshwater Wetlands
○ Other SPDES	○ Tidal Wetlands
○ Solid Waste	○ Wild, Scenic and Recreational Rivers

Other

32. If this NOI is being submitted for the purpose of continuing coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.

NYR

Details/Comments

Due to the dispersive nature of this project and the minimal impact from the low use gravel roads NYSDEC Region 5 personnel have indicated that water quality and water quantity controls are not required for this project
The Owner Marble River LLC will provide long term maintenance and inspection of the roads over the life of the project. NOTE: The total site area is 29,726 acres.

Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I also certify under penalty of law that this document and the corresponding documents were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction. and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name: KEN

MI:

Print Last Name: RIPPER

Owner/Operator Signature:

Date: / /

0567059169

Other Permits

31. Select any other DEC permits that are required for this project or ○ None

DEC Permits

○ Air Pollution Control	● Stream Protection/Article 15
○ Coastal Erosion	○ Water Quality Certificate
○ Hazardous Waste	○ Dam Safety
○ Long Island Wells	○ Water Supply
○ Mined Land Reclamation	● Freshwater Wetlands
○ Other SPDES	○ Tidal Wetlands
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Other

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Print First Name: KEN

MI:

Print Last Name: RIPPER

Owner/Operator Signature: Kenneth A Ripper

Date: 04/14/2008

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NOTICE OF TERMINATION for Storm Water Discharges Associated with Construction Activity UNDER SPDES GENERAL PERMIT: ☐ #GP-93-06 or ☐ #GP-02-01

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Permittee Information

1. Owner/Operator Name:

2a. Mailing Address:	2b. City/State/Zip:

3a. Contact Person:	3b. Phone:	3c. E-mail:

II. Site /Activity Information

4. Facility/Project Site Name:

5a. Street Address:	5b. City/State/Zip:

6. County:

III. Reason for Termination

7a. ☐ Site has been finally stabilized in accordance with permit and SWPPP. Date site stabilization completed: _____ month/year

7b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR _ _ _ _ _ _
(Note: Permit coverage can not be terminated by permittee identified in I.1. above until new owner/operator obtains coverage under GP-02-01)

IV. Final Site Information:

8a. Are there permanent stormwater management practices remaining on the site? ☐ yes ☐ no
If the answer to question 8a. is no, go to question 8e.
If the answer to question 8a. is yes, answer the following questions 8b., 8c., and 8d.:
8b. Is the design and function of each permanent practice described in the final SWPPP? ☐ yes ☐ no
8c. Who will be responsible for long-term operation and maintenance of practice(s)? _____
8d. Has the individual(s) responsible for long-term operation and maintenance been given a copy of the operation and maintenance requirements? ☐ yes ☐ no
8e. Provide the total acreage of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? _____

V. Certification

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name:	Title/Position:
Signature:	Date:

Reset Button

08/16/04

APPENDIX E
STANDARD INSPECTION FORMS

APPENDIX H

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

Table of Contents

Properly completing forms such as those contained in Appendix H meet the inspection requirement of NYS-DEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

Permit No. _____ **Date of Authorization** _____

Name of Operator _____

Prime Contractor _____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

The operator shall also prepare a written summary of compliance with this general permit at a minimum frequency of every three months (Operator's Compliance Response Form), while coverage exists. The summary should address the status of achieving each component of the SWPPP.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).

2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Operators Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Name (please print): _____

Title _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

c. Qualified Professional's Credentials & Certification

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): _____

Title _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

d. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_____
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_____
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Perimeter Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page _____
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:
Inspection Forms will be filled out during the entire construction phase of the project.
Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass
water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

CONSTRUCTION DURATION INSPECTIONS **Page 1 of _____**

SITE PLAN/SKETCH

_____ _____

Inspector (print name) **Date of Inspection**

_____ _____

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.

Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:
1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

III. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	Today's Date:	Reporting Month:
Location:	Permit Identification #:	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature of Permittee or Duly Authorized Representative

Name of Permittee or Duly Authorized Representative Date

Duly authorized representatives must have written authorization, submitted to DEC, to sign any permit documents.

APPENDIX F
CULVERT SIZING CALCULATIONS

MARBLE RIVER WIND FARM

SUMMARY OF MODIFICATIONS TO CULVERT DESIGN CALCULATION PACKAGE

PREPARED FOR AMENDED SWPPP – JANUARY 2012

The most recent layout of the Marble River Wind Farm, issued by URS in October and November, 2011, reflects a number of changes to the design of the project:

- The elimination of the access roads and approximately 35 wind turbines from the Northeastern portion of the project,
- Realignment of several access roads in other portions of the project,
- Elimination of upslope diversion berms and alteration of the cross-section of the road so that surface water runoff from upslope will sheet flow across the road, and
- Using "stone bridges" in place of culverts in areas with poor drainage and wet soils – the stone bridges are sections of the road constructed with a thick, porous stone base to allow groundwater to flow under the road at the same time that surface water runoff sheet flows over it.

As a result of these changes, the culvert design calculation package has been revised as follows:

- Elimination of culverts that are no longer necessary due to the removal of access roads;
- Elimination of culverts due to a revised stormwater design approach, which introduced the utilization of stone bridges in locations where stormwater runoff conveyance was necessary but the installation of culverts was determined to be impractical;
- Adjustments to the culvert dimensions as required to address re-aligned access roads and/or revised dimensions of access roads and intersections;

A total of approximately 81 culverts have been eliminated from the design as a result of these changes. The current calculation package contains the design of approximately 68 culverts.

Table 2 within the attached calculation package presents the current list of culverts proposed for the site. For many of the culverts, only the length was changed for the current design, which does not warrant a redesign but a simple evaluation to ensure the culvert diameter still is acceptable given the design constraints. Several of the culverts also underwent no design

changes. The most notable design changes made to the culverts in this calculation package were either to the diameter or number of barrels.

For the recent set of calculations, there were two instances where the design criteria could not be met (note that these designs are based on assumed vertical constraints, most notably the elevation of the crest of the road crossing and the elevation of the culvert inverts, which are not included in the design):

- Culvert CH1A: The design criteria limiting the headwater for the 10-year peak design flow to 1 foot below the road surface could not be met due to the geometric constraints of the topography and the adjacent road and proposed access road intersection. In order to reduce the headwater, the design for this culvert calls for smooth-interior HDPE pipe rather than the standard corrugated steel.

- Culvert DOTAQ1: The design criteria limiting the headwater for the 10-year peak design flow to 1 foot below the road surface could not be met due to the geometric constraints of the topography and the adjacent road and proposed access road intersection. In addition, the design criterion requiring 2 feet of cover was not met for the upstream portion of the pipe.

Additionally, culverts AW-3 and AW-4 do not have their own dedicated designs. They are instead sized based on culverts AW-1 and AW-2, which share the same watershed.

URS

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: Marble River Wind Farm Project Name: Marble River Wind Farm

Project/Calculation Number: 11174823

Title: Culvert Design

Total Number of Pages (including cover sheet): ~~458 (note there is both a page 51 and page 51A)~~ 205

Total Number of Computer Runs: Win TR-55 per drainage area, HY-8 for each culvert as appropriate

Prepared by: Mary Steblein Date: 3/11/08

Checked by: MATTHEW WING Date: 3/11/08

Description and Purpose:

Design culverts for Marble River Wind Farm project, including Typical Culverts, Culverts at Wetlands, and Oversized Culverts at Streams. Includes determination of peak flow using TR-55.

Design Basis/References/Assumptions

See pages 2 through 8 for design basis and assumptions.

Reference #1: "Hydraulic Design of Highway Culverts." Federal Highway Administration (FHWA), May 2001.
Reference #2: "Urban Hydrology for Small Watersheds," Soil Conservation Services Technical Release No. 55 (TR-55), US Department of Agriculture, Springfield, Virginia, 1986

Remarks/Conclusions/Results:

Drainage areas and flow paths/time of concentrations were not reviewed as a part of this calculation set. See Table 1 for drainage area sizes, flow path characteristics, hydrologic soil group types and associated peak flow. See Table 2 for culvert sizing information. TR-55 output is included in pages ~~14~~ 5 through ~~155~~ 81. Culvert output is included in pages ~~156-457~~ 82-204

Calculation Approved by: Kevin T. Hanrahan 1/5/12
Project Manager/Date

Revision No.:	Description of Revision:	Approved by:
1	Revised Project	Kevin T. Hanrahan 1/5/12

Project Manager/Date

URS

Culvert Design

The project area was delineated into Drainage Areas discharging through existing culverts, recommended culverts, or existing streams. Culvert design was divided into three general types:

1. "Typical" culverts that drain from a drainage area under an access or existing road and may accept drainage from a diversion swale,
2. "Wetland connection" or "hydraulic connection" culverts that connect two delineated wetland areas or other low areas, and
3. "Stream culverts," which may be a series of several culverts, or a bottomless structure, depending on the stream's slope in the project area.

Drainage areas and time of concentration flow paths were determined using AutoCAD, the base topographic maps of the planned development, and the proposed access roads. The cover type within the drainage areas was determined from the survey information and the soil survey electronic images.

USDA NRCS Win TR-55 program was used to develop the Weighted Curve Number and Time of Concentration for each drainage area. The Peak Flow for the ten-year storm was also computed by drainage area. A summary table, **Table 1**, includes the drainage area, cover types, flow path characteristics, hydrologic soil group(s), and peak flows. Software output for these calculations are included **TR-55 Output**.

1) Typical Culverts

U.S. Department of Transportation Federal Highway Administration's HY-8, version 7.0 was used for the typical culvert design. For each proposed culvert, the peak flow (from Win TR-55) and the proposed culvert length were entered.

In some instances, hydrologic group "A" soils, small drainage areas, and/or flat slopes within a drainage area led to zero cubic feet per second (cfs) peak flows. These zero flows are noted on the appropriate tables, however, it should be noted that there is no HY-8 design/output for these culverts.

Design Criteria

- Circular Culvert sizes 12", 15", 18", 21", 24", 30", 36", 42", Arch culverts considered to minimize height
- Minimum culvert diameter of 12"
- Corrugated Steel culvert (n=0.024)
- No overtopping; headwater limited to one foot below road surface elevation
- Conventional, thin-edge-projecting culvert with no inlet depression
- Slope of 1% minimum
- Minimum culvert cover = 2 feet

Assumptions
- Constant tailwater elevation was set equal to the diameter of the circular culvert
- Gravel roadway surface, crest length of 100', and top width equal to the road width; however the "values entered for the crest length and top width of the roadway have no effect on the hydraulic computations unless overtopping occurs." As the design criteria indicates, no overtopping was allowed, therefore, this input had no effect on the computations.

HY-8 input and output data are included in **HY-8 Output,** and a summary table, **Table 2,** is attached. The data includes the site data and culvert data used, the resulting Water Surface Profile Plot for the design flow, and a Summary of Culvert Flows at the crossing.

2) Wetland Connection/Hydraulic Connection

Low areas connected by a culvert were sized based on the general drainage area with a minimum culvert size of 12".

Design Criteria
- Circular Culvert sizes 12", 15", 18", 21", 24", 30", 36", 42"
- Minimum culvert diameter of 12"
- Corrugated Steel culvert (n=0.024)
- No overtopping; headwater limited to one foot below road surface elevation
- Conventional, thin-edge-projecting culvert with no inlet depression
- Slope of 0% minimum
- Minimum culvert cover = 2 feet
- Drainage areas and/or peak flows were not determined for every individual wetland/hydraulic connection area. Many of the areas are low flat areas, or a new access road related to this project divides an existing wetland or low area. In these instances, a peak flow would likely be zero, therefore, not useful from a design standpoint. Appropriate-sized culverts were chosen based on similar conditions and the overall drainage design.

Assumptions
- Constant tailwater elevation was set equal to the diameter of the circular culvert
- Gravel roadway surface, crest length of 100', and top width equal to the road width; however the "values entered for the crest length and top width of the roadway have no effect on the hydraulic computations unless overtopping occurs." As the design criteria indicates, no overtopping was allowed, therefore, this input had no effect on the computations.

Wetland and hydraulic connection culvert information is summarized in **Table 2** and limited software output is included in **HY-8 Output**.

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*3) **Stream Culverts***

There are several variations in stream culverts. There are two varieties of streams in this project – NYSDEC Classified Streams, and unclassified streams.

For the NYSDEC Classified streams, the Joint Wetland Permit Conditions were followed, namely:

Design Criteria

- 20% of the culvert's height is to be embedded (all TetraTech-identified streams)
- Streams with 3% slope or less shall have a culvert with zero percent slope
- Streams with more than 3% slope shall have a bottomless culvert or bridge
- Culvert diameter or span shall be 1.25 times the channel bed width for Class C(T) streams and greater
- Circular Culvert, or arch culverts considered to minimize height
- Corrugated Steel culvert (n=0.024)
- No overtopping; headwater limited to one foot below road surface elevation
- Conventional, thin-edge-projecting culvert with no inlet depression
- Slope of 0% minimum
- Minimum culvert cover = 2 feet

Assumptions

- Constant tailwater elevation was set equal to the diameter of the culvert if specific stream cross-section information was not available.
- Gravel roadway surface, crest length of 100', and top width equal to the road width; however the "values entered for the crest length and top width of the roadway have no effect on the hydraulic computations unless overtopping occurs." As the design criteria indicates, no overtopping was allowed, therefore, this input had no effect on the computations.

The Joint Wetland permit requires 20% of the culvert's height to be embedded, as noted above. Using the HY-8 program, a culvert size was determined for peak flow, then the culvert was upsized so that 20% of the upsized (oversized) barrel is embedded (see pages 6 and 7).

For the streams that were not NYSDEC classified, the only changes from those listed above are:

- No conditions on the culvert diameter or span relative to the channel bed width
- Slope follows the existing slope of the stream as calculated from the topographic survey information

Stream culvert information is summarized in **Table 2** and the software output is included in **HY-8 Output.**

TABLE 1
Drainage Areas, Flow Paths, Cover Type, and Peak Flow
Marble River Wind Farm
Culvert Design

Culvert ID	Drainage Area acres	Ground Cover for Sheet Flow	Flow Path Characteristics: Sheet Length ft	Sheet Slope ft/ft	Shallow Length ft	Shallow Slope ft/ft	Shallow Length ft	Shallow Slope ft/ft	Channel Length ft	Channel Slope ft/ft	Channel or Notes	Hydrologic Soil Group(s)	Cover Type: Brush %	Brush acre	SG	Brush %	Brush acre	SG	Brush %	Brush acre	SG	Brush %	Brush acre	SG	Pasture 1 %	Pasture 1 acre	SG	Pasture 2 %	Pasture 2 acre	SG	Pasture 3 %	Pasture 3 acre	SG	Pasture 4 %	Pasture 4 acre	SG	Field 1 %	Field 1 acre	SG	Field 2 %	Field 2 acre	SG	Field 3 %	Field 3 acre	SG	Field 4 %	Field 4 acre	SG	Wetland %	Wetland acre	SG	Wetland 2 %	Wetland 2 acre	SG	Impervious %	Impervious acre	SG	Peak Flow (cfs)
AA1	24.04	brush	79	0.0088	591	0.0034	502	0.0193			Wetland to Wetland	D	86%	20.67	D										2%	0.48	D																			12%	2.88	D						14.11
AE1	10.09	wetland	100	0.0600	846	0.0160	232	0.0185				B	65%	6.56	B																																	35%	3.53	B					0.26
AG1	26.05	field	100	0.0300	86	0.0698	1321	0.0159				B & C	3%	0.78	B	12%	3.13	C							49%	12.76	B	3%	0.78	C																										9.52
AL1	12.38	field	100	0.0570	301	0.0515	267	0.0599	295	0.0102		B													34%	4.21	B										65%	8.05	B																	5.10
AL2	413.23				4456	0.0027	2584	0.0155	1354	0.0118																											1%	4.13	B																	44.64
AM3	920.88	unpaved rd	52	0.0269	6938	0.0118	1462	0.0029	4544	0.0159	Hydraulic Connection AR79-A/B-ST1/2	A B C D	22%	202.59	C	55%	506.48	D	10%	92.09	B	2%	18.42	A																									11%	101.30	D					211.93
AM4	4.54	brush	100	0.1050	382	0.0406						B	15%	0.68	B										10%	0.45	B										70%	3.18	B															5%	0.23	B	1.51
AP1	7.40	brush	100	0.0270	688	0.0278						A	100%	7.40	A																																									0.00
AP2	3.55	brush	100	0.0550	325	0.0846	324	0.0324				A & C	62%	2.20	C	38%	1.35	A																																							0.28
AP3	1.73				180	0.1333	147	0.0286				A	100%	1.73																																									0.00
AT1	243.52	brush	100	0.0110	2151	0.0258	2875	0.0094			Hydraulic Connection AR534-A/B-ST	B & D	86%	209.43	D	3%	7.31	B	1%	2.44	C																6%	14.61	B	4%	9.74	D																89.60
AW1, 2, 3, 4	2.17	brush	90	0.0244	205	0.0488	343	0.0181			Wetland	B & C	14%	0.30	C	21%	0.46	B																																	65%	1.41	C					0.65
AX2	338.43	brush	48	0.0125	670	0.0179	3998	0.0016	852	0.0115	Stream AR1037-ST/IC364-A/B-ST	A C D	2%	6.77	C	15%	50.76	B	14%	47.38	A				1%	3.38	B										28%	94.76	C	5%	16.92	B																44.83
AY1	13.96	brush	72	0.0236	300	0.0277	479	0.0094			Hydraulic Connection	A C D	19%	2.65	B	20%	2.79	C							11%	1.54	B	3%	0.42	C							14%	1.95	B																			4.35
BB4	6.94	brush	84	0.0417	160	0.0375	619	0.0137			Wetland	A & B	50%	3.47	B	22%	1.53	A																																	28%	1.94	B					0.00
BB5	7.57	brush	100	0.0160	337	0.0172	79	0.0570	461	0.0076		A	85%	6.43	A										12%	0.91	A																											3%	0.23	A	0.00
BB7	366.30	pasture	100	0.0262	2501	0.0358	1130	0.0088	135	0.0315	Stream ID AR942-A-ST	A B C D	33%	120.88	D	9%	32.97	A	3%	10.99	B	44%	161.17	C	1%	3.66	A	3%	10.99	C							3%	10.99	C													1%	3.66	D	3%	10.99	C			141.13
BG2	12.18	field	100	0.0110	1141	0.0066	265	0.0098				B	75%	9.14	B										4%	0.45	B										21%	2.60	B																	0.67
BO1	1.53	brush	73	0.0288	66	0.1212	36	0.0056				A	#REF!	#REF!	A																																	#####	0.04	A					0.00
BP1	8.08	field	100	0.0100	717	0.0156	92	0.0348				B & C													7%	0.57	B	6%	0.48	C							50%	4.04	C	37%	2.99	B																5.07
BR1, 2	3.21	pasture	22	0.1045	104	0.0769	442	0.0057			Hydraulic Connection	A & D													36%	1.16	A	53%	1.70	D																			11%	0.35	D					2.89
BR3	14.26	pasture	89	0.0337	591	0.0237	824	0.0085			Hydraulic Connection	A B D	2%	0.29	A	5%	0.71	B	19%	2.71	D				50%	7.13	A	21%	2.99	D																			1%	0.14	B	1%	0.14	D	1%	0.14	A	1.99
BS1	13.60	pasture	100	0.0200	224	0.0179	1020	0.0108				A & B													29%	3.94	A	15%	2.04	B							36%	4.90	A	15%	2.04	B													5%	0.68	A	0.12
BS1A	12.48	pasture	100	0.0100	1370	0.0200						C	5%	0.62	C	5%	0.62	C	Woods and paved						90%	11.23	C																												20.07
BU1	11.28	brush	100	0.0050	902	0.0072	493	0.0213				A D B	37%	4.17	B	11%	1.24	D	15%	1.69	A				13%	1.47	B	9%	1.02	D							7%	0.79	A										8%	0.90	B					0.43
BY1	6.51	pasture	100	0.0050	310	0.0210	369	0.0420				B	3%	0.20	B										28%	1.82	C	18%	1.17	B							8%	0.52	C	40%	2.60	B							3%	0.20	B					1.76
BY2	11.89	brush	100	0.0170	209	0.0254			693	0.0087		B C D	37%	4.40	C	17%	2.02	D							36%	4.28	C	6%	0.71	D							3%	0.36	C										0%	0.00	C	1%	0.12	B			6.73
BZ2	5.25	brush	100	0.0210	477	0.0084	670	0.0261				B & D	17%	0.89	B	9%	0.47	D																			42%	2.21	B										7%	0.37	D	25%	1.31	B			0.68
CC1	25.66	field	100	0.0200	865	0.0162	477	0.0273				B & C																									40%	10.26	C	60%	15.40	B																12.69
CC2A	0.28	field	100	0.022	14	0.01429						C																							100%	0.28	C																	0.00
CC2B	7.11	pasture	100	0.02	1000	0.02						C													100%	7.11	C																												11.19
CH1	7.04	brush	100	0.0060	253	0.0138	388	0.0155				B & C	74%	5.21	C	18%	1.27	B																			4%	0.28	C	4%	0.28	B							0%	0.00	C					2.76
CH1A	9.94	pasture	100	0.0100	1350	0.0100						B & C	0%	0.00	C	0%	0.00	B							60%	5.96	C	40%	3.98	B																												8.8
CH2	144.66	field	75	0.0267	1236	0.0097			1368	0.0095	Stream Crossing	B & C	6%	8.90	B	6%	9.00	C																			19%	26.77	B	22%	31.61	C							7%	10.43	B	40%	57.95	C			37.29
CH3	1.38	pasture	100	0.0100	200	0.0500						C	75%	1.04	C	Woods/Grass									25%	0.35	C																												2.01
CL1, 2, 3	64.53	field	100	0.0270	1493	0.0289	1013	0.0094			Wetland to Wetland	B C D	53%	34.20	C	21%	13.55	D																			14%	9.03	B	10%	6.45	C							1%	0.65	C	1%	0.65	D			35.20
CN3	37.27	field	100	0.0050	2075	0.0128	422	0.0355				B & C													1%	0.37	C										95%	35.41	C	3%	1.12	B													1%	0.37	C	22.88
CR1	18.28	pasture	100	0.0200	600	0.0200	700	0.0300				B & C	50%	9.14	B	ods/Grass									5%	0.91	C	Paved								45%	8.23	C																			20.27
CT1	27.91				1014	0.0182	452	0.0243	157	0.0064		B	82%	22.89	B										7%	1.95	B										11%	3.07	B																	1.81
CT2	4.95				377	0.0703	369	0.0352				B & C	100%	4.95																																									0.15
CT3	4.05				633	0.0071	87	0.0690				B & C	100%	4.05																																									0.11
CX1	2.25	pasture	100	0.0400	250	0.0900						B & C	10%	1.47	C	30%	0.68	C	(10% paved)						60%	1.35	C																														3.87
CX2	Done in a previous calculation																																																								
DC1	225.03	brush	33	0.0909	1633	0.0196	1607	0.0208	2428	0.0179	Stream Crossing	A B C	13%	29.25	C	3%	6.75	D	31%	69.76	B				10%	22.50	C	5%	11.25	D	4%	9.00	B				3%	6.75	A	22%	49.51	B	3%	6.75	C	0%	0.00	D	1%	2.25	C				5%	11.25	C	58.34
DG1	40.85	brush	100	0.0150	1062	0.0033	253	0.0296				B & C	48%	19.61	D	27%	11.03	C	9%	3.68	B				10%	4.09	B	6%	2.45	C																												14.7
DH1	12.67	brush	100	0.0330	556	0.0300	579	0.0777				B & C	85%	10.77											13%	1.65																													2%	0.25		0.87
DL1	3.00	brush	100	0.0370	392	0.0311	81	0.0691				B	57%	1.70	B										33%	1.00																													10%	0.30		0.57
DL2	47.63	field	100	0.0580	2337	0.0337	664	0.0648				B	80%	38.10	B										16%	7.48	B										4%	2.05	B																	2.24
DOTAQ1	11.77	pasture	100	0.0300	350	0.0500			730	3 fps	(velocity)	B & C	6%	0.76	B										74%	8.71	B	20%	2.30	C																												14.91
DOTAR1	2.40	trees	100	0.0100	520	0.0100						B	10%	0.24	B										90%	2.16	B																														1.56
DOTAV1	2.82	pasture	100	0.0100	770	0.0100						B	15%	0.42	B	85%	2.40	B	(woods/ paved)																																						3.87
DOTAX1	2.40	pasture	100	0.0100	170	0.0300			130	3 fps	(velocity)	B	80%	1.92	B										88%	2.10	B																														3.29
DOTBV1	2.95	trees	100	0.0200	100	0.0300			370	3 fps	(velocity)	B, C & D	15%	0.44	B	10%	0.30	B	15%	0.44	D	(woods and paved)			30%	0.89	C	30%	0.89	D																												5.21
DOTBY1	1.19	--							700	3 fps	(velocity)	B	20%	0.24	B	40%	0.48	B	(woods/ paved)																			40%	0.48	B																	2.6
DOTDC1	0.84	--							430	3 fps	(velocity)	B	50%	0.42	B	(paved)																					50%	0.42	B																	2.11
DOTDG1	0.71	--							400	3 fps	(velocity)	B	50%	0.36	B	(paved)																					50%	0.36	B																	1.71
DR1	23.93	field	100	0.0520	1880	0.0367						B	39%	9.23	B																						61%	14.70																		3.72
DS1	11.44	pasture	100	0.0140	352	0.0256	647	0.0286				B	80%	9.15	B										19%	2.17																												1%	0.11		0.63
DS2	116.86	field	100	0.0340	3326	0.0333	1558	0.0132				B & C	25%	29.22	B	6%	7.01	C																			53%	61.94	B	13%	15.19	C	3%	3.51	D										5%	5.84		21.68
DS3A	117.86	field	101	0.0337	3327	0.0333	1559	0.0131				B & C	125%	147.33	B	106%	124.93	C																			153%	180.33	B	113%	#####	C	103%	#####	D										#####	######		22.68
DS3B	118.86	field	102	0.0333	3328	0.0333	1560	0.0131				B & C	225%	267.44	B	206%	244.85	C																			253%	300.72	B	213%	#####	C	203%	#####	D										#####	######		23.68
DT1	52.13	field	100	0.0030	3748	0.0314	815	0.0221				B & C	3%	1.56	B	6%	3.13	C																			65%	33.88	B	26%	13.55	C																12.67
TAL1	4.60	brush	100	0.0500	316	0.0475	746	0.0121	90	0.0111		B	100%	4.60	B																																									0.10

4A

Table 2
Culvert Design and Stream Information
Marble River Wind Farm

Culvert Name	Peak Flow (cfs)	Length (ft)	Culvert Size (in)	Construction Slope	Culvert Type	Stream Designation[1]	Stream Class[1]	Stream Slope (%)
AA1	14.11	100	3 @ 24	Minimum 0% Slope	Culvert at Wetland			
AE1	0.26	80	12	Minimum 1% Slope	Typical Culvert			
AG1	9.52	135	24	Minimum 1% Slope	Typical Culvert			
AL1	5.1	160	24	Match existing stream slope	Oversize at stream	Stream, no ID		1.0000
AL2	44.64	48	2 @ 42	0% Slope	Oversize at Stream	WTGS-A/B-ST	D	0.27
AM3	211.93	50	3 Arches 77 X 52	0% Slope	Oversize at stream	AR79-A/B-ST1/2	D	0.8700
AM4	1.51	45	12	Minimum 1% Slope	Typical Culvert			
AP1	0.00	45	12	Minimum 1% Slope	Typical Culvert			
AP2	0.28	95	12	Minimum 1% slope	Typical culvert			
AP3	0.00	60	12	Minimum 1% slope	Typical culvert			
AT1	89.6	30	4 @ 30	0% Slope	Oversize at Stream	AR534-A/B-ST	D	1.28
AW1	0.65	30	12	Minimum 0% Slope	Culvert at Wetland			
AW2	0.65	30	12	Minimum 0% Slope	Culvert at Wetland			
AW3	0.65	30	12	Minimum 0% Slope	Culvert at Wetland			
AW4	0.65	30	12	Minimum 0% Slope	Culvert at Wetland			
AX2	44.83	35	2 arches @ 49 X 33	0% Slope	Oversize at stream	AR1037-ST/IC364-A/B-ST	D	2.5700
AY1	4.35	44	3 @ 12	Minimum 0% Slope	Culvert at Wetland			
BB4	0.00	30	12	Minimum 0% Slope	Culvert at Wetland			
BB5	0.00	86	12	Minimum 1% slope	Typical culvert			
BB7	141.13	30	2 Arches @ 71 x 47	Match existing stream slope	Oversize at stream	AR942-A-ST (not on Table 7.7)		1.0300
BG2	0.67	70	12	Minimum 1% Slope	Typical Culvert			
BO1	0	195	18	Minimum 1% Slope	Typical Culvert			
BP1	5.07	100	24	Minimum 1% slope	Typical culvert			
BR1	2.89	50	18	Minimum 0% slope	Culvert at Wetland			
BR2	2.89	50	18	Minimum 0% slope	Culvert at Wetland			
BR3	1.99	50	15	Minimum 0% slope	Culvert at Wetland			
BS1	0.12	50	12	Minimum 1% slope	Typical culvert			
BS1A	20.07	50	12	Minimum 0% slope	Culvert at Wetland			
BY1	1.76	42	12	Minimum 1% Slope	Typical Culvert			
BY2	6.73	55	24	Match existing stream slope	Oversize at stream	Stream, no ID		1.2000
BZ2	0.68	50	12	Minimum 1% slope	Typical Culvert			
CC1	12.69	70	18	Minimum 1% slope	Typical Culvert			
CC2A	0.00	49	12	Minimum 1% Slope	Typical Culvert			
CH1	2.76	50	18	Minimum 1% slope	Typical culvert			
CH1A	8.8	190	12	Minimum 1% Slope	Typical Culvert			
CH2	37.29	50	3 @ 30	Match existing stream slope	Oversize at Stream	AR111A-A/B-ST (Not on Table 7.7)		1.25
CH3	2.01	60	3 @ 12	0% Slope	Culvert at Wetland			
CL1	11.7	50	30	Minimum 0% slope	Culvert at Wetland			
CL2	11.7	50	30	Minimum 0% Slope	Culvert at Wetland			
CL3	11.7	50	30	Minimum 0% Slope	Culvert at Wetland			
CN3	22.88	75	36	Minimum 1% slope	Typical culvert			
CR1	20.27	70	30	Minimum 1% Slope	Typical Culvert			
CT1	1.81	135	12	Minimum 1% slope	Typical culvert			
CT2	0.15	65	12	Minimum 1% slope	Typical culvert			
CT3	0.11	50	12	Minimum 1% slope	Typical culvert			
CX1	3.87	30	4 @ 12	0% Slope	Culvert at Wetland			
CX2	9.37	65	24	Minimum 1% Slope	Typical Culvert			
DC1	58.34	68	3 @ 30	0% Slope	Oversize at stream	Parallels AR1-A/B/ST	D	1.9700
DG1	14.7	40	2 @ 21	Minimum 0% slope	Culvert at wetland			
DH1	0.87	26	12	0% Slope	Culvert at Wetland			
DL1	0.57	45	12	Minimum 1% Slope	Typical Culvert			
DL2	2.24	44	15	0% Slope	Culvert at Wetland			
DOTAQ1	14.91	240	24	Minimum 1% Slope	Typical Culvert			
DOTAR1	1.56	120	18	Minimum 1% Slope	Typical Culvert			
DOTAV1	3.87	105	18	Minimum 1% Slope	Typical Culvert			
DOTAX1	3.29	120	18	Minimum 1% Slope	Typical Culvert			
DOTBV1	5.21	160	21	Minimum 1% Slope	Typical Culvert			
DOTBY1	2.6	215	18	Minimum 1% Slope	Typical Culvert			
DOTBZ1	3.43	260	18	Minimum 1% slope	Typical Culvert			
DOTDC1	2.11	165	18	Minimum 1% slope	Typical Culvert			
DOTDG1	1.71	170	18	Minimum 1% slope	Typical Culvert			
DS1	0.63	25	12	Minimum 1% slope	Typical Culvert			
DS2	2.5	25	12	Minimum 1% Slope	Typical Culvert			
DS3A	16.9	30	30	Minimum 1% Slope	Typical Culvert			
DS3B	16.9	30	30	Minimum 1% Slope	Typical Culvert			
DT1	12.67	60	24	Minimum 1% slope	Typical culvert			
TAL1	0.10	40	12	Minimum 1% slope	Typical culvert			

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
AA1	Pasture, grassland or range	(good)	D	.48	80
	Brush - brush, weed, grass mix	(good)	D	23.55	73
	Total Area / Weighted Curve Number			24.03 ✓	73
	Brush - brush, weed, grass mix	(good)	D	7.09	73
	Total Area / Weighted Curve Number			7.09 ✓	73
	Brush - brush, weed, grass mix	(good)		7.09	73
	Total Area / Weighted Curve Number			7.09 ✓	73
	Brush - brush, weed, grass mix	(good)	B	.98	48
	Brush - brush, weed, grass mix	(good)	C	2.6	65
	Brush - brush, weed, grass mix	(good)	D	9.4	73
	Total Area / Weighted Curve Number			12.98 ✓	70
	Pasture, grassland or range	(good)	B	.44	61
	Brush - brush, weed, grass mix	(good)	B	1.7	48
	Total Area / Weighted Curve Number			2.18 ✓	51

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

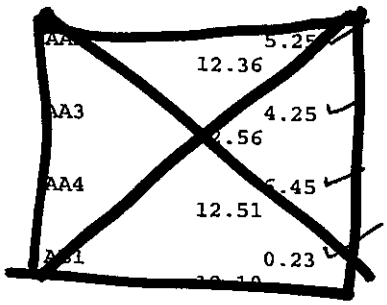
Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
AA1							
SHEET	79	0.0088	0.800				0.811
SHALLOW	591	0.0034	0.050				0.174
SHALLOW	502	0.0193	0.050				0.062
						Time of Concentration	1.047
AA2							
SHEET	61	0.0114	0.800				0.504
SHALLOW	382	0.0052	0.050				0.091
SHALLOW	562	0.0160	0.050				0.076
						Time of Concentration	.761
AA3							
SHEET	95	0.0105	0.800				0.876
SHALLOW	250	0.0080	0.050				0.048
SHALLOW	694	0.0170	0.050				0.092
						Time of Concentration	1.016
AA4							
SHEET	72	0.0069	0.800				0.830
SHALLOW	467	0.0086	0.050				0.087
SHALLOW	555	0.0144	0.050				0.080
						Time of Concentration	.997
AB1							
SHEET	100	0.6400	0.800				0.176
SHALLOW	111	0.0243	0.050				0.012
						Time of Concentration	.188

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
AA1	14.11 ✓ 12.55
AA2	5.25 ✓ 12.36
AA3	4.25 ✓ 12.56
AA4	5.45 ✓ 12.51
AA1	0.23 ✓
REACHES	
OUTLET	29.48



MWing

Marble River Wind Farm
Job #11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
AE1	Brush - brush, weed, grass mix	(good)	B	10.09	48
	Total Area / Weighted Curve Number			10.09 ✓	48
~~AE3~~	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~B~~	~~2.15~~	~~48~~
	~~Total Area / Weighted Curve Number~~			~~2.15~~ ✓	~~48~~
~~AE4~~	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~B~~	~~7.01~~	~~48~~
	~~Total Area / Weighted Curve Number~~			~~7.01~~ ✓	~~48~~
AG1~~,2~~	Pasture, grassland or range	(good)	B	12.76	61
	Pasture, grassland or range	(good)	C	.78	74
	Meadow -cont. grass (non grazed)		B	8.6	58
	Brush - brush, weed, grass mix	(good)	B	.78	48
	Brush - brush, weed, grass mix	(good)	C	3.13	65
	Total Area / Weighted Curve Number			26.05 ✓	60
AG3	Pasture, grassland or range	(good)	B	2.37	61
	Meadow -cont. grass (non grazed)		B	2.7	58
	Brush - brush, weed, grass mix	(good)	B	1.35	48
	Brush - brush, weed, grass mix	(good)	C	.34	65
	Total Area / Weighted Curve Number			6.76 ✓	57
AG4	Pasture, grassland or range	(good)	B	.63	61
	Meadow -cont. grass (non grazed)		C	4.43	71
	Brush - brush, weed, grass mix	(good)	C	4.81	65
	Brush - brush, weed, grass mix	(good)	D	2.79	73
	Total Area / Weighted Curve Number			12.66 ✓	69
AG5	Meadow -cont. grass (non grazed)		C	11.2	71
	Brush - brush, weed, grass mix	(good)	B	5.62	48
	Brush - brush, weed, grass mix	(good)	D	18.27	73
	Total Area / Weighted Curve Number			35.09 ✓	68
AG6	Meadow -cont. grass (non grazed)		B	6.73	58
	Meadow -cont. grass (non grazed)		C	.96	71
	Brush - brush, weed, grass mix	(good)	D	11.54	73
	Total Area / Weighted Curve Number			19.23 ✓	68

MWing

Marble River Wind Farm
Job #11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
AE1							
SHEET	100	0.0600	0.240				0.173
SHALLOW	846	0.0160	0.050				0.115
SHALLOW	232	0.0185	0.050				0.029
						Time of Concentration	.317
AE3							
SHEET	100	0.0100	0.800				0.930
SHALLOW	96	0.0208	0.050				0.011
SHALLOW	110	0.0545	0.050				0.008
						Time of Concentration	.949
AE4							
SHEET	100	0.0550	0.800				0.470
SHALLOW	138	0.0232	0.050				0.016
SHALLOW	369	0.0128	0.050				0.077
						Time of Concentration	0.563
AG1, 2							
SHEET	100	0.0300	0.240				0.229
SHALLOW	86	0.0698	0.050				0.006
SHALLOW	1321	0.0159	0.050				0.180
						Time of Concentration	.415
AG3							
SHEET	100	0.0500	0.240				.187
SHALLOW	195	0.0103	0.050				0.033
SHALLOW	145	0.0345	0.050				0.013
						Time of Concentration	.233
AG4							
SHEET	100	0.0200	0.800				0.705
SHALLOW	1211	0.0209	0.050				0.144
						Time of Concentration	.849
AG5							
SHEET	100	0.0300	0.800				0.599
SHALLOW	1888	0.0212	0.050				0.223
SHALLOW	418	0.0167	0.050				0.056

MWing

Marble River Wind Farm
Job #11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
AE1	0.26 ✓ 12.49
~~AG3~~	n/a
~~AE~~	0 ✓ 12.74
AG1, ~~2~~	9.52 ✓ 12.18
~~AG3~~	2.34 ✓ 12.09
AG4	6.60 ✓
AG5	1.52 ✓ 12.48
~~AG6~~	8.63 ✓ 12.50
REACHES	
OUTLET	38.22

AG2 REMOVED (AG1 RECEIVES FULL FLOW)

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
AL1	Paved parking lots, roofs, driveways		B	.124	98
	Pasture, grassland or range	(good)	B	4.21	61
	Meadow -cont. grass (non grazed)		B	8.05	58
	Total Area / Weighted Curve Number			12.38 ✓	59
AL2	Meadow -cont. grass (non grazed)		B	4.13	58
	Brush - brush, weed, grass mix	(good)	A	70.25	30
	Brush - brush, weed, grass mix	(good)	B	61.98	48
	Brush - brush, weed, grass mix	(good)	C	123.97	65
	Brush - brush, weed, grass mix	(good)	D	152.9	73
	Total Area / Weighted Curve Number			413.23 ✓	59
AM1	Meadow -cont. [illegible]		B	11.54	58
	Total Area / Weighted Curve Number			11.54 ✓	58
AM3	Brush - brush, weed, grass mix	(good)	A	18.42	30
	Brush - brush, weed, grass mix	(good)	B	92.09	48
	Brush - brush, weed, grass mix	(good)	C	202.59	65
	Brush - brush, weed, grass mix	(good)	D	607.78	73
	Total Area / Weighted Curve Number			920.88 ✓	68
AM4	Paved parking lots, roofs, driveways		B	.227	98
	Pasture, grassland or range	(good)	B	.45	61
	Meadow -cont. grass (non grazed)		B	3.18	58
	Brush - brush, weed, grass mix	(good)	B	.68	48
	Total Area / Weighted Curve Number			4.54 ✓	59
AP1	Brush - brush, weed, grass mix	(good)	A	7.4	30
	Total Area / Weighted Curve Number			7.4 ✓	30
AP2	Brush - brush, weed, grass mix	(good)	A	1.35	30
	Brush - brush, weed, grass mix	(good)	C	2.2	65
	Total Area / Weighted Curve Number			3.55 ✓	52
AP3	Brush - brush, weed, grass mix	(good)	A	1.73	30
	Total Area / Weighted Curve Number			1.73 ✓	30
AP4	Brush - brush, weed, grass mix	(good)	[illegible]	[illegible]	[illegible]

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
AL1							
SHEET	100	0.0570	0.240				0.177
SHALLOW	301	0.0515	0.050				0.023
SHALLOW	267	0.0599	0.050				0.019
CHANNEL	295	0.0102	0.070	4.07	8.75	1.301	0.063
					Time of Concentration		0.282
AL2							
SHALLOW	4456	0.0027	0.050				1.476
SHALLOW	2584	0.0155	0.050				0.357
CHANNEL	1354	0.0118	0.070	4.70	8.74	1.529	0.246
					Time of Concentration		2.079
AM1							
SHEET	100	[illegible]	0.240				0.250
SHALLOW	819	0.0348	[illegible]				0.076
SHALLOW	[illegible]	[illegible]	0.050				0.053
					Time of Concentration		0.379
AM3							
SHEET	52	0.0269	0.011				0.012
SHALLOW	6938	0.0118	0.050				1.100
SHALLOW	1462	0.0029	0.050				0.467
CHANNEL	4544	0.0159	0.070	4.70	8.74	1.775	0.711
					Time of Concentration		2.29
AM4							
SHEET	100	0.1050	0.800				0.363
SHALLOW	382	0.0406	0.050				0.033
					Time of Concentration		.396
AP1							
SHEET	100	0.0270	0.800				0.625
SHALLOW	688	0.0278	0.050				0.071
					Time of Concentration		.696
AP2							
SHEET	100	0.0550	0.800				0.470
SHALLOW	325	0.0846	0.050				0.019
SHALLOW	324	0.0324	0.050				0.031
					Time of Concentration		0.520

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
AP3							
SHALLOW	180	0.1333	0.050				0.008
SHALLOW	147	0.0286	0.050				0.015
					Time of Concentration		0.1
AP4							
SHEET	[illegible]	0.0570	0.800				0.464
SHALLOW	374	0.0428	[illegible]				0.031
SHALLOW	249	0.0402	0.050				0.021
					Time of Concentration		.516
AQ1							
CHANNEL	1476	0.0278	0.070	4.70	8.75	2.343	0.175
CHANNEL	1083	0.0198	0.070	4.70	8.75	1.979	0.152
					Time of Concentration		0.327

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
AL1	5.10 ✓ 12.11
AL2	44.64 ✓ 13.46
[redacted]	[redacted] ✓ 12.18
AM3	211.93 ✓ 13.55
AM4	1.51 ✓ 12.18
AP1	.00 ✓ n/a
AP2	0.28 ✓ 12.36
AP3	.00 ✓ n/a
[redacted]	[redacted]
~~AQ1~~	~~13.90~~ ✓ ~~12.13~~
[redacted]	

REACHES

OUTLET	260.10

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
AR2	Pasture, grassland or range	(good)	B	.07	61
	Meadow -cont. grass (non grazed)		B	2.38	58
	Brush - brush, weed, grass mix	(good)	B	4.56	48
	Total Area / Weighted Curve Number			7.01 ✓	52
				====	==
AT1	Meadow -cont. grass (non grazed)		B	14.61	58
	Meadow -cont. grass (non grazed)		D	9.74	78
	Brush - brush, weed, grass mix	(good)	A	2.44	30
	Brush - brush, weed, grass mix	(good)	B	7.31	48
	Brush - brush, weed, grass mix	(good)	D	209.43	73
	Total Area / Weighted Curve Number			243.53 ✓	71
				======	==
AW1	Paved parking lots, roofs, driveways		B	6.199	98
	Pasture, grassland or range	(good)	B	18.6	61
	Brush - brush, weed, grass mix	(good)	C	4.96	65
	Brush - brush, weed, grass mix	(good)	D	94.22	73
	Total Area / Weighted Curve Number			123.98 ✓	72
				======	==
AW1,2	Brush - brush, weed, grass mix	(good)	B	.46	48
	Brush - brush, weed, grass mix	(good)	C	1.711	65
	Total Area / Weighted Curve Number			2.17 ✓	61
				====	==
AX1	Pasture, grassland or range	(good)	B	2.02	61
	Pasture, grassland or range	(good)	D	1	80
	Total Area / Weighted Curve Number			3.02	67
				====	==
AX2	Pasture, grassland or range	(good)	B	3.38	61
	Meadow -cont. grass (non grazed)		B	16.92	58
	Meadow -cont. grass (non grazed)		C	94.76	71
	Brush - brush, weed, grass mix	(good)	A	47.38	30
	Brush - brush, weed, grass mix	(good)	B	50.76	48
	Brush - brush, weed, grass mix	(good)	C	6.77	65
	Brush - brush, weed, grass mix	(good)	D	118.5	73
	Total Area / Weighted Curve Number			338.47 ✓	62
				======	==
AX3	Pasture, grassland or range	(good)	B	.16	61
	Pasture, grassland or range	(good)	C	.23	74
	Meadow -cont. grass (non grazed)		B	3.22	58
	Meadow -cont. grass (non grazed)		C	4.07	71
	Total Area / Weighted Curve Number			7.67 ✓	65
				====	==

MWing

Marble River Wind Farm
Job# 11174823
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Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
AY1	Pasture, grassland or range	(good)	B	1.54	61
	Pasture, grassland or range	(good)	C	.42	74
	Meadow -cont. grass (non grazed)		B	1.95	58
	Brush - brush, weed, grass mix	(good)	B	2.65	48
	Brush - brush, weed, grass mix	(good)	C	7.397	65
	Total Area / Weighted Curve Number			13.96	61

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
~~AX2~~							
SHEET	~~100~~	~~0.0100~~	0.240				0.275
SHALLOW	227	~~0.0220~~	~~0.050~~				0.026
SHALLOW	~~[illegible]~~	0.0055	0.050				0.085
					Time of Concentration		.386
AT1							
SHEET	100	0.0110	0.800				0.895
SHALLOW	2151	0.0258	0.050				0.231
SHALLOW	2875	0.0094	0.050				0.511
					Time of Concentration		1.637
~~AV1~~							
~~SHEET~~	~~70~~	~~0.0029~~	~~0.800~~				~~1.147~~
~~SHALLOW~~	~~756~~	~~0.0110~~	~~0.050~~				~~0.124~~
~~SHALLOW~~	~~258~~	~~0.0136~~	~~0.050~~				~~0.038~~
					~~Time of Concentration~~		~~1.309~~
AW1,2							
SHEET	90	0.0244	0.800				0.598
SHALLOW	205	0.0488	0.050				0.016
SHALLOW	343	0.0181	0.050				0.044
					Time of Concentration		.658
~~AX1~~							
~~SHEET~~	~~88~~	~~0.0341~~	~~0.240~~				~~0.196~~
~~CHANNEL~~	~~283~~	~~0.0071~~	~~0.070~~	~~4.70~~	~~8.75~~	~~1.191~~	~~0.066~~
					~~Time of Concentration~~		~~.262~~
AX2							
SHEET	48	0.0125	0.800				0.473
SHALLOW	670	0.0179	0.050				0.086
SHALLOW	3998	0.0016	0.050				1.721
CHANNEL	852	0.0115	0.070	4.70	8.75	1.507	0.157
					Time of Concentration		2.437
AX3							
SHEET	100	0.0100	0.240				0.355
SHALLOW	674	~~0.0089~~	~~0.050~~				0.128
SHALLOW	225	0.0222	0.050				0.026

MWing

Marble River Wind Farm
Job# 11174823
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Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
					Time of Concentration		.509
AY1							
SHEET	72	0.0236	0.800				0.507
SHALLOW	300	0.0277	0.050				0.031
SHALLOW	479	0.0094	0.050				0.085
					Time of Concentration		.623

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[redacted]	0.64
	[redacted]
AT1	89.60
	12.94
~~AV1~~	~~57.69~~ ~~REPLACED BY REVISED CALC~~
	~~12.71~~
AW1,2	0.65
	12.38
~~AX1~~	~~2.85~~
	~~12.08~~
AX2	44.83
	13.69
[redacted]	[redacted]
	[redacted]
AY1	4.35
	12.34
REACHES	
OUTLET	177.43

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
	Pasture, grassland or range	(good)	B	4.02	61
	Pasture, grassland or range	(good)	C	10.66	74
	Brush - brush, weed, grass mix	(good)	B	1.57	48
	Brush - brush, weed, grass mix	(good)	C	1.223	65
	Total Area / Weighted Curve Number			17.47 ✓	68
				=====	==
BA1	Pasture, grassland or range	(good)	B	.67	61
	Meadow -cont. grass (non graz		B	12.74	58
	Total Area / Weighted Curve Number			13.41 ✓	58
				=====	==
BB1,2	Brush - brush, weed, grass mix	(good)	B	10.6	48
	Brush - brush, weed, grass mix	(good)	C	18.06	65
	Total Area / Weighted Curve Number			28.66 ✓	59
BB3,4	Brush - brush, weed, grass mix	(good)	A	1.53	30
	Brush - brush, weed, grass mix	(good)	B	5.413	48
	Total Area / Weighted Curve Number			6.94 ✓	44
				====	==
BB5	Paved parking lots, roofs, driveways		A	.227	98
	Pasture, grassland or range	(good)	A	.91	39
	Brush - brush, weed, grass mix	(good)	A	6.43	30
	Total Area / Weighted Curve Number			7.57 ✓	33
				====	==
BB6	Brush - brush, weed, grass mix	(good)	A	6.57	30
	Brush - brush, weed, grass mix	(good)		.72	73
	Total Area / Weighted Curve Number			7.29 ✓	34
				====	
BC1	Brush - brush, weed, grass mix	(good)	A	.42	30
	Brush - brush, weed, grass mix	(good)	B	.71	48
	Total Area / Weighted Curve Number			1.13 ✓	41
				====	==

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
BA1							
SHEET	100	0.0030	0.240				0.575
SHALLOW	778	0.0215	0.050				0.091
SHALLOW	242	0.0124	0.050				0.037
					Time of Concentration		.703
BA1							
SHEET	100	0.0170	0.240				0.287
SHALLOW	732	0.0184	0.050				0.093
					Time of Concentration		.38
BB1,2							
SHEET	100	0.0040	0.800				1.342
SHALLOW	1718	0.0292	0.050				0.173
SHALLOW	255	0.0282	0.050				0.026
					Time of Concentration		1.541
BB3,4							
SHEET	84	0.0417	0.800				0.457
SHALLOW	160	0.0375	0.050				0.014
SHALLOW	619	0.0137	0.050				0.091
					Time of Concentration		.562
BB5							
SHEET	100	0.0160	0.800				0.771
SHALLOW	337	0.0172	0.050				0.044
SHALLOW	79	0.0570	0.050				0.006
CHANNEL	461	0.0076	0.070	4.70	8.75	1.231	0.104
					Time of Concentration		.925
BB6							
SHEET	100	0.0160	0.800				0.771
SHALLOW	141	0.0567	0.050				0.010
SHALLOW	148	0.0169	0.050				0.020
CHANNEL	530	0.0178	0.070	4.70	8.75	1.887	0.078
					Time of Concentration		.879

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[illegible]	12.35
BA1	3.99 ✓ 12.19
BB2	[illegible] 78 ✓
BB3,4	.00 ✓ n/a
BB5	.00 ✓ n/a
[illegible]	✓
[illegible]	✓
REACHES	
OUTLET	13.80

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
BB7	141.13 12.40
REACHES	
OUTLET	141.13

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BB7	Pasture, grassland or range	(good)	A	3.66	39
	Pasture, grassland or range	(good)	C	10.99	74
	Meadow -cont. grass (non grazed)		C	10.99	71
	Brush - brush, weed, grass mix	(good)	A	32.97	30
	Brush - brush, weed, grass mix	(good)	B	10.99	48
	Brush - brush, weed, grass mix	(good)	C	172.16	65
	Brush - brush, weed, grass mix	(good)	D	124.54	73
	Total Area / Weighted Curve Number			366.3	64

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
BB7							
SHEET	100	0.0262	0.240				0.242
SHALLOW	2501	0.0358	0.050				0.228
SHALLOW	1130	0.0088	0.050				0.207
CHANNEL	135	0.0315	0.070	1.25	10.10	0.938	0.040
					Time of Concentration		0.717

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BD4,[illegible]	Pasture, grassland or range	(good)	[illegible]	[illegible]	[illegible]
	Brush - brush, weed, grass mix	(good)	B	10.78	48
	Brush - brush, weed, grass mix	(good)	C	7.[illegible]	65
	Brush - brush, weed, grass mix	(good)	D	[illegible].15	73
	Total Area / Weighted Curve Number			24.51 ✓	60
				=====	==
BF1	Paved parking lots, roofs, driveways		D	.199	98
	Pasture, grassland or range	(good)	D	.3	80
	Brush - brush, weed, grass mix	(good)	C	1.5	65
	Brush - brush, weed, grass mix	(good)	D	[illegible].98	73
	Total Area / Weighted Curve Number			9.98 ✓	73
				====	[illegible]
BG2	Pasture, grassland or range	(good)	B	.45	61
	Meadow -cont. grass (non grazed)		B	2.6	58
	Brush - brush, weed, grass mix	(good)	B	9.14	48
	Total Area / Weighted Curve Number			12.19 ✓	51
				=====	==
~~BH~~[illegible]	~~Pasture, grassland or range~~	~~(good)~~	~~B~~	~~.6~~	~~61~~
	~~Meadow -cont. grass (non grazed)~~		~~B~~	~~4.27~~	~~58~~
	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~B~~	~~3.67~~	~~48~~
	~~Total Area / Weighted Curve Number~~			~~8.5~~[illegible]	~~54~~
				====	==
BJ[illegible],2	Pasture, grassland or range	(good)	A	7.56	39
	Pasture, grassland or range	(good)	B	3.32	61
	Brush - brush, weed, grass mix	(good)	A	5.133	30
	Brush - brush, weed, grass mix	(good)	B	2.12	48
	Brush - brush, weed, grass mix	(good)	C	4.23	65
	Brush - brush, weed, grass mix	(good)	D	7.857	73
	Total Area / Weighted Curve Number			30.22 ✓	53
				=====	==
BJ3	Pasture, grassland or range	(good)	D	[illegible].79	80
	Brush - brush, weed, grass mix	(good)	B	6.04	48
	Brush - brush, weed, grass mix	(good)	D	19.41	73
	Total Area / Weighted Curve Number			26.24 ✓	[illegible]
				=====	==

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
[illegible]							
SHEET	100	0.0060	0.800				[illegible]
SHALLOW	874	0.0071	0.050				0.179
SHALLOW	640	0.0141	0.050				0.093
					Time of Concentration		1.413
[illegible]F1							
SHEET	100	[illegible]	0.800				1.506
SHALLOW	104[illegible]	0.0103	0.050				0.177
					Time of Concentration		1.683
BG2							
SHEET	100	0.0110	0.240				0.342
SHALLOW	1141	0.0066	0.050				0.242
SHALLOW	265	0.0098	0.050				0.046
					Time of Concentration		.63
[illegible]							
SHEET	100	0.0060	0.800				[illegible]
SHALLOW	245	0.0241	0.050				0.027
SHALLOW	[illegible]8	0.0566	0.050				0.023
					Time of Concentration		1.191
BJ1,2							
SHEET	100	0.0250	0.800				0.645
SHALLOW	669	0.0546	0.050				0.049
SHALLOW	2208	0.0118	0.[illegible]				0.350
					Time [illegible] Concentration		1.044
BJ3							
SHEET	100	0.0120	0.800				0.865
SHALLOW	1231	0.0388	0.050				0.108
SHALLOW	1379	0.0131	0.050				0.207
					Time of Concentration		1.[illegible]80

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[redacted]	3.85 ✓
	12.89
[redacted]	4.10 ✓
	[redacted]
BG2	0.67 ✓
	12.52
~~BH1~~	~~0.65~~
	~~12.89~~
[redacted]	✓
	[redacted]
[redacted]	✓
	[redacted]
REACHES	
OUTLET	19.84

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BO1	Brush - brush, weed, grass mix	(good)	A	1.53	30
	Total Area / Weighted Curve Number			1.53	30

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
BO1							
SHEET	73	0.0288	0.400				0.272
SHALLOW	66	0.1212	0.050				0.003
SHALLOW	36	0.0056	0.050				0.008
						Time of Concentration	0.283

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
B01	.00 ✓ n/a
REACHES	
OUTLET	.00

MWing

Marble River Wind Farm
Job# 111174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BP1	Pasture, grassland or range	(good)	B	.57	61
	Pasture, grassland or range	(good)	C	.48	74
	Meadow -cont. grass (non grazed)		B	2.99	58
	Meadow -cont. grass (non grazed)		C	4.04	71
	Total Area / Weighted Curve Number			8.08	66
BP2	Pasture, grassland or range	(good)	C	.24	74
	Meadow -cont. grass (non grazed)		B	.6	58
	Meadow -cont. grass (non grazed)		C	1.21	71
	Brush - brush, weed, grass mix	(good)	C	.333	65
	Total Area / Weighted Curve Number			2.38	67
BP3	Paved parking lots, roofs, driveways		B	.21	98
	Brush - brush, weed, grass mix	(good)	B	4.242	48
	Brush - brush, weed, grass mix	(good)	C	16.738	65
	Total Area / Weighted Curve Number			21.19	62
BR1,2	Pasture, grassland or range	(good)	A	1.16	39
	Pasture, grassland or range	(good)	D	1.7	80
	Brush - brush, weed, grass mix	(good)	D	.35	73
	Total Area / Weighted Curve Number			3.21	64
BR3	Paved parking lots, roofs, driveways		A	.14	98
	Pasture, grassland or range	(good)	A	7.13	39
	Pasture, grassland or range	(good)	D	2.99	80
	Brush - brush, weed, grass mix	(good)	A	.29	30
	Brush - brush, weed, grass mix	(good)	B	.853	48
	Brush - brush, weed, grass mix	(good)	C	2.853	65
	Total Area / Weighted Curve Number			14.26	54
BS1	Paved parking lots, roofs, driveways		A	.68	98
	Pasture, grassland or range	(good)	A	3.94	39
	Pasture, grassland or range	(good)	B	2.04	61
	Meadow -cont. grass (non grazed)		A	4.9	30
	Meadow -cont. grass (non grazed)		B	2.04	58
	Total Area / Weighted Curve Number			13.6	45
BS2	Pasture, grassland or range	(good)	B	3.19	61
	Pasture, grassland or range	(good)	C	3.72	74
	Meadow -cont. grass (non grazed)		B	3.99	58
	Meadow -cont. grass (non grazed)		C	12.75	71
	Brush - brush, weed, grass mix	(good)	B	1.23	48
	Brush - brush, weed, grass mix	(good)	C	1.593	65

MWing

Marble River Wind Farm
Job# 111174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
BP1							
SHEET	100	0.0100	0.240				0.355
SHALLOW	717	0.0156	0.050				0.099
SHALLOW	92	0.0348	0.050				0.008
					Time of Concentration		.462
BP2							
SHEET	100	0.0130	0.240				0.320
SHALLOW	279	0.0133	0.050				0.042
SHALLOW	300	0.0300	0.050				0.037
					Time of Concentration		.399
BP3							
SHALLOW	1010	0.0150	0.050				0.138
SHALLOW	894	0.0173	0.050				0.117
					Time of Concentration		.255
BR1,2							
SHEET	22	0.1045	0.240				0.041
SHALLOW	104	0.0769	0.050				0.006
SHALLOW	442	0.0057	0.050				0.101
					Time of Concentration		.148
BR3							
SHEET	89	0.0337	0.240				0.199
SHALLOW	591	0.0237	0.050				0.066
SHALLOW	824	0.0085	0.050				0.154
					Time of Concentration		.419
BS1							
SHEET	100	0.0200	0.240				0.269
SHALLOW	224	0.0179	0.050				0.029
SHALLOW	1020	0.0108	0.050				0.169
					Time of Concentration		.467
BS2							
SHEET	100	0.0350	0.240				0.215
SHALLOW	1716	0.0227	0.050				0.196
SHALLOW	232	0.0129	0.050				0.035

MWing

Marble River Wind Farm
Job# 111174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
BP1	5.07 ✓ 12.19
[redacted]	[redacted] ✓
~~BP3~~	~~13.05 12.08~~
BR1,2	2.89 ✓ 12.02
BR3	1.99 ✓ 12.24
BS1	0.12 ✓ 13.76
[redacted]	[redacted] ✓
REACHES	
OUTLET	39.07

Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
BS1A	20.07 12.14

Sub-Area Time of Concentration Details

BS1A					
SHEET	100	0.0100	0.150		0.244
SHALLOW	1370	0.0200	0.050		0.167
				Time of Concentration	0.411

Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
BS1A	20.07 12.14

Sub-Area Time of Concentration Details

BS1A					
SHEET	100	0.0100	0.150		0.244
SHALLOW	1370	0.0200	0.050		0.167
				Time of Concentration	0.411

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BS1A	Paved; curbs and storm sewers		C	.6	98
	Pasture, grassland or range	(fair)	C	11.23	79
	Woods - grass combination	(fair)	C	.65	76
	Total Area / Weighted Curve Number			12.48	80

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
[illegible]	Pasture, grassland or range	(good)	B	1.47	[illegible]
	Pasture, grassland or range	(good)	D	1.02	80
	Meadow -cont. grass (non grazed)		A	.79	30
	[illegible]ush - brush, weed, grass mix	(good)	A	1.69	30
	Brus[illegible] - brush, weed, grass mix	(good)	B	5.0[illegible]2	48
	Brush [illegible] brush, weed, grass mix	(good)	D	1.24	73
	Total Area / Weighted Curve Number			11.28✓	51
				=====	==
BW1	Pasture, grassland or range	(good)	B	3.98	61
	Meadow -cont. grass (non grazed)		B	1.86	58
	Total Area / Weighted Curve Number			5.84✓	60
				====	==
BW2	Pasture, grassland or range	(good)	B	3.61	61
	Pasture, grassland or range	(good)	C	1.36	74
	Brush - brush, weed, grass mix	(good)	C	3.044	65
	Total Area / Weighted Curve Number			8.01✓	65
				====	==
BX1	Pasture, grassland or range	(good)	B	.99	61
	Meadow -cont. grass (non grazed)		B	.[illegible]	58
	Brush - brush, weed, grass mix	(good)	B	2.14	48
	Total Area / Weighted Curve Number			3.19✓	[illegible]2
				====	==
BY1	Pasture, grassland or range	(good)	B	2.6	61
	Meadow -cont. grass (non grazed)		B	3.91	58
	Total Area / Weighted Curve Number			6.51✓	59
				====	==
BY2	Pasture, grassland or range	(good)	C	4.28	74
	Pasture, grassland or range	(good)	D	.71	80
	Meadow -cont. grass (non grazed)		C	.36	71
	Brush - brush, weed, grass mix	(good)	B	.119	48
	Brush - brush, weed, grass mix	(good)	C	4.4	65
	Brush - brush, weed, grass mix	(good)	D	2.02	73
	Total Area / Weighted Curve Number			11.89✓	71
				=====	==
BY3	Pa[illegible]re, grassland or range	(good)	B	.47	61
	Meadow -co[illegible] grass (non grazed)		B	2.81	58
	Brush - brush, weed[illegible]ass mix	(g[illegible]d)	B	1.4	48
	Total Area / Weighted Cu[illegible] Number			4.68✓	55
				====	==
BZ1	Paved parking lots, roofs, driveways		B	.58	98
	Pasture, grassland or range	(good)	B	1.13	61

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
	~~Meadow -cont. grass (non grazed)~~		B	7.91	58
	Brush - brush, weed, grass mix		B	1.7	48
	~~Total Area / Weighted Curve Number~~			~~9.61~~ ✓	59
BZ2	Meadow -cont. grass (non grazed)		B	2.21	58
	Brush - brush, weed, grass mix	(good)	B	2.203	48
	Brush - brush, weed, grass mix	(good)	D	.838	73
	Total Area / Weighted Curve Number			5.25 ✓	56

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
SHEET	100	0.0050	0.800				1.22
SHALLOW	902	0.0072	0.050				0.183
SHALLOW	493	0.0213	0.050				0.058
					Time of Concentration		1.468
BW1							
SHEET	100	0.0120	0.240				0.330
SHALLOW	218	0.0115	0.050				0.035
SHALLOW	213	0.0139	0.050				0.017
					Time of Concentration		.382
BW2							
SHEET	100	0.0520	0.240				0.184
SHALLOW	299	0.0303	0.050				0.019
SHALLOW	531	0.0105	0.050				0.089
					Time of Concentration		.292
BX1							
SHEET	85	0.0213	0.240				0.230
SHALLOW	348	0.0149	0.050				0.049
					Time of Concentration		.279
BY1							
SHEET	100	0.0050	0.240				0.468
SHALLOW	310	0.0210	0.050				0.037
SHALLOW	349	0.0420	0.050				0.029
					Time of Concentration		.534
BY2							
SHEET	100	0.0170	0.800				0.752
SHALLOW	209	0.0254	0.050				0.023
CHANNEL	693	0.0087	0.070	4.70	8.75	1.310	0.147
					Time of Concentration		.922
BY3							
SHALLOW	216	0.0324	0.050				0.036
SHALLOW	243	0.0329	0.050				0.023
					Time of Concentration		0.1

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
BZ1							
SHEET	100	0.01[illegible]	[illegible]				0.320
SHALLOW	[illegible]	0.0159	0.050				0.052
SHALLOW	708	0.0233	0.050				0.080
					Time of Concentration		0.452
BZ2							
SHEET	100	0.0210	0.800				0.691
SHALLOW	477	0.0084	0.050				0.090
SHALLOW	670	0.0261	0.050				0.071
					Time of Concentration		0.852

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[redacted]	[redacted] ✓
BW1	2.37 ✓
	12.17
[redacted]	[redacted] ✓
[redacted]	[redacted] ✓
	12.15
BY1	1.76 ✓
	12.30
BY2	6.73 ✓
	12.49
[redacted]	[redacted] ✓
[redacted]	[redacted] ✓
BZ2	0.68 ✓
	12.57
REACHES	
OUTLET	17.33

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
C1	Brush - brush, weed, grass mix	(good)	B	4.07	48
	Brush - brush, weed, grass mix	(good)	C	52.85	65
	Brush - brush, weed, grass mix	(good)	D	146.35	73
	Total Area / Weighted Curve Number			203.27	70
C1A	Pasture, grassland or range	(good)	B	1.49	61
	Pasture, grassland or range	(good)	C	1.4	74
	Brush - brush, weed, grass mix	(good)	C	.152	65
	Total Area / Weighted Curve Number			3.04	67
CA1	Brush - brush, weed, grass mix	(good)	B	4.254	48
	Brush - brush, weed, grass mix	(good)	D	.132	73
	Total Area / Weighted Curve Number			4.39	49
CB1,2,3	Pasture, grassland or range	(good)	A	14.86	39
	Pasture, grassland or range	(good)	B	4.95	61
	Pasture, grassland or range	(good)	C	8.26	74
	Pasture, grassland or range	(good)	D	8.26	80
	Meadow -cont. grass (non grazed)		A	3.3	30
	Meadow -cont. grass (non grazed)		B	8.26	58
	Meadow -cont. grass (non grazed)		C	14.86	71
	Meadow -cont. grass (non grazed)		D	4.13	78
	Brush - brush, weed, grass mix	(good)	A	3.3	30
	Brush - brush, weed, grass mix	(good)	B	2.48	48
	Brush - brush, weed, grass mix	(good)	C	8.25	65
	Brush - brush, weed, grass mix	(good)	D	1.65	73
	Total Area / Weighted Curve Number			82.56	60
CC1, [redacted]	Meadow -cont. grass (non grazed)		B	15.4	58
	Meadow -cont. grass (non grazed)		C	10.26	71
	Total Area / Weighted Curve Number			25.66	63
CD1	Pasture, grassland or range	(good)	B	.7	61
	Meadow -cont. grass (non grazed)		B	3.39	58
	Meadow -cont. grass (non grazed)		C	.62	71
	Brush - brush, weed, grass mix	(good)	B	.66	48
	Total Area / Weighted Curve Number			4.75	58
CD2	Pasture, grassland or range	(good)	B	.3	61
	Brush - brush, weed, grass mix	(good)	B	2.73	48
	Total Area / Weighted Curve Number			3.03	49

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CD3	Paved parking lots, roofs, driveways		B	.636	98
	Pasture, grassland or range	(good)	A	8.27	39
	Pasture, grassland or range	(good)	B	17.82	61
	Pasture, grassland or range	(good)	C	.64	74
	Meadow -cont. grass (non grazed)		B	12.73	58
	Meadow -cont. grass (non grazed)		C	5.09	71
	Brush - brush, weed, grass mix	(good)	A	1.27	30
	Brush - brush, weed, grass mix	(good)	B	9.546	48
	Brush - brush, weed, grass mix	(good)	C	7.639	65
	Total Area / Weighted Curve Number			63.64 ✓	57
				=====	==
CH1	Meadow -cont. grass (non grazed)		B	.28	58
	Meadow -cont. grass (non grazed)		C	.28	71
	Brush - brush, weed, grass mix	(good)	B	1.27	48
	Brush - brush, weed, grass mix	(good)	C	5.21	65
	Total Area / Weighted Curve Number			7.04 ✓	62
				====	==

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
[illegible]							
SHEET	67	0.0224	0.800				0.48[illegible]
SHALLOW	700	0.0271	0.050				0.[illegible]3
SHALLOW	1803	0.0061	0.050				[illegible].397
						Time of Concentration	.959
C1A							
SHEET	100	0.[illegible]060	0.800				1.141
SHALLOW	120	0.01[illegible]	0.050				0.016
SHALLOW	199	0.0095	0.050				0.035
						Time of Concentration	1.192
CA1							
SHEET	100	0.0130	0.[illegible]00				0.838
SHALLOW	330	0.0085	0.050				0.062
SHALLOW	453	0.039[illegible]	0.050				0.039
						Time of [illegible]oncentration	.939
CB1,2,3							
SHEET	100	0.0370	0.240				0.210
SHALL[illegible]	1368	0.0212	0.050				0.162
SHA[illegible]OW	929	0.0118	0.050				0.147
						Time of Concentration	.5[illegible]9
CC1, [illegible]							
SHEET	100	0.0200	0.240				0.269
SHALLOW	865	0.0162	0.050				0.117
SHALLOW	477	0.0273	0.050				0.050
						Time of Concentration	.436
[illegible]D1							
SHEET	100	0.0150	0.240				0.30[illegible]
SHALLOW	15[illegible]	0.0165	0.050				0.211
						Time of Concentration	.513
CD2							
SHALLOW	198	0.0242	0.050				0.022
SHA[illegible]OW	384	0.0161	0.050				0.052
						Time of Concentration	0.[illegible]

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CD3							
SHEET	100	0.0480	0.240				0.190
SHALLOW	916	0.0302	0.050				0.091
SHALLOW	1906	0.0068	0.050				0.398
						Time of Concentration	0.679
CH1							
SHEET	100	0.0060	0.240				0.436
SHALLOW	253	0.0138	0.050				0.037
SHALLOW	388	0.0155	0.050				0.054
						Time of Concentration	.527

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[redacted]	[redacted] ✓
	[redacted] ✓
	[redacted] ✓
CB1	25.95 ✓
	[redacted]
CC1,	12.69 ✓
	12.18
	[redacted] ✓
	[redacted] ✓
	[redacted] ✓
CH1	2.76 ✓
	12.26
REACHES	
OUTLET	144.36

MSteblein

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CC2A	Meadow -cont. grass (non grazed)	C	.28	71
	Total Area / Weighted Curve Number		.28	71
CC2B	Meadow -cont. grass (non grazed)		.023	58
	Meadow -cont. grass (non	C	1.14	71
	Total / Weighted Curve Number		1.16	71

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CC2A							
SHEET	100	0.0220	0.170				0.197
SHALLOW	14	0.0140	0.050				0.002
					Time of Concentration		0.199
CC2B							
SHEET	100	0.0250	0.170				0.187
SHALLOW	248	0.0210	0.050				0.029
					Time of Concentration		0.216

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
CC2A	.00 ✓ n/a
[redacted]	✓
REACHES	
[redacted]	

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Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
CH1A	4.56
	12.17
CH3	2.01
	12.12

Marble River Wind Farm
Culvert Design
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CH1A	Gravel (w/ right-of-way)		B	.39	85
	Pasture, grassland or range	(fair)	B	3	69
	Pasture, grassland or range	(fair)	C	1	79
	Total Area / Weighted Curve Number			4.39	73
CH3	Pasture, grassland or range	(fair)	C	.34	79
	Woods - grass combination	(fair)	C	1.04	76
	Total Area / Weighted Curve Number			1.38	77

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CH1A							
SHEET	100	0.0100	0.240				0.355
SHALLOW	850	0.0200	0.050				0.103
						Time of Concentration	0.458
CH3							
SHEET	100	0.0100	0.240				0.355
SHALLOW	200	0.0200	0.050				0.024
						Time of Concentration	0.379

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Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CH2	Meadow -cont. grass (non grazed)		B	26.77	58
	Meadow -cont. grass (non grazed)		C	31.61	71
	Brush - brush, weed, grass mix	(good)	B	19.33	48
	Brush - brush, weed, grass mix	(good)	C	66.95	65
	Total Area / Weighted Curve Number			144.66 ✓	63

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CH2							
SHEET	75	0.0267	0.170				0.145
SHALLOW	1236	0.0097	0.050				0.216
CHANNEL	1368	0.0095	0.070	1.25	10.10	0.515	0.738
					Time of Concentration		1.099

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
CH2	37.29 ✓ 12.70
REACHES	
OUTLET	37.29

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CL1,2,3	Meadow -cont. grass (non grazed)		B	8.96	58
	Meadow -cont. grass (non grazed)		C	6.4	71
	Brush - brush, weed, grass mix	(good)	C	34.56	65
	Brush - brush, weed, grass mix	(good)	D	14.08	73
	Total Area / Weighted Curve Number			64.64	66
CN1	Pasture, grassland or range	(good)	B	0	61
	Pasture, grassland or range	(good)	C	.64	74
	Meadow -cont. grass (non grazed)		B	3.84	58
	Meadow -cont. grass (non grazed)		C	7.68	71
	Total Area / Weighted Curve Number			11.5	67
CN2	Meadow -cont. grass (non grazed)		B	6.36	58
	Meadow -cont. grass (non grazed)		C	37.47	71
	Brush - brush, weed, grass mix	(good)	B	6.36	48
	Brush - brush, weed, grass mix	(good)	C	20.5	65
	Total Area / Weighted Curve Number			70.69	66
CN3	Paved parking lots, roofs, driveways		C	.37	98
	Pasture, grassland or range	(good)	C	.37	74
	Meadow -cont. grass (non grazed)		B	1.12	58
	Meadow -cont. grass (non grazed)		C	35.41	71
	Total Area / Weighted Curve Number			37.27	71
CN4	Paved parking lots, roofs, driveways		D	.86	98
	Meadow -cont. grass (non grazed)		B	3.44	58
	Meadow -cont. grass (non grazed)		C	24.96	71
	Brush - brush, weed, grass mix	(good)	B	10.33	48
	Brush - brush, weed, grass mix	(good)	C	45.62	65
	Brush - brush, weed, grass mix	(good)	D	.86	73
	Total Area / Weighted Curve Number			86.07	65
CT1	Pasture, grassland or range	(good)	B	1.95	61
	Meadow -cont. grass (non grazed)		B	3.07	58
	Brush - brush, weed, grass mix	(good)	B	22.89	48
	Total Area / Weighted Curve Number			27.91	50

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CT2	Brush - brush, weed, grass mix	(good)	B	4.95	48
	Total Area / Weighted Curve Number			4.95	48
CT3	Brush - brush, weed, grass mix	(good)	B	4.05	48
	Total Area / Weighted Curve Number			4.05	48
CT4	Paved parking lots, roofs, driveways		C	.29	98
	Brush - brush, weed, grass mix	(good)	B	3.76	48
	Total Area / Weighted Curve Number			4.05	52
CN2A	Paved parking lots, roofs, driveways		C	.21	98
	Pasture, grassland or range	(good)	B	.61	61
	Pasture, grassland or range	(good)	C	19.45	74
	Meadow - grass (non grazed)		C	.2	71
	Total Area / Weighted Curve Number			20.47	74

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CL1,2,3							
SHEET	100	0.0270	0.240				0.239
SHALLOW	1493	0.0289	0.050				0.151
SHALLOW	1013	0.0094	0.050				0.180
					Time of Concentration		.57
CN1							
SHEET	100	0.0250	0.240				0.246
SHALLOW	686	0.0124	0.050				0.106
SHALLOW	160	0.0250	0.050				0.017
					Time of Concentration		.369
CN2							
SHEET	100	0.0120	0.240				0.330
SHALLOW	1725	0.0136	0.050				0.255
SHALLOW	466	0.0376	0.050				0.041
					Time of Concentration		0.626
CN3							
SHEET	100	0.0050	0.240				0.468
SHALLOW	2075	0.0128	0.050				0.316
SHALLOW	422	0.0355	0.050				0.039
					Time of Concentration		0.823
CN4							
SHEET	100	0.0130	0.800				0.838
SHALLOW	651	0.0072	0.050				0.132
SHALLOW	385	0.0156	0.050				0.053
CHANNEL	1038	0.0135	0.070	4.70	8.75	1.638	0.176
CHANNEL	316	0.0253	0.070	4.70	8.75	2.251	0.039
					Time of Concentration		1.238
CT1							
SHALLOW	1014	0.0182	0.050				0.129
SHALLOW	452	0.0243	0.050				0.050
CHANNEL	157	0.0064	0.070	4.70	8.75	1.118	0.039
					Time of Concentration		.218

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CT2							
SHALLOW	377	0.0703	0.050				0.024
SHALLOW	369	0.0352	0.050				0.034
					Time of Concentration		0.100
CT3							
SHALLOW	633	0.0071	0.050				0.129
SHALLOW	87	0.0690	0.050				0.006
					Time of Concentration		.135
~~CT4~~							
SHALLOW	~~312~~	~~0.0128~~	~~0.050~~				~~0.047~~
~~SHALLOW~~	~~230~~	~~0.0217~~	~~0.050~~				0.027
					Time of Concentration		~~0.100~~
CN2A							
SHEET	100	~~0.0~~	~~0.240~~				0.342
SHALLOW	~~1950~~	~~0.0112~~	~~0.0~~				0.319
SHALLOW	293	0.0478	0.050				0.023
					Time of Concentration		0.684

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Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
CL1,2,3	35.20 ✓ 12.27
~~CN1~~	[redacted] ✓
~~CN2~~	~~36.01~~ ✓ ~~12.50~~
CN3	22.88 ✓ 12.43
~~CN4~~	~~24.53~~ ✓ ~~12.77~~
CT1	1.81 ✓ 12.14
CT2	0.15 ✓ 12.06
CT3	0.11 ✓ 12.35
~~CT4~~	~~0.00~~ ✓ ~~12.03~~
~~CN2A~~	[redacted] ✓
REACHES	
OUTLET	130.44

WinTR-55 Current Data Description

--- Identification Data ---

User: D. McDaid
Project: Marble River Wind Farm
SubTitle: New Culverts
State: New York
County: Clinton
Filename: I:\11176310\SWPPP\New Culvert Calculations\Watersheds.w55

Date: 10/29/2010
Units: English
Area Units: Acres

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.5	3.1	3.6	4.1	4.6	4.9	2.1

Storm Data Source: Chautauqua County, NY (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 10-Yr (cfs)
SUBAREAS	
CR1	20.27
CX1	3.87
CX2	9.37

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
CR1							
SHEET	100	0.0200	0.240				0.269
SHALLOW	600	0.0200	0.050				0.073
SHALLOW	700	0.0300	0.050				0.070
					Time of Concentration		0.412
CX1							
SHEET	100	0.0400	0.150				0.140
SHALLOW	250	0.0900	0.050				0.014
					Time of Concentration		0.154
CX2							
SHEET	100	0.0200	0.240				0.269
SHALLOW	925	0.0260	0.050				0.099
					Time of Concentration		.368

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
CR1	Paved; curbs and storm sewers		C	.91	98
	Pasture, grassland or range	(fair)	C	8.23	79
	Woods - grass combination	(fair)	B	9.14	65
	Total Area / Weighted Curve Number			18.28	73
CX1	Open space; grass cover > 75%	(good)	C	1.35	74
	Paved; curbs and storm sewers		C	.22	98
	Woods - grass combination	(fair)	B	.675	65
	Total Area / Weighted Curve Number			2.25	74
CX2	Pasture, grassland or range	(fair)	A	3.892	49
	Pasture, grassland or range	(fair)	B	3.892	69
	Woods - grass combination	(fair)	A	3.892	43
	Woods - grass combination	(fair)	B	3.892	65
	Total Area / Weighted Curve Number			15.57	57

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Marble River Wind Farm
Job#: 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
D2	Pasture, grassland or range	(good)	D	1.77	
	Brush - brush, weed, grass mix	(good)	D	33.59	73
	Total Area / Weighted Curve Number			35.36 ✓	73
D3	Brush - brush, weed, grass mix	(good)	D	5.3	73
	Total Area / Weighted Curve Number			5.3 ✓	73
D4,D4A	Brush - brush, weed, grass mix	(good)	D	74.09	73
	Total Area / Weighted Curve Number			74.09 ✓	73
D5	Brush - brush, weed, grass mix	(good)	A	3.91	30
	Total Area / Weighted Curve Number			3.91 ✓	30
~~D6~~	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~A~~	~~2.54~~	~~30~~
	~~Total Area / Weighted Curve Number~~			~~2.54~~ ✓	~~30~~
D7	Brush - brush, weed, grass mix	(good)	A	7.4	30
	Brush - brush, weed, grass mix	(good)	C	6.06	65
	Total Area / Weighted Curve Number			13.46 ✓	46
D8	Brush - brush, weed, grass mix	(good)	C	4.61	65
	Brush - brush, weed, grass mix	(good)	D	.5	73
	Total Area / Weighted Curve Number			5.12 ✓	66
~~DB1~~	~~Meadow -cont. grass (non grazed)~~		~~C~~	~~7.29~~	~~71~~
	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~B~~	~~3.13~~	~~4~~
	~~Total Area / Weighted Curve Number~~			~~10.42~~ ✓	~~64~~
DC1	Paved parking lots, roofs, driveways		C	11.25	98
	Pasture, grassland or range	(good)	B	9	61
	Pasture, grassland or range	(good)	C	22.5	74
	Pasture, grassland or range	(good)	D	11.25	80
	Meadow -cont. grass (non grazed)		A	6.75	30
	Meadow -cont. grass (non grazed)		B	49.51	58
	Meadow -cont. grass (non grazed)		C	6.75	71
	Brush - brush, weed, grass mix	(good)	B	69.76	48
	Brush - brush, weed, grass mix	(good)	C	31.5	65
	Brush - brush, weed, grass mix	(good)	D	6.75	73

MWing

Marble River Wind Farm
Job#: 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
	Total Area / Weighted Curve Number			225.02	61
DC2	Meadow -cont. grass [illegible]		A	1.34	[illegible]
	Brush - [illegible] weed, grass mix	(good)	A	14.46	30
	Total Area / Weighted Curve Number			[illegible]	30

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Marble River Wind Farm
Job#: 11174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
SHALLOW	215	0.0326	0.050				
CHANNEL	123	0.0163	0.070	4.70	8.75		0.019
					Time of Concentration		.846
DB1							
SHEET		0.0040	0.240				
SHALLOW	833	0.0120	0.050				0.131
	135	0.0170	0.050				0.018
					Time of Concentration		.661
DC1							
SHEET	33	0.0909	0.240				0.060
SHALLOW	1633	0.0196	0.050				0.201
SHALLOW	1607	0.0208	0.050				0.192
CHANNEL	2428	0.0179	0.070	4.70	8.75	1.884	0.358
					Time of Concentration		.811
DC2							
SHEET	100	0.0390					0.540
SHALLOW			0.050				0.074
	1383	0.0174	0.050				0.181
					Time of Concentration		0.795

MWing

Marble River Wind Farm
Job#: 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[redacted]	[redacted] ✓
[redacted]	[redacted] ✓
[redacted]	[redacted] ✓
D5	[redacted] ✓
D6	.00 ✓ n/a
D7	[redacted] ✓
D8	[redacted] ✓
DB1	4.27 ✓ 12.34 [redacted]
DC1	58.34 ✓ 12.48
DC2	[redacted] ✓
REACHES	
[redacted]	140.64

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DG1	Pasture, grassland or range	(good)	B	4.09	61
	Pasture, grassland or range	(good)	C	2.45	74
	Brush - brush, weed, grass mix	(good)	B	3.68	48
	Brush - brush, weed, grass mix	(good)	C	11.03	65
	Brush - brush, weed, grass mix	(good)	D	19.61	73
	Total Area / Weighted Curve Number			40.86	67
DH1	Paved parking lots, roofs, driveways		D	.253	98
	Pasture, grassland or range	(good)	C	1.65	74
	Brush - brush, weed, grass mix	(good)	B	10.77	48
	Total Area / Weighted Curve Number			12.67	52
DL1	Paved parking lots, roofs, driveways		B	.3	98
	Pasture, grassland or range	(good)	B	1	61
	Brush - brush, weed, grass mix	(good)	B	1.7	48
	Total Area / Weighted Curve Number			3	57
DL2	Pasture, grassland or range	(good)	B	7.48	61
	Meadow -cont. grass (non grazed)		B	2.05	58
	Brush - brush, weed, grass mix	(good)	B	38.1	48
	Total Area / Weighted Curve Number			47.63	50
DQ1	Pasture, grassland or range	(good)	B	3.98	61
	Meadow -cont. grass (non grazed)		B	.34	58
	Brush - brush, weed, grass mix	(good)	B	39.29	48
	Total Area / Weighted Curve Number			43.61	49
DQ2	Meadow -cont. grass (non grazed)		B	24.11	58
	Brush - brush, weed, grass mix	(good)	B	16.07	48
	Total Area / Weighted Curve Number			40.18	54
DR1	Meadow -cont. grass (non grazed)		B	14.7	58
	Brush - brush, weed, grass mix	(good)	B	9.23	48
	Total Area / Weighted Curve Number			23.93	54
DS1	Paved parking lots, roofs, driveways		B	.11	98
	Meadow -cont. grass (non grazed)		B	2.17	58
	Brush - brush, weed, grass mix	(good)	B	9.15	48
	Total Area / Weighted Curve Number			11.43	50

* DG1 INCLUDES WITH 1 CULVERTS, FORMERLY 1 AREA

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DS2	Meadow -cont. grass (non grazed)		B	61.94	58
	Meadow -cont. grass (non grazed)		C	[illegible]	71
	Meadow -cont. grass (non grazed)		[illegible]	3.51	78
	Brush - brush, weed, grass mix	[illegible]	B	29.22	48
	Brush - brush, weed, grass mix	(good)	C	7.01	65
	Total Area / Weighted Curve Number			[illegible] ✓	58
DT1	Meadow -cont. grass (non grazed)		B	33.88	58
	Meadow -cont. grass (non grazed)		C	13.55	71
	Brush - brush, weed, grass mix	(good)	B	1.56	48
	Brush - brush, weed, grass mix	(good)	C	3.13	65
	Total Area / Weighted Curve Number			52.12 ✓	62

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DG1							
SHEET	100	0.0150	0.800				0.791
SHALLOW	1062	0.0033	0.050				0.318
SHALLOW	253	0.0296	0.050				0.025
						Time of Concentration	1.134
DH1							
SHEET	100	0.0330	0.800				0.577
SHALLOW	556	0.0300	0.050				0.055
SHALLOW	579	0.0777	0.050				0.036
						Time of Concentration	.668
DL1							
SHEET	100	0.0370	0.800				0.551
SHALLOW	392	0.0311	0.050				0.038
SHALLOW	81	0.0691	0.050				0.005
						Time of Concentration	.594
DL2							
SHEET	100	0.0580	0.240				0.176
SHALLOW	2337	0.0337	0.050				0.219
SHALLOW	664	0.0648	0.050				0.045
						Time of Concentration	.44
DQ1							
SHEET	100	0.0770	0.240				0.157
SHALLOW	642	0.0335	0.050				0.060
SHALLOW	1197	0.0334	0.050				0.111
CHANNEL	815	0.0366	0.070	4.70	8.75	2.663	0.085
						Time of Concentration	.41
DQ2							
SHEET	100	0.0900	0.800				0.594
SHALLOW	716	0.0740	0.050				0.048
SHALLOW	454	0.0264	0.050				0.047
						Time of Concentration	.69

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
SHEET	[illegible]	[illegible]	0.240				0.184
SHALLOW	1880	0.0367	[illegible]				0.169
					Time of Concentration		.353
DS1							
SHEET	100	0.0140	0.130				0.190
SHALLOW	352	0.0256	0.050				0.038
SHALLOW	647	0.0286	0.050				0.066
					Time of Concentration		.294
DS2							
SHEET	100	0.0340	[illegible]				0.218
SHALLOW	3326	0.0333	0.050				0.314
SHALLOW	1558	0.0132	[illegible]				0.233
					Time of Concentration		.765
DT1							
SHEET	100	0.0030	0.240				0.575
SHALLOW	3748	0.0314	0.050				0.364
SHALLOW	815	0.0221	0.050				0.094
					Time of Concentration		1.033

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
DG1	14.70 ✓
	12.63
DH1	0.87 ✓
	12.50
DL1	0.57 ✓
	12.36
DL2	2.24 ✓
	12.38
[redacted]	✓
[redacted]	✓
[redacted]	✓
DS1	0.63 ✓
	12.20
[redacted]	✓
DT1	12.67 ✓
	12.60
[redacted]	
[redacted]	

[redacted] CULVERTS, [redacted]

Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
DOTAQ1	14.91
	12.11
DOTAR1	1.56
	12.28
DOTAV1	3.87
	12.01
DOTAX1	3.29
	12.06
DOTBV1	5.21
	12.08
DOTBY1	2.60
	11.94
DOTDC1	2.11
	11.94
DOTDG1	1.71
	11.94

Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DOTAQ1	Paved; curbs and storm sewers		B	.76	98
	Pasture, grassland or range	(fair)	B	8.71	69
	Pasture, grassland or range	(fair)	C	2.3	79
	Total Area / Weighted Curve Number			11.77	73
DOTAR1	Pasture, grassland or range	(fair)	B	2.16	69
	Woods - grass combination	(fair)	B	.24	65
	Total Area / Weighted Curve Number			2.4	69
DOTAV1	Paved; curbs and storm sewers		B	.42	98
	Woods - grass combination	(fair)	B	2.4	65
	Total Area / Weighted Curve Number			2.82	70
DOTAX1	Paved; curbs and storm sewers		B	.3	98
	Pasture, grassland or range	(fair)	B	2.1	69
	Total Area / Weighted Curve Number			2.4	73
DOTBV1	Open space; grass cover > 75%	(good)	C	.89	74
	Open space; grass cover > 75%	(good)	D	.88	80
	Paved parking lots, roofs, driveways		B	.44	98
	Woods	(fair)	B	.3	60
	Woods	(fair)	D	.44	79
	Total Area / Weighted Curve Number			2.95	79
DOTBY1	Open space; grass cover > 75%	(good)	B	.48	61
	Paved; curbs and storm sewers		B	.48	98
	Woods - grass combination	(fair)	B	.23	65
	Total Area / Weighted Curve Number			1.19	77
DOTDC1	Open space; grass cover > 75%	(good)	B	.42	61
	Paved; curbs and storm sewers		B	.42	98
	Total Area / Weighted Curve Number			.84	80
DOTDG1	Open space; grass cover > 75%	(good)	B	.36	61
	Paved; curbs and storm sewers		B	.35	98
	Total Area / Weighted Curve Number			.71	79

Dan McDaid

Marble River Wind Farm
Culvert Design
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DOTAQ1							
SHEET	100	0.0300	0.240				0.229
SHALLOW	350	0.0500	0.050				0.027
CHANNEL	730					3.000	0.068
					Time of Concentration		0.324
DOTAR1							
SHEET	100	0.0100	0.400				0.534
SHALLOW	520	0.0100	0.050				0.090
					Time of Concentration		0.624
DOTAV1							
SHEET	50	0.0100	0.011				0.017
SHALLOW	770	0.0100	0.050				0.133
					Time of Concentration		0.150
DOTAX1							
SHEET	100	0.0100	0.150				0.244
SHALLOW	170	0.0300	0.050				0.017
CHANNEL	130					3.000	0.012
					Time of Concentration		0.273
DOTBV1							
SHEET	100	0.0200	0.240				0.269
SHALLOW	100	0.0300	0.050				0.010
CHANNEL	370					3.000	0.034
					Time of Concentration		0.313
DOTBY1							
CHANNEL	700					3.000	0.065
					Time of Concentration		0.100
DOTDC1							
CHANNEL	430					3.000	0.040
					Time of Concentration		0.100
DOTDG1							
CHANNEL	400					3.000	0.037
					Time of Concentration		0.100

WinTR-55 Current Data Description

--- Identification Data ---

User: D. McDaid
Project: Marble River Wind Farm
SubTitle: New Culverts
State: New York
County: Clinton
Filename: I:\11176310\SWPPP\New Culvert Calculations\Watersheds.w55

Date: 10/29/2010
Units: English
Area Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
DS2		Outlet	2	71	0.299
DS3		Outlet	13.9	71	0.312

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.5	3.1	3.6	4.1	4.6	4.9	2.1

Storm Data Source: Chautauqua County, NY (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 10-Yr (cfs)
SUBAREAS	
DS2	2.49
DS3	16.91

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DS2							
SHEET	100	0.0200	0.240				0.269
SHALLOW	400	0.0530	0.050				0.030
					Time of Concentration		0.299
DS3							
SHEET	100	0.0600	0.240				0.173
SHALLOW	1350	0.0280	0.050				0.139
					Time of Concentration		.312

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
BX1	Pasture, grassland or range	(good)	B	1.47	61
	Pasture, grassland or range	(good)	D	1.02	80
	Meadow -cont. grass (non grazed)		A	.79	30
	Brush - brush, weed, grass mix	(good)	A	1.69	30
	Brush - brush, weed, grass mix	(good)	B	5.072	48
	Brush - brush, weed, grass mix	(good)	D	1.24	73
	Total Area / Weighted Curve Number			11.28 ✓	51
				====	==
BW1	Pasture, grassland or range	(good)	B	3.98	61
	Meadow -cont. grass (non grazed)		B	1.86	58
	Total Area / Weighted Curve Number			5.84 ✓	60
				====	==
BW2	Pasture, grassland or range	(good)	B	3.61	61
	Pasture, grassland or range	(good)	C	1.36	74
	Brush - brush, weed, grass mix	(good)	C	3.044	65
	Total Area / Weighted Curve Number			8.01 ✓	65
				====	==
BX1	Pasture, grassland or range	(good)	B	.99	61
	Meadow -cont. grass (non grazed)		B	.06	58
	Brush - brush, weed, grass mix	(good)	B	2.14	48
	Total Area / Weighted Curve Number			3.19 ✓	52
				====	==
BY1	Pasture, grassland or range	(good)	B	2.6	61
	Meadow -cont. grass (non grazed)		B	3.91	58
	Total Area / Weighted Curve Number			6.51 ✓	59
				====	==
BY2	Pasture, grassland or range	(good)	C	4.28	74
	Pasture, grassland or range	(good)	D	.71	80
	Meadow -cont. grass (non grazed)		C	.36	71
	Brush - brush, weed, grass mix	(good)	B	.119	48
	Brush - brush, weed, grass mix	(good)	C	4.4	65
	Brush - brush, weed, grass mix	(good)	D	.02	73
	Total Area / Weighted Curve Number			11.8 ✓	71
				=====	==
BY3	Pasture, grassland or range	(good)	B	.47	61
	Meadow -cont. grass (non grazed)		B	2.81	58
	Brush - brush, weed, grass mix	(good)	B	1.4	48
	Total Area / Weighted Curve Number			4.68 ✓	5[illegible]
				====	==
BZ1	Paved parking lots, roofs, driveways		B	.565	98
	Pasture, grassland or range	(good)	B	1.13	61

DOT

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details (continued)

DOT B31

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
	Meadow -cont. grass (non grazed)		B	7.91	58
	Brush - brush, weed, grass mix	(good)	B	1.7	48
	Total Area / Weighted Curve Number			11.31 ✓	59
				=====	==
	Meadow -cont. grass (non grazed)		B	2.21	58
	Brush - brush, weed, grass mix	(good)	B	2.203	48
	Brush - brush, weed, grass mix	(good)	D	.838	73
	Total Area / Weighted Curve Number			5.25 ✓	56
				====	==

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DoT BZ1							
SHEET	100	0.0130	0.240				0.320
SHALLOW	378	0.0159	0.050				0.052
SHALLOW	708	0.0233	0.050				0.080
						Time of Concentration	.452
BZ2							
SHEET	100	0.0210	0.800				0.69
SHALLOW	477	0.0084	0.050				0.09
SHALLOW	670	0.0261	0.050				0.07
						Time of Concentration	0.85

MWing

Marble River Wind Farm
Job# 1174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
[illegible]	[illegible] 12.38 ✓
BW1	2.27 ✓ 12.17
[illegible]	[illegible] 12.[illegible] ✓
[illegible]	[illegible] ✓
[illegible]	[illegible] ✓
[illegible]	[illegible] ✓
[illegible]	[illegible] ✓
BZ1	3.43 ✓ 12.21
[illegible]	[illegible] ✓
REACHES	
OUTLET	[illegible]

DOT

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
~~TA01~~	~~Pasture, grassland or range~~	~~(good)~~	~~C~~	~~2.63~~	~~74~~
DG2	Brush - brush, [illegible] mix	(good)	B	6.09	48
	Total Area / Weighted Curve Number			8.72 ✓	56
				====	==
~~TAG1~~	~~Meadow - cont. grass (non-grazed)~~		~~C~~	~~5.79~~	~~71~~
	~~Total Area / Weighted Curve Number~~			~~5.79~~ ✓	~~71~~
				====	==
TAL1	Brush - brush, weed, grass mix	(good)	B	4.6	48
	Total Area / Weighted Curve Number			4.6 ✓	48
				===	==
~~TC1~~	~~Brush - brush, weed, grass mix~~	~~(good)~~	~~D~~	~~1.26~~	~~73~~
	~~Total Area / Weighted Curve Number~~			~~1.26~~ ✓	~~73~~
				====	==
~~TP1~~	~~Paved parking lots, roofs, driveways~~		~~B~~	~~.135~~	~~98~~
	~~Meadow - cont. grass (non-grazed)~~		~~B~~	~~8.61~~	~~58~~
	~~Total Area / Weighted Curve Number~~			~~8.74~~ ✓	~~59~~
				====	==

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DG2							
SHEET	80	0.0063	0.800				0.666
SHALLOW	110	0.0195	0.050				0.051
SHALLOW	203	0.0345	0.050				0.019
					Time of Concentration		.736
TAG1							
SHEET	42	0.0238	0.240				0.125
SHALLOW	294	0.0272	0.050				0.031
SHALLOW	404	0.0149	0.050				0.057
					Time of Concentration		.213
TAL1							
SHEET	100	0.0500	0.800				0.489
SHALLOW	316	0.0475	0.050				0.025
SHALLOW	746	0.0121	0.050				0.117
CHANNEL	90	0.0111	0.070	4.70	8.75	1.471	0.017
					Time of Concentration		.648
TC1							
SHEET	20	0.0500	0.800				0.135
SHALLOW	52	0.1154	0.050				0.003
SHALLOW	110	0.0491	0.050				0.009
					Time of Concentration		.147
TP1							
SHEET	100	0.0200	0.240				0.269
SHALLOW	770	0.0104	0.050				0.130
SHALLOW	179	0.0145	0.050				0.026
					Time of Concentration		.425

MWing

Marble River Wind Farm
Job# 11174823
Clinton County, New York

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
TA01	1.23
DO2	12.16
TAC1	7.76
	12.04
TAL1	0.10
	12.85
TC1	2.06
	12.00
TPT	2.77
	12.21
REACHES	
OUTLET	11.41

HY-8 Culvert Analysis Report

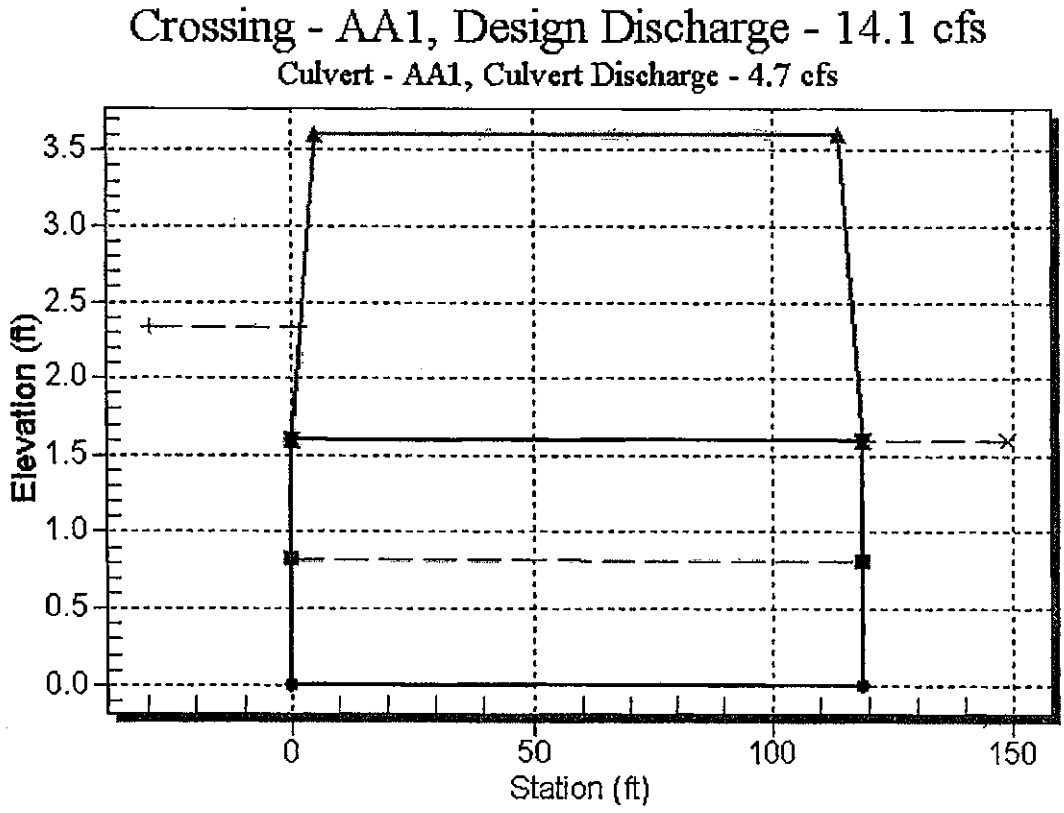
Culvert Data Summary - AA1

Barrel Shape: Circular
Barrel Diameter: 1.60 ft ✓
Barrel Material:
Barrel Manning's n: 0.0240
Inlet Type:
Inlet Edge Condition:
Inlet Depression: None

Site Data - AA1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 119.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AA1



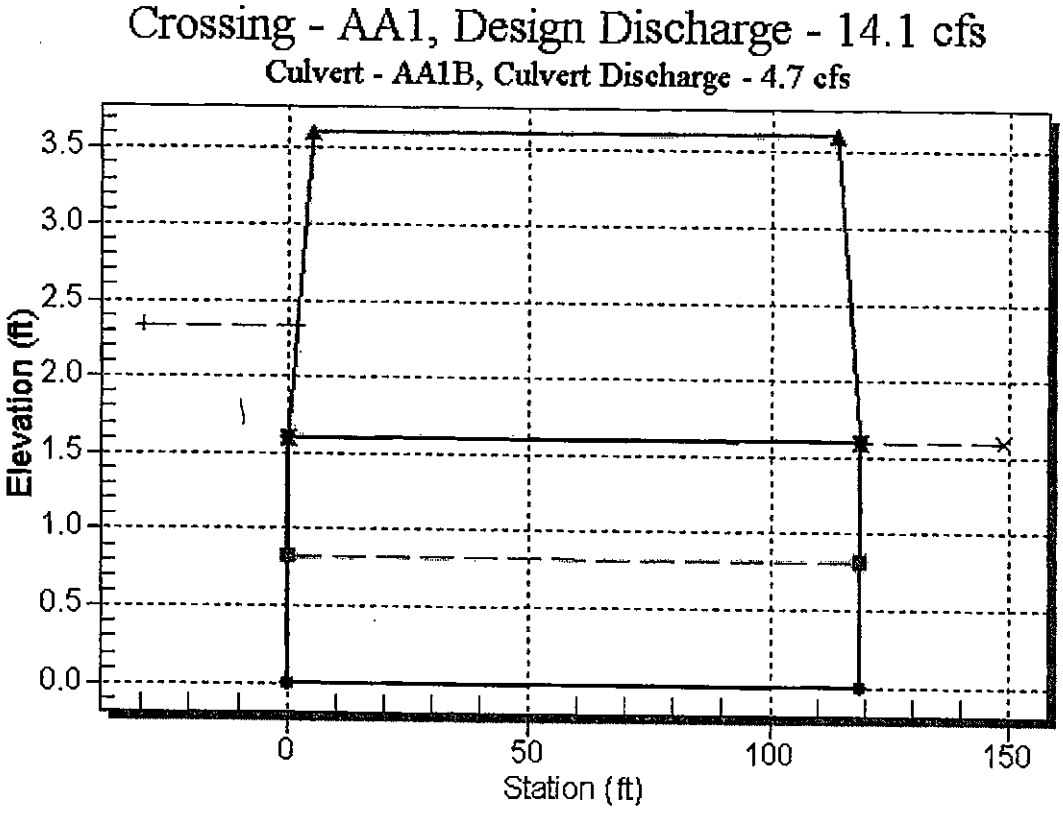
Culvert Data Summary - AA1B

Barrel Shape: Circular
Barrel Diameter: 1.60 ft
Barrel Material:
Barrel Manning's n: 0.0240
Inlet Type:
Inlet Edge Condition:
Inlet Depression: None

Site Data - AA1B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 119.00 ft
Outlet Elevation: -0.00 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AA1B



Culvert Data Summary - AA1C

Barrel Shape: Circular
Barrel Diameter: 1.60 ft ✓
Barrel Material:
Barrel Manning's n: 0.0240
Inlet Type:
Inlet Edge Condition:
Inlet Depression: None

Site Data - AA1C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 119.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AA1C

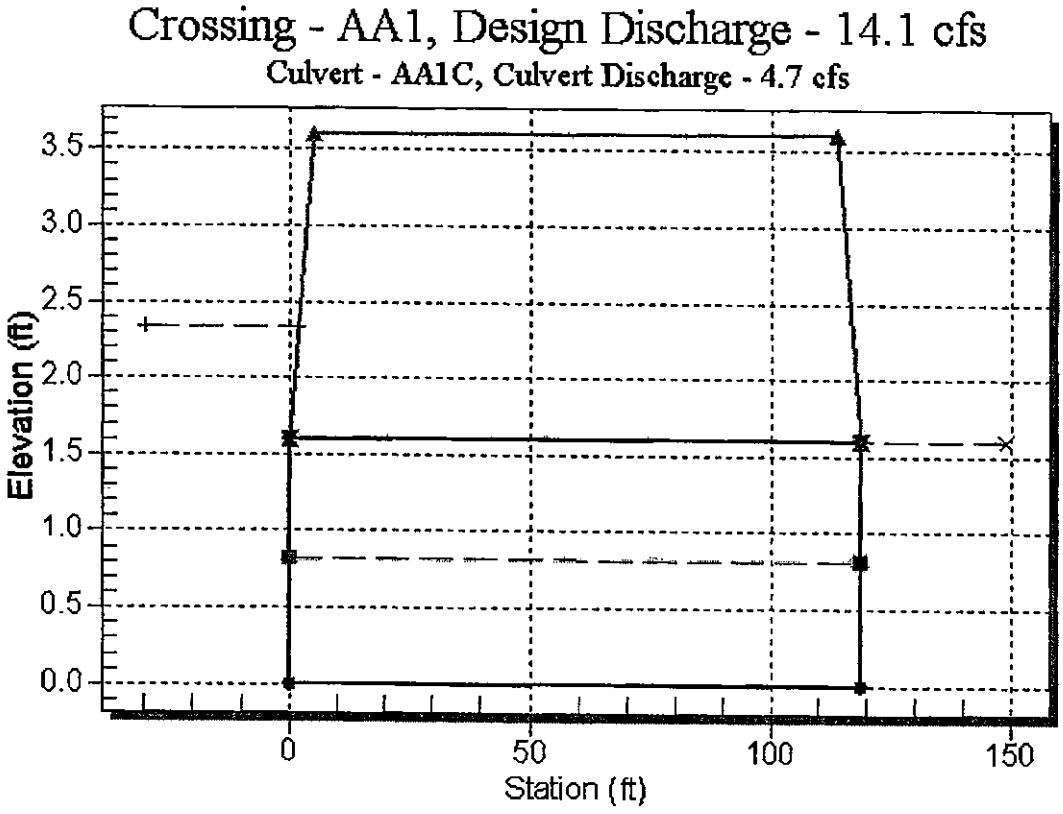


Table 1 - Summary of Culvert Flows at Crossing: AA1

Headwater Elevation (ft)	Total Discharge (cfs)	AA1 Discharge (cfs)	AA1B Discharge (cfs)	AA1C Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.60	0.00	0.00	0.00	0.00	0.00	0
1.61	1.41	0.47	0.47	0.47	0.00	8
1.63	2.82	0.95	0.95	0.95	0.00	5
1.67	4.23	1.42	1.42	1.42	0.00	5
1.72	5.64	1.89	1.89	1.89	0.00	4
1.78	7.05	2.36	2.36	2.36	0.00	4
1.87	8.47	2.83	2.83	2.83	0.00	4
1.96	9.88	3.29	3.29	3.29	0.00	4
2.07	11.29	3.76	3.76	3.76	0.00	4
2.20	12.70	4.23	4.23	4.23	0.00	4
2.33	14.11 ✓	4.70	4.70	4.70	0.00	4

HY-8 Culvert Analysis Report

Culvert Data Summary - AE1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AE1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 80.00 ft

Outlet Elevation: -0.80 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AE1

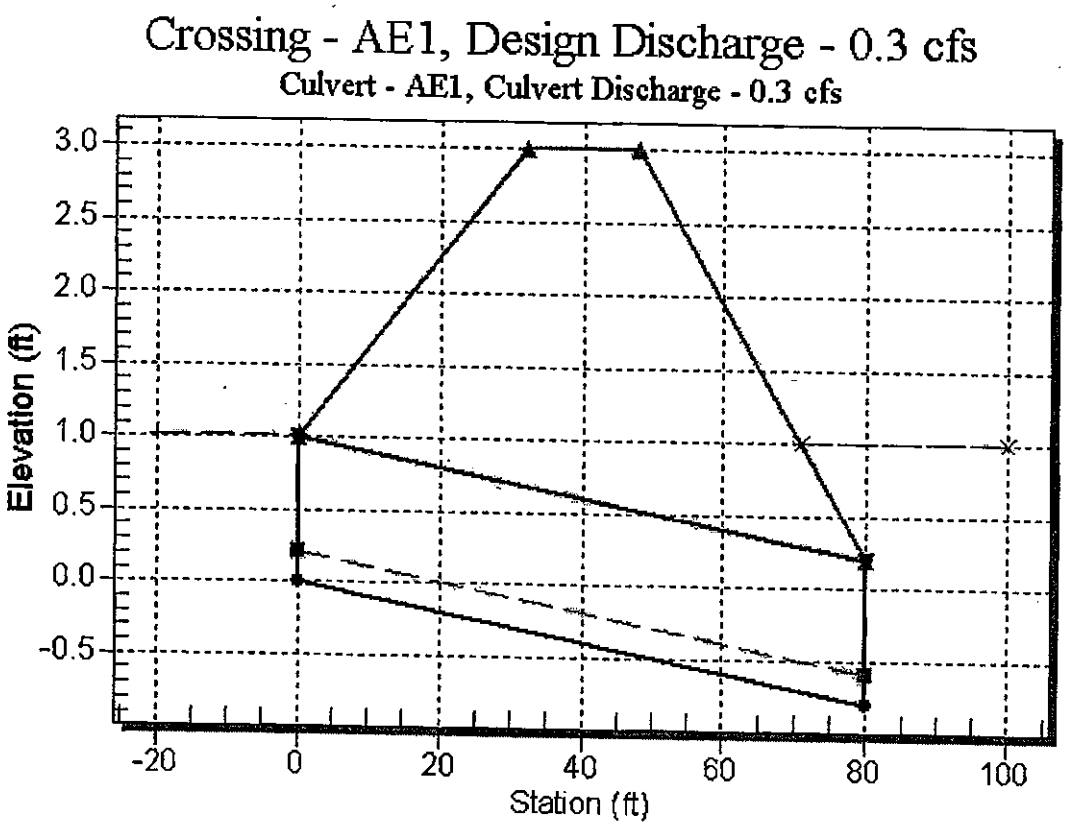


Table 1 - Summary of Culvert Flows at Crossing: AE1

Headwater Elevation (ft)	Total Discharge (cfs)	AE1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.03	0.03	0.00	1
1.00	0.05	0.05	0.00	1
1.00	0.08	0.08	0.00	1
1.00	0.10	0.10	0.00	1
1.00	0.13	0.13	0.00	1
1.01	0.16	0.16	0.00	1
1.01	0.18	0.18	0.00	1
1.01	0.21	0.21	0.00	1
1.01	0.23	0.23	0.00	1
1.02	0.26	0.26	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AG1

Barrel Shape: Circular
Barrel Diameter: 2.00 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AG1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 135.00 ft ✓
Outlet Elevation: -1.35 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AG1

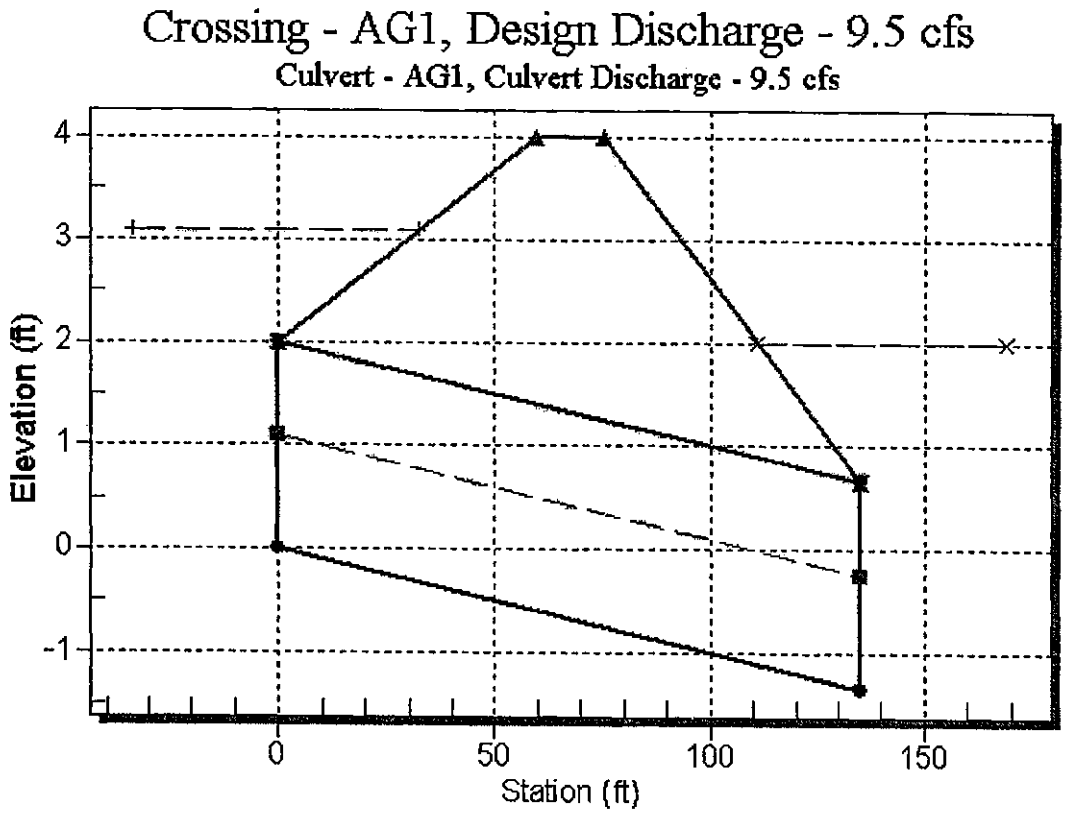


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Table 1 - Summary of Culvert Flows at Crossing: AG1

Headwater Elevation (ft)	Total Discharge (cfs)	AG1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.01	0.95	0.95	0.00	1
2.04	1.90	1.90	0.00	1
2.10	2.86	2.86	0.00	1
2.17	3.81	3.81	0.00	1
2.27	4.76	4.76	0.00	1
2.39	5.71	5.71	0.00	1
2.53	6.66	6.66	0.00	1
2.69	7.62	7.62	0.00	1
2.88	8.57	8.57	0.00	1
3.08	9.52 ✓	9.52	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AL1

Barrel Shape: Circular

Barrel Diameter: 1.60 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AL1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

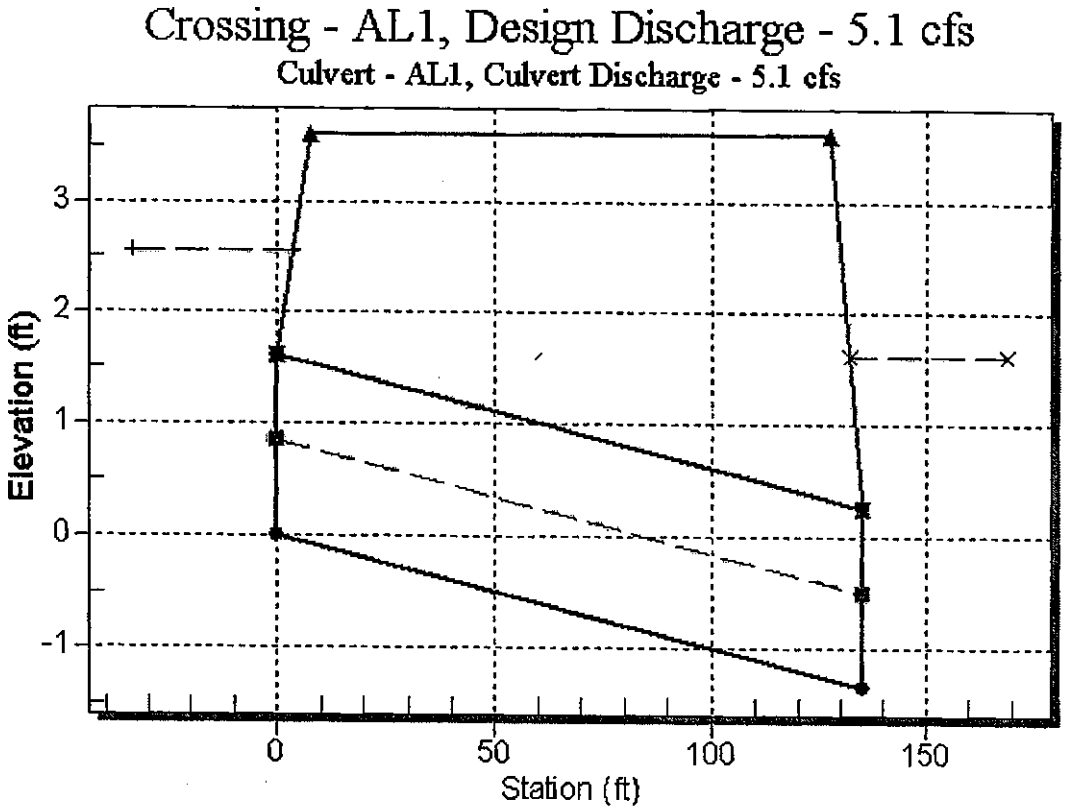
Inlet Elevation: 0.00 ft

Outlet Station: 135.00 ft ✓

Outlet Elevation: -1.35 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AL1



S

Table 1 - Summary of Culvert Flows at Crossing: AL1

Headwater Elevation (ft)	Total Discharge (cfs)	AL1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.60	0.00	0.00	0.00	1
1.61	0.51	0.51	0.00	1
1.64	1.02	1.02	0.00	1
1.69	1.53	1.53	0.00	1
1.75	2.04	2.04	0.00	1
1.84	2.55	2.55	0.00	1
1.94	3.06	3.06	0.00	1
2.07	3.57	3.57	0.00	1
2.21	4.08	4.08	0.00	1
2.37	4.59	4.59	0.00	1
2.55	5.10 ✓	5.10	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AL2

Barrel Shape: Circular

Barrel Diameter: 2.80 ft ✓ (upsize to 42")

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AL2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 48.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 2 ✓

Water Surface Profile Plot for Culvert: AL2

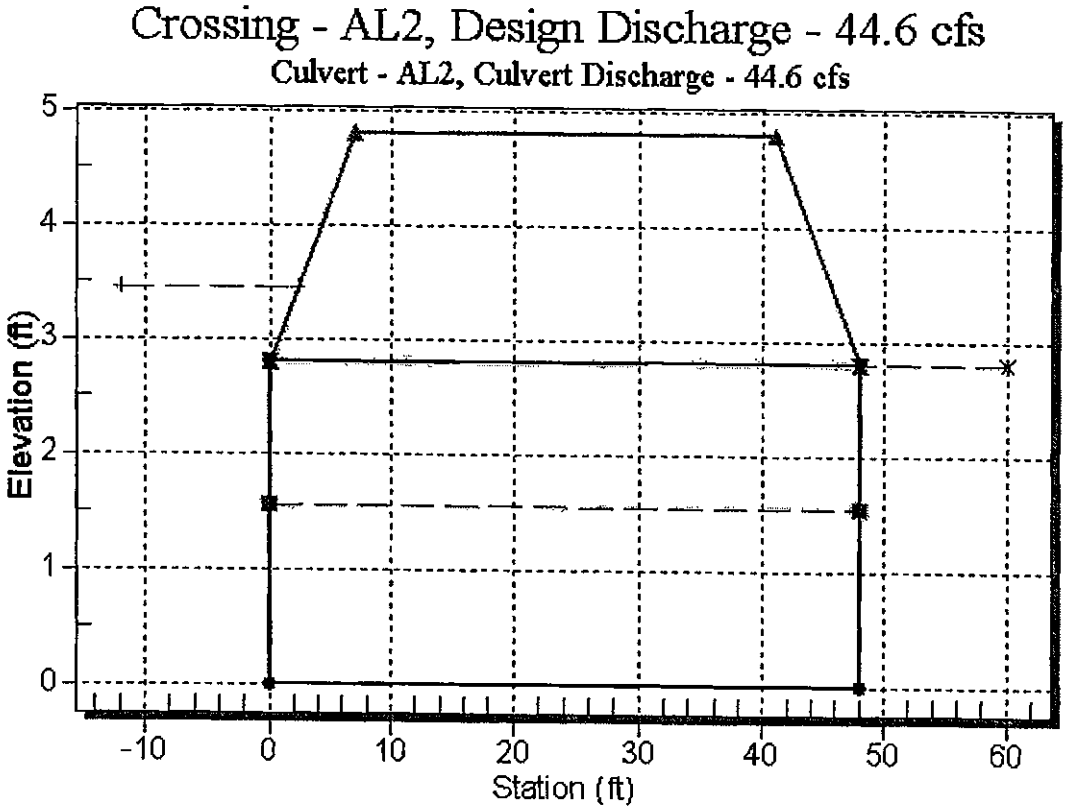


Table 1 - Summary of Culvert Flows at Crossing: AL2

Headwater Elevation (ft)	Total Discharge (cfs)	AL2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.80	0.00	0.00	0.00	1
2.81	4.46	4.46	0.00	1
2.83	8.93	8.93	0.00	1
2.86	13.39	13.39	0.00	1
2.90	17.86	17.86	0.00	1
2.96	22.32	22.32	0.00	1
3.03	26.78	26.78	0.00	1
3.12	31.25	31.25	0.00	1
3.22	35.71	35.71	0.00	1
3.33	40.18	40.18	0.00	1
3.45	44.64 ✓	44.64	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AM3

Barrel Shape: Pipe Arch
Barrel Span: 64.00 in (upsize to 77" x 52") ✓
Barrel Rise: 43.00 in
Barrel Material: Steel or Aluminum
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Projecting
Inlet Depression: None

Site Data - AM3

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 44.50 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 3 ✓

Water Surface Profile Plot for Culvert: AM3

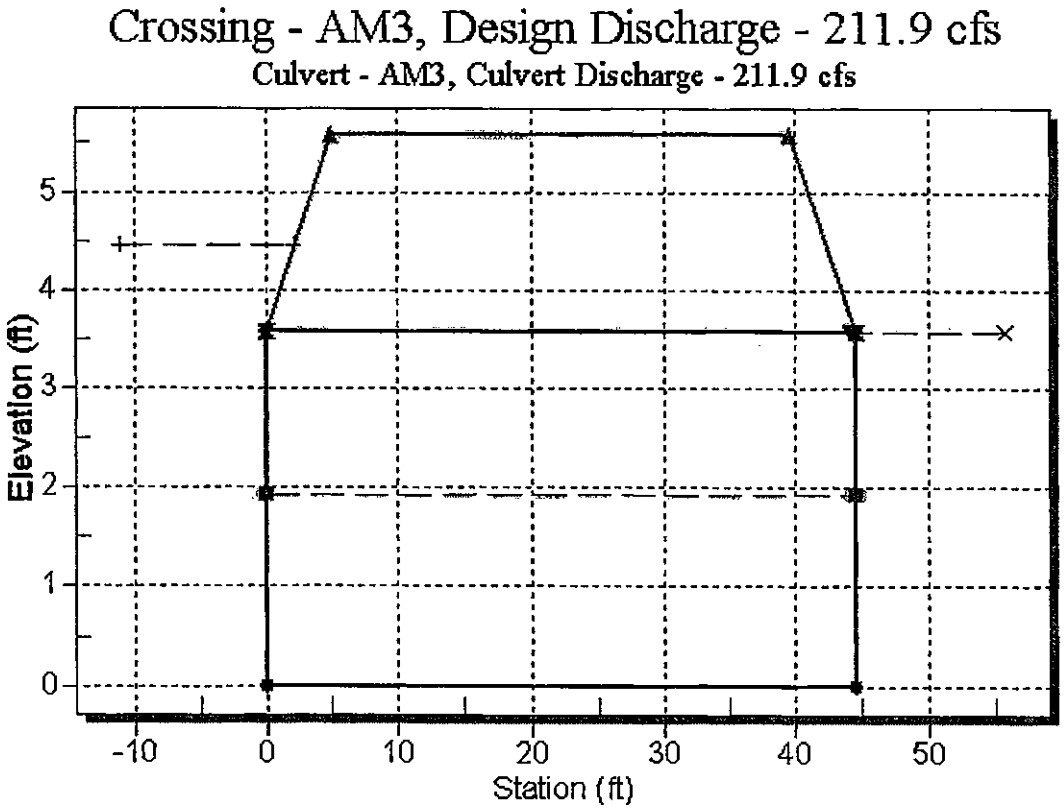


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Table 1 - Summary of Culvert Flows at Crossing: AM3

Headwater Elevation (ft)	Total Discharge (cfs)	AM3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3.58	0.00	0.00	0.00	1
3.59	21.19	21.19	0.00	1
3.62	42.39	42.39	0.00	1
3.66	63.58	63.58	0.00	1
3.72	84.77	84.77	0.00	1
3.80	105.97	105.97	0.00	1
3.90	127.16	127.16	0.00	1
4.01	148.35	148.35	0.00	1
4.14	169.54	169.54	0.00	1
4.29	190.74	190.74	0.00	1
4.46	211.93 ✓	211.93	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AM4

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AM4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.44 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AM4

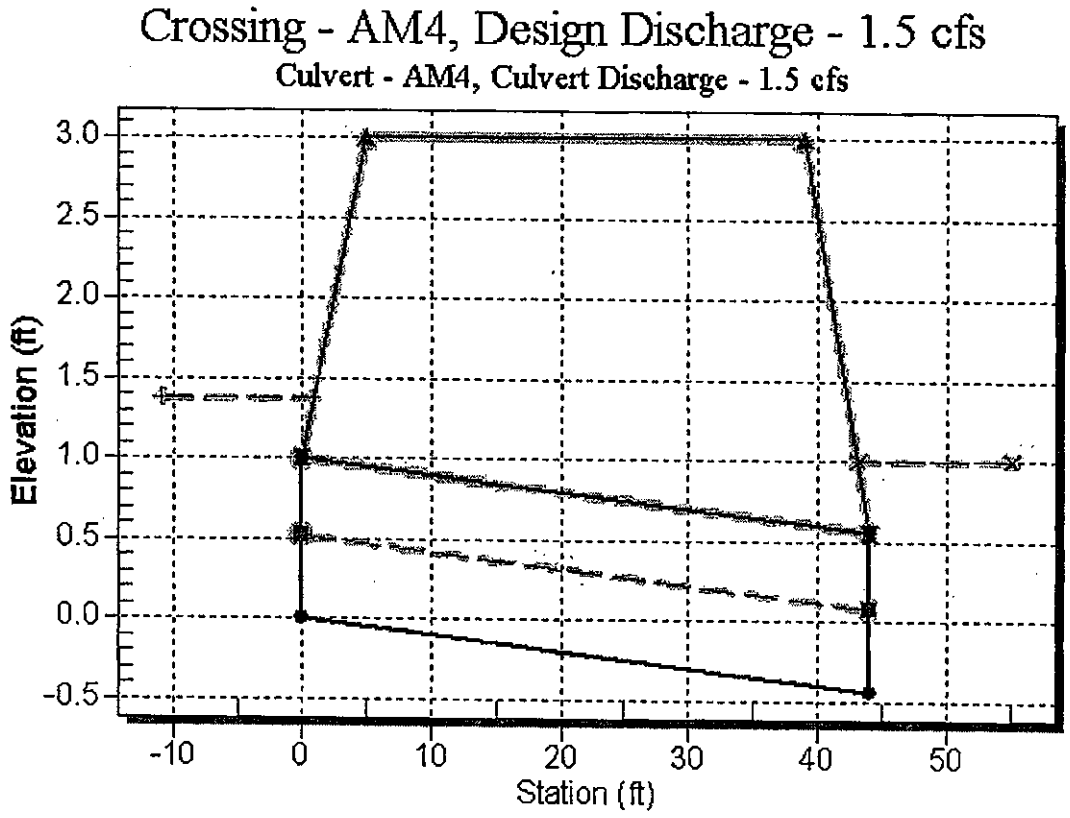


Table 1 - Summary of Culvert Flows at Crossing: AM4

Headwater Elevation (ft)	Total Discharge (cfs)	AM4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.15	0.15	0.00	1
1.02	0.30	0.30	0.00	1
1.03	0.45	0.45	0.00	1
1.06	0.60	0.60	0.00	1
1.09	0.76	0.76	0.00	1
1.14	0.91	0.91	0.00	1
1.18	1.06	1.06	0.00	1
1.24	1.21	1.21	0.00	1
1.31	1.36	1.36	0.00	1
1.38	1.51 ✓	1.51	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AP2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AP2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 47.00 ft

Outlet Elevation: -0.47 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AP2

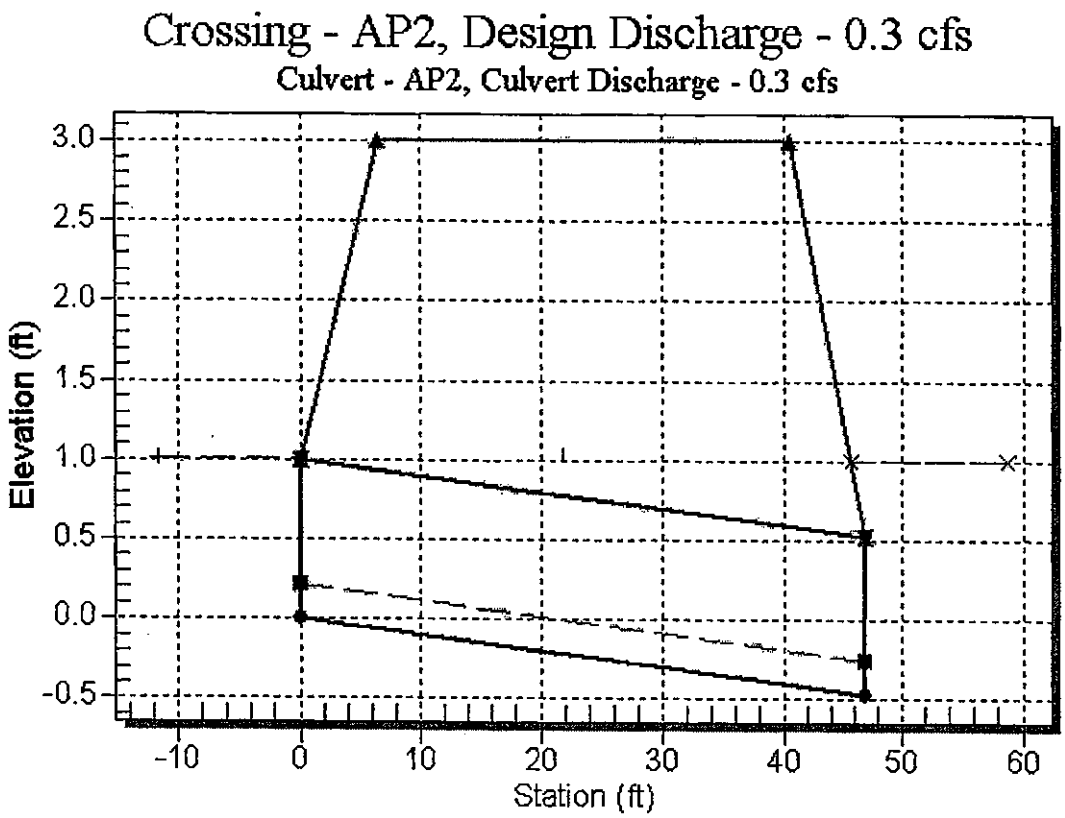


Table 1 - Summary of Culvert Flows at Crossing: AP2

Headwater Elevation (ft)	Total Discharge (cfs)	AP2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.03	0.03	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.08	0.08	0.00	1
1.00	0.11	0.11	0.00	1
1.00	0.14	0.14	0.00	1
1.00	0.17	0.17	0.00	1
1.01	0.20	0.20	0.00	1
1.01	0.22	0.22	0.00	1
1.01	0.25	0.25	0.00	1
1.01	0.28 ✓	0.28	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AT1

Barrel Shape: Circular

Barrel Diameter: 2.40 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AT1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

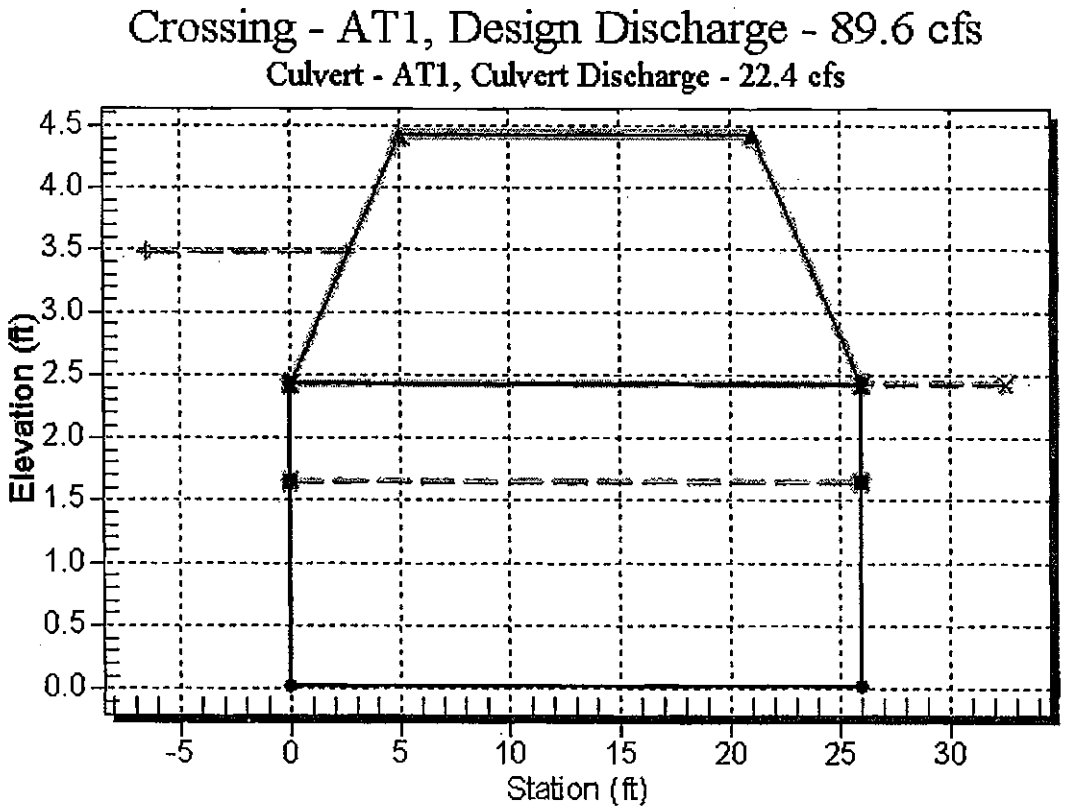
Inlet Elevation: 0.00 ft

Outlet Station: 26.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AT1



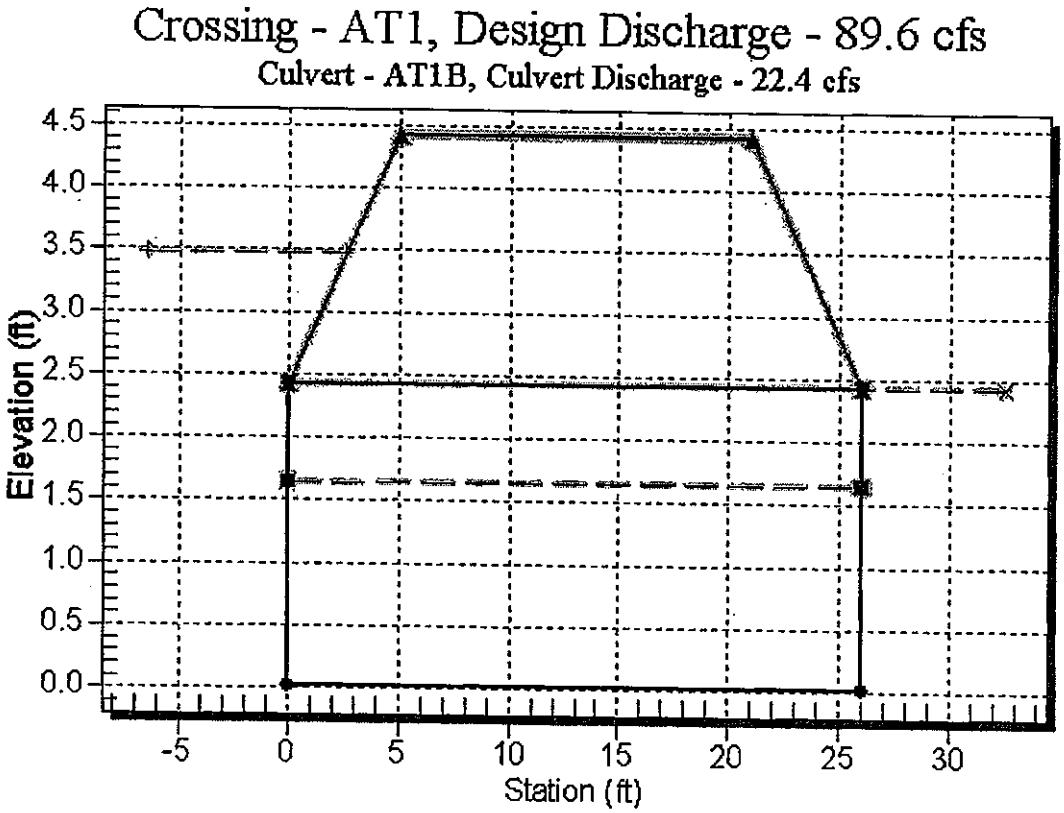
Culvert Data Summary - AT1B

Barrel Shape: Circular
Barrel Diameter: 2.40 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AT1B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 26.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AT1B



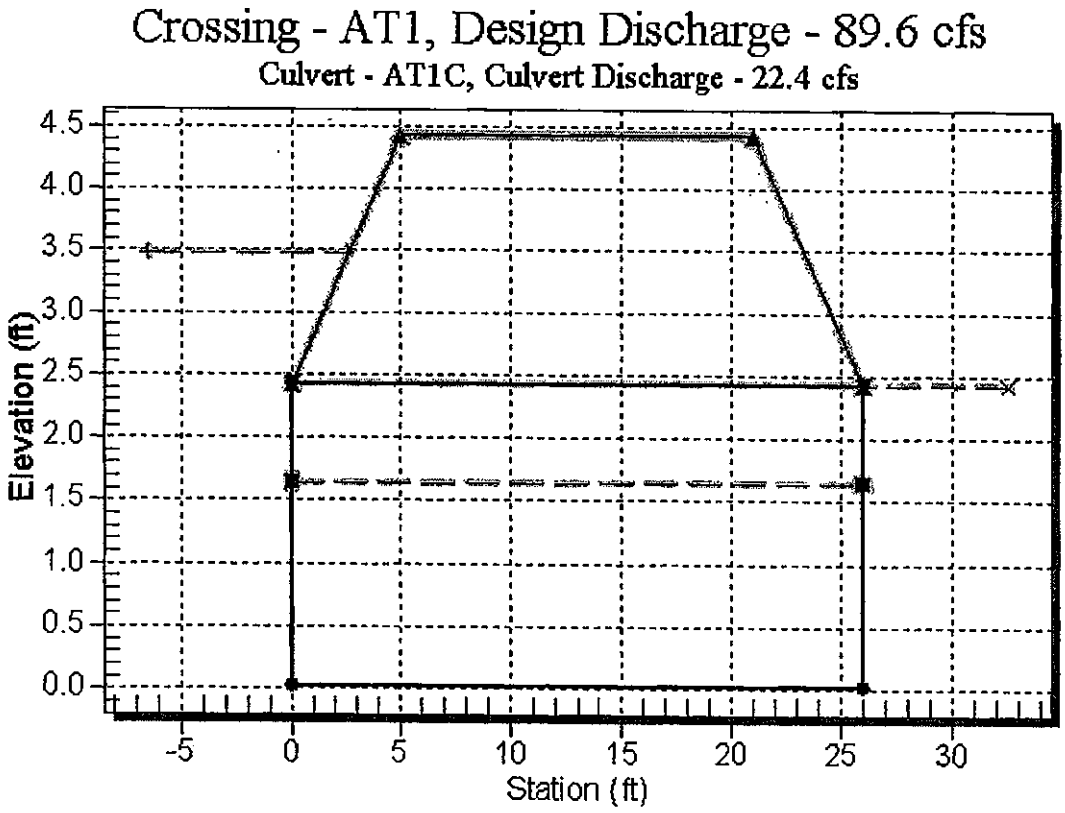
Culvert Data Summary - AT1C

Barrel Shape: Circular
Barrel Diameter: 2.40 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AT1C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 26.00 ft
Outlet Elevation: -0.00 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AT1C



Culvert Data Summary - AT1D

Barrel Shape: Circular
Barrel Diameter: 2.40 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AT1D

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 26.00 ft
Outlet Elevation: -0.00 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AT1D

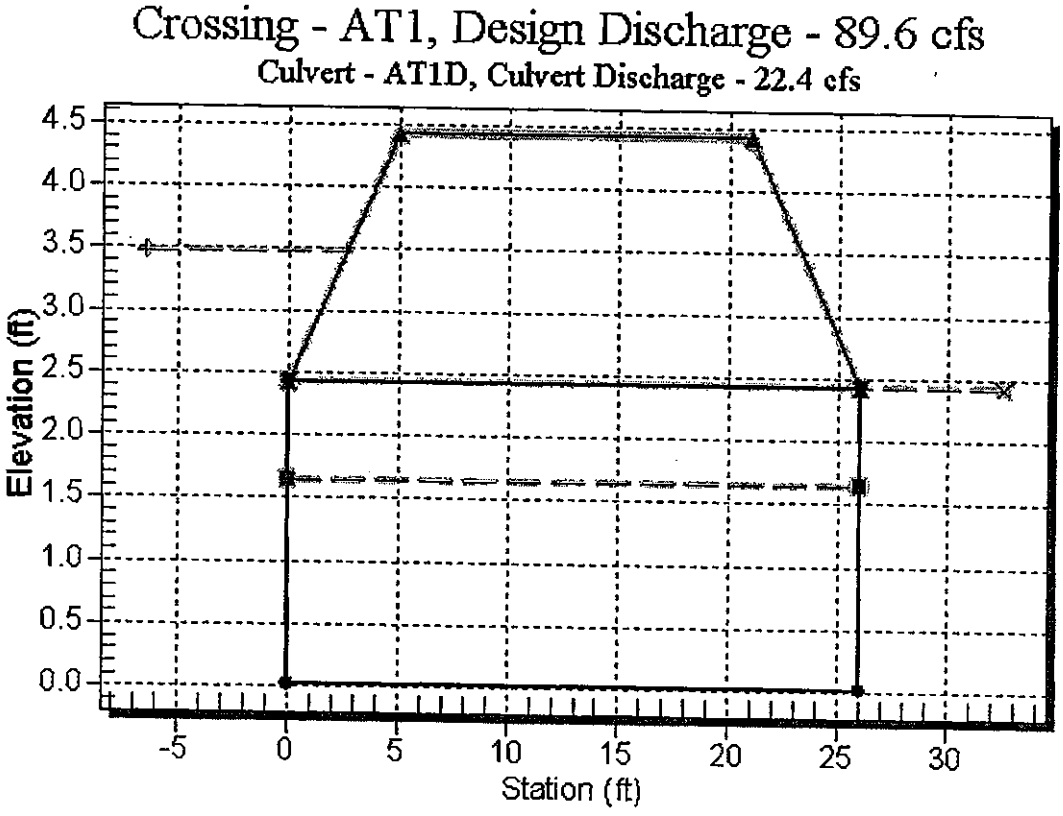


Table 1 - Summary of Culvert Flows at Crossing: AT1

Headwater Elevation (ft)	Total Discharge (cfs)	AT1 Discharge (cfs)	AT1B Discharge (cfs)	AT1C Discharge (cfs)	AT1D Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.40	0.00	0.00	0.00	0.00	0.00	0.00	0
2.41	8.96	2.25	2.25	2.25	2.25	0.00	10
2.44	17.92	4.52	4.52	4.52	4.52	0.00	5
2.50	26.88	6.76	6.76	6.76	6.76	0.00	5
2.57	35.84	8.97	8.97	8.97	8.97	0.00	5
2.66	44.80	11.21	11.21	11.21	11.21	0.00	4
2.78	53.76	13.45	13.45	13.45	13.45	0.00	4
2.91	62.72	15.68	15.68	15.68	15.68	0.00	4
3.07	71.68	17.93	17.93	17.93	17.93	0.00	4
3.25	80.64	20.16	20.16	20.16	20.16	0.00	4
3.45	89.60	22.40	22.40	22.40	22.40	0.00	4

HY-8 Culvert Analysis Report

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Culvert Data Summary - AW1

Barrel Shape: Circular

Barrel Diameter: 0.80 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AW1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 26.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AW1

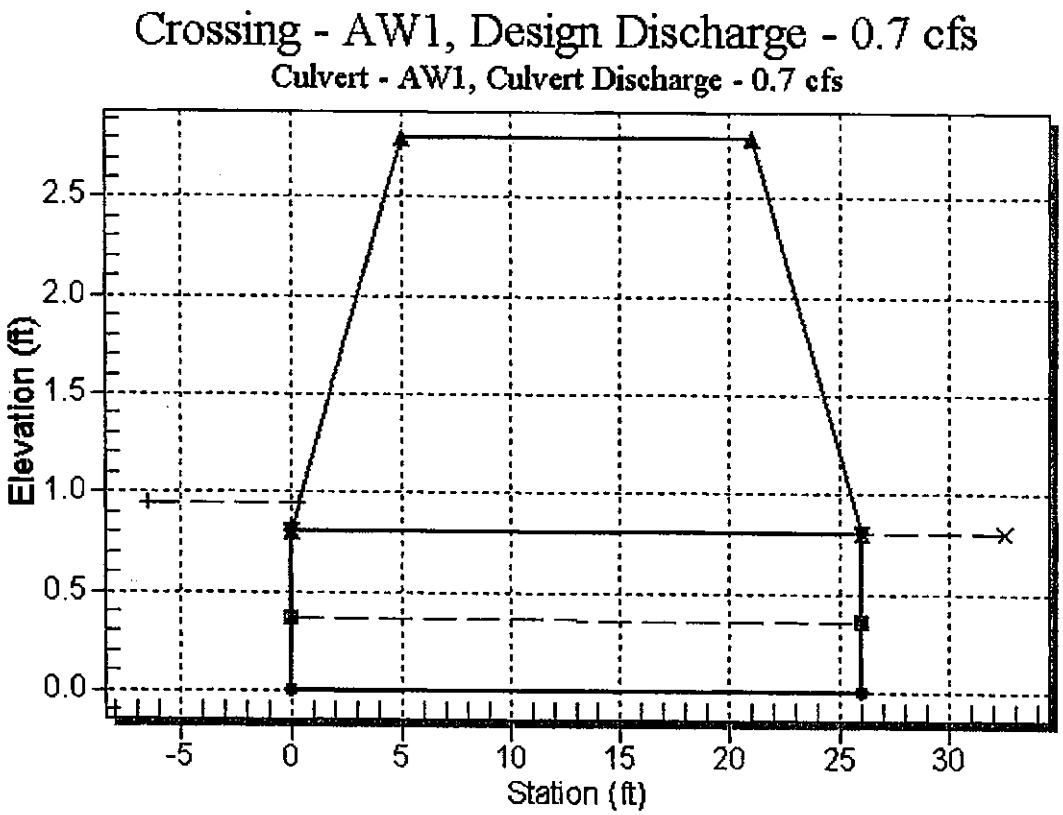


Table 1 - Summary of Culvert Flows at Crossing: AW1

Headwater Elevation (ft)	Total Discharge (cfs)	AW1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
0.80	0.00	0.00	0.00	1
0.80	0.07	0.07	0.00	1
0.81	0.13	0.13	0.00	1
0.81	0.20	0.20	0.00	1
0.82	0.26	0.26	0.00	1
0.84	0.33	0.33	0.00	1
0.85	0.39	0.39	0.00	1
0.87	0.46	0.46	0.00	1
0.89	0.52	0.52	0.00	1
0.92	0.58	0.58	0.00	1
0.95	0.65	0.65	0.00	1

Culvert Data Summary - AW2

Barrel Shape: Circular

Barrel Diameter: 0.80 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AW2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 26.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AW2

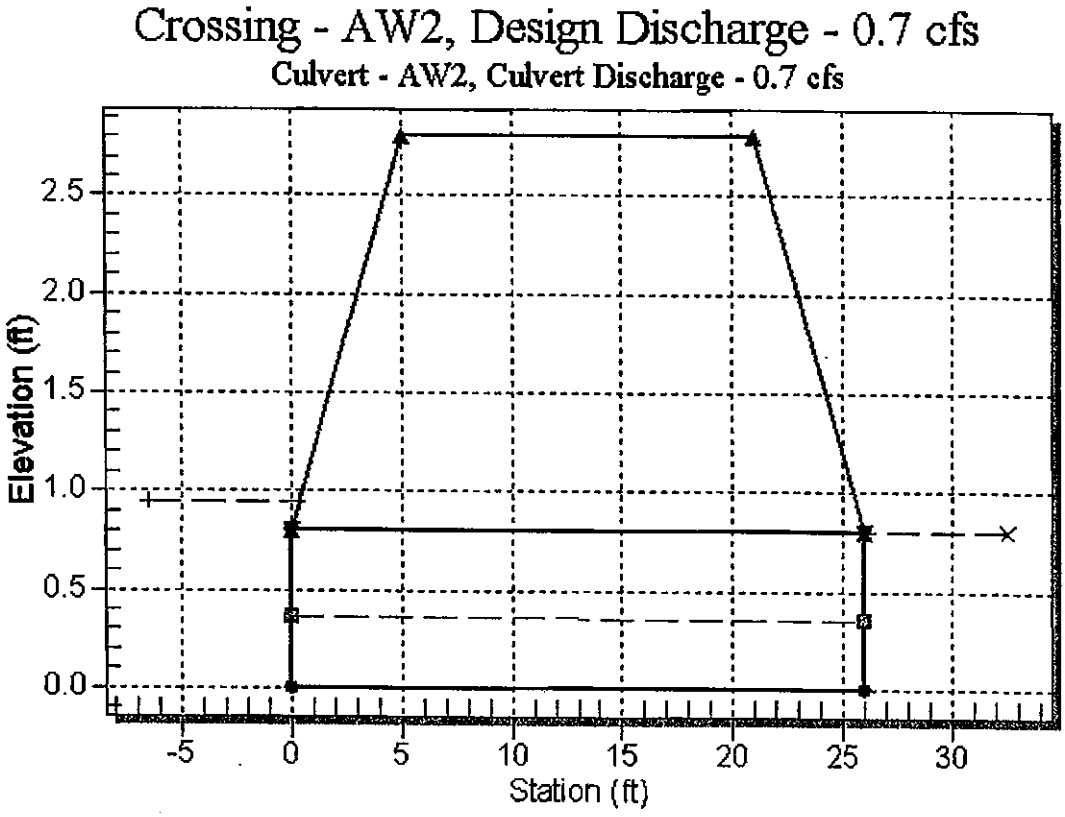


Table 2 - Summary of Culvert Flows at Crossing: AW2

Headwater Elevation (ft)	Total Discharge (cfs)	AW2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
0.80	0.00	0.00	0.00	1
0.80	0.07	0.07	0.00	1
0.81	0.13	0.13	0.00	1
0.81	0.20	0.20	0.00	1
0.82	0.26	0.26	0.00	1
0.84	0.33	0.33	0.00	1
0.85	0.39	0.39	0.00	1
0.87	0.46	0.46	0.00	1
0.89	0.52	0.52	0.00	1
0.92	0.58	0.58	0.00	1
0.95	0.65 ✓	0.65	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AX2

Barrel Shape: Pipe Arch

Barrel Span: 35.00 in (upsized to 49" x 33")

Barrel Rise: 24.00 in

Barrel Material: Steel or Aluminum

Barrel Manning's n: 0.0250

Inlet Type: Conventional

Inlet Edge Condition: Projecting

Inlet Depression: None

Site Data - AX2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 28.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 2 ✓

Water Surface Profile Plot for Culvert: AX2

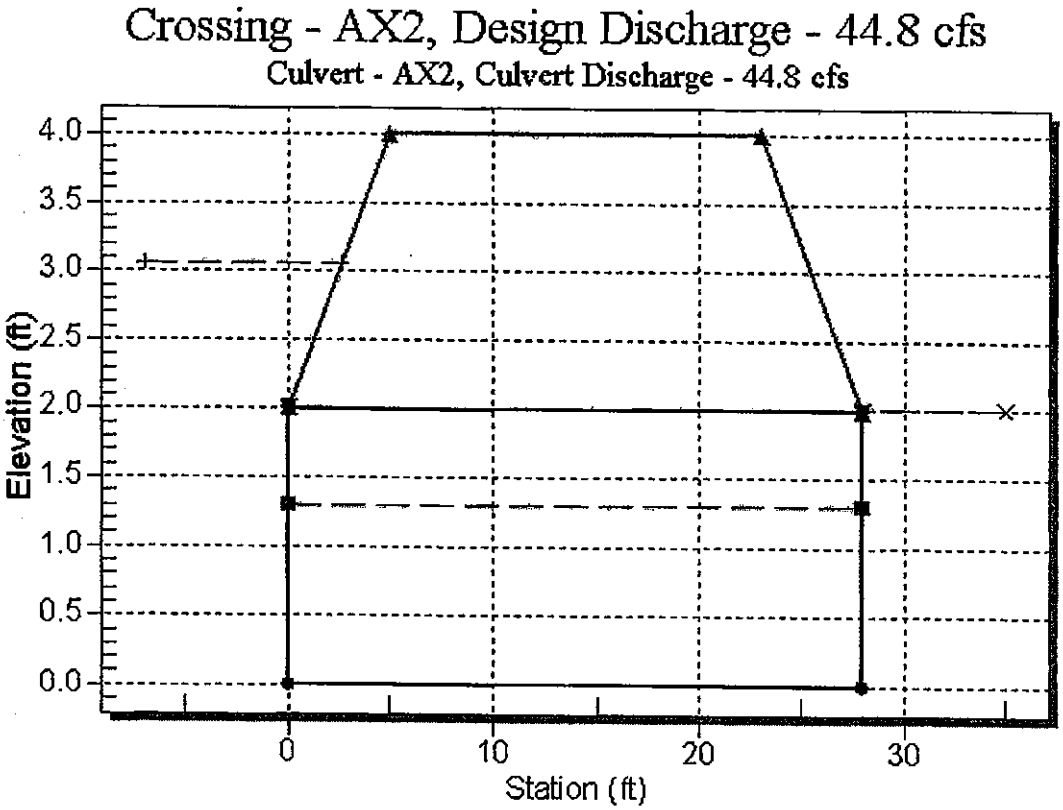


Table 1 - Summary of Culvert Flows at Crossing: AX2

Headwater Elevation (ft)	Total Discharge (cfs)	AX2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.01	4.48	4.48	0.00	1
2.04	8.97	8.97	0.00	1
2.10	13.45	13.45	0.00	1
2.17	17.93	17.93	0.00	1
2.26	22.41	22.41	0.00	1
2.38	26.90	26.90	0.00	1
2.52	31.38	31.38	0.00	1
2.68	35.86	35.86	0.00	1
2.86	40.35	40.35	0.00	1
3.06	44.83	44.83	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - AY1

Barrel Shape: Circular

Barrel Diameter: 0.80 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - AY1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

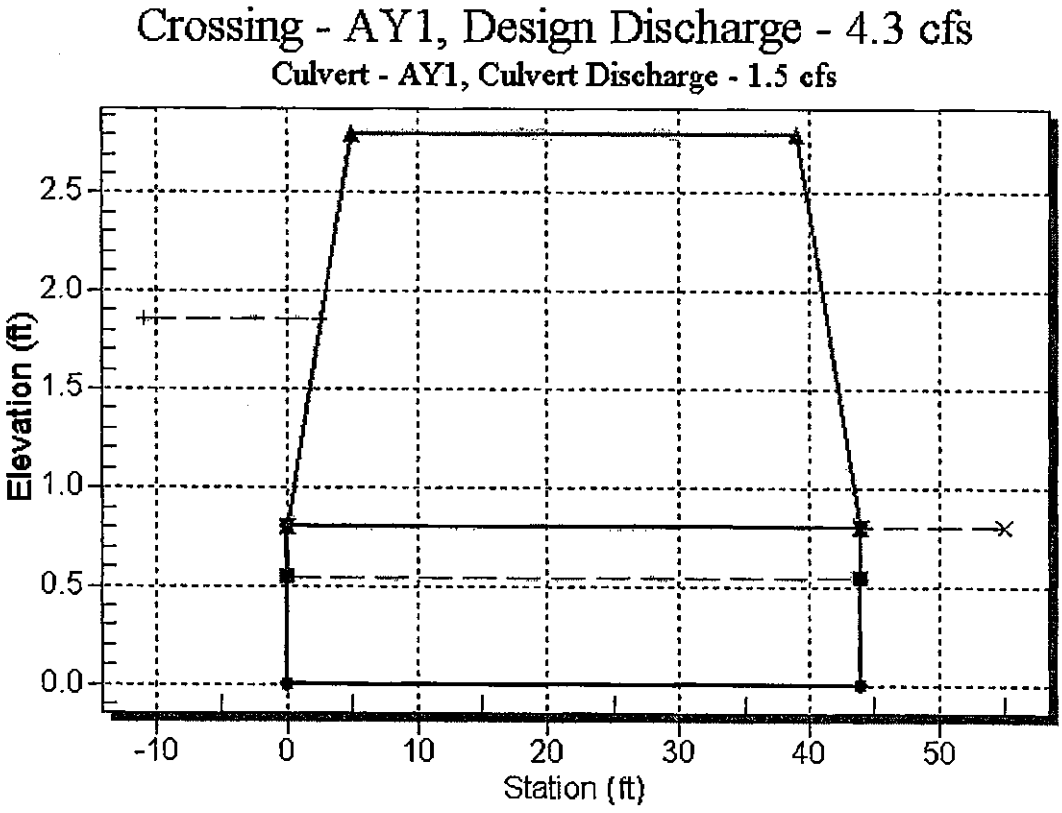
Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: AY1



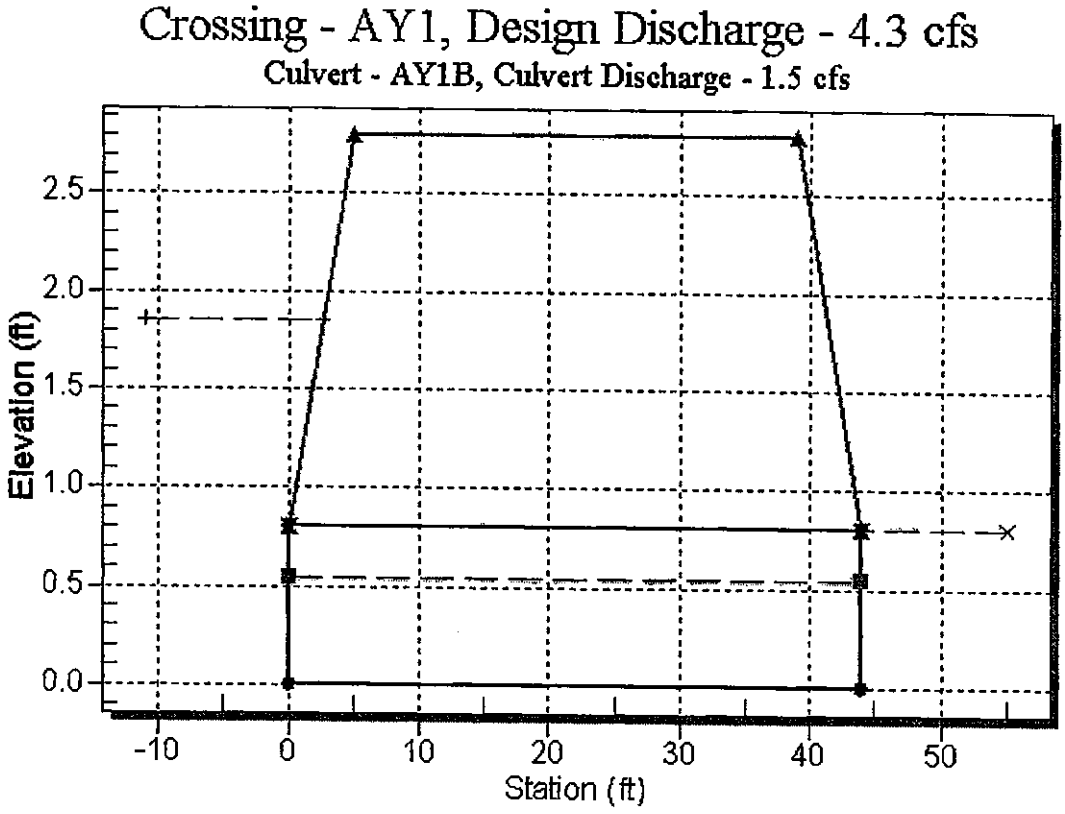
Culvert Data Summary - AY1B

Barrel Shape: Circular
Barrel Diameter: 0.80 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AY1B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 44.00 ft
Outlet Elevation: -0.00 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AY1B



Culvert Data Summary - AY1C

Barrel Shape: Circular
Barrel Diameter: 0.80 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - AY1C

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 44.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: AY1C

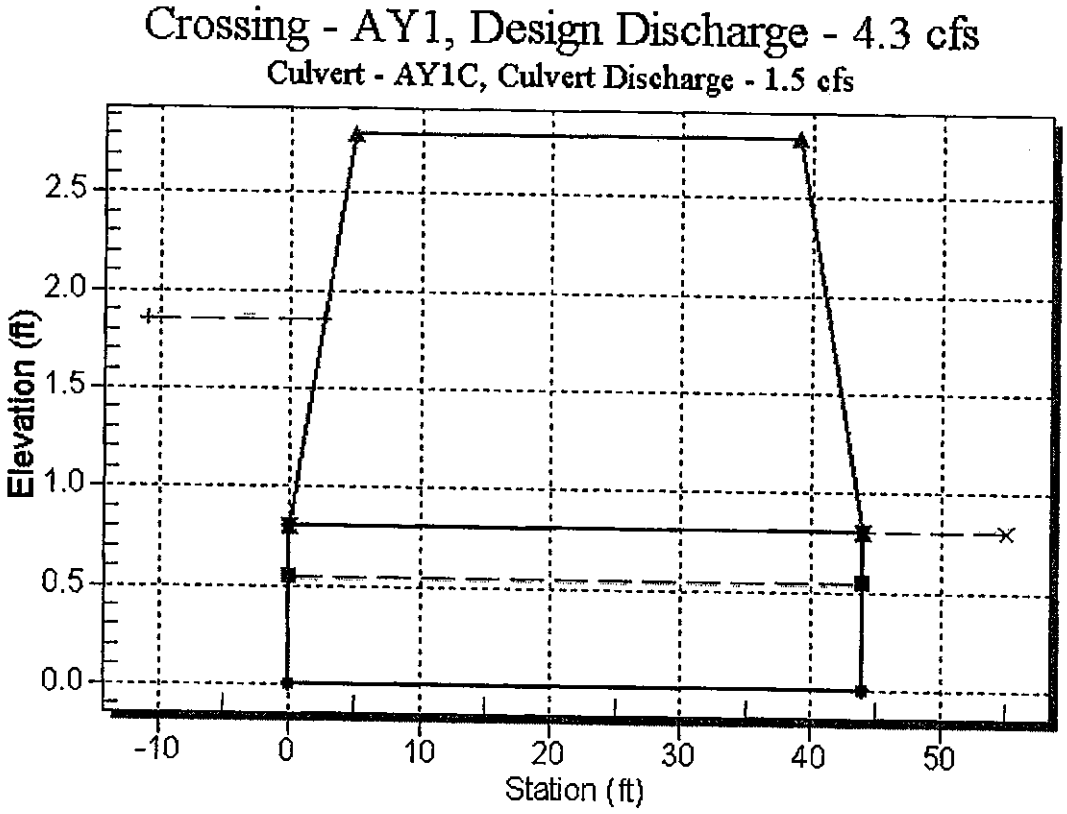


Table 1 - Summary of Culvert Flows at Crossing: AY1

Headwater Elevation (ft)	Total Discharge (cfs)	AY1 Discharge (cfs)	AY1B Discharge (cfs)	AY1C Discharge (cfs)	Roadway Discharge (cfs)	Iterations
0.80	0.00	0.00	0.00	0.00	0.00	0
0.81	0.43	0.15	0.15	0.15	0.00	9
0.84	0.87	0.29	0.29	0.29	0.00	6
0.90	1.30	0.44	0.44	0.44	0.00	5
0.97	1.74	0.58	0.58	0.58	0.00	4
1.07	2.17	0.73	0.73	0.73	0.00	4
1.18	2.61	0.87	0.87	0.87	0.00	4
1.32	3.04	1.02	1.02	1.02	0.00	4
1.48	3.48	1.16	1.16	1.16	0.00	4
1.66	3.91	1.31	1.31	1.31	0.00	4
1.86	4.35 ✓	1.45	1.45	1.45	0.00	4

HY-8 Culvert Analysis Report

Culvert Data Summary - BB7

Barrel Shape: Pipe Arch
Barrel Span: 57.00 in (Upsize to 71" x 47") ✓
Barrel Rise: 38.00 in
Barrel Material: Steel or Aluminum
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Projecting
Inlet Depression: None

Site Data - BB7

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 27.00 ft ✓
Outlet Elevation: -0.28 ft ✓
Number of Barrels: 2 ✓

Water Surface Profile Plot for Culvert: BB7

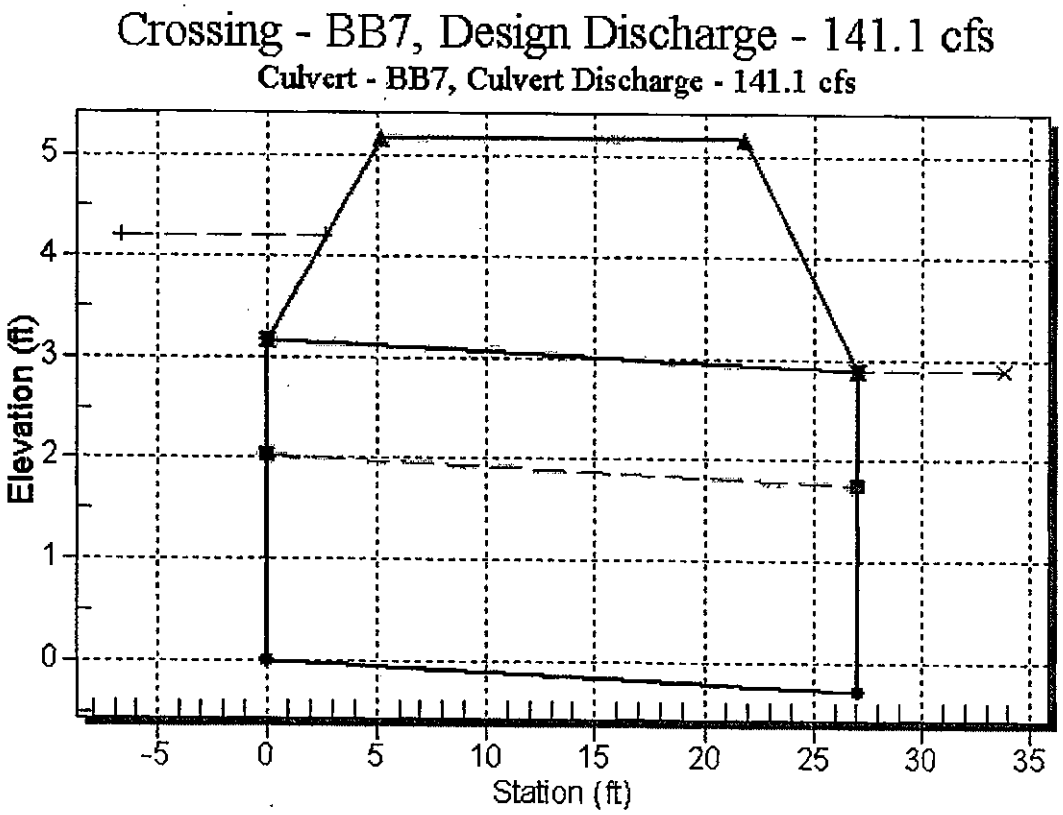


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Table 1 - Summary of Culvert Flows at Crossing: BB7

Headwater Elevation (ft)	Total Discharge (cfs)	BB7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.89	0.00	0.00	0.00	1
2.91	14.11	14.11	0.00	1
2.97	28.23	28.23	0.00	1
3.01	42.34	42.34	0.00	1
3.19	56.45	56.45	0.00	1
3.36	70.56	70.56	0.00	1
3.37	84.68	84.68	0.00	1
3.54	98.79	98.79	0.00	1
3.74	112.90	112.90	0.00	1
3.96	127.02	127.02	0.00	1
4.21	141.13 ✓	141.13	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BG2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BG2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 70.00 ft ✓

Outlet Elevation: -0.70 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: BG2

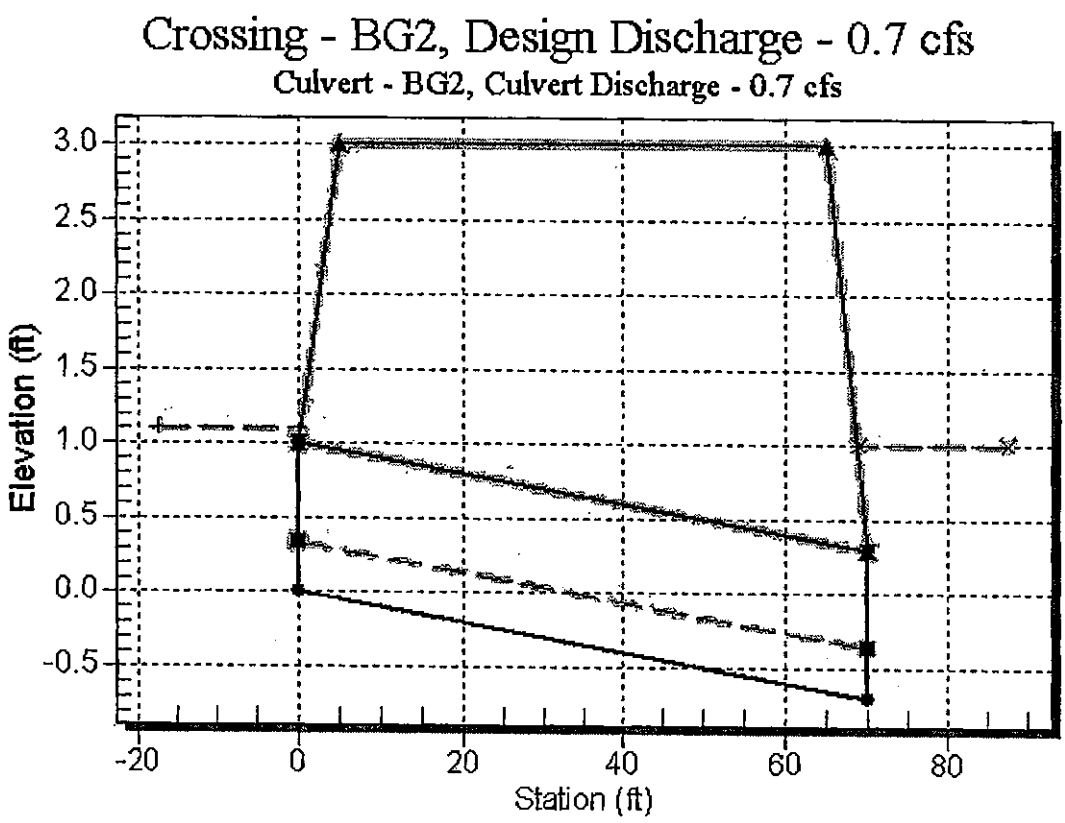

Table 1 - Summary of Culvert Flows at Crossing: BG2

Headwater Elevation (ft)	Total Discharge (cfs)	BG2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.13	0.13	0.00	1
1.01	0.20	0.20	0.00	1
1.02	0.27	0.27	0.00	1
1.03	0.34	0.34	0.00	1
1.04	0.40	0.40	0.00	1
1.05	0.47	0.47	0.00	1
1.07	0.54	0.54	0.00	1
1.09	0.60	0.60	0.00	1
1.11	0.67 ✓	0.67	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BP1

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - BP1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 135.00 ft
Outlet Elevation: -1.35 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: BP1

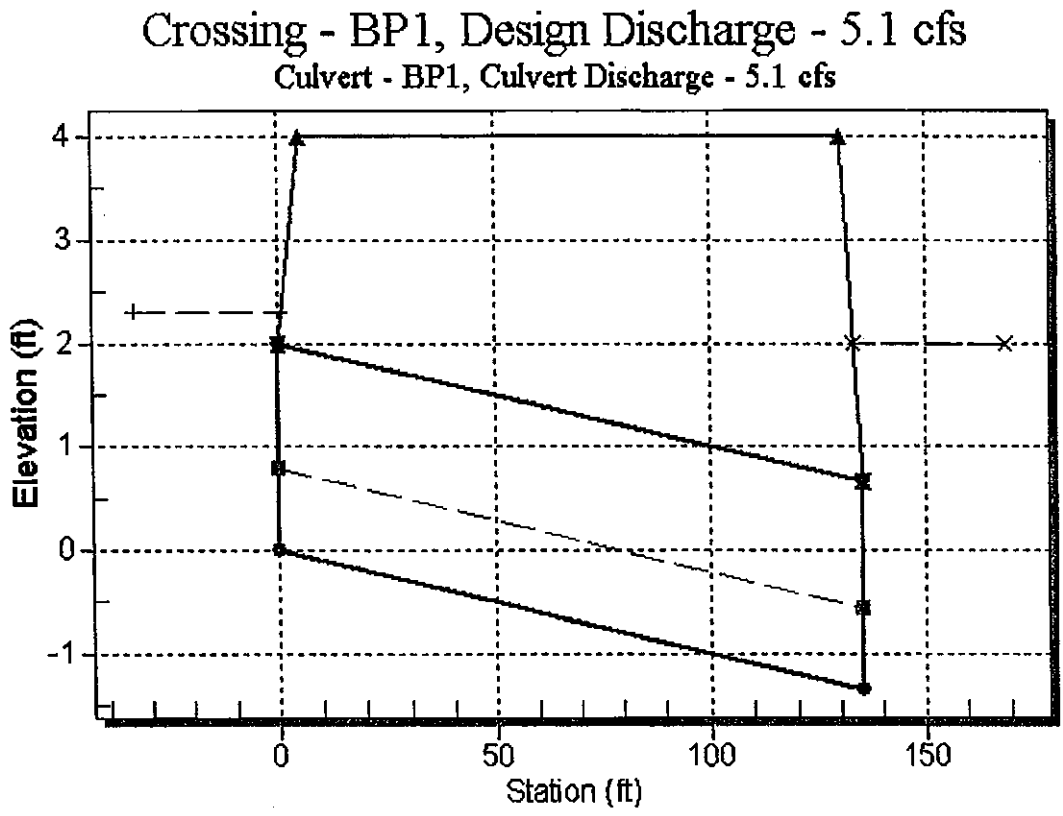

Table 1 - Summary of Culvert Flows at Crossing: BP1

Headwater Elevation (ft)	Total Discharge (cfs)	BP1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.00	0.51	0.51	0.00	1
2.01	1.01	1.01	0.00	1
2.03	1.52	1.52	0.00	1
2.05	2.03	2.03	0.00	1
2.08	2.54	2.54	0.00	1
2.11	3.04	3.04	0.00	1
2.15	3.55	3.55	0.00	1
2.20	4.06	4.06	0.00	1
2.25	4.56	4.56	0.00	1
2.31	5.07	5.07	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BR1

Barrel Shape: Circular
Barrel Diameter: 1.20 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - BR1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 44.00 ft
Outlet Elevation: -0.00 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: BR1

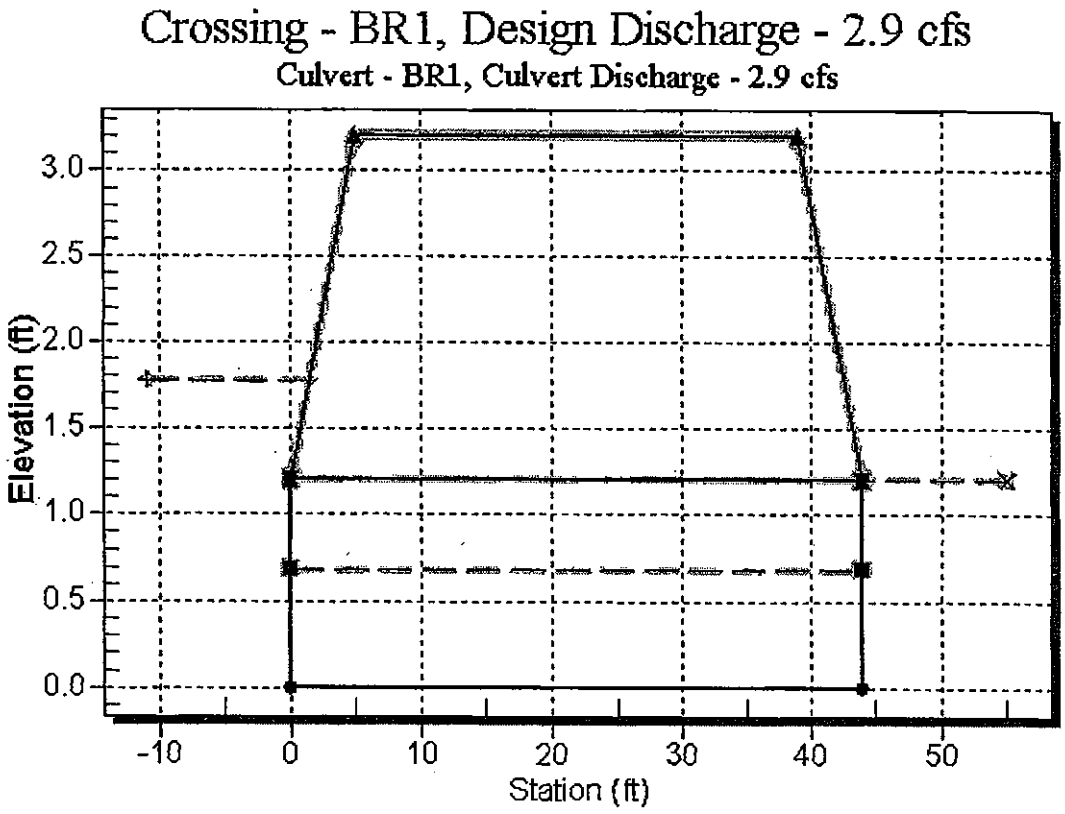

Table 1 - Summary of Culvert Flows at Crossing: BR1

Headwater Elevation (ft)	Total Discharge (cfs)	BR1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.20	0.00	0.00	0.00	1
1.21	0.29	0.29	0.00	1
1.22	0.58	0.58	0.00	1
1.25	0.87	0.87	0.00	1
1.29	1.16	1.16	0.00	1
1.34	1.45	1.45	0.00	1
1.40	1.73	1.73	0.00	1
1.48	2.02	2.02	0.00	1
1.56	2.31	2.31	0.00	1
1.66	2.60	2.60	0.00	1
1.76	2.89 ✓	2.89	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BR2

Barrel Shape: Circular

Barrel Diameter: 1.20 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BR2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: BR2

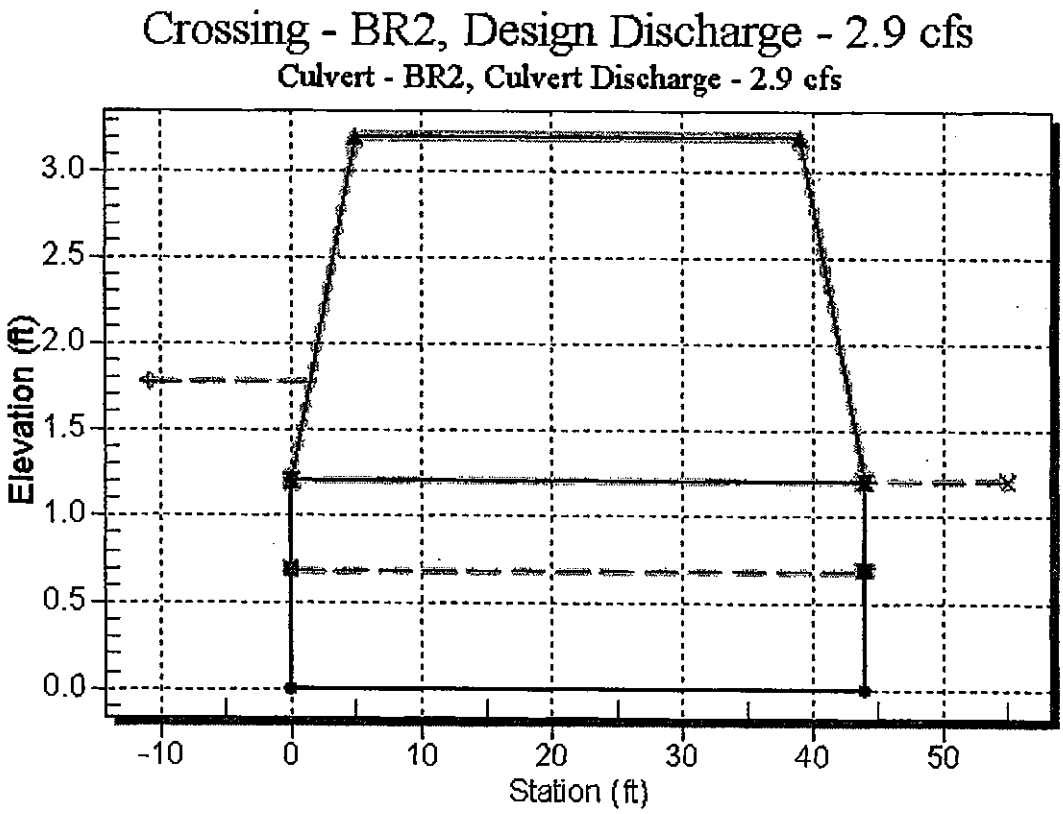

Table 1 - Summary of Culvert Flows at Crossing: BR2

Headwater Elevation (ft)	Total Discharge (cfs)	BR2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.20	0.00	0.00	0.00	1
1.21	0.29	0.29	0.00	1
1.22	0.58	0.58	0.00	1
1.25	0.87	0.87	0.00	1
1.29	1.16	1.16	0.00	1
1.34	1.45	1.45	0.00	1
1.40	1.73	1.73	0.00	1
1.48	2.02	2.02	0.00	1
1.56	2.31	2.31	0.00	1
1.66	2.60	2.60	0.00	1
1.76	2.89 ✓	2.89	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BR3

Barrel Shape: Circular
Barrel Diameter: 1.00 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - BR3

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 44.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: BR3

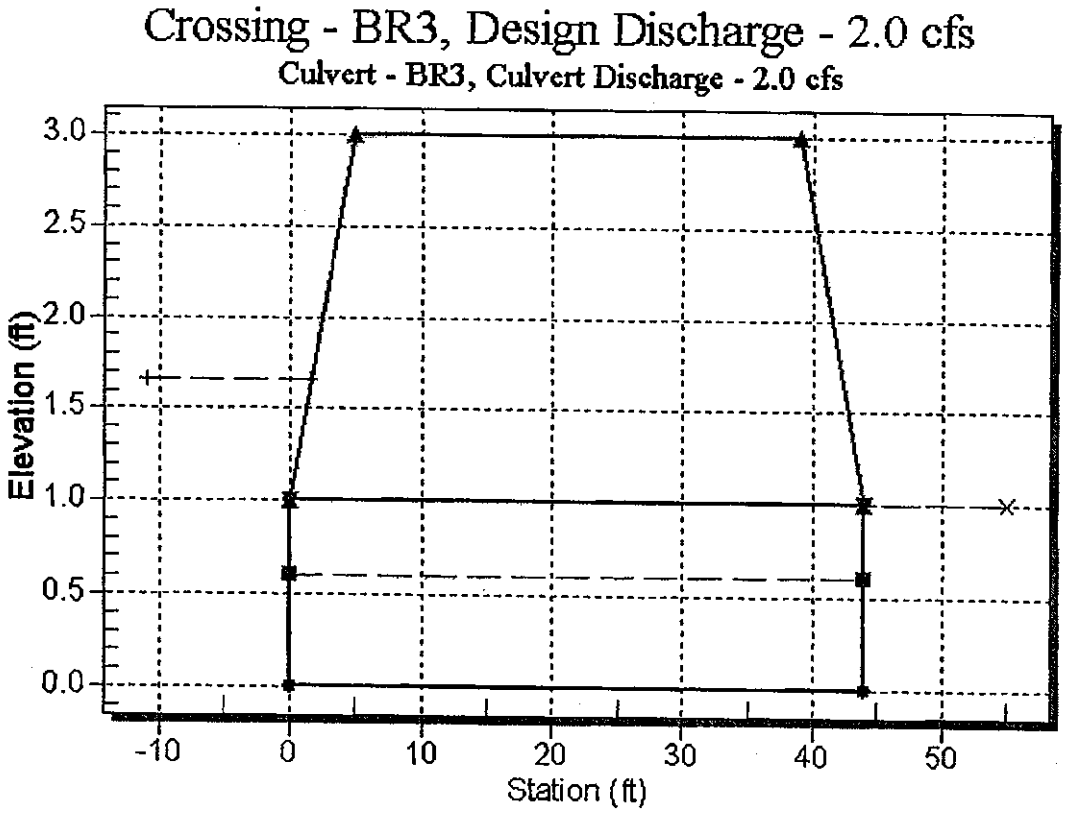

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Table 1 - Summary of Culvert Flows at Crossing: BR3

Headwater Elevation (ft)	Total Discharge (cfs)	BR3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.01	0.20	0.20	0.00	1
1.03	0.40	0.40	0.00	1
1.06	0.60	0.60	0.00	1
1.10	0.80	0.80	0.00	1
1.16	1.00	1.00	0.00	1
1.24	1.19	1.19	0.00	1
1.32	1.39	1.39	0.00	1
1.42	1.59	1.59	0.00	1
1.53	1.79	1.79	0.00	1
1.65	1.99 ✓	1.99	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BS1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BS1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.44 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: BS1

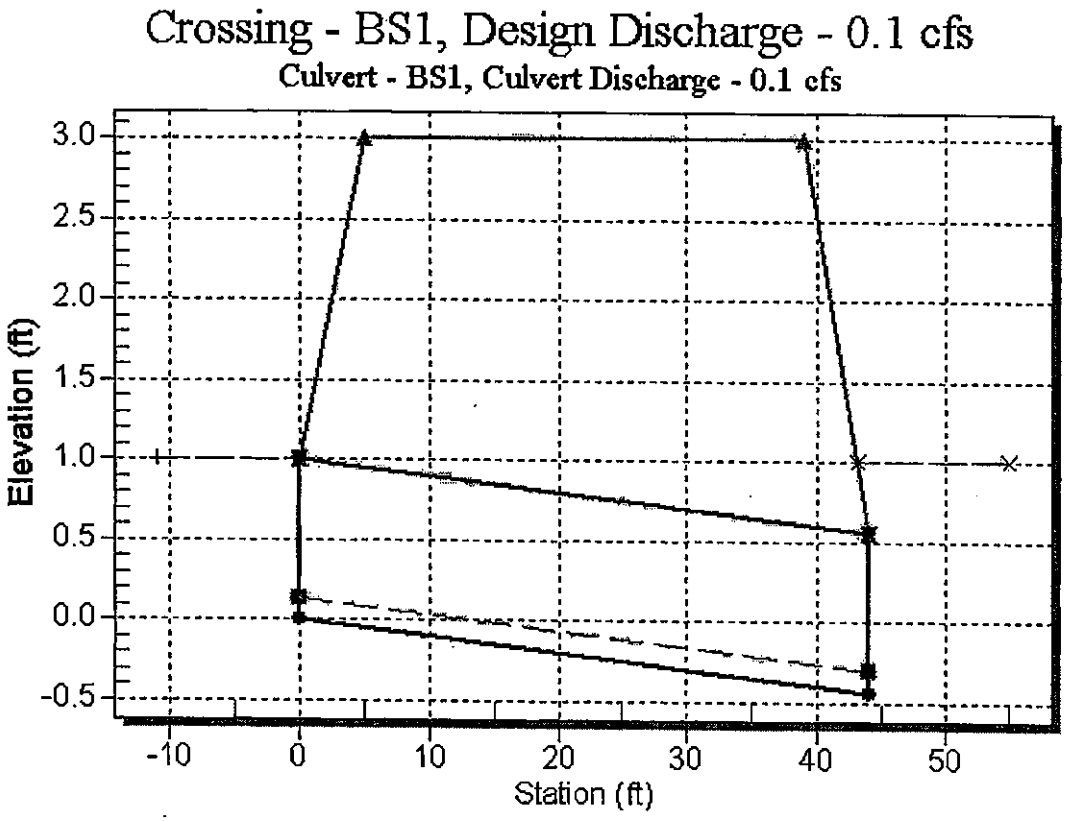


Table 1 - Summary of Culvert Flows at Crossing: BS1

Headwater Elevation (ft)	Total Discharge (cfs)	BS1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.01	0.01	0.00	1
1.00	0.02	0.02	0.00	1
1.00	0.04	0.04	0.00	1
1.00	0.05	0.05	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.08	0.08	0.00	1
1.00	0.10	0.10	0.00	1
1.00	0.11	0.11	0.00	1
1.00	0.12 ✓	0.12	0.00	1

Table 9 - Summary of Culvert Flows at Crossing: BS1A

Headwater Elevation (ft)	Total Discharge (cfs)	BS1A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.01	2.01	2.01	0.00	1
1.04	4.01	4.01	0.00	1
1.09	6.02	6.02	0.00	1
1.15	8.03	8.03	0.00	1
1.22	10.04	10.04	0.00	1
1.31	12.04	12.04	0.00	1
1.39	14.05	14.05	0.00	1
1.49	16.06	16.06	0.00	1
1.60	18.06	18.06	0.00	1
1.72	20.07	20.07	0.00	1

Culvert Data Summary - BS1A

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BS1A

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

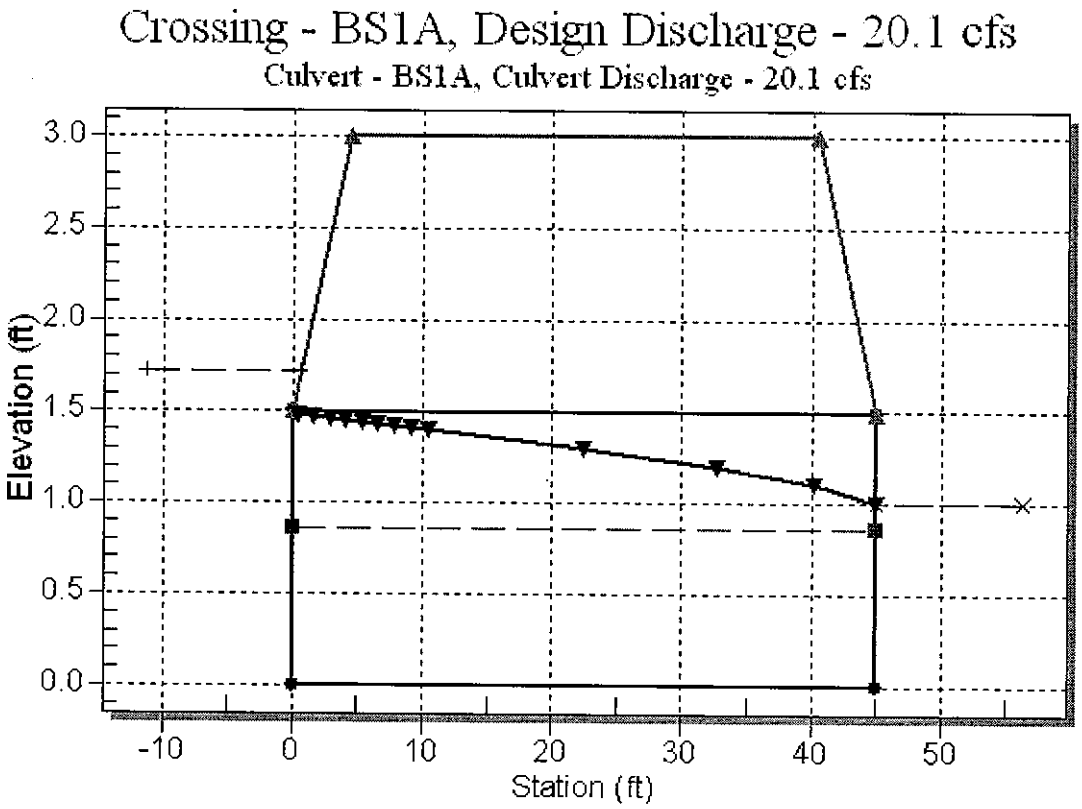
Inlet Elevation: 0.00 ft

Outlet Station: 45.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 4

Water Surface Profile Plot for Culvert: BS1A



HY-8 Culvert Analysis Report

Culvert Data Summary - BY1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BY1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 42.00 ft

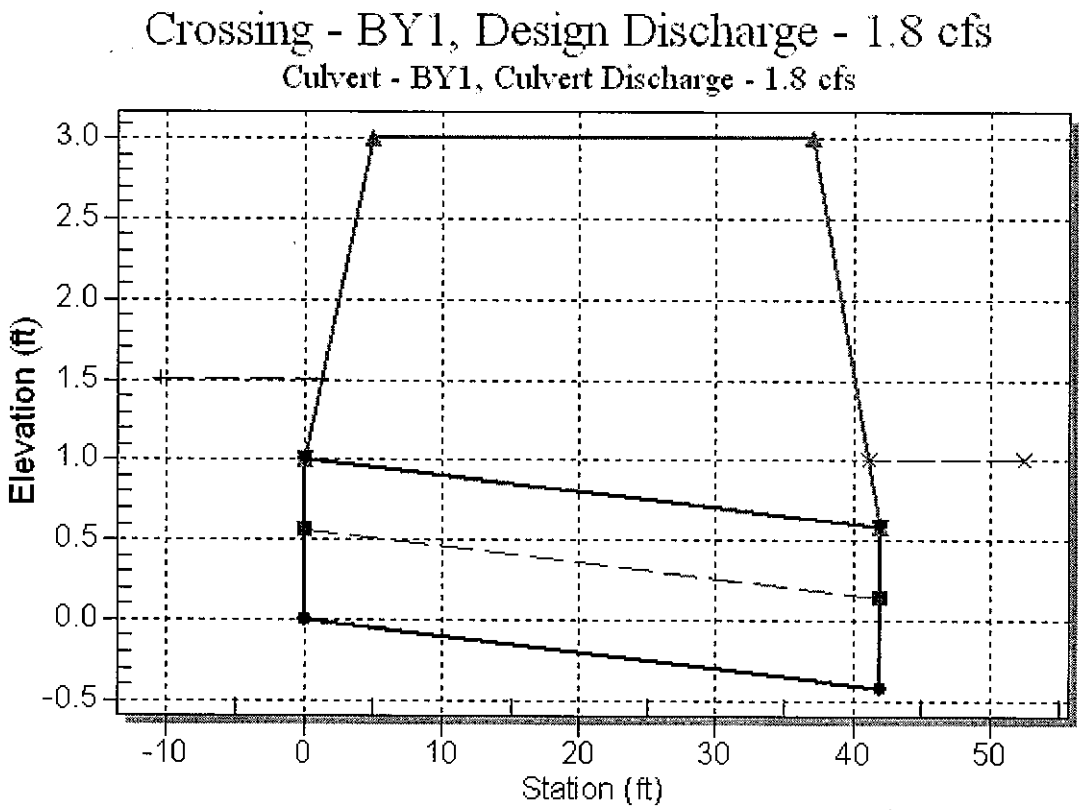
Outlet Elevation: -0.42 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: BY1

Headwater Elevation (ft)	Total Discharge (cfs)	BY1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.18	0.18	0.00	1
1.02	0.35	0.35	0.00	1
1.05	0.53	0.53	0.00	1
1.08	0.71	0.71	0.00	1
1.13	0.89	0.89	0.00	1
1.18	1.06	1.06	0.00	1
1.25	1.24	1.24	0.00	1
1.32	1.42	1.42	0.00	1
1.41	1.59	1.59	0.00	1
1.50	1.77	1.77	0.00	1

Water Surface Profile Plot for Culvert: BY1



HY-8 Culvert Analysis Report

Culvert Data Summary - BY2

Barrel Shape: Circular

Barrel Diameter: 1.60 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BY2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 45.00 ft ✓

Outlet Elevation: -0.54 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: BY2

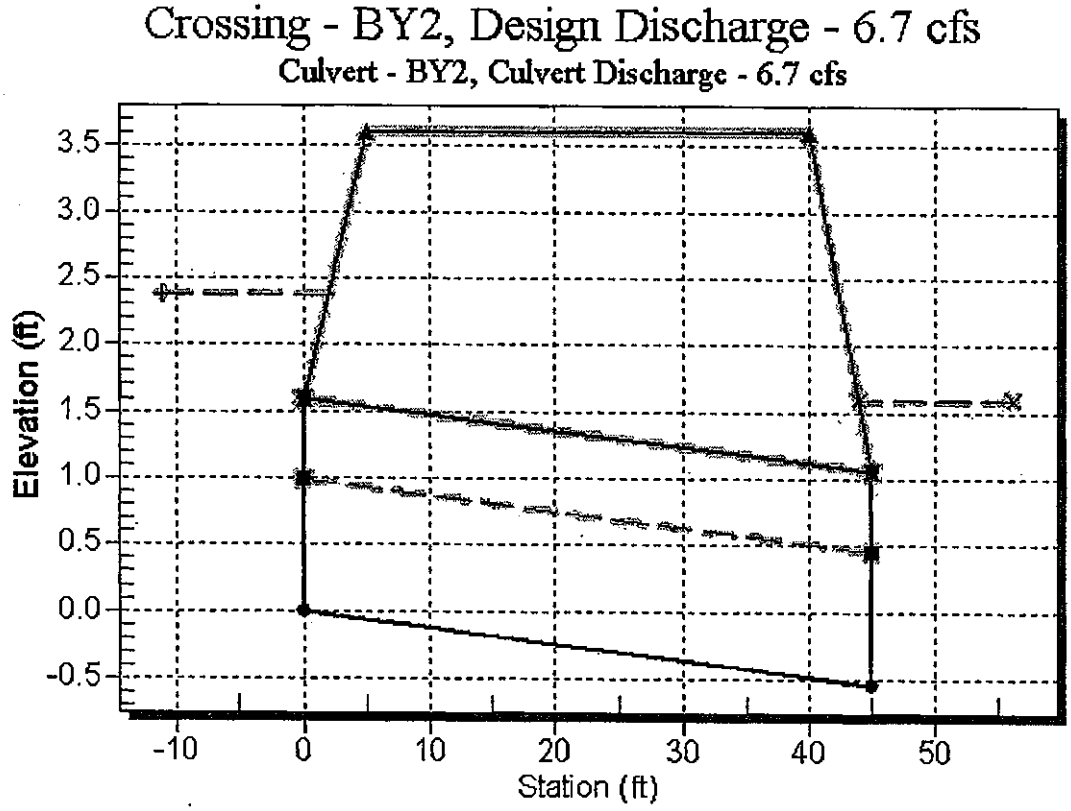


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Table 1 - Summary of Culvert Flows at Crossing: BY2

Headwater Elevation (ft)	Total Discharge (cfs)	BY2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.60	0.00	0.00	0.00	1
1.61	0.67	0.67	0.00	1
1.63	1.35	1.35	0.00	1
1.67	2.02	2.02	0.00	1
1.72	2.69	2.69	0.00	1
1.79	3.37	3.37	0.00	1
1.88	4.04	4.04	0.00	1
1.98	4.71	4.71	0.00	1
2.10	5.38	5.38	0.00	1
2.23	6.06	6.06	0.00	1
2.37	6.73	6.73	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - BZ2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - BZ2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 69.00 ft ✓

Outlet Elevation: -0.69 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: BZ2

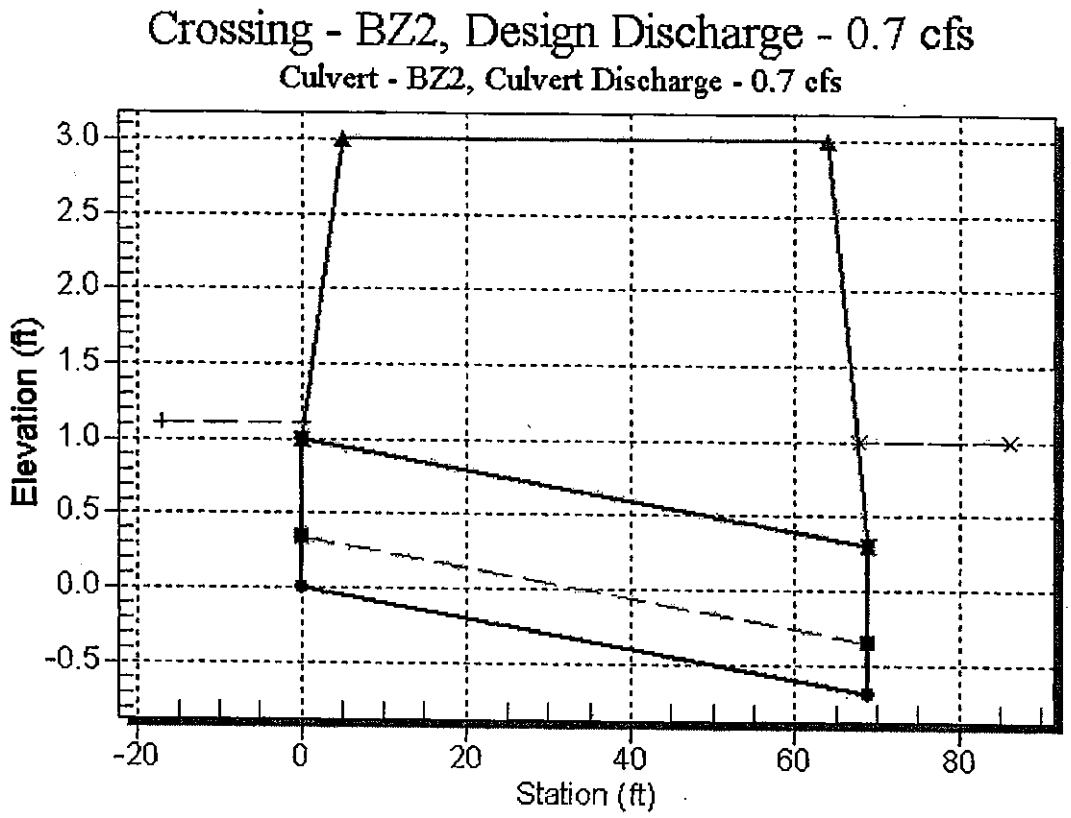


Table 1 - Summary of Culvert Flows at Crossing: BZ2

Headwater Elevation (ft)	Total Discharge (cfs)	BZ2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.14	0.14	0.00	1
1.01	0.20	0.20	0.00	1
1.02	0.27	0.27	0.00	1
1.03	0.34	0.34	0.00	1
1.04	0.41	0.41	0.00	1
1.05	0.48	0.48	0.00	1
1.07	0.54	0.54	0.00	1
1.09	0.61	0.61	0.00	1
1.11	0.68 ✓	0.68	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - CC1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CC1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

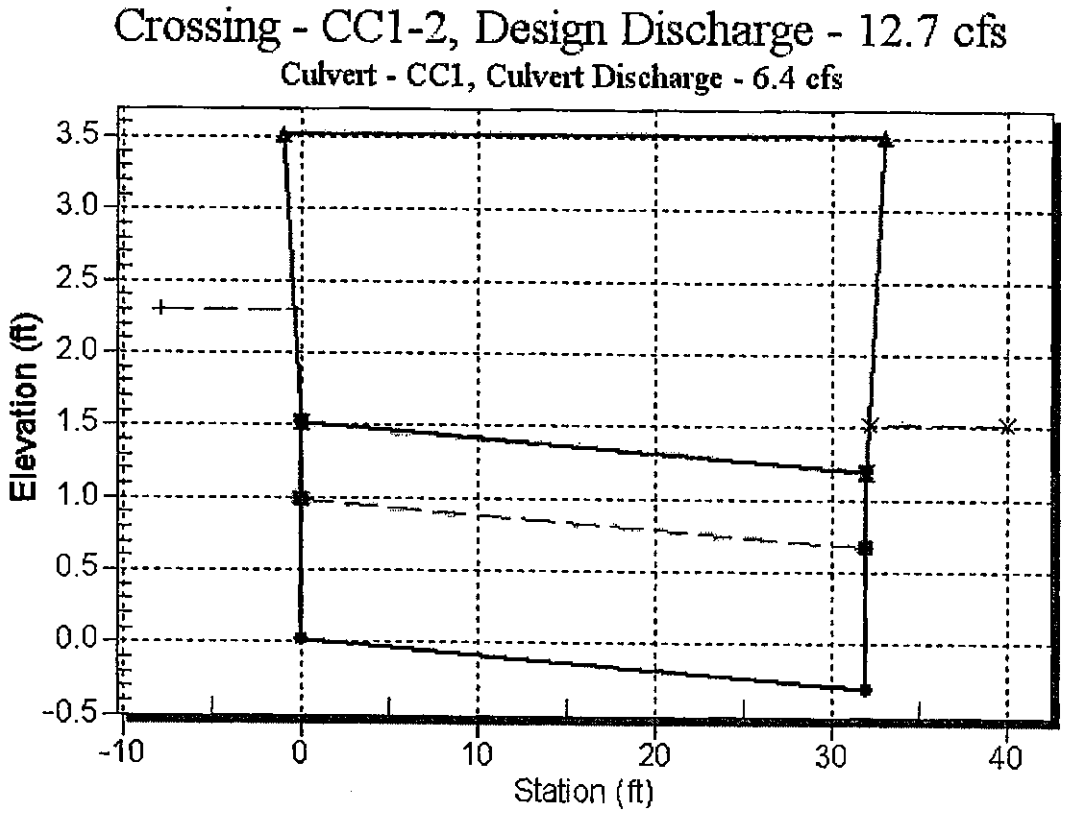
Inlet Elevation: 0.00 ft

Outlet Station: 32.00 ft ✓

Outlet Elevation: -0.32 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CC1



Culvert Data Summary - CC2

Barrel Shape: Circular
Barrel Diameter: 1.50 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - CC2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 34.00 ft ✓
Outlet Elevation: -0.34 ft
Number of Barrels: 1

Water Surface Profile Plot for Culvert: CC2

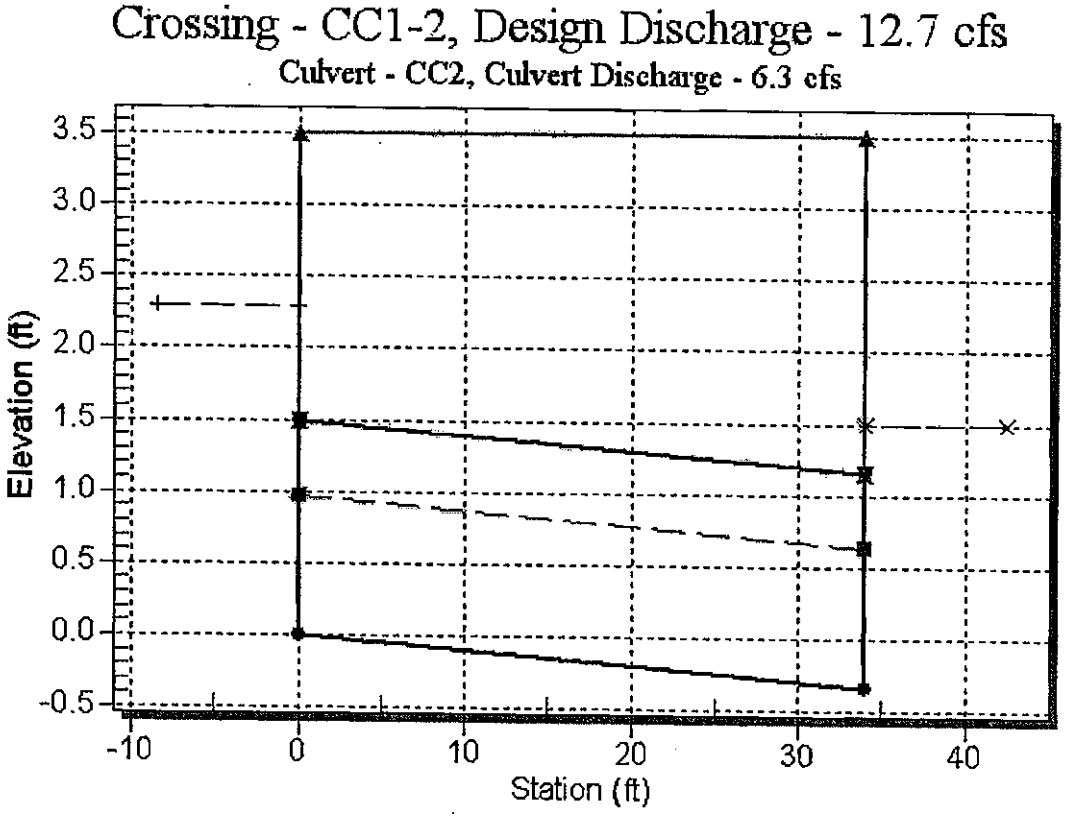


Table 1 - Summary of Culvert Flows at Crossing: CC1-2

Headwater Elevation (ft)	Total Discharge (cfs)	CC1 Discharge (cfs)	CC2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	0.00	0
1.51	1.27	0.65	0.63	0.00	8
1.53	2.54	1.29	1.27	0.00	6
1.57	3.81	1.92	1.89	0.00	5
1.63	5.08	2.56	2.53	0.00	4
1.70	6.34	3.20	3.15	0.00	4
1.78	7.61	3.84	3.78	0.00	4
1.89	8.88	4.48	4.41	0.00	4
2.01	10.15	5.11	5.04	0.00	4
2.14	11.42	5.76	5.67	0.00	4
2.29	12.69 ✓	6.40 ✓	6.30 ✓	0.00	4

HY-8 Culvert Analysis Report

Culvert Data Summary - CH1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CH1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft

Outlet Elevation: -0.44 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CH1

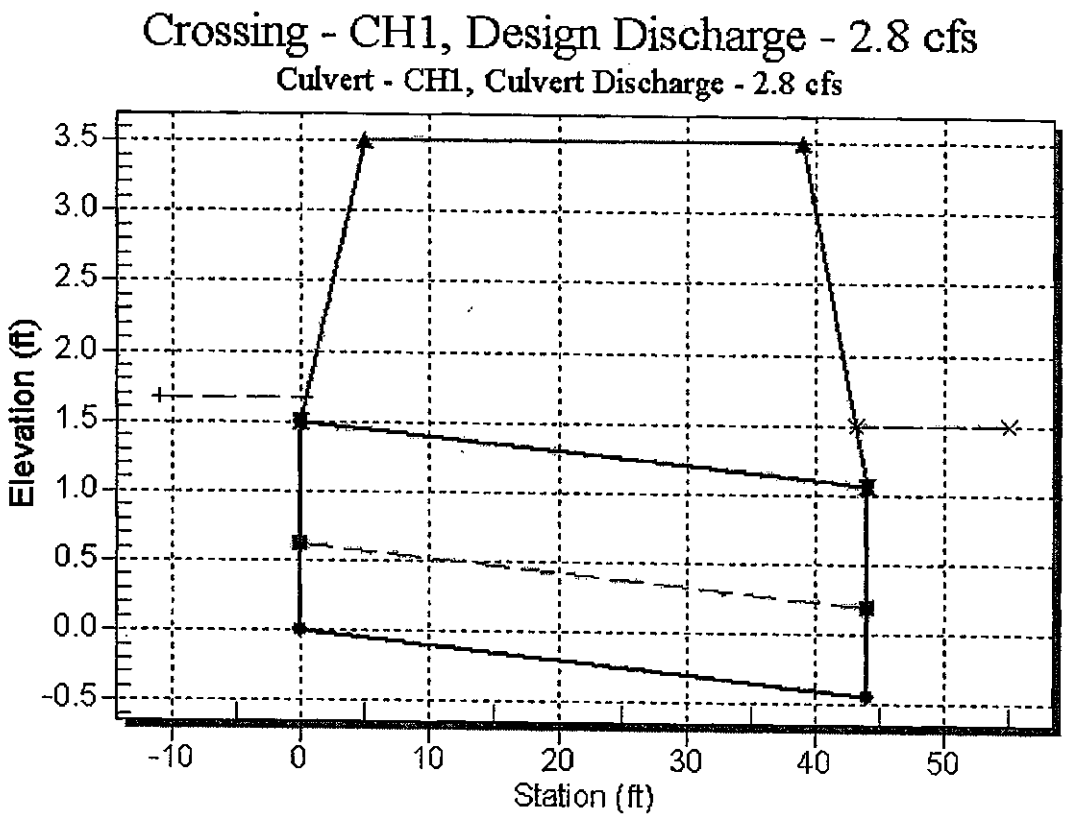


Table 1 - Summary of Culvert Flows at Crossing: CH1

Headwater Elevation (ft)	Total Discharge (cfs)	CH1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	1
1.50	0.28	0.28	0.00	1
1.51	0.55	0.55	0.00	1
1.52	0.83	0.83	0.00	1
1.53	1.10	1.10	0.00	1
1.54	1.38	1.38	0.00	1
1.56	1.66	1.66	0.00	1
1.59	1.93	1.93	0.00	1
1.61	2.21	2.21	0.00	1
1.64	2.48	2.48	0.00	1
1.67	2.76 ✓	2.76	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - CH1A

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: Yes

Site Data - CH1A

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2.00 ft

Outlet Station: 190.00 ft

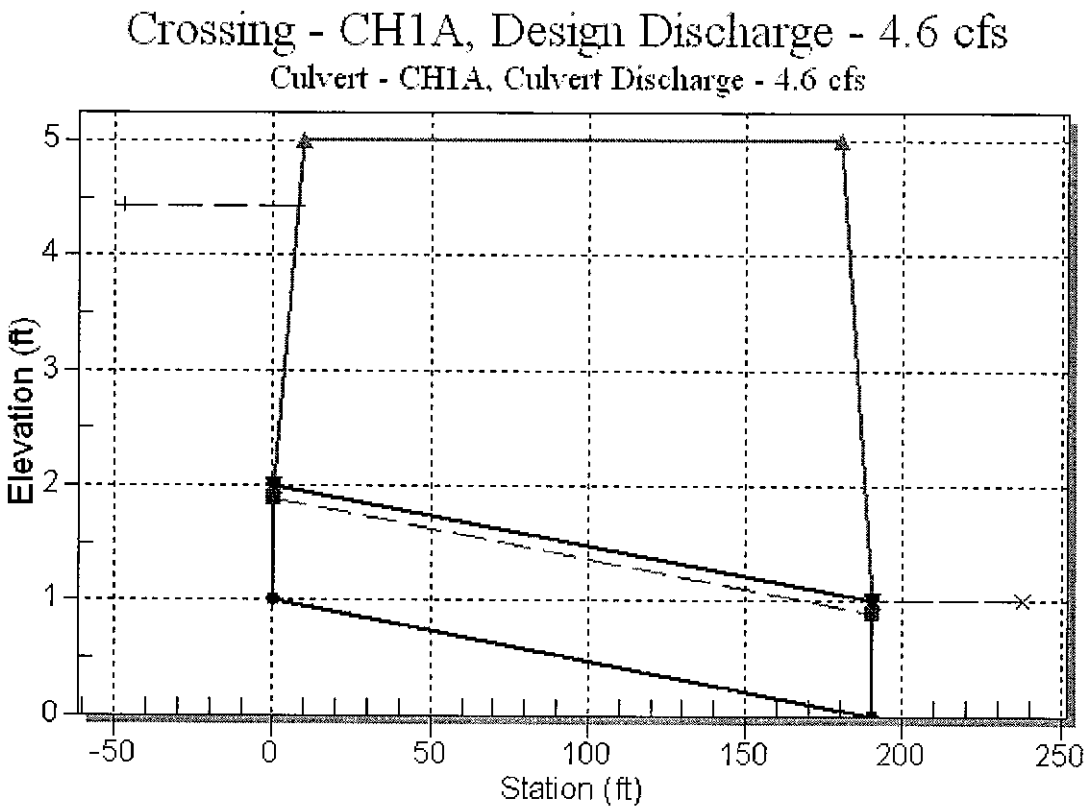
Outlet Elevation: 0.00 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: CH1A

Headwater Elevation (ft)	Total Discharge (cfs)	CH1A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.01	0.00	0.00	0.00	1
1.00	0.46	0.46	0.00	1
1.00	0.91	0.91	0.00	1
1.00	1.37	1.37	0.00	1
1.92	1.82	1.82	0.00	1
2.05	2.28	2.28	0.00	1
2.23	2.74	2.74	0.00	1
2.68	3.19	3.19	0.00	1
3.19	3.65	3.65	0.00	1
3.77	4.10	4.10	0.00	1
4.42	4.56	4.56	0.00	1

Water Surface Profile Plot for Culvert: CH1A



HY-8 Culvert Analysis Report

Culvert Data Summary - CH2

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - CH2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 47.00 ft
Outlet Elevation: -0.59 ft
Number of Barrels: 3

Water Surface Profile Plot for Culvert: CH2

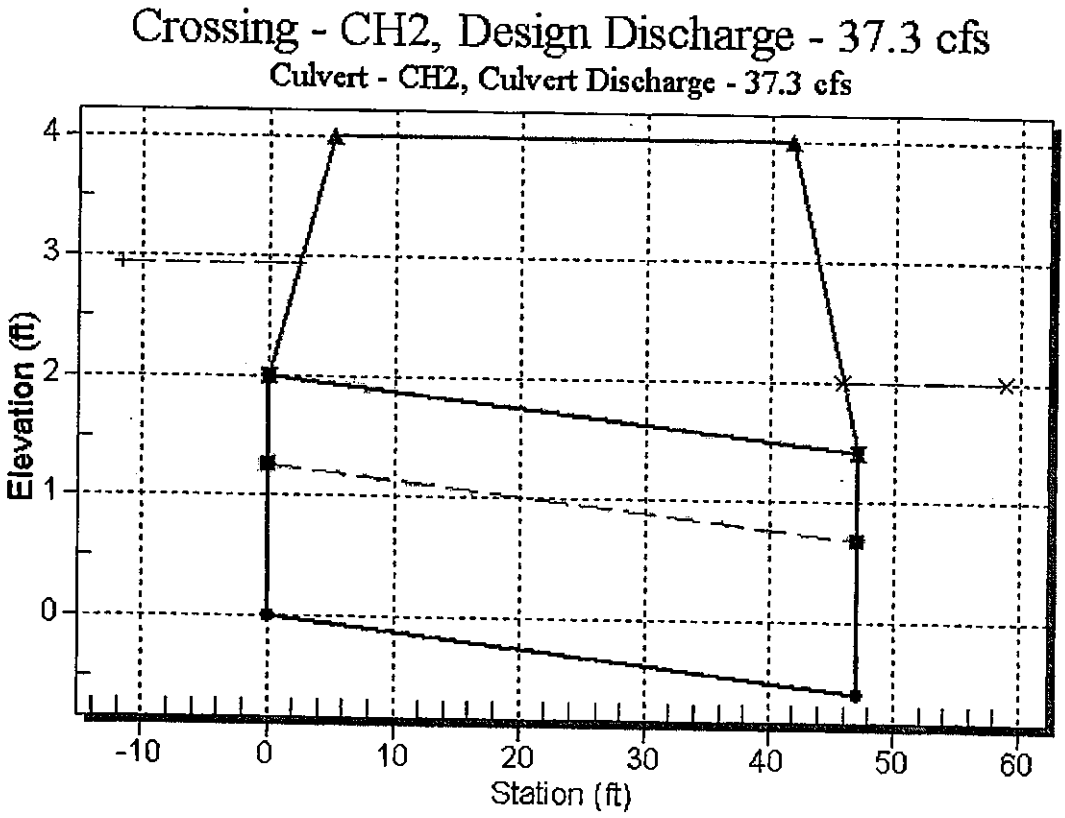


Table 1 - Summary of Culvert Flows at Crossing: CH2

Headwater Elevation (ft)	Total Discharge (cfs)	CH2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.01	3.73	3.73	0.00	1
2.04	7.46	7.46	0.00	1
2.08	11.19	11.19	0.00	1
2.15	14.92	14.92	0.00	1
2.24	18.65	18.65	0.00	1
2.34	22.37	22.37	0.00	1
2.46	26.10	26.10	0.00	1
2.60	29.83	29.83	0.00	1
2.76	33.56	33.56	0.00	1
2.94	37.29	37.29	0.00	1

Table 12 - Summary of Culvert Flows at Crossing: CH3

Headwater Elevation (ft)	Total Discharge (cfs)	CH3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.20	0.20	0.00	1
1.00	0.40	0.40	0.00	1
1.01	0.60	0.60	0.00	1
1.01	0.80	0.80	0.00	1
1.02	1.00	1.00	0.00	1
1.03	1.21	1.21	0.00	1
1.04	1.41	1.41	0.00	1
1.05	1.61	1.61	0.00	1
1.07	1.81	1.81	0.00	1
1.08	2.01	2.01	0.00	1

Culvert Data Summary - CH3

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CH3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

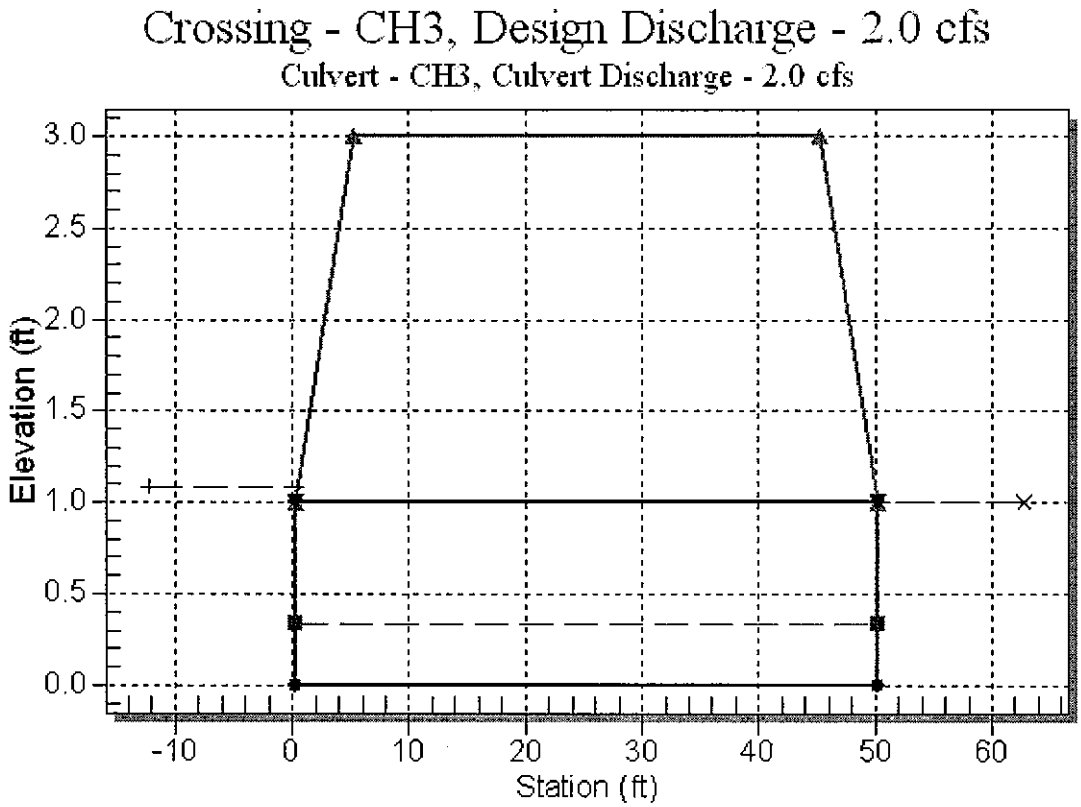
Inlet Elevation: 0.00 ft

Outlet Station: 50.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 3

Water Surface Profile Plot for Culvert: CH3



HY-8 Culvert Analysis Report

Culvert Data Summary - CL1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CL1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

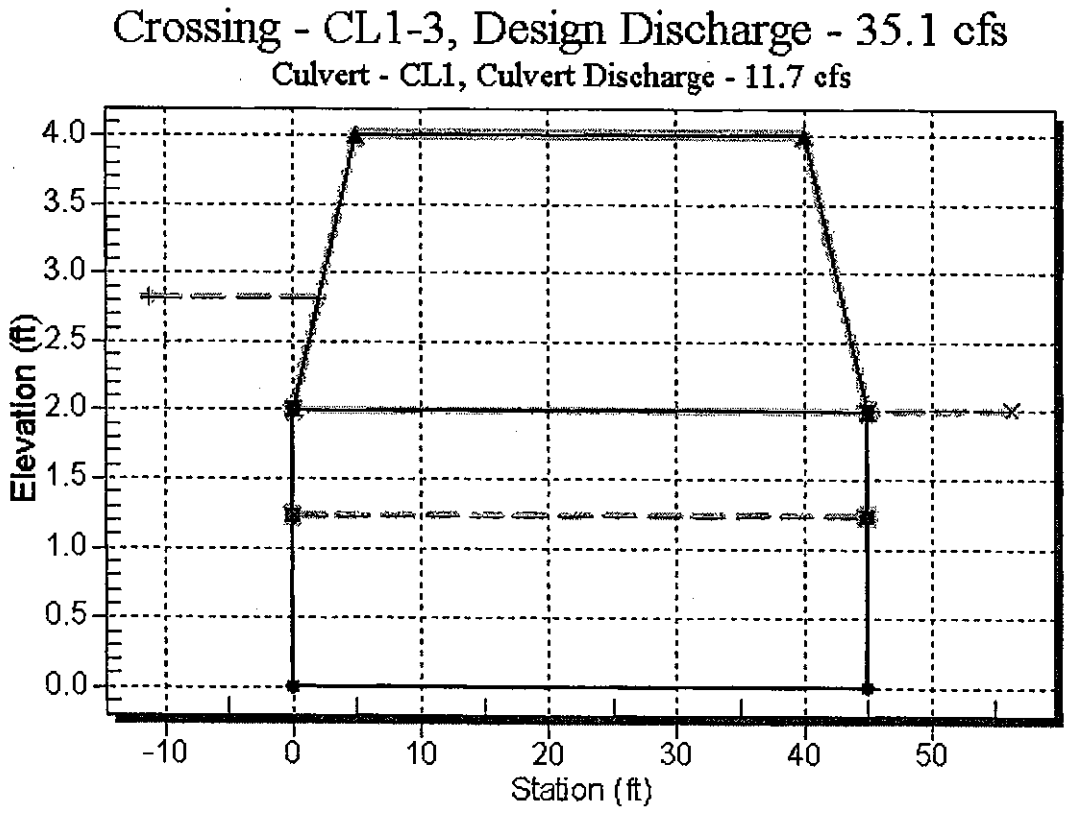
Inlet Elevation: 0.00 ft

Outlet Station: 45.00 ft ✓

Outlet Elevation: -0.00 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CL1



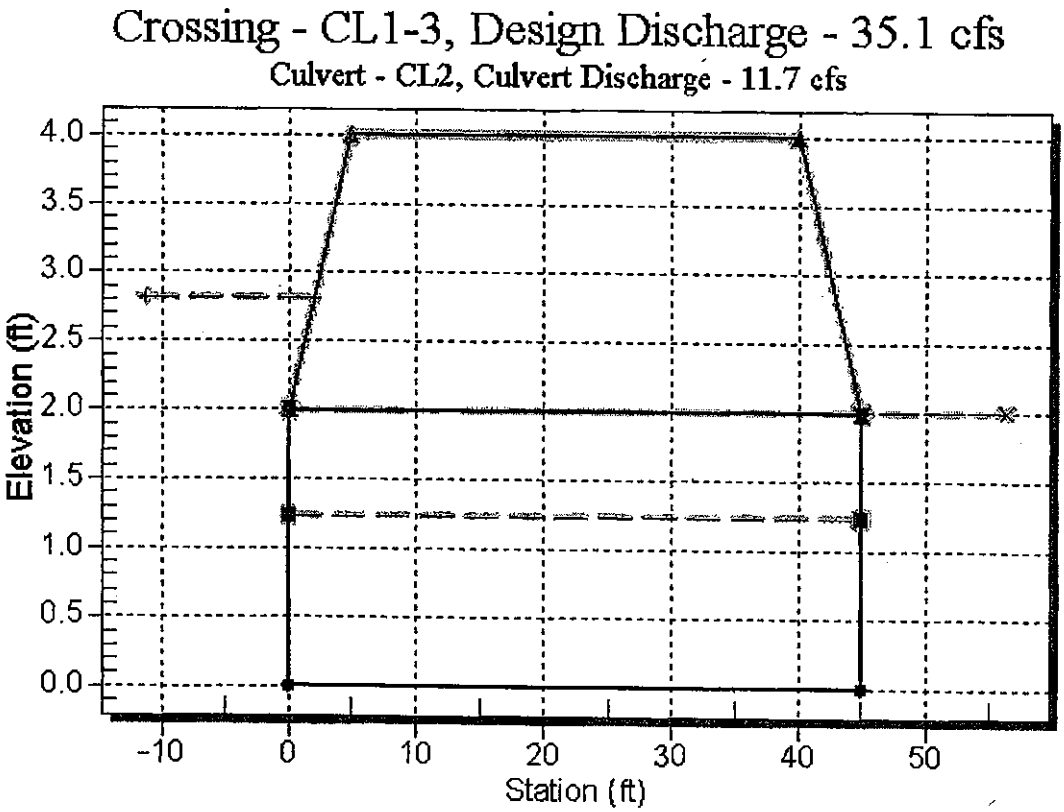
Culvert Data Summary - CL2

Barrel Shape: Circular
Barrel Diameter: 2.00 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - CL2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 45.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: CL2



Culvert Data Summary - CL3

Barrel Shape: Circular
Barrel Diameter: 2.00 ft ✓
Barrel Material: Corrugated Steel
Barrel Manning's n: 0.0240
Inlet Type: Conventional
Inlet Edge Condition: Thin Edge Projecting
Inlet Depression: None

Site Data - CL3

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 0.00 ft
Outlet Station: 45.00 ft ✓
Outlet Elevation: -0.00 ft ✓
Number of Barrels: 1

Water Surface Profile Plot for Culvert: CL3

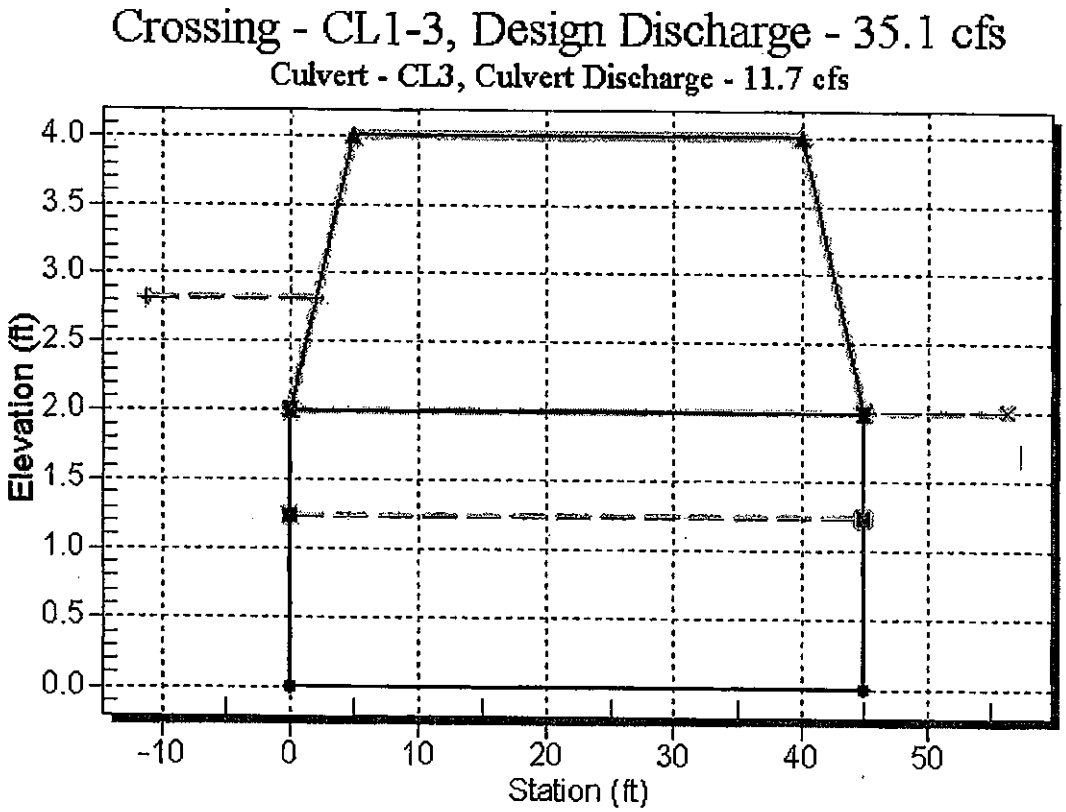


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Table 1 - Summary of Culvert Flows at Crossing: CL1-3

Headwater Elevation (ft)	Total Discharge (cfs)	CL1 Discharge (cfs)	CL2 Discharge (cfs)	CL3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	0.00	0.00	0
2.01	3.51	1.18	1.18	1.18	0.00	8
2.03	7.03	2.36	2.36	2.36	0.00	5
2.07	10.54	3.53	3.53	3.53	0.00	5
2.13	14.05	4.70	4.70	4.70	0.00	4
2.21	17.57	5.86	5.86	5.86	0.00	4
2.30	21.08	7.04	7.04	7.04	0.00	4
2.40	24.59	8.20	8.20	8.20	0.00	4
2.52	28.10	9.38	9.38	9.38	0.00	4
2.66	31.62	10.54	10.54	10.54	0.00	4
2.82	35.13 ✓	11.71	11.71	11.71	0.00	4

HY-8 Culvert Analysis Report

Culvert Data Summary - CN3

Barrel Shape: Circular

Barrel Diameter: 3.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CN3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.44 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CN3

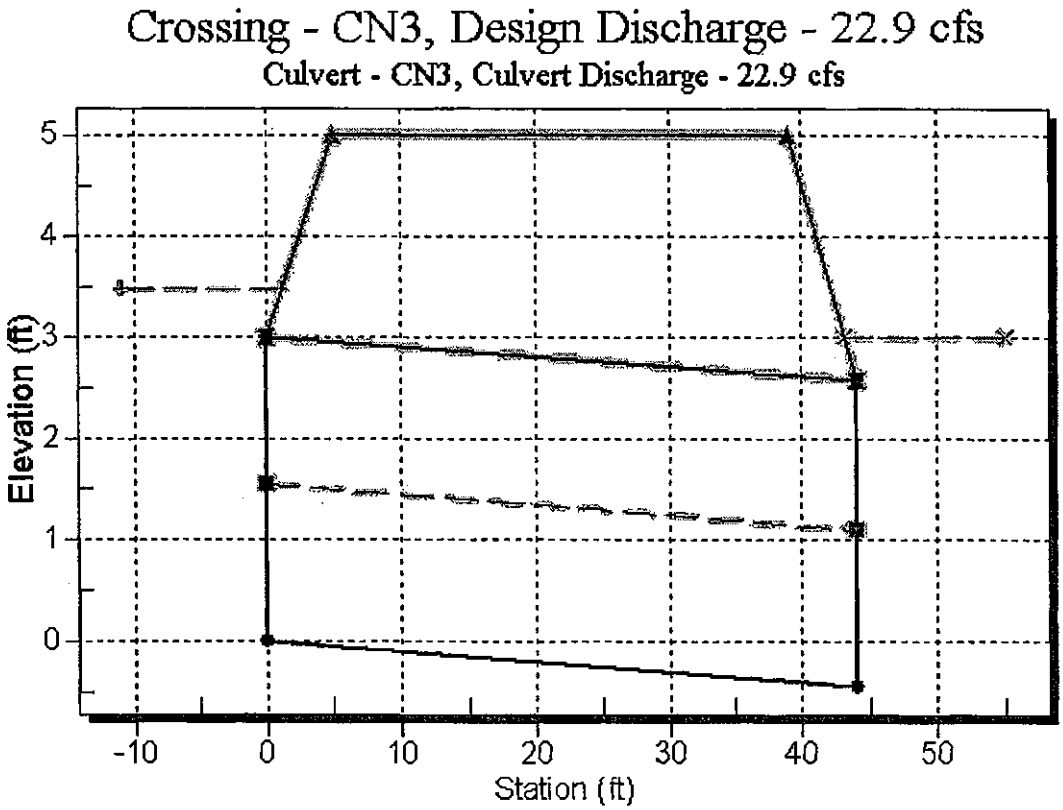


Table 1 - Summary of Culvert Flows at Crossing: CN3

Headwater Elevation (ft)	Total Discharge (cfs)	CN3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3.00	0.00	0.00	0.00	1
3.00	2.29	2.29	0.00	1
3.02	4.58	4.58	0.00	1
3.04	6.86	6.86	0.00	1
3.08	9.15	9.15	0.00	1
3.12	11.44	11.44	0.00	1
3.17	13.73	13.73	0.00	1
3.24	16.02	16.02	0.00	1
3.31	18.30	18.30	0.00	1
3.39	20.59	20.59	0.00	1
3.48	22.88 ✓	22.88	0.00	1

Table 13 - Summary of Culvert Flows at Crossing: CR1

Headwater Elevation (ft)	Total Discharge (cfs)	CR1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.50	0.00	0.00	0.00	1
2.66	2.03	2.03	0.00	1
2.95	4.05	4.05	0.00	1
3.18	6.08	6.08	0.00	1
3.39	8.11	8.11	0.00	1
3.59	10.14	10.14	0.00	1
3.78	12.16	12.16	0.00	1
3.96	14.19	14.19	0.00	1
4.14	16.22	16.22	0.00	1
4.33	18.24	18.24	0.00	1
4.52	20.27	20.27	0.00	1

Culvert Data Summary - CR1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CR1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

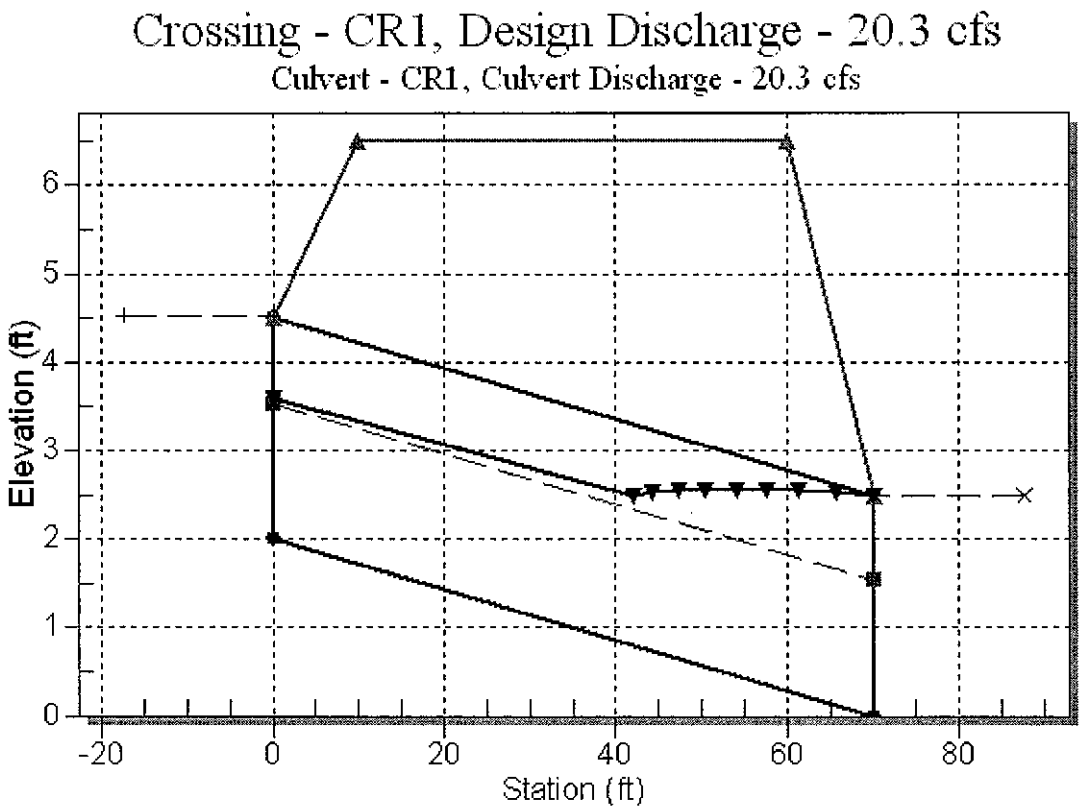
Inlet Elevation: 2.00 ft

Outlet Station: 70.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CR1



HY-8 Culvert Analysis Report

Culvert Data Summary - CT1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CT1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 104.00 ft ✓

Outlet Elevation: -1.04 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CT1

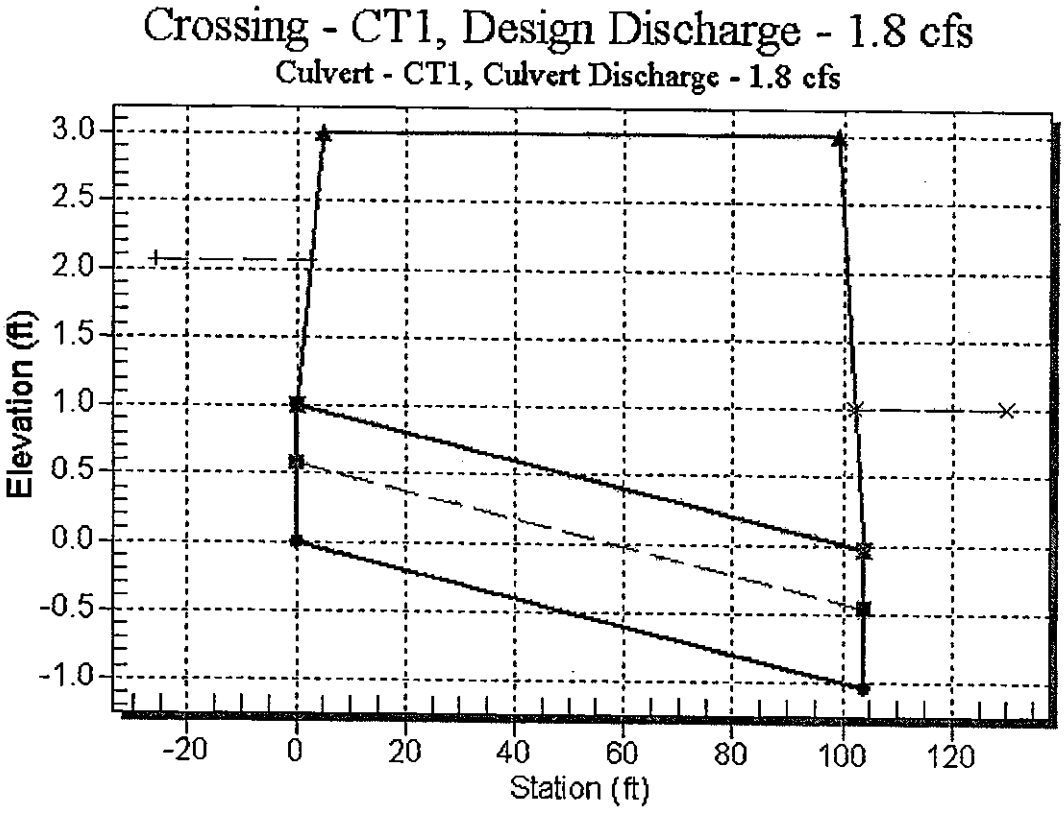


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Table 1 - Summary of Culvert Flows at Crossing: CT1

Headwater Elevation (ft)	Total Discharge (cfs)	CT1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.01	0.18	0.18	0.00	1
1.04	0.36	0.36	0.00	1
1.10	0.54	0.54	0.00	1
1.17	0.72	0.72	0.00	1
1.27	0.91	0.91	0.00	1
1.38	1.09	1.09	0.00	1
1.52	1.27	1.27	0.00	1
1.68	1.45	1.45	0.00	1
1.86	1.63	1.63	0.00	1
2.07	1.81 ✓	1.81	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - CT2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CT2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 83.00 ft

Outlet Elevation: -0.83 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CT2

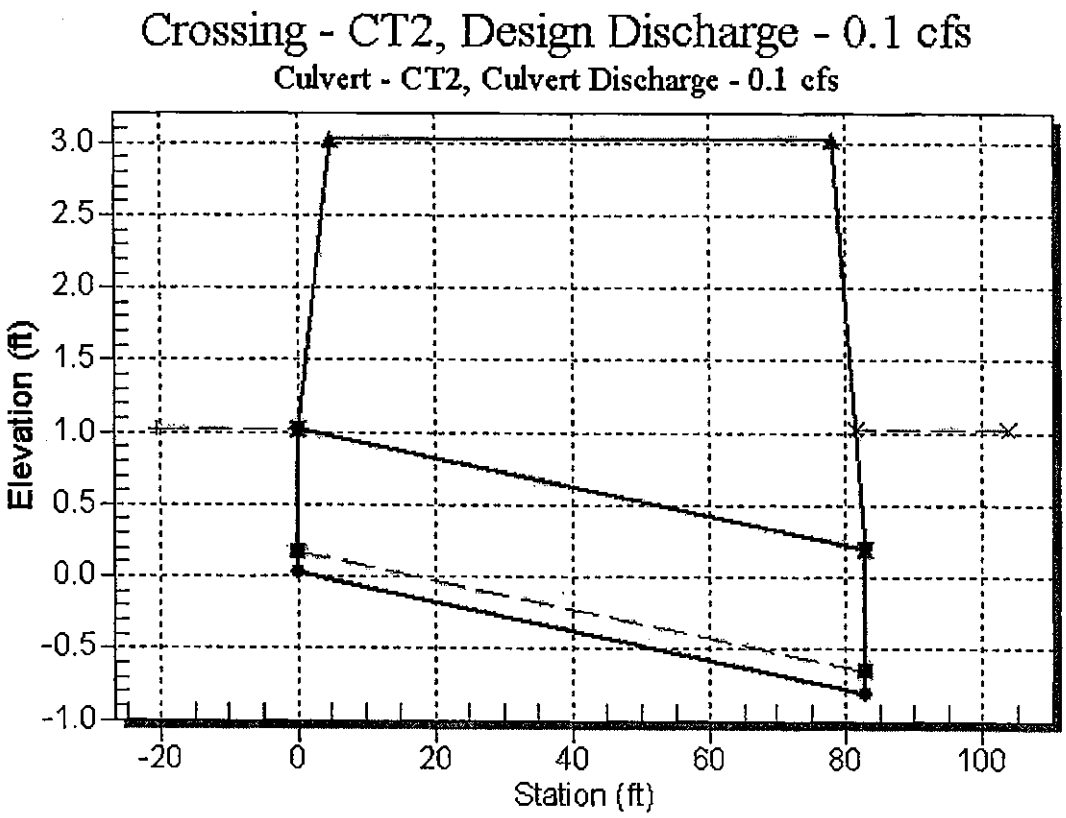


Table 1 - Summary of Culvert Flows at Crossing: CT2

Headwater Elevation (ft)	Total Discharge (cfs)	CT2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.01	0.01	0.00	1
1.00	0.03	0.03	0.00	1
1.00	0.04	0.04	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.09	0.09	0.00	1
1.00	0.11	0.11	0.00	1
1.00	0.12	0.12	0.00	1
1.00	0.14	0.14	0.00	1
1.01	0.15	0.15	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - CT3

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CT3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 49.00 ft

Outlet Elevation: -0.49 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: CT3

Headwater Elevation (ft)	Total Discharge (cfs)	CT3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.01	0.01	0.00	1
1.00	0.02	0.02	0.00	1
1.00	0.04	0.04	0.00	1
1.00	0.05	0.05	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.08	0.08	0.00	1
1.00	0.10	0.10	0.00	1
1.00	0.11	0.11	0.00	1
1.00	0.12	0.12	0.00	1

Water Surface Profile Plot for Culvert: CT3

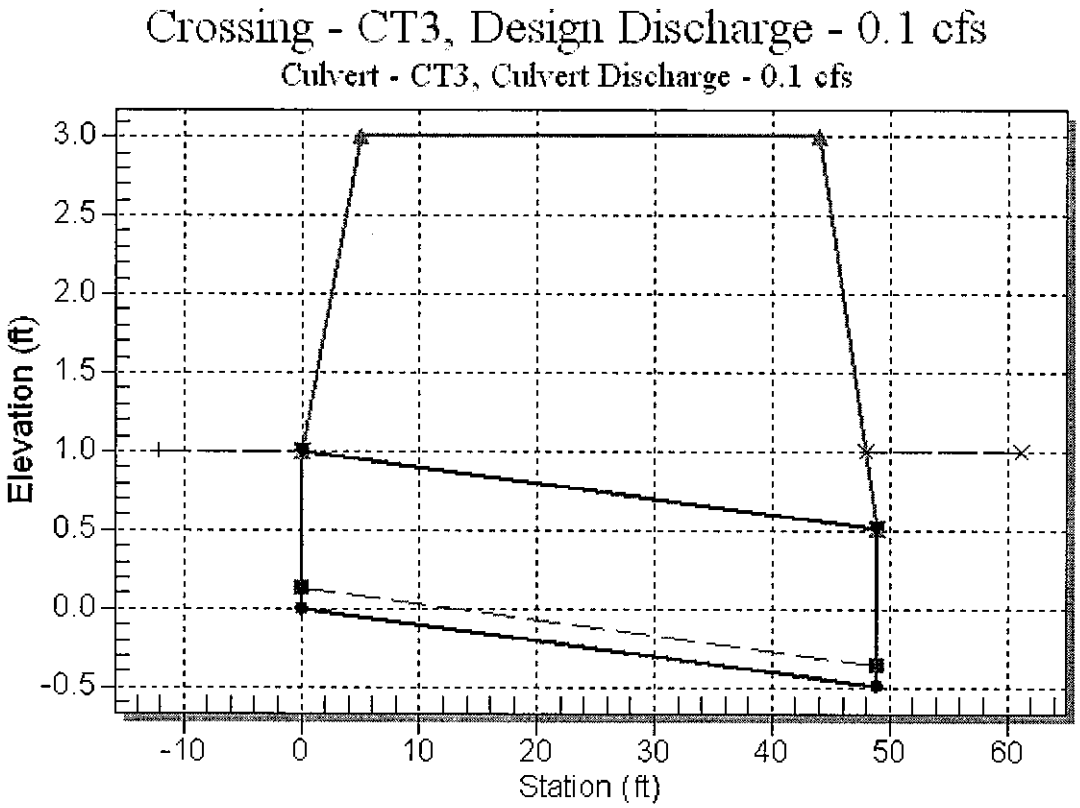


Table 14 - Summary of Culvert Flows at Crossing: CX1

Headwater Elevation (ft)	Total Discharge (cfs)	CX1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.39	0.39	0.00	1
1.01	0.77	0.77	0.00	1
1.01	1.16	1.16	0.00	1
1.02	1.55	1.55	0.00	1
1.03	1.94	1.94	0.00	1
1.05	2.32	2.32	0.00	1
1.06	2.71	2.71	0.00	1
1.08	3.10	3.10	0.00	1
1.11	3.48	3.48	0.00	1
1.13	3.87	3.87	0.00	1

Culvert Data Summary - CX1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CX1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 35.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 4

Water Surface Profile Plot for Culvert: CX1

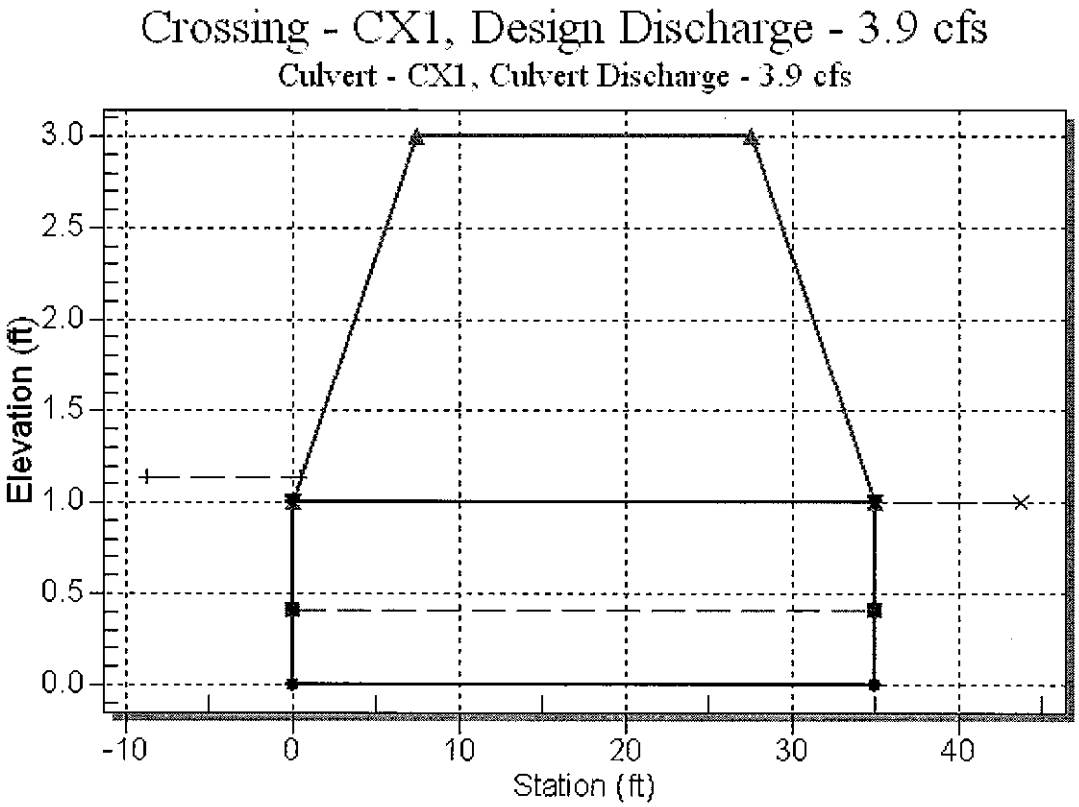


Table 15 - Summary of Culvert Flows at Crossing: CX2

Headwater Elevation (ft)	Total Discharge (cfs)	CX2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.01	0.94	0.94	0.00	1
2.03	1.88	1.88	0.00	1
2.07	2.82	2.82	0.00	1
2.11	3.76	3.76	0.00	1
2.16	4.70	4.70	0.00	1
2.23	5.64	5.64	0.00	1
2.32	6.58	6.58	0.00	1
2.41	7.52	7.52	0.00	1
2.40	8.46	8.46	0.00	1
2.50	9.40	9.40	0.00	1

Culvert Data Summary - CX2

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - CX2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

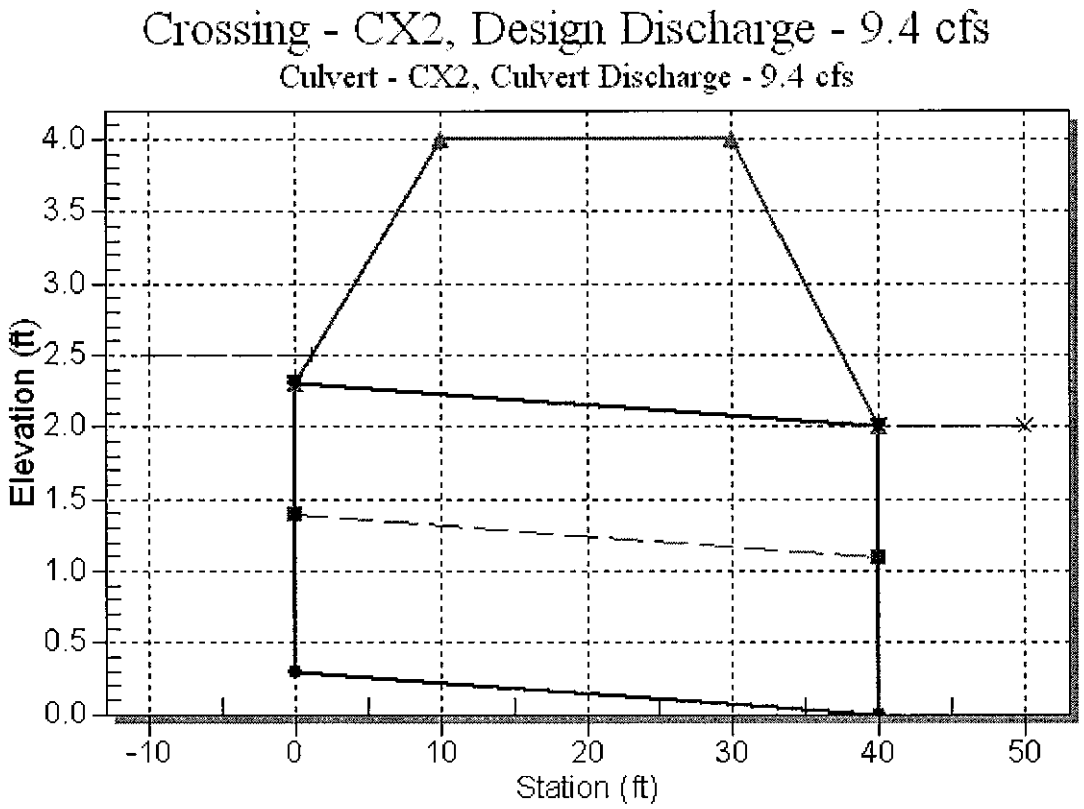
Inlet Elevation: 0.30 ft

Outlet Station: 40.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: CX2



HY-8 Culvert Analysis Report

Culvert Data Summary - DC1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material:

Barrel Manning's n: 0.0240

Inlet Type:

Inlet Edge Condition:

Inlet Depression: None

Site Data - DC1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 68.00 ft

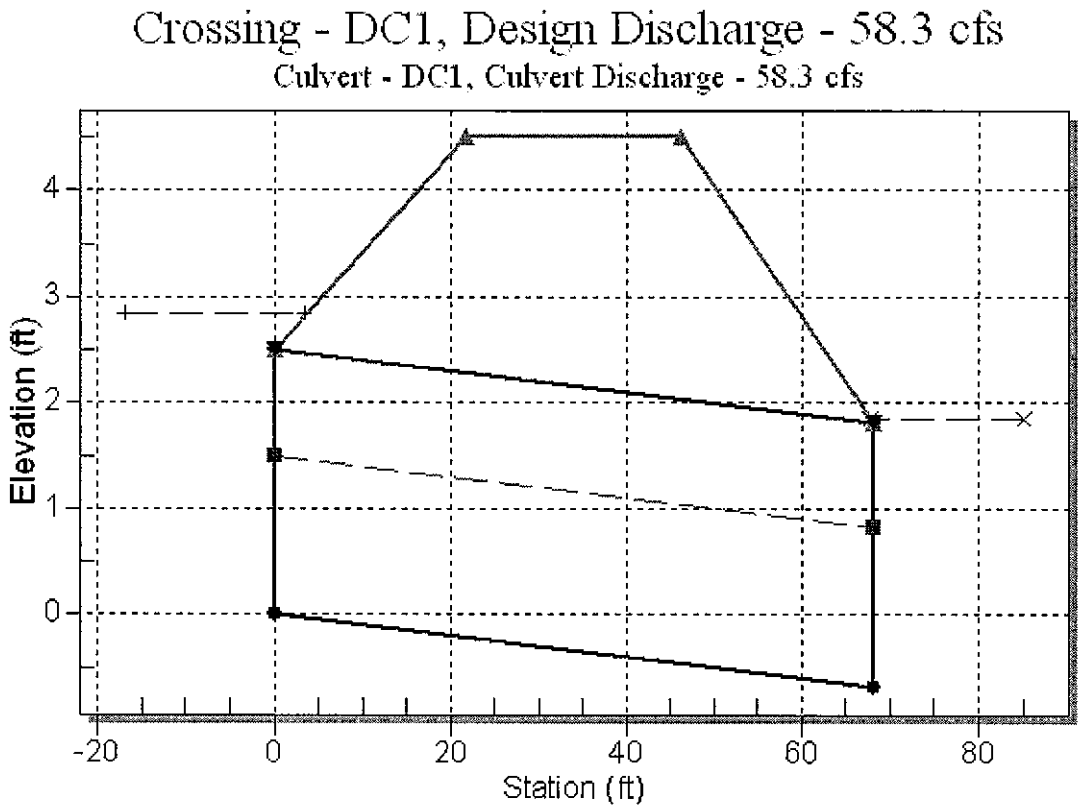
Outlet Elevation: -0.68 ft

Number of Barrels: 3

Table 1 - Summary of Culvert Flows at Crossing: DC1

Headwater Elevation (ft)	Total Discharge (cfs)	DC1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.85	0.00	0.00	0.00	1
1.87	5.83	5.83	0.00	1
1.91	11.67	11.67	0.00	1
1.97	17.50	17.50	0.00	1
2.06	23.34	23.34	0.00	1
2.17	29.17	29.17	0.00	1
2.30	35.00	35.00	0.00	1
2.46	40.84	40.84	0.00	1
2.65	46.67	46.67	0.00	1
2.85	52.51	52.51	0.00	1
2.83	58.34	58.34	0.00	1

Water Surface Profile Plot for Culvert: DC1



HY-8 Culvert Analysis Report

Culvert Data Summary - DG1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material:

Barrel Manning's n: 0.0240

Inlet Type:

Inlet Edge Condition:

Inlet Depression: None

Site Data - DG1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 40.00 ft

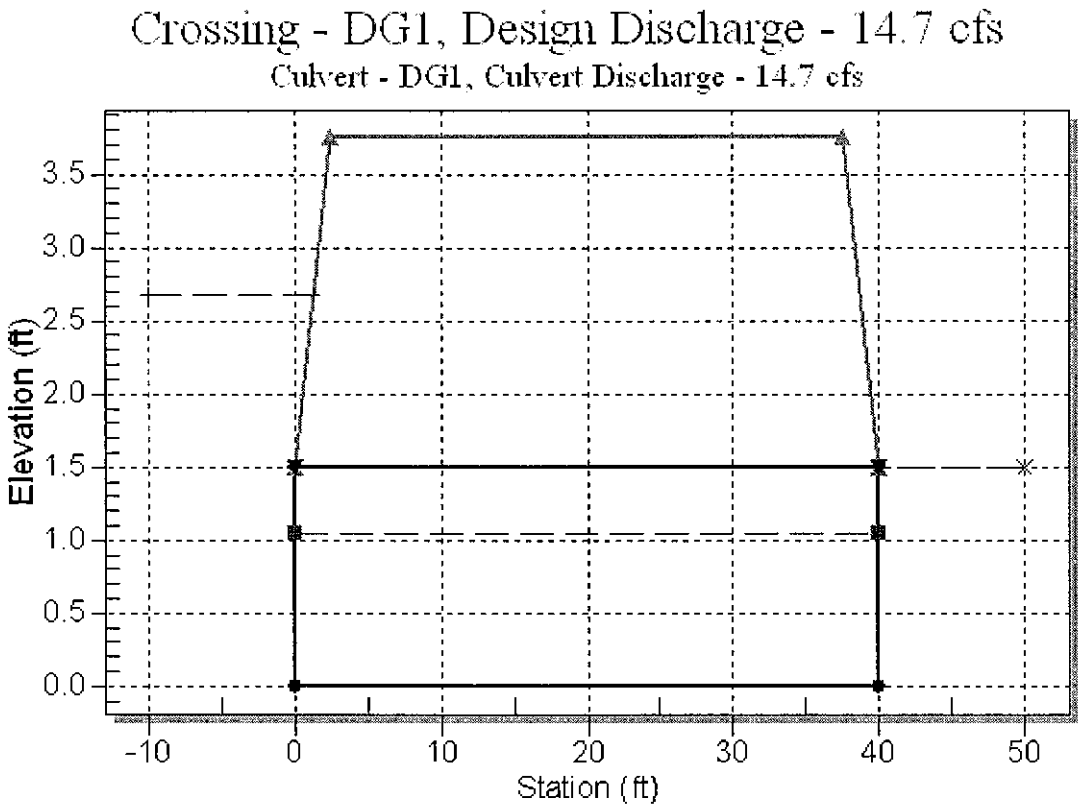
Outlet Elevation: -0.00 ft

Number of Barrels: 2

Table 1 - Summary of Culvert Flows at Crossing: DG1

Headwater Elevation (ft)	Total Discharge (cfs)	DG1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	1
1.51	1.47	1.47	0.00	1
1.55	2.94	2.94	0.00	1
1.61	4.41	4.41	0.00	1
1.69	5.88	5.88	0.00	1
1.79	7.35	7.35	0.00	1
1.92	8.82	8.82	0.00	1
2.08	10.29	10.29	0.00	1
2.25	11.76	11.76	0.00	1
2.45	13.23	13.23	0.00	1
2.67	14.70	14.70	0.00	1

Water Surface Profile Plot for Culvert: DG1



HY-8 Culvert Analysis Report

Site Data - DH 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.01 ft

Inlet Elevation: 0.00 ft

Outlet Station: 30.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 1

Culvert Data Summary - DH 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

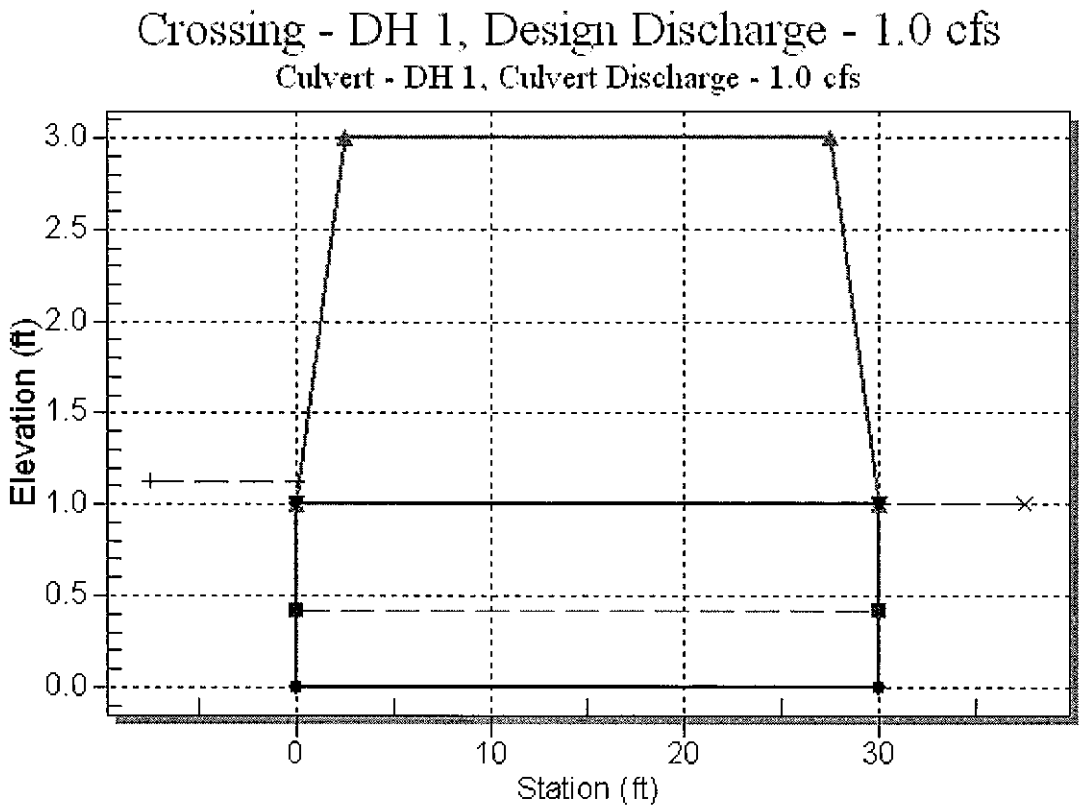
Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Table 1 - Summary of Culvert Flows at Crossing: DH 1

Headwater Elevation (ft)	Total Discharge (cfs)	DH 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.10	0.10	0.00	1
1.01	0.20	0.20	0.00	1
1.01	0.30	0.30	0.00	1
1.02	0.40	0.40	0.00	1
1.03	0.50	0.50	0.00	1
1.05	0.60	0.60	0.00	1
1.06	0.70	0.70	0.00	1
1.08	0.80	0.80	0.00	1
1.10	0.90	0.90	0.00	1
1.13	1.00	1.00	0.00	1

Water Surface Profile Plot for Culvert: DH 1



HY-8 Culvert Analysis Report

Culvert Data Summary - DL1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DL1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 45.00 ft

Outlet Elevation: -0.45 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DL1

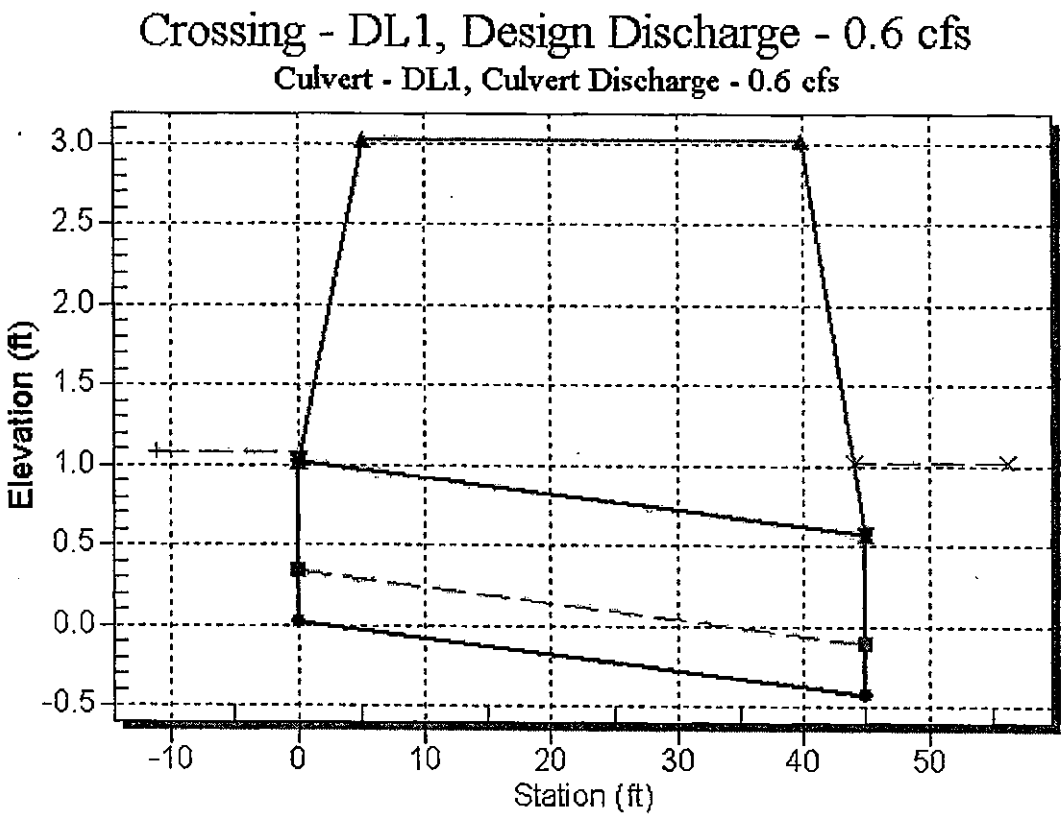


Table 1 - Summary of Culvert Flows at Crossing: DL1

Headwater Elevation (ft)	Total Discharge (cfs)	DL1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.11	0.11	0.00	1
1.00	0.17	0.17	0.00	1
1.01	0.23	0.23	0.00	1
1.01	0.28	0.28	0.00	1
1.02	0.34	0.34	0.00	1
1.03	0.40	0.40	0.00	1
1.03	0.46	0.46	0.00	1
1.04	0.51	0.51	0.00	1
1.05	0.57 ✓	0.57	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - DL2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DL2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 44.00 ft

Outlet Elevation: -0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DL2

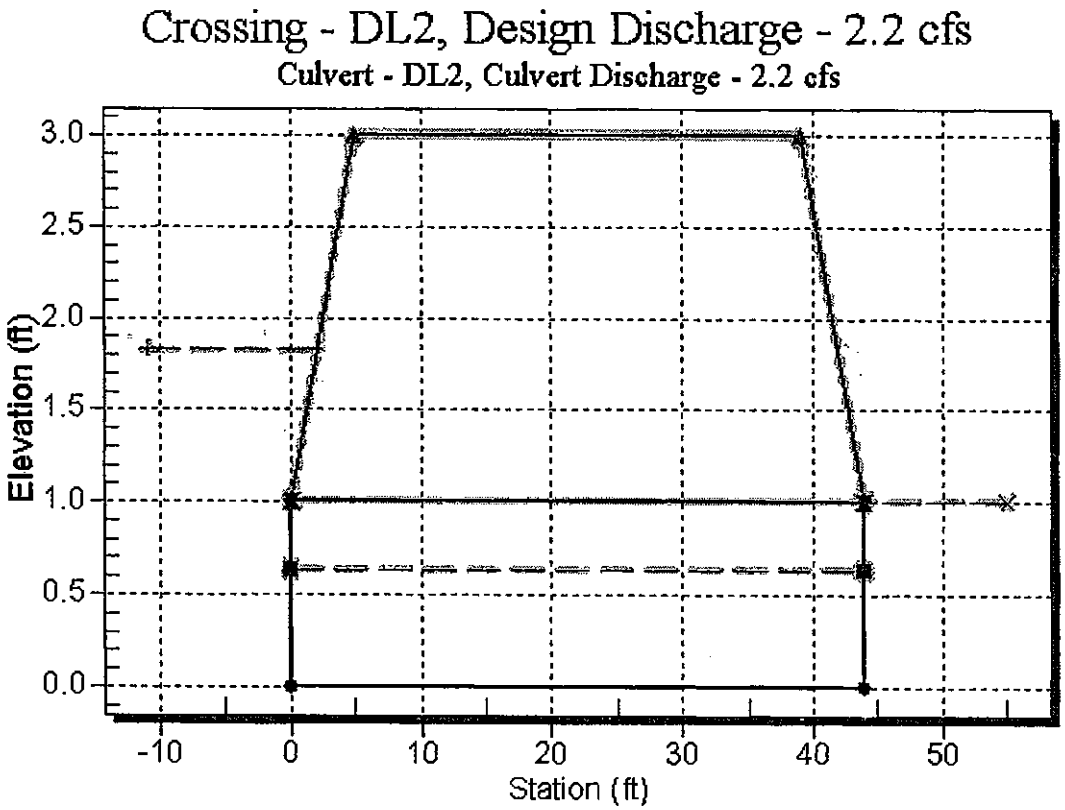


Table 1 - Summary of Culvert Flows at Crossing: DL2

Headwater Elevation (ft)	Total Discharge (cfs)	DL2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.01	0.22	0.22	0.00	1
1.03	0.45	0.45	0.00	1
1.07	0.67	0.67	0.00	1
1.13	0.90	0.90	0.00	1
1.21	1.12	1.12	0.00	1
1.30	1.34	1.34	0.00	1
1.41	1.57	1.57	0.00	1
1.53	1.79	1.79	0.00	1
1.67	2.02	2.02	0.00	1
1.83	2.24	2.24	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - DOTAQ1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTAQ1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.00 ft

Outlet Station: 240.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: DOTAQ1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTAQ1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
4.00	0.00	0.00	0.00	1
4.62	1.49	1.49	0.00	1
4.88	2.98	2.98	0.00	1
5.10	4.47	4.47	0.00	1
5.30	5.96	5.96	0.00	1
5.50	7.46	7.46	0.00	1
5.87	8.95	8.95	0.00	1
6.04	10.44	10.44	0.00	1
6.20	11.93	11.93	0.00	1
6.36	13.42	13.42	0.00	1
6.55	14.91	14.91	0.00	1

Water Surface Profile Plot for Culvert: DOTAQ1

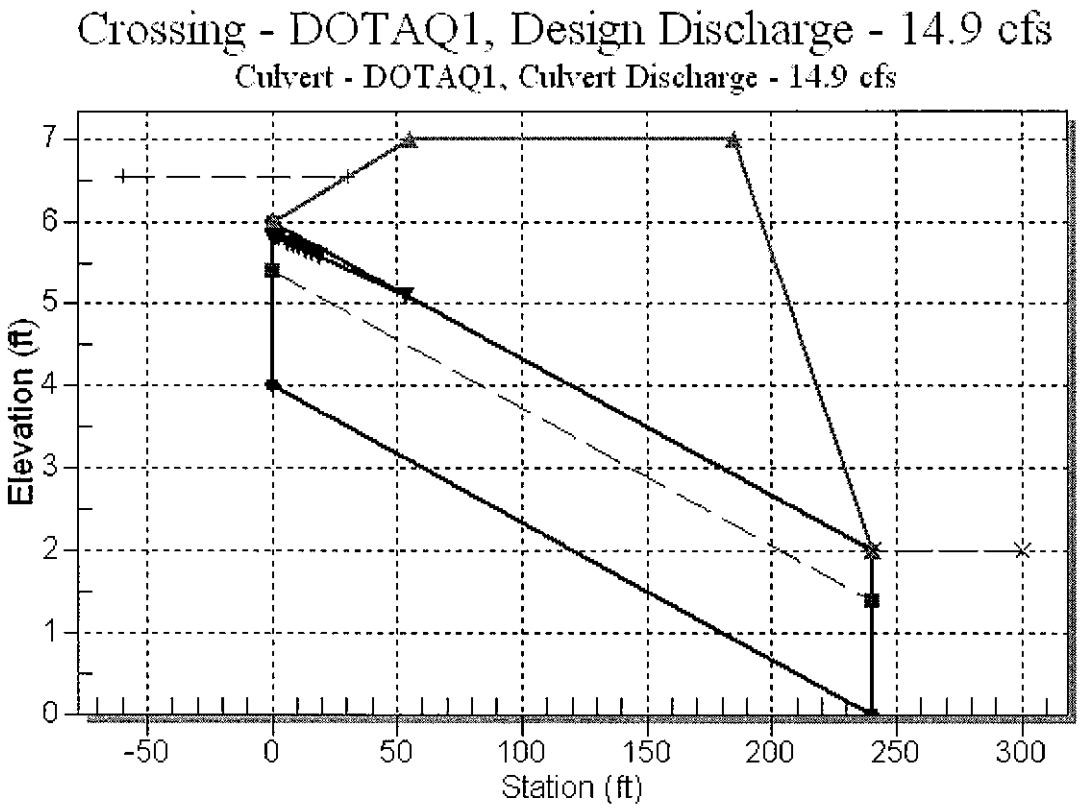


Table 2 - Summary of Culvert Flows at Crossing: DOTAR1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTAR1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	1
1.51	0.16	0.16	0.00	1
1.53	0.31	0.31	0.00	1
1.55	0.47	0.47	0.00	1
1.57	0.62	0.62	0.00	1
1.60	0.78	0.78	0.00	1
1.64	0.94	0.94	0.00	1
1.67	1.09	1.09	0.00	1
1.71	1.25	1.25	0.00	1
1.75	1.40	1.40	0.00	1
1.79	1.56	1.56	0.00	1

Culvert Data Summary - DOTAR1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTAR1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1.00 ft

Outlet Station: 120.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTAR1

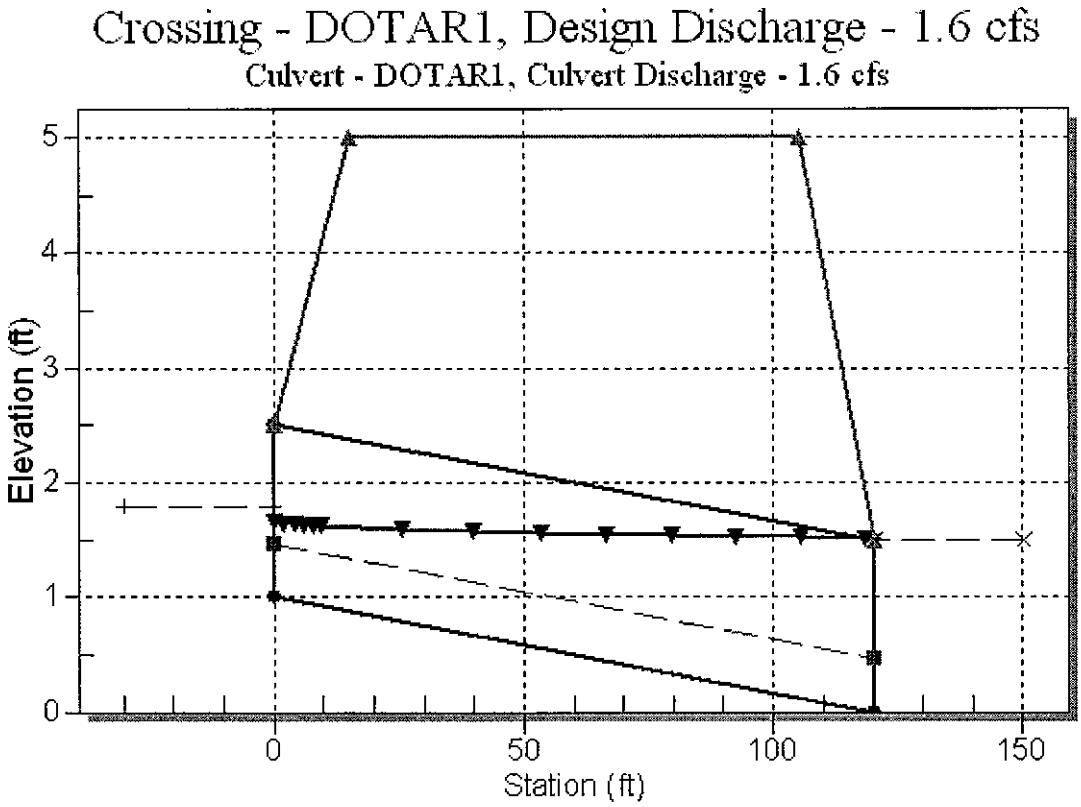


Table 3 - Summary of Culvert Flows at Crossing: DOTAV1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTAV1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	1
1.53	0.39	0.39	0.00	1
1.59	0.77	0.77	0.00	1
1.68	1.16	1.16	0.00	1
1.77	1.55	1.55	0.00	1
1.86	1.94	1.94	0.00	1
1.95	2.32	2.32	0.00	1
2.03	2.71	2.71	0.00	1
2.12	3.10	3.10	0.00	1
2.20	3.48	3.48	0.00	1
2.29	3.87	3.87	0.00	1

Culvert Data Summary - DOTAV1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTAV1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

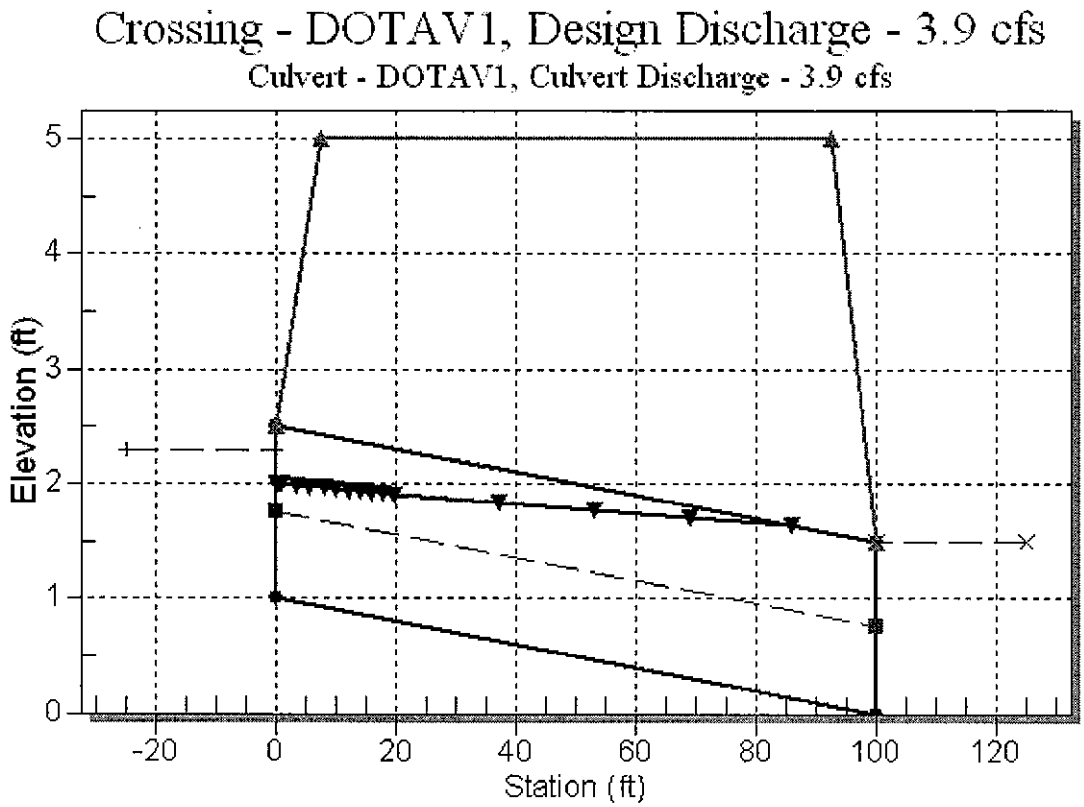
Inlet Elevation: 1.00 ft

Outlet Station: 100.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTAV1



HY-8 Culvert Analysis Report

Culvert Data Summary - DOTAX1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material:

Barrel Manning's n: 0.0240

Inlet Type:

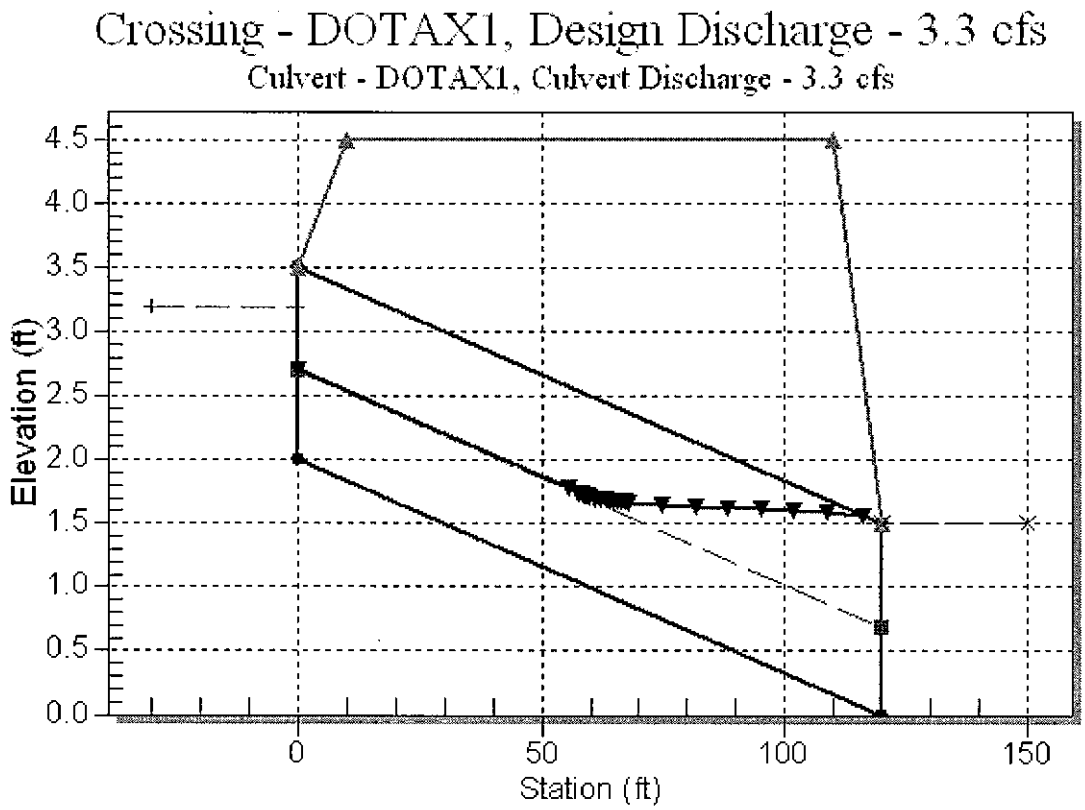
Inlet Edge Condition:

Inlet Depression: None

Table 1 - Summary of Culvert Flows at Crossing: DOTAX1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTAX1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.52	0.33	0.33	0.00	1
2.50	0.66	0.66	0.00	1
2.62	0.99	0.99	0.00	1
2.72	1.32	1.32	0.00	1
2.82	1.65	1.65	0.00	1
2.90	1.97	1.97	0.00	1
2.97	2.30	2.30	0.00	1
3.05	2.63	2.63	0.00	1
3.12	2.96	2.96	0.00	1
3.18	3.29	3.29	0.00	1

Water Surface Profile Plot for Culvert: DOTAX1



Site Data - DOTAX1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2.00 ft

Outlet Station: 120.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Table 5 - Summary of Culvert Flows at Crossing: DOTBV1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTBV1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
13.00	0.00	0.00	0.00	1
13.37	0.52	0.52	0.00	1
13.54	1.04	1.04	0.00	1
13.67	1.56	1.56	0.00	1
13.78	2.08	2.08	0.00	1
13.89	2.61	2.61	0.00	1
14.00	3.13	3.13	0.00	1
14.10	3.65	3.65	0.00	1
14.20	4.17	4.17	0.00	1
14.30	4.69	4.69	0.00	1
14.40	5.21	5.21	0.00	1

Culvert Data Summary - DOTBV1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTBV1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.00 ft

Outlet Station: 260.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTBV1

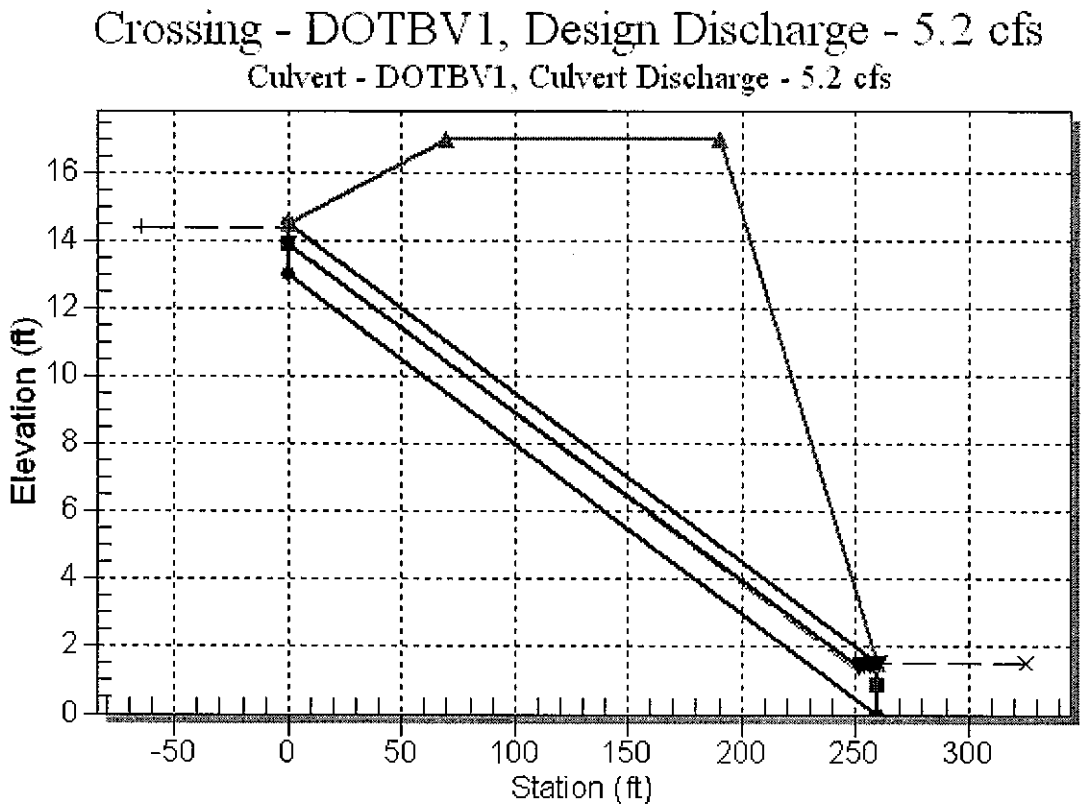


Table 6 - Summary of Culvert Flows at Crossing: DOTBY1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTBY1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
7.00	0.00	0.00	0.00	1
7.34	0.26	0.26	0.00	1
7.38	0.52	0.52	0.00	1
7.48	0.78	0.78	0.00	1
7.55	1.04	1.04	0.00	1
7.61	1.30	1.30	0.00	1
7.68	1.56	1.56	0.00	1
7.74	1.82	1.82	0.00	1
7.79	2.08	2.08	0.00	1
7.85	2.34	2.34	0.00	1
7.90	2.60	2.60	0.00	1

Culvert Data Summary - DOTBY1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTBY1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

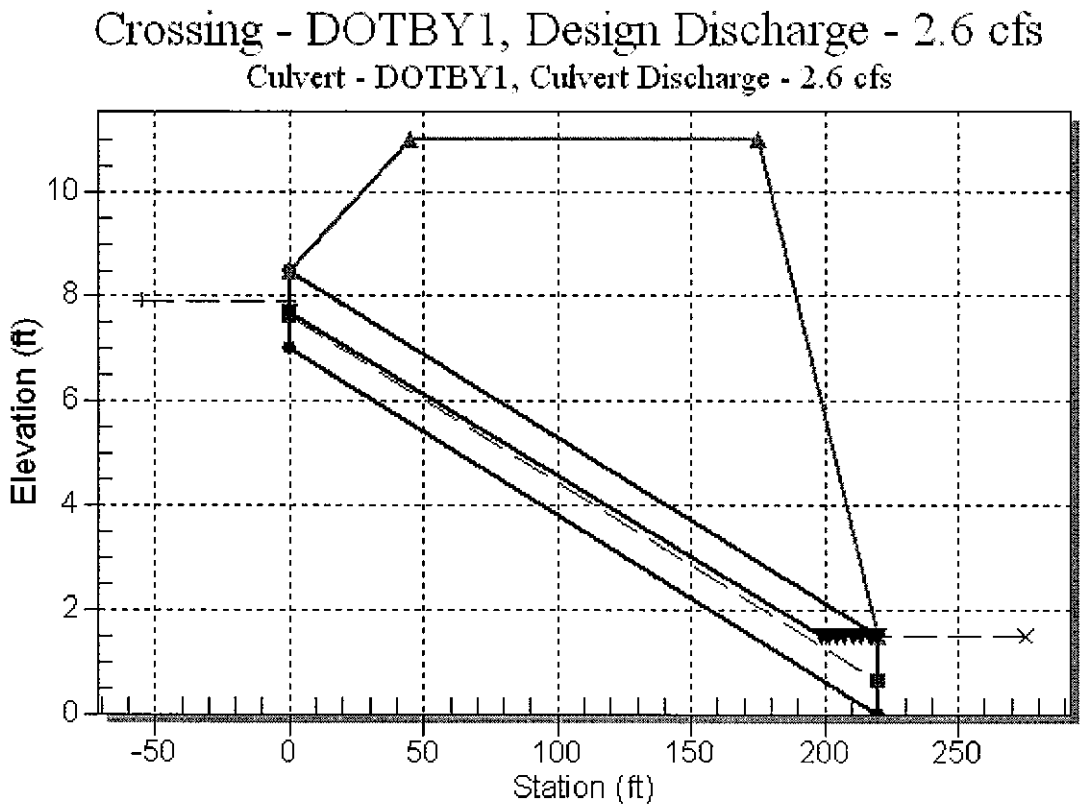
Inlet Elevation: 7.00 ft

Outlet Station: 220.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTBY1



HY-8 Culvert Analysis Report

DOT

Culvert Data Summary - BZ1

Barrel Shape: Circular

Barrel Diameter: 1.25 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

DOT

Site Data - BZ1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

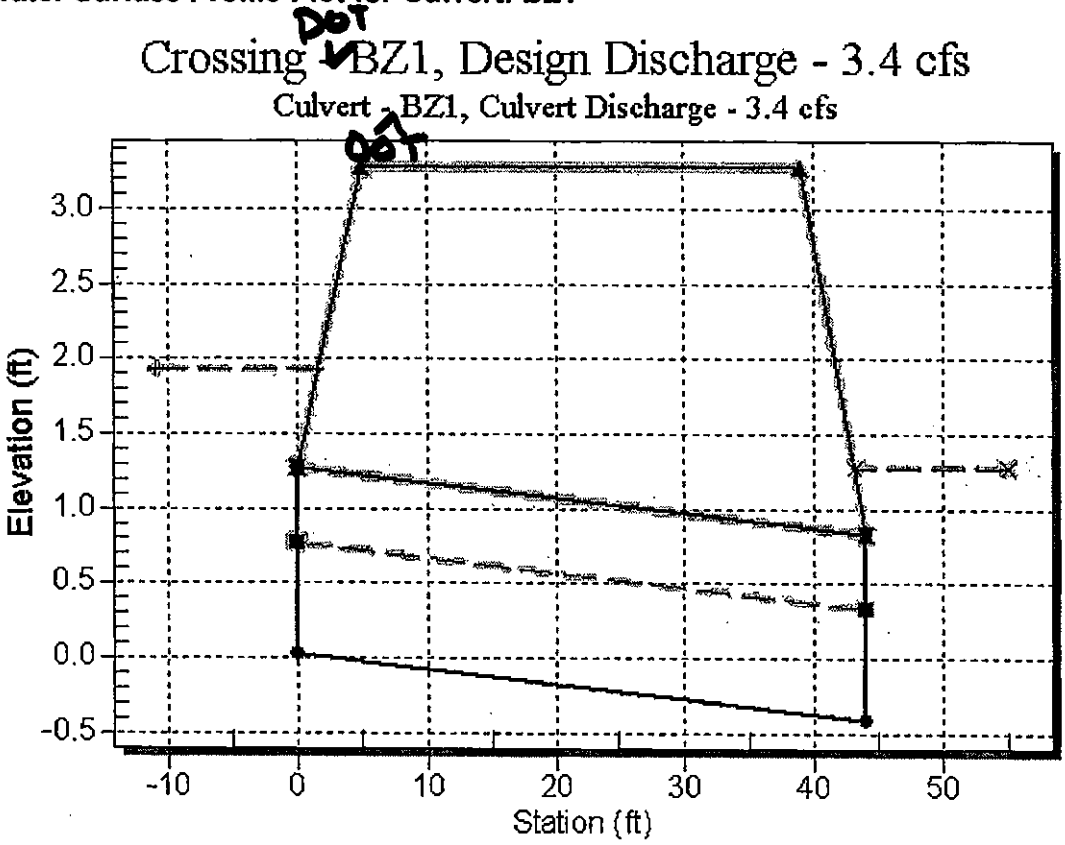
Outlet Station: 44.00 ft ✓

Outlet Elevation: -0.44 ft

Number of Barrels: 1

DOT

Water Surface Profile Plot for Culvert: BZ1



DOT

Table 1 - Summary of Culvert Flows at Crossing: BZ1

Headwater Elevation (ft)	Total Discharge (cfs)	BZ1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.25	0.00	0.00	0.00	1
1.26	0.34	0.34	0.00	1
1.28	0.69	0.69	0.00	1
1.31	1.03	1.03	0.00	1
1.35	1.37	1.37	0.00	1
1.41	1.72	1.72	0.00	1
1.48	2.06	2.06	0.00	1
1.57	2.40	2.40	0.00	1
1.67	2.74	2.74	0.00	1
1.78	3.09	3.09	0.00	1
1.90	3.43 ✓	3.43	0.00	1

Table 7 - Summary of Culvert Flows at Crossing: DOTDC1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTDC1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.00	0.00	0.00	0.00	1
2.27	0.21	0.21	0.00	1
2.38	0.42	0.42	0.00	1
2.48	0.63	0.63	0.00	1
2.55	0.84	0.84	0.00	1
2.62	1.05	1.05	0.00	1
2.68	1.27	1.27	0.00	1
2.75	1.48	1.48	0.00	1
2.80	1.69	1.69	0.00	1
2.85	1.90	1.90	0.00	1
2.90	2.11	2.11	0.00	1

Culvert Data Summary - DOTDC1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTDC1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 2.00 ft

Outlet Station: 170.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTDC1

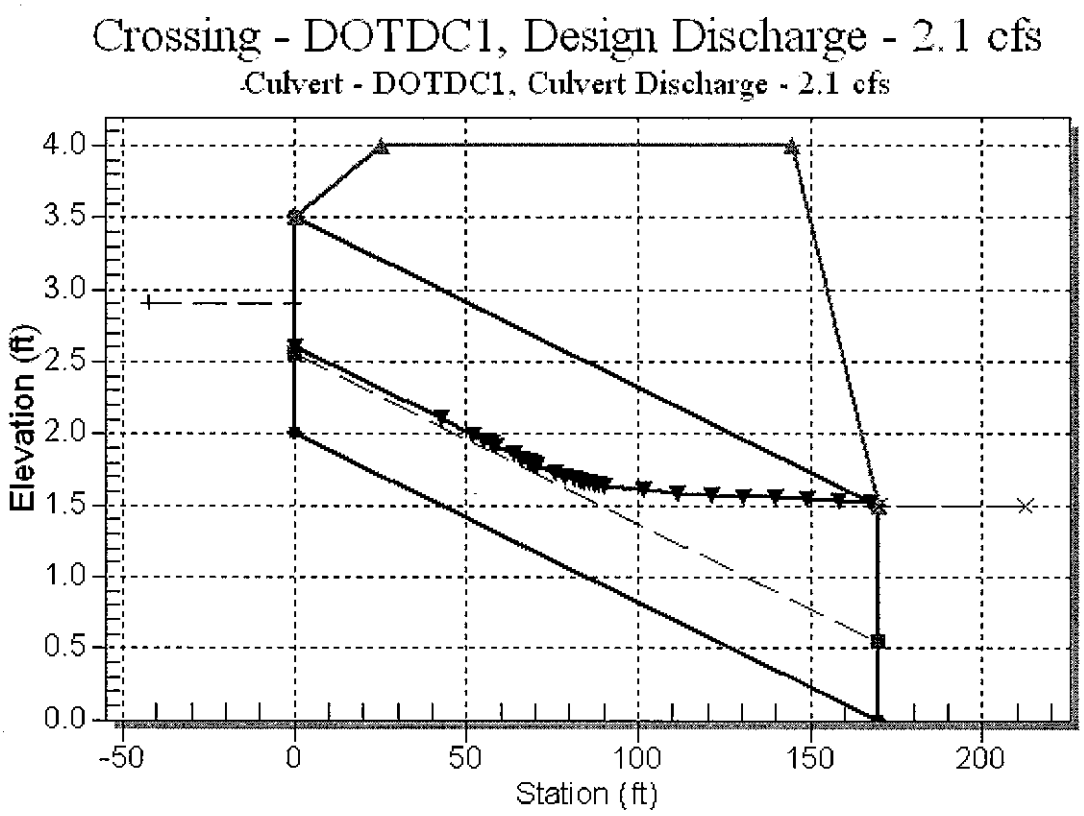


Table 8 - Summary of Culvert Flows at Crossing: DOTDG1

Headwater Elevation (ft)	Total Discharge (cfs)	DOTDG1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3.00	0.00	0.00	0.00	1
3.33	0.17	0.17	0.00	1
3.35	0.34	0.34	0.00	1
3.44	0.51	0.51	0.00	1
3.45	0.68	0.68	0.00	1
3.51	0.85	0.85	0.00	1
3.55	1.03	1.03	0.00	1
3.60	1.20	1.20	0.00	1
3.64	1.37	1.37	0.00	1
3.68	1.54	1.54	0.00	1
3.73	1.71	1.71	0.00	1

Culvert Data Summary - DOTDG1

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DOTDG1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

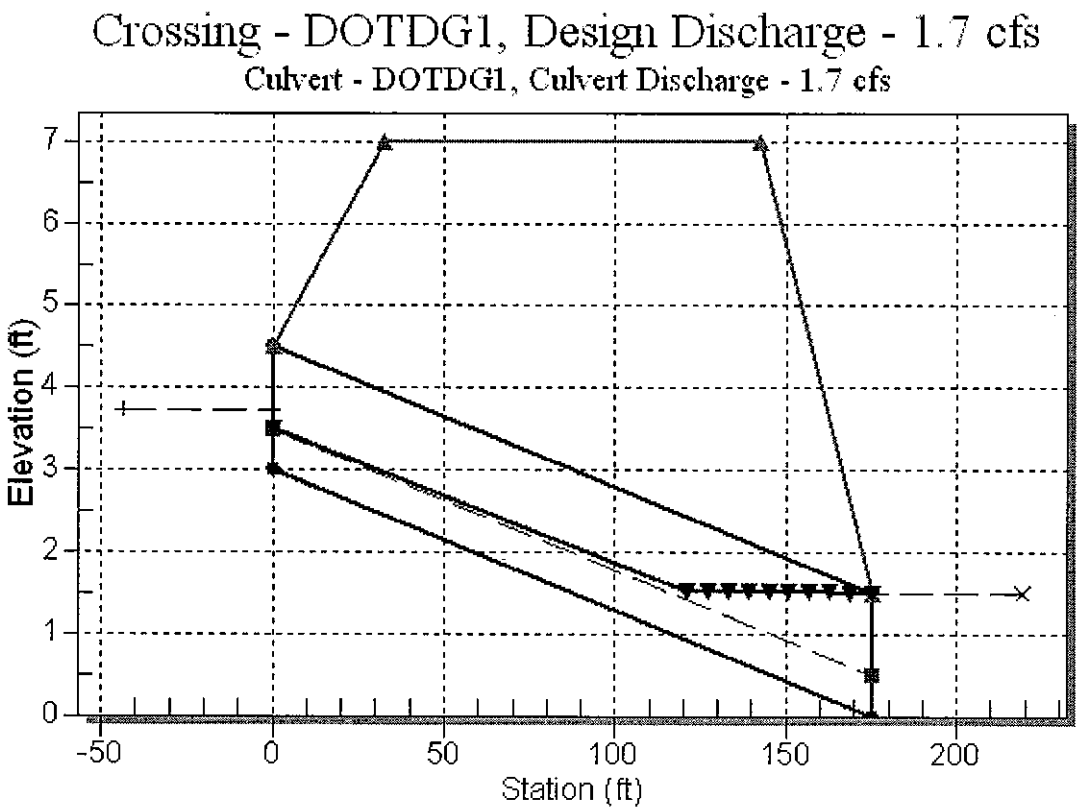
Inlet Elevation: 3.00 ft

Outlet Station: 175.00 ft

Outlet Elevation: 0.00 ft

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DOTDG1



HY-8 Culvert Analysis Report

Culvert Data Summary - DS1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DS1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 56.00 ft ✓

Outlet Elevation: -0.56 ft ✓

Number of Barrels: 1

Water Surface Profile Plot for Culvert: DS1

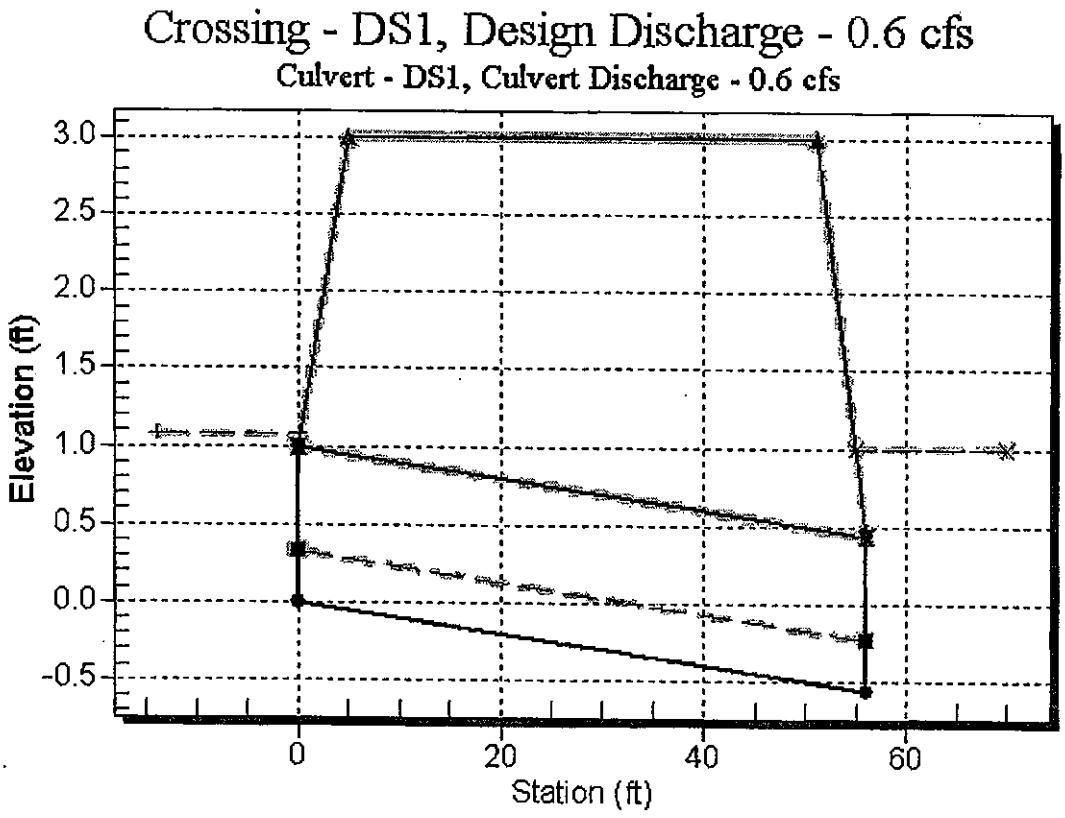


Table 1 - Summary of Culvert Flows at Crossing: DS1

Headwater Elevation (ft)	Total Discharge (cfs)	DS1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.13	0.13	0.00	1
1.01	0.19	0.19	0.00	1
1.01	0.25	0.25	0.00	1
1.02	0.32	0.32	0.00	1
1.03	0.38	0.38	0.00	1
1.04	0.44	0.44	0.00	1
1.05	0.50	0.50	0.00	1
1.06	0.57	0.57	0.00	1
1.08	0.63 ✓	0.63	0.00	1

HY-8 Culvert Analysis Report

Culvert Data Summary - DS2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DS2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 25.00 ft

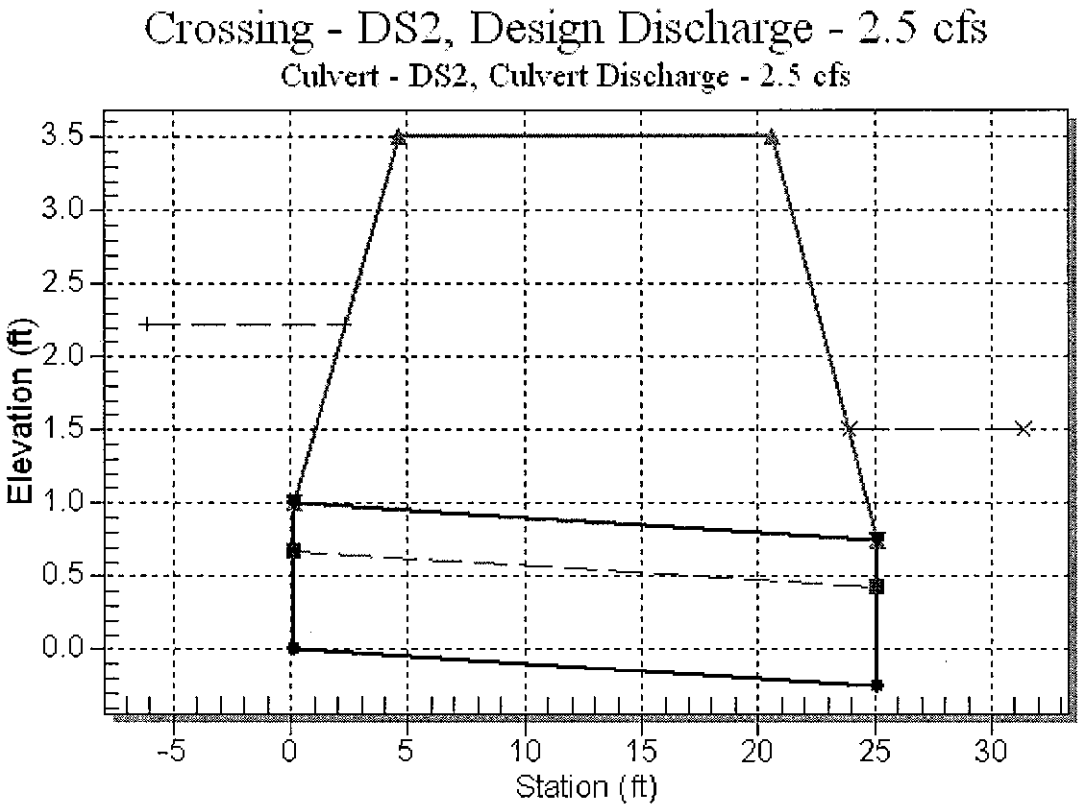
Outlet Elevation: -0.25 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: DS2

Headwater Elevation (ft)	Total Discharge (cfs)	DS2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.50	0.00	0.00	0.00	1
1.51	0.25	0.25	0.00	1
1.53	0.50	0.50	0.00	1
1.56	0.75	0.75	0.00	1
1.61	1.00	1.00	0.00	1
1.68	1.25	1.25	0.00	1
1.76	1.50	1.50	0.00	1
1.85	1.75	1.75	0.00	1
1.96	2.00	2.00	0.00	1
2.08	2.25	2.25	0.00	1
2.22	2.50	2.50	0.00	1

Water Surface Profile Plot for Culvert: DS2



HY-8 Culvert Analysis Report

Culvert Data Summary - DS3A

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DS3A

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 25.00 ft

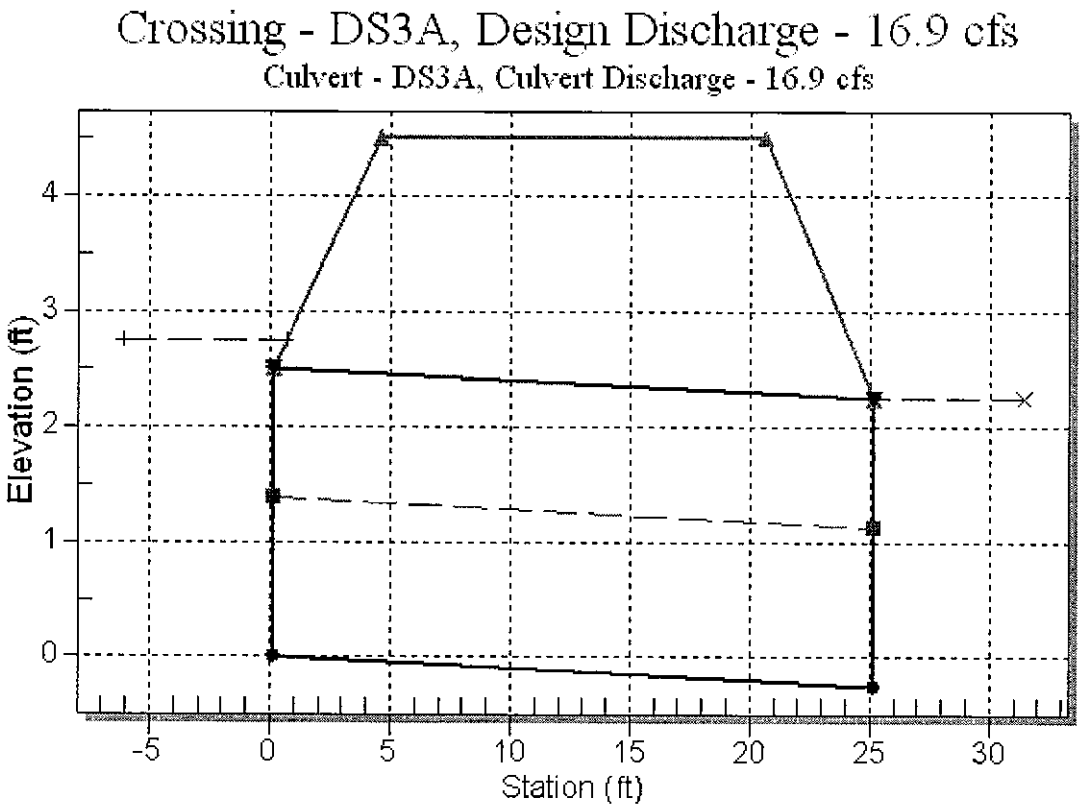
Outlet Elevation: -0.25 ft

Number of Barrels: 1

Table 1 - Culvert Summary Table: DS3A

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2.25	0.000	2.250	0-NF	0.000	0.000	0.000	2.250	0.000	0.000
1.69	1.69	2.26	0.612	2.259	3-M1f	0.456	0.406	2.500	2.250	0.344	0.000
3.38	3.38	2.28	0.882	2.279	3-M1f	0.648	0.592	2.500	2.250	0.689	0.000
5.07	5.07	2.31	1.094	2.313	3-M1f	0.807	0.741	2.500	2.250	1.033	0.000
6.76	6.76	2.46	1.277	2.458	3-M1f	0.941	0.854	2.500	2.250	1.377	0.000
8.45	8.45	2.42	1.449	2.423	3-M1f	1.065	0.964	2.500	2.250	1.721	0.000
10.14	10.14	2.50	1.612	2.497	3-M1f	1.182	1.059	2.500	2.250	2.066	0.000
11.83	11.83	2.59	1.769	2.585	3-M1f	1.296	1.147	2.500	2.250	2.410	0.000
13.52	13.52	2.69	1.922	2.687	3-M1f	1.406	1.235	2.500	2.250	2.754	0.000
15.21	15.21	2.65	2.074	2.650	4-FFf	1.517	1.311	2.500	2.250	3.099	0.000
16.90	16.90	2.74	2.227	2.744	4-FFf	1.632	1.385	2.500	2.250	3.443	0.000

Water Surface Profile Plot for Culvert: DS3A



Culvert Data Summary - DS3B

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DS3B

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 50.00 ft

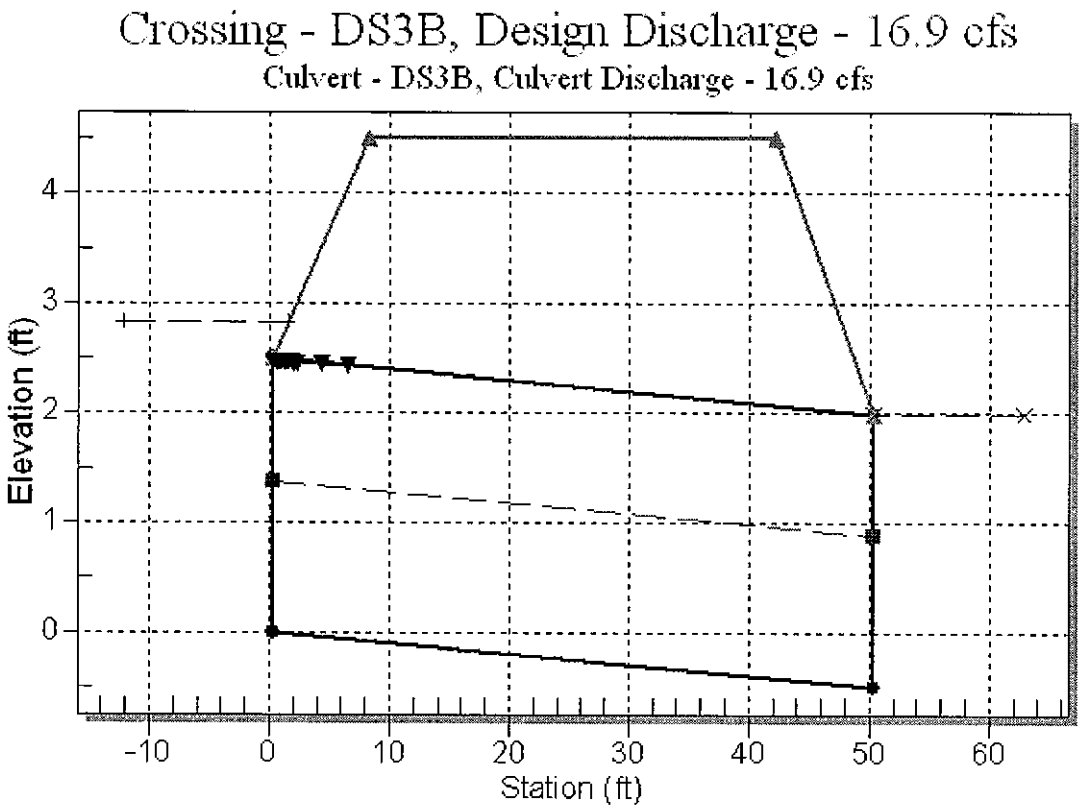
Outlet Elevation: -0.50 ft

Number of Barrels: 1

Table 2 - Culvert Summary Table: DS3B

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	2.00	0.000	2.000	0-NF	0.000	0.000	0.000	2.500	0.000	0.000
1.69	1.69	2.01	0.612	2.012	3-M1f	0.456	0.406	2.500	2.500	0.344	0.000
3.38	3.38	2.04	0.882	2.038	3-M1f	0.648	0.592	2.500	2.500	0.689	0.000
5.07	5.07	2.08	1.094	2.080	3-M1f	0.807	0.741	2.500	2.500	1.033	0.000
6.76	6.76	2.14	1.277	2.139	3-M1f	0.941	0.854	2.500	2.500	1.377	0.000
8.45	8.45	2.21	1.449	2.213	3-M1f	1.065	0.964	2.500	2.500	1.721	0.000
10.14	10.14	2.31	1.612	2.310	3-M1f	1.182	1.059	2.500	2.500	2.066	0.000
11.83	11.83	2.42	1.769	2.415	3-M1f	1.296	1.147	2.500	2.500	2.410	0.000
13.52	13.52	2.53	1.922	2.529	3-M1f	1.406	1.235	2.500	2.500	2.754	0.000
15.21	15.21	2.67	2.074	2.671	3-M1f	1.517	1.311	2.500	2.500	3.099	0.000
16.90	16.90	2.82	2.227	2.825	3-M1f	1.632	1.385	2.500	2.500	3.443	0.000

Water Surface Profile Plot for Culvert: DS3B



HY-8 Culvert Analysis Report

Culvert Data Summary - DT1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - DT1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 60.00 ft

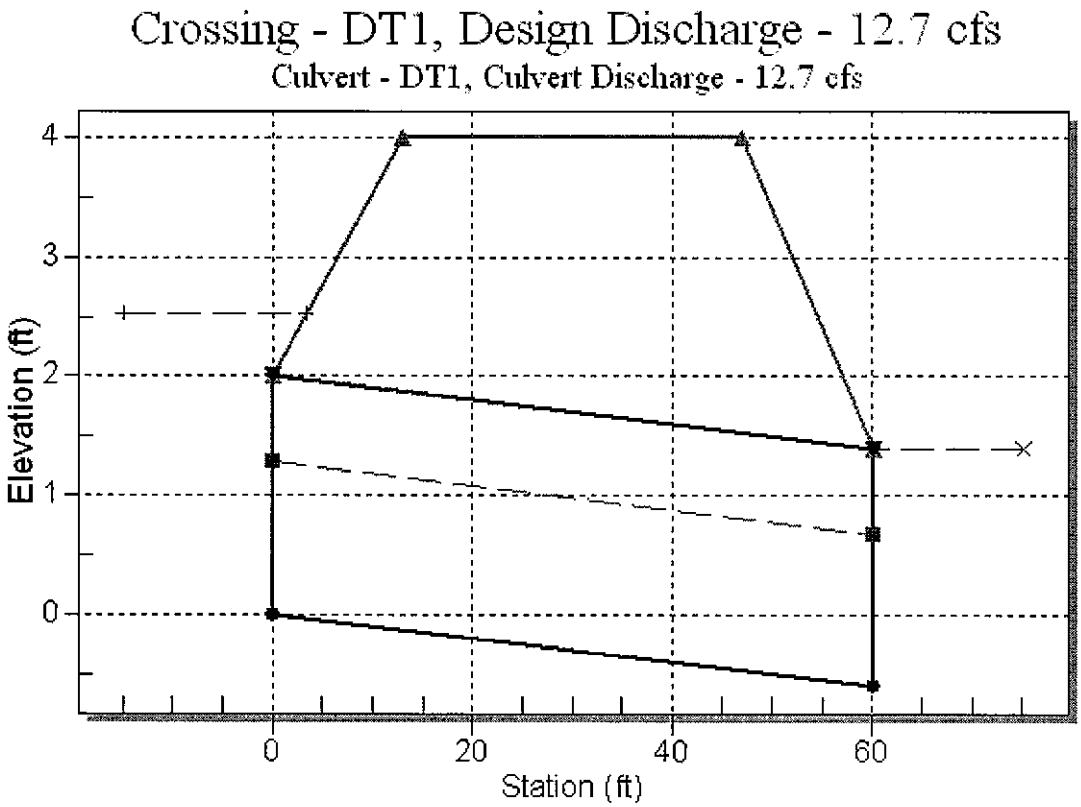
Outlet Elevation: -0.60 ft

Number of Barrels: 1

Table 1 - Summary of Culvert Flows at Crossing: DT1

Headwater Elevation (ft)	Total Discharge (cfs)	DT1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.40	0.00	0.00	0.00	1
1.43	1.27	1.27	0.00	1
1.47	2.54	2.54	0.00	1
1.54	3.80	3.80	0.00	1
1.64	5.07	5.07	0.00	1
1.76	6.34	6.34	0.00	1
1.91	7.61	7.61	0.00	1
2.07	8.88	8.88	0.00	1
2.28	10.14	10.14	0.00	1
2.31	11.41	11.41	0.00	1
2.52	12.68	12.68	0.00	1

Water Surface Profile Plot for Culvert: DT1



HY-8 Culvert Analysis Report

Culvert Data Summary - TAL1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft ✓

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: None

Site Data - TAL1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 0.00 ft

Outlet Station: 36.00 ft ✓

Outlet Elevation: -0.36 ft ✓

Number of Barrels: 1

~~434.1~~ 457
204

Water Surface Profile Plot for Culvert: TAL1

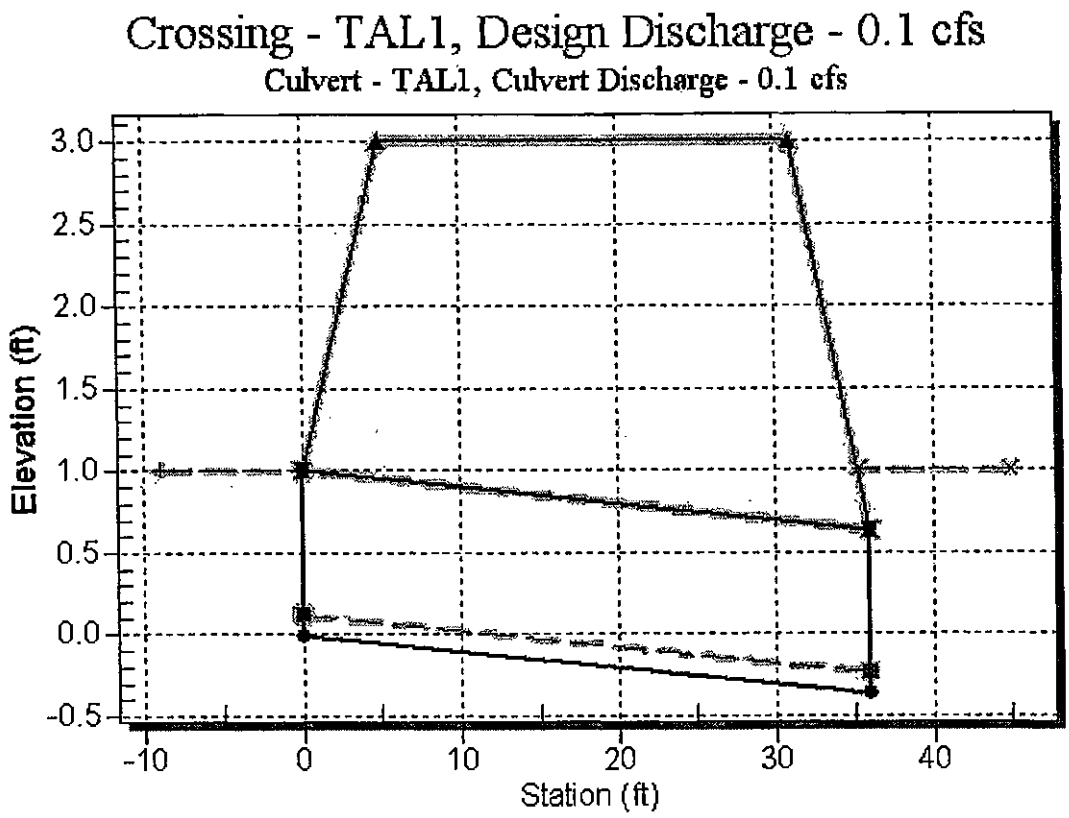


Table 1 - Summary of Culvert Flows at Crossing: TAL1

Headwater Elevation (ft)	Total Discharge (cfs)	TAL1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.00	0.00	0.00	0.00	1
1.00	0.01	0.01	0.00	1
1.00	0.02	0.02	0.00	1
1.00	0.03	0.03	0.00	1
1.00	0.04	0.04	0.00	1
1.00	0.05	0.05	0.00	1
1.00	0.06	0.06	0.00	1
1.00	0.07	0.07	0.00	1
1.00	0.08	0.08	0.00	1
1.00	0.09	0.09	0.00	1
1.00	0.10 ✓	0.10	0.00	1

APPENDIX G
CONSTRUCTION DRAWINGS
(BOUND SEPARATELY)