

Erosion & Sediment Control Plan and Site Restoration Plan Narrative

Atlantic Sunrise Project Temporary and Permanent Access Roads Fairmount, Ross, Lake, Lehman & Dallas Township Luzerne County Pennsylvania

Prepared For:



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GENERAL INFORMATION

Project Description

The following erosion and sediment control (E&SC) and site restoration (SR) narrative describes the E&SC and SR designs for the temporary and permanent access roads to be constructed within Luzerne County (County), Pennsylvania as part of the Transcontinental Gas Pipe Line Company, LLC (Transco) Atlantic Sunrise Project (“Project”).

The Project includes modifications to the existing Transco Mainline system to reverse the direction of flow, enabling new north-to-south capabilities (bi-directional flow) to transport this new source of natural gas to existing markets. In Luzerne County, the main Project improvements that the temporary and permanent access roads will support include **installation of a 30-inch-diameter greenfield pipeline** referred to as the Central Penn Line (CPL) North pipeline.

Where possible, existing public and private roads will be utilized to provide access to the pipeline ROW during and after construction. ***During construction, E&SC BMPs will be installed along all access roads as shown on the road-specific Soil Erosion Control Plans included in the Erosion & Sediment Control and Layout Plans for Access Roads in Section 2 of the Erosion and Sediment Control General Permit 2 (ESCGP-2) Notice of Intent (NOI).***

Temporary access roads will be installed and maintained for the duration of construction. When no longer needed, the road materials will be removed and the impacted areas will be restored to pre-construction conditions as shown on the ***road-specific Site Restoration Plans included in the Erosion & Sediment Control and Layout Plans for Access Roads in Section 2 of the Erosion and Sediment Control General Permit 2 (ESCGP-2) Notice of Intent (NOI).***

Permanent gravel access roads will be installed, and maintained by Transco, to provide access to mainline valves (***MLVs***) and select portions of the pipeline right of way (ROW) not accessible by existing roads, ***for pipeline maintenance and inspections*** in accordance with applicable regulatory guidelines. ***The increase in impervious area for the permanent access roads that provide access to the MLVs is permanent. However, the proposed increase in impervious area for the permanent access roads to the pipeline ROW is temporary. Similar to temporary access roads, upon construction completion, the proposed road materials will be removed and the impacted areas will be restored to pre-construction conditions. Transco operations will use the restored road surface to access the ROW as necessary in the future. Typically, pickup trucks will be used to perform routine maintenance and inspections and the trucks are capable of driving over grassy areas similar to***

the pipeline ROW. A separate Post-Construction Stormwater Management Plan (PCSM) Narrative has been developed for the permanent access roads to the MLV sites. The PCSM Narrative for Permanent Access Roads is included in Section 3 of the Erosion and Sediment Control General Permit 2 (ESCGP-2) Notice of Intent (NOI). The permanent access roads to be restored to pre-construction conditions are not included in the separate PCSM narrative.

The temporary sediment barriers associated with the permanent access roads to MLV sites are depicted on the pipeline E&SC plans. These temporary measures are shown as shaded on the access road plans for coordination purposes.

References

E&SC Best Management Practices (E&SC BMPs), in accordance with the standards and specifications in the Pennsylvania Department of Environmental Protection's (PADEP's) "Erosion and Sediment Pollution Control Program Manual," Technical Guidance No. 363-2134-008, as amended and updated (E&SC Manual) will be used during the construction phase of the project. The proposed practices are designed to achieve the regulatory standard of minimizing the potential for accelerated erosion and sedimentation associated with temporary earth disturbance activities. The E&SC BMPs will remain in place until the surrounding area has reached final stabilization. An area shall be considered to have achieved final stabilization when it has a minimum uniform 70% perennial vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated surface erosion and subsurface characteristic sufficient to resist sliding and other movements.

Impacts to wetlands, streams or waterbodies will be avoided to the maximum extent practicable. Refer to the Wetland Delineation Report provided as **Section 5 of the ESCGP-2 NOI** for information supporting wetland mapping shown on the E&SC Plans (**Appendix A of this narrative and Section 2 of the ESCGP-2 NOI**).

Temporary and Permanent Access Road Table

The following access roads are proposed to be constructed in Luzerne County to support the CPL North pipeline:

Temporary/ Permanent	Access Road	Mile Post (MP)	Major River Basin	Receiving Water	Existing Use	Chapter 93 Designated Use	Impairment	Total Maximum Daily Load	
Temporary	LU-006	MP 5.7	Susquehanna River	Maple Run	None	HQ-CWF, MF	None	None	
	LU-008	MP 7.3	Susquehanna River	Kitchen Creek	None	HQ-CWF, MF	None	None	
	LU-009	M-0056 MP 0.7	Susquehanna River	Phillips Creek	None	HQ-CWF, MF	None	None	
	LU-011	MP 17.2	Susquehanna River	UNT to Paint Spring Run	None	HQ-CWF, MF	None	None	
	LU-012	MP 17.5	Susquehanna River	Paint Spring Run	None	HQ-SWF, MF	None	None	
	LU-014	MP 21.5	Susquehanna River	UNT to Huntington Creek	None	CWF, MF	None	None	
	LU-015	M-0141 MP 0.1	Susquehanna River	Leonard Creek	None	HQ-CWF, MF	None	None	
	LU-019	MP 25.4	Susquehanna River	UNT to Leonard Creek	None	HQ-CWF, MF	None	None	
	LU-020	M-0142 MP 0.0	Susquehanna River	UNT to Leonard Creek	None	HQ-CWF, MF	None	None	
	LU-020.1	MP 25.5	Susquehanna River	UNT to Leonard Creek	None	HQ-CWF, MF	None	None	
	Permanent	LU-007.1	MP 6.7	Susquehanna River	UNT to Maple Run	None	HQ-CWF, MF	None	None
		LU-009.1	MP 13.4	Susquehanna River	Huntington Creek	None	HQ-CWF, MF	None	None

1.0 COMMON INFORMATION

1.1 Topographic Features

See the **Appendices E through S** for road-specific United States Geological Survey (USGS) mapping.

1.2 Soil Characteristics

AECOM prepared the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Custom Soil Resource Report for the counties crossed by the CPL North pipeline. The NRCS Custom Soil Resource Report for Luzerne County, Pennsylvania and the Soil Association Maps prepared by Wood Group Mustang Inc. are included in **Appendix C**. County-specific soil type and use limitations are presented in Table 1.2.1 below.

Table 1.2.1
Soil Type and Use Limitations for Luzerne County

Map Symbol	Soil Name	Slope	Cut Banks Cave	Corrosive to Concrete or Steel	Droughty	Easily Erodible	Flooding	High Water Table	Hydric/Hydric Inclusions	Low Strength	Slow Percolation	Piping	Poor Source of Topsoil	Frost Action	Shrink-Swell	Potential Sinkhole	Ponding	Wetness
Ag	Alluvial land		X	C/S			X	X	X		X	X	X	X		X		X
At	Atherton loam, ponded		X	S				X	X	X	X	X	X	X			X	X
BrB	Braceville gravelly loam	3-8%	X	C/S	X	X		X	X	X	X	X	X	X				X
ChA Chb ChC	Chenango gravelly loam	0-3% 3-8% 8-15%	X	C	X		X	X	X		X	X	X	X				
Ho	Holly silt loam		X	C/S			X	X	X	X	X	X	X	X			X	X
LaB LaC	Lackawanna channery silt loam	3-8% 8-15%	X	C	X			X	X	X			X	X				X
LcB LcD	Lackawanna very stony silt loam	0-12% 12-35%	X	C	X			X	X	X			X	X				X
MoB MoC MsB	Morris Channery silt loam Morris very stony silt loam	0-8% 8-15% 0-8%	X	C/S	X	X		X	X	X	X		X	X				X

Map Symbol	Soil Name	Slope	Cut Banks Cave	Corrosive to Concrete or Steel	Droughty	Easily Erodiible	Flooding	High Water Table	Hydric/Hydric Inclusions	Low Strength	Slow Percolation	Piping	Poor Source of Topsoil	Frost Action	Shrink-Swell	Potential Sinkhole	Ponding	Wetness
OIC OID OpD OxF	Oquaga and Lordstown Channery silt loam Oquaga and lordstown ext. stony silt loam	8-15% 15-25% 8-25% steep	X	C	X	X			X		X			X				
RdA	Rexford loam	0-3%	X	C/S	X		X	X	X	X	X	X	X	X				X
WIB WIC	Wellsboro Channery silt loam	3-8% 8-15%	X	C/S	X	X		X	X	X	X	X		X				X
WmB	Wellsboro very stony silt loam	3-8%	X	C/S	X	X		X	X	X	X	X		X				X
WyD	Wyoming gravelly loam	15-25%	X	C	X				X		X		X					

Source: Appendix E, Table E-1, PADEP, *Erosion and Sediment Pollution Control Program Manual*, Technical Guidance Number 363-2134-008.

Table 1.2.2
Soil Use Limitations Resolutions

Limitation	Resolution
Slopes	Excavations should be stabilized to prevent erosion and contractor should employ proper construction techniques to ensure safety on steep slope areas.
Cut Banks Cave	Excavations will be properly supported by sheeting and shoring to prevent caves.
Corrosive to Concrete or Steel	No concrete or steel piping is proposed without appropriate coatings and protection.
Droughty	Existing suitable topsoil and soil amendments will be used during construction as necessary.
Easily Erodible	Temporary and permanent E&SC BMPs will be employed throughout the construction and operation of the access roads.
Flooding	Ensure that the access roads have has proper drainage and no obstructions within floodway/floodplain.
High Water Table	A geotechnical investigation was conducted to minimize conflicts with saturated zones.
Hydric/Hydric Inclusions	A wetland investigation was completed. Impacts to wetlands have been minimized by modifying the access road alignment to avoid wetlands and/or protecting wetlands with E&SC BMPs where existing roads are adjacent to wetlands.
Low Strength	A maximum of 3:1 slopes area proposed.
Slow Percolation	A field investigation of percolation rates at the infiltration areas will be performed to verify the soils percolation capacity.
Piping	Watertight pipe, antiseep collars, clay cores through basin berms, and concrete endwalls will be used to minimize water movement via pipe bedding.
Poor Source of Topsoil	Existing topsoil, which has proven to be suitable, will be reused on the site.
Frost Action	Gravel specified in lieu of pavement to minimize frost effects.
Shrink-Swell	Gravel specified in lieu of pavement.
Potential Sinkhole	Geotechnical Engineer of record recommendations will be followed for any potential occurrences.
Ponding	Surface grading and drainage facilities will be provided to minimize ponding affects.
Wetness	Wet weather construction recommendations, per the Geotechnical Engineer's recommendations, will be employed to minimize the effects of wetness during construction, surface grading. Surface grading and drainage will be provided to minimize wetness affects after construction.

1.3 Earth Disturbance Activity

The proposed temporary and permanent access roads are located in grassy areas, agricultural areas, and woodland areas. Portions of the roads are located along existing dirt, gravel, or paved roads. The proposed land use is temporary or permanent access

roads intended to provide a means of ingress/egress to/from the pipeline ROW for construction personnel and inspectors. The proposed alteration of the land includes modifying the existing access road ROW to accommodate a 14 foot wide gravel access road, typically. Installing the access roads may require grading activity to widen existing roads or to construct new portions of road. See the Access Road E&SC Plans in **Section 2 of the ESCGP-2 NOI**.

Characterization of Land Use

The characterization of land use within the proposed CPL North project areas is based on interpretation of aerial photographs taken in the spring of 2014 and information gathered from field surveys conducted during 2014 and 2015. Transco classified land uses within the proposed Project areas into the following eight broad types:

1. Agricultural Land – land associated with active cultivation of ROW and field crops; areas of grasses planted for livestock grazing or for the production of hay crops; orchards; and specialty crops, including vineyards, Christmas trees, and fruits and vegetables.
2. Upland Forest/Woodland – includes upland deciduous forest, evergreen forest, and mixed (deciduous and evergreen) forest, but does not include forested wetlands.
3. Industrial/Commercial Land – land used for mines or quarries and associated processing plants; manufacturing or other industrial facilities; and land developed for commercial or retail uses, including malls, strip plazas, business parks, and medical facilities.
4. Transportation Land – land used for transportation purposes, including interstate highways; state, county, and local highways and roads; and railroad lines.
5. Residential Land – residential areas, including yards of individual residences.
6. Open Land – non-forested and undeveloped land not classified for another use, including land maintained as utility ROWs for overhead and underground electric transmission, natural gas transmission, and oil transmission facilities.
7. Wetlands – includes wetlands covered with emergent, scrub-shrub, and forested vegetation.
8. Open Water – include rivers, streams, creeks, canals, and other linear waterbodies, as well as lakes, ponds, and other non-flowing waterbodies.

Area Types

The access road construction ROW is comprised of the following area types:

- **Limit of Disturbance (LOD) Area** – The LOD area is the construction ROW for the access roads. For most roads, this area is 50 feet wide and centered on the centerline of the access road. In areas where grading and/or E&SC BMPs require more room, the LOD has been expanded to encompass the proposed improvement area.
- **ESCGP-2 Permit Boundary/ Site Area** – The ESCGP-2 Permit Boundary / Site Area is the area to be permitted for improvements with the Chapter 102 Application. This area is slightly larger than the LOD area. The limit of the ESCGP-2 Permit Boundary/ Site Area is typically offset 5 feet from the LOD limit for access roads.

Future changes made to the LOD area that are still within the ESCGP-2 Permit Boundary/ Site Area would likely be considered a minor modification to the Project's Chapter 102 Permit. However, future changes to the LOD area that are outside the ESCGP-2 Permit Boundary/ Site Area may require a major modification to the Permit.

- **Area of Minimum Disturbance / Reduced Grading** – The Area of Minimum Disturbance / Reduced Grading is the area within the LOD area that is outside the proposed grading area. Disturbances within the Area of Minimum Disturbance / Reduced Grading will be minimal.
- **LOD Area within Floodway/Floodplain** – The LOD Area within Floodway/Floodplain is the area within the LOD that is within a FEMA (Federal Emergency Management Agency) designated Floodplain or an assumed floodway that extends approximately 50 feet from the top of bank of a stream landward. The LOD Area within Floodway/Floodplain have been coordinated with the Chapter 105 Permit application. For most of the access roads, where the LOD crosses a floodway/floodplain, the LOD area has been minimized and the existing road will be used. Where the existing road cannot support the intended traffic loads, timber matting will be installed to provide an adequate driving surface.
- **Area of Riparian buffer** – The Area of Riparian buffer is the area within the LOD that is within the assumed riparian buffer area. For most of the access roads, where the LOD crosses the riparian buffer area, the LOD area has been minimized and the existing road will be used. Where the existing road cannot support the intended traffic loads, timber matting will be installed to provide an adequate driving surface.

1.4 Minimize Soil Compaction in Disturbed Areas

The impacts associated with the temporary and permanent access roads related to soil compaction in disturbed areas will be minimized to the maximum extent practicable. The following categories describe the different levels of compaction experienced by soils within the project limits and the measures required to mitigate the impacts of compaction in the disturbed areas. See the attached access road appendices for the specific measures implemented on each individual access road.

- ***Minimal Disturbance Areas: The minimal disturbance areas are depicted as AREA OF MINIMUM DISTURBANCE/REDUCED GRADING on the E&SC plans. Specifically, this area is located between the limit of grading and the access road right of way. Construction traffic is prohibited from these areas outside of existing roadway areas. The impacts associated with soil compaction are minimized by making this area as large as possible within the access road ROW.***
- ***Construction Traffic Areas: Construction traffic will be limited to the 14' wide access road. Existing roads will be used wherever possible. The width of the access roads has been reduced as much as possible to maximize the minimal disturbance areas while still providing safe travel to the anticipated construction vehicles. The use of existing roads and the restoration plan will ensure the impacts associated with soil compaction will be minimized to the maximum extent practicable.***
- ***Stockpile and Storage Areas: The locations of the stockpile and storage areas will be subject to a restoration plan. The restoration of the storage areas will act to minimize the impacts associated with soil compaction to the maximum extent practicable.***
- ***Topsoil Quality and Placement: Topsoil stripped and stockpiled for the construction of the temporary roads and permanent roads that provide access to the pipeline ROW will be utilized for the restoration of the area upon completion of construction. Utilizing this topsoil will enhance the revegetation process due to the presence of the native soil organisms. The use of the native soils and the proper placement of the soil will act to minimize the impacts associated with soil compaction to the maximum extent practicable.***

1.5 Project Site Runoff

The E&SC BMPs for the access roads are sized using E&SC Worksheets 1 and 11 of the PADEP E&SC Manual. These worksheets take into consideration the slope length

above the sediment barrier and the drainage area contributing to the channel, respectively. (See **Appendices E through S** for road-specific worksheets.)

For temporary access roads **and permanent access roads that provide access to the pipeline ROW**, no permanent increase in impervious area is proposed. Disturbed areas will be restored to pre-construction conditions or meadow in good condition.

For permanent access roads, **that provide access to MLVs**, a summary table presenting the change in runoff volume for the 2-year **24-hour** design storm and the change in peak rate of runoff for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year **24-hour** design storms for pre-construction and post construction conditions, along with the supporting calculations, are provided for each permanent access road in **the road-specific appendix**.

Where applicable, Act 167 Plan names and adoption dates for each access road watershed are included in the road-specific narratives provided in **Appendices E through S**.

Act 167 Summary

The proposed permanent access roads located in Luzerne County were designed to meet the Luzerne County Act 167 Phase II Stormwater Management Plan. This PCSM/SR narrative provides evidence that the Act 167 standards for stormwater runoff rate release, stormwater volume, and water quality are met. The proposed permanent access roads in Luzerne County, AR-LU-007.1 and AR-LU-009.1 fall into two categories of road. AR-LU-007.1 is a proposed permanent access road that provides access to a main line valve site. The proposed improvements for AR-LU-007.1 will be permanent and remain in place after construction and throughout the life of the pipeline. AR-LU-009.1 is a proposed permanent road that will provide access to the pipeline right-of-way. AR-LU-009.1 is proposed over an existing road. No new impervious area is proposed for this road, therefore no PCSMs are proposed for this road and this road is not subject to the requirements of the ACT 167 plan. Only AR-LU-007.1 will be subject to the PCSM requirements of the Luzerne ACT 167 Plan.

1.6 Surface Water Classification

The locations and Chapter 93 designation of the streams and wetlands near the LOD for the temporary and permanent access roads are shown on the **Best Management Practices and Quantities Plan Set (Section 2 of the ESCGP-2 NOI)**.

1.7 BMP Description Narrative

E&SC BMPs, consistent with the PADEP E&SC Manual are planned to be used along the temporary and permanent access roads before, during, and after earth disturbance activities. E&SC BMPs will be installed prior to disturbance. Installation and maintenance guidelines, as well as E&SC and SR BMP locations are as shown on the E&SC Plans (**Section 2 of the ESCGP-2 NOI**) and the Best Management Practices and Quantities Plan **Set**. The E&SC and SR BMPs that will be used for the temporary and permanent access roads include the following:

E&SC BMPs

- **Rock Construction Entrances**: Rock Construction Entrances (RCEs) shall be installed from any public road, as shown on the E&SC Plans (**Section 2 of the ESCGP-2 NOI**) and the detail provided in the Best Management Practices and Quantities Plan. Upon access road ROW stabilization, the RCEs shall be removed and the area restored.
- **Rock Construction Entrance with Wash Rack**: RCEs with wash racks shall be installed in High Quality (HQ), Exceptional Value (EV), ***or siltation impaired watersheds*** as shown on the E&SC Plans and Detail Sheets (provided in Section 2 of the ESCGP-2 NOI). Upon Site stabilization, the RCEs shall be removed and the area restored.

A stabilized construction entrance will be provided on each access road to reduce the vehicle tracking of sediments off-site. The adjacent off-site road to which the access road connects will be inspected daily during active use of the access road and maintained as necessary to remove any excess mud, dirt, or rock tracked from the access road. Additionally, the access road LOD, including existing roads used as part of the access road will be inspected daily during active use of the access road and maintained as necessary to remove any excess mud, dirt, or rock tracked from the access road.

- **Vacuum Sweeping**: Vacuum Sweeping may be used to mitigate the spread of sediment beyond the RCEs. RCEs will be inspected daily for sediment tracking onto public roadways. The roadway shall be vacuum swept ***upon discovery of sediment. Any large clumps of dirt that accumulate on the road surface will need to be hand cleared before vacuum sweeping.*** All vehicles leaving the RCE shall be inspected for large clumps of debris. If debris, larger than ***4"*** diameter is observed, it shall be manually removed from the vehicle. Dirt roads shall be inspected weekly for rutting. ***There shall be no more than a maximum of 4" of rutting on access roads.*** If rutting in excess of ***4"*** is observed, the road shall be rolled as soon as feasible.

- **Compost Filter Sock**: Compost Filter Sock (CFS) shall be installed in accordance with the detail provided in the Best Management Practices and Quantities Plan to filter sediment-laden sheet flow runoff from the LOD. Upon access road ROW stabilization, ***stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.***
- **Silt Fence**: Silt Fence (SF), Reinforced Silt Fence (RSF), or Super Silt Fence (SSF) shall be installed in accordance with the detail provided in the Best Management Practices and Quantities Plan to filter sediment-laden sheet flow runoff from the LOD. Upon access road ROW stabilization, SF, RSF, and/or SSF shall be removed and the area restored.
- **Compost Filter Sock Diversions**: Compost Filter Sock Diversions (FSD) will be designed to convey clean water around disturbed areas or may be designed to convey sediment-laden water to E&SC BMPs. Upon access road ROW stabilization, Compost Filter Sock Diversions shall be removed and the area restored or converted to final grades.
- **Rock Filter Outlet**: ***Rock Filter Outlets (RFOs) may be used to control runoff, below construction work while flow is being diverted past the work area, or to control sediment either during construction or during temporary disturbance. RFOs should be constructed according to the specifications shown in the Standard Detail Sheets. Anchored compost layer shall be used on upslope face in HQ and EV watersheds.***
- **Rock Filter**: ***Rock Filters will be installed as shown on the E&SC Plans and according to the Standard Detail Sheets. Rock Filters dissipate energy from the concentrated flow in roadside ditches and channels to prevent erosion of the channel and at the outlet. Rock Filters may be used in HQ watersheds if a 6-inch layer of compost is layered on the upgradient side.***
- **Riprap Aprons/Outlet Protection**: Riprap Aprons shall be installed to dissipate energy from flow concentrated at culverts, channels, and Compost Filter Sock Diversions. Upon access road ROW stabilization, temporary Riprap Aprons will be removed and the area restored.
- **Broad-based Dips and Water Deflectors**: Broad-based Dips may be used to direct runoff from active access roads to well-vegetated areas or sediment removal E&SC BMPs. Broad-based Dips are easily traversed by most construction equipment and typically require less maintenance to ensure their integrity. Broad-based Dips, will not be constructed on roads with grades exceeding 10%. Where access roads exceed 10% gradients, insloping or ***water deflectors*** may be used to control runoff.
- **Construction Fence**: Construction Fence shall be installed at the limits of all streams, wetlands, stormwater management facilities, and public roads to be

protected from construction vehicle access. Upon access road ROW stabilization, the Construction Fence shall be removed.

- Erosion Control Blankets: Erosion Control Blankets (ECB) shall be installed in the following areas of disturbance:
 - Areas within 50 feet of a stream or wetland (DS75, as manufactured by North American Green or approved equal).
 - Areas within 100 feet of HQ or EV streams and wetlands (DS75, as manufactured by North American Green or approved equal).
 - Slopes **equal to 3:1 or greater** (SC150, as manufactured by North American Green or approved equal).North American Green product data is included in **Appendix D**.
- Temporary Vegetative Stabilization: Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed four days, the access road ROW shall be immediately seeded, mulched, or otherwise protected from accelerated erosion.

1.8 BMP Installation Sequence Narrative

Refer to the E&SC Plans (Section 2 of the ESCGP-2 NOI) for the location of the proposed work and the associated E&SC BMPs. The construction sequence is intended to provide a general course of action in order to conform to the applicable regulatory agency requirements for temporary and permanent **BMPs. Detailed road specific sequences are provided on the E&SC plans and within the road specific appendices.** Necessary procedures for proper and complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the Contractor. It is not intended that the drawings and **road-specific construction sequence** show every detailed piece of material or equipment.

1.9 Supporting Calculations and Measurements

Supporting calculations for each access road E&SC design are provided in **Appendices E through S**.

1.10 Plan Drawings

Full size copies of the permanent access road E&SC Plans have been provided under separate cover in Section 2 of the ESCGP-2 NOI.

Preparer Qualifications are included in Appendix D.

1.11 Maintenance Program

E&SC BMPs shall be maintained properly throughout Project construction. The following inspection and maintenance shall be implemented to maintain E&SC BMPs.

- Maintenance and inspection of E&SC BMPs shall conform to the following:
 - Federal Energy Regulatory Commission (FERC) regulations;
 - Transco's project-specific Upland Erosion Control, Revegetation, and Maintenance Plan (Transco Plan) included as **Attachment 17 to the Environmental Construction Plan (ECP) provided as Section 4 of the ESCGP-2 NOI**;
 - Transco's project-specific Wetland and Waterbody Construction and Mitigation Procedures, and Procedures (Transco Procedures) included as **Attachment 18 to the ECP provided as Section 4 of the ESCGP-2 NOI**; and
 - PA Code Chapter 102 and 105 regulations, including all conditions of the ESCGP-2.
- Until an access road is stabilized, the associated E&SC BMPs shall be maintained properly. Maintenance shall include inspections of E&SC BMPs after each runoff event and on a weekly basis. Preventative and remedial maintenance work, including clean out, repair, replacement, re-grading, reseeding, re-mulching, and re-netting must be initiated immediately. If the E&SC BMPs fail to perform as expected, replacement E&SC BMPs, or modifications of those installed will be required.
- Immediately upon discovering unforeseen circumstances posing the potential for accelerated erosion and/or sediment pollution, the Contractor shall implement appropriate E&SC BMPs to minimize the potential for erosion and sediment pollution and notify the local CCD and/or the regional office of the PADEP.
- A log showing dates that E&SC BMPs were inspected as well as any deficiencies found and the date they were corrected shall be maintained with the Environmental Inspectors records for the associated Construction Spread and be made available to regulatory agency officials at the time of inspection.
- The reviewing agency (PADEP or local CCD) shall be notified of any changes to the approved E&SC Plans (**Section 2 of the ESCGP-2 NOI**) prior to implementation of those changes. The reviewing agency may require a written submittal of those changes for review and approval at its discretion.
- Refer to the E&SC BMP details provided in the Best Management Practices and Quantities Plan **Set** for inspection and maintenance procedures specific to each E&SC BMP.

- Sediment removed from E&SC BMPs shall be properly disposed of off-site in accordance with applicable regulations or placed within the access road ROW up gradient of E&SC BMPs.
- RCEs will be inspected on a daily basis for evidence of off-site tracking of mud. The Contractor shall clean streets and roads of mud and/or dust and keep the streets and roads in a clean and dust-free condition in accordance with the Fugitive Dust Control Plan included as **Attachment 1 to the ECP provided as Section 4 of the ESCGP-2 NOI**.
- Access road gravel thickness shall be constantly maintained. A stockpile shall be maintained nearby the access road within the pipeline ROW for this purpose.
- E&SC BMPs shall remain functional as such until all areas tributary to them are permanently stabilized or until they are replaced by another BMP approved by the local CCD or PADEP.
- Permanent stabilization is defined as a minimum uniform, perennial 70% vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated erosion. Cut and fill slopes shall be capable of resisting failure due to slumping, sliding, or other movements. Any area not achieving a minimum uniform 70% perennial vegetative cover shall be reseeded and mulched within 24 hours of detection.

1.12 Material Recycling and Disposal

The restoration of the temporary access roads and of the permanent access roads that provide access to the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, the stone surface of the road and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites in compliance with local, state and federal regulations.

Transco has prepared a Spill Plan for Oil and Hazardous Materials to assist in prevention of any spills that may occur during the Project and to respond to any spills that do occur. The Contractor will be required to become familiar with the Spill Plan for Oil and Hazardous Materials and its contents prior to commencing any construction-related activities. The Spill Plan for Oil and Hazardous Materials is included as Attachment 9 to the ECP provided as **Section 4 of the ESCGP-2 NOI**. The Spill Plan for Oil and Hazardous Materials will be available on-site as the Preparedness, Prevention, and Contingency (PPC) Plan. For the access roads, “on-site” refers to the access road ROW or the office trailer that is serving the appropriate construction spread for each access road.

The Contractors are required to inventory and manage their construction on-site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater.

Materials Covered

The following materials or substances are expected to be present on-site during construction (**Note: This list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site**):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydro seeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here): _____

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. The Contractor shall provide a weather proof container to store chemicals or erodible substances that must be kept on-site. The Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of safety data sheets (SDS).

Material Management Practices

The following are material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

1. Good Housekeeping Practices

The following good housekeeping practices will be followed during construction:

- Store only enough material required to do the job.
- Store materials in a neat, orderly manner.
- Store chemicals in watertight containers or in a storage shed, under a roof,

completely enclosed, with appropriate secondary containment to prevent spill or leakage. Drip pans shall be provided under dispensers.

- Substances will not be mixed with one another unless recommended by the manufacturer.
- Manufacturer's recommendations for proper use and disposal will be followed.
- Inspections will be performed to ensure proper use and disposal of materials.
- Cover and berm loose stockpiled construction materials that are not actively being used (i.e. Soil, spoils, aggregate, etc.).
- Minimize exposure of construction materials to precipitation.
- Minimize the potential for off-site tracking of loose construction and landscape materials.

2. Hazardous Products

These practices will be used to reduce the risks associated with hazardous materials. SDS will be posted in the immediate area where a substance with hazardous properties is stored and/or used and another copy of the SDS will be maintained in a file at the construction spread trailer office. Each employee who must handle a substance with hazardous properties will be instructed on the use of SDS and the specific information in the applicable SDS for the product he/she is using, particularly regarding spill control techniques. The following measures will be implemented:

- Products will be kept in original containers with the original labels in legible condition.
- Original labels and SDSs will be produced and used for each material.
- If surplus product must be disposed of, manufacturers or local/state/federal recommended methods for proper disposal will be followed.

3. Hazardous Wastes

Hazardous waste materials will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products.

4. Concrete and Other Wash Waters

Prevent disposal of rinse, wash waters, or materials on impervious or pervious surfaces, into streams, wetlands or other water bodies.

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water within the permanent access road LOD, but only in either (1) specifically

designated diked areas which have been prepared to prevent contact between the concrete and/or washout and soil and stormwater having the potential to be discharged from the access roads; or (2) in locations where waste concrete can be poured into forms to make riprap or other useful concrete products.

The hardened residue from the concrete washout diked areas will be disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on-site as deemed appropriate by the Contractor and Geotechnical Engineer. The Contractor will be responsible for seeing that these procedures are followed.

Concrete washout areas will be located in an area where the likelihood of the area contributing to stormwater discharge is negligible. If required, additional E&SC BMPs must be implemented to prevent concrete wastes from contributing to stormwater discharges. The location of the concrete washout area(s) must be identified, by the Contractor, on the on-site copy of the E&SC Plans (**Section 2 of the ESCGP-2 NOI**).

5. Sanitary Wastes

Sanitary waste units will be located in an area where the likelihood of the unit contributing to stormwater discharges is negligible. Additional E&SC BMPs must be implemented, such as containment trays (typically provided by the rental company) or special containment created with 2"x4" lumber, impervious plastic, and gravel. The location of the sanitary waste units must be identified, by the Contractor, on the on-site copy of the E&SC Plans (**Section 2 of the ESCGP-2 NOI**).

6. Solid and Construction Wastes

Waste materials will be collected and stored in a securely lidded metal dumpster. The dumpster will comply with all local and state solid waste management regulations. The dumpster/container lids shall be closed at the end of every business day and during rain events. Appropriate measures shall be taken to prevent discharges from waste disposal containers to the receiving water.

7. Construction Access

A stabilized RCE will be provided to help reduce vehicle tracking of sediments. The paved roads adjacent to the RCEs will be inspected daily and ***maintained*** as necessary to remove any excess mud, dirt, or rock tracked from the LOD. Dump trucks hauling material from the access roads will be covered with a tarpaulin as necessary.

8. Petroleum products

Construction vehicles will be monitored for leaks and receive regular preventative maintenance. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Petroleum storage tanks will have a dike or berm containment structure constructed around it to contain spills which may occur (containment volume to be 110% of volume stored). The dike or bermed area shall be lined with an impervious material such as a heavy duty plastic sheet. Drip pans shall be provided for all dispensers.

9. Fertilizers and landscape materials

Where permitted, fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to minimize the potential for exposure to stormwater. Storage will be under cover. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to minimize the potential for spills. The bin shall be labeled appropriately.

10. Paints, Paint Solvents and Cleaning Solvents

Containers will be tightly sealed and stored when not in use. Excess paint and solvents will be properly disposed of according to manufacturer's instructions or local/state/federal regulations.

11. Contaminated Soils

Contaminated soils (resulting from spills of materials with hazardous properties) which may result from construction activities will be contained and cleaned up immediately in accordance with the Spill Plan for Oil and Hazardous Materials included as **Attachment 9 to the ECP provided as Section 4 of the ESCGP-2 NOI**.

1.13 Soil Conditions and Geologic Formations

AECOM conducted a review of the proposed CPL North pipeline for the potential of geologic formation which may cause pollution if disturbed or exposed during construction.

Karst Bedrock Formations

As identified by AECOM, naturally-occurring bedrock formations and soils types that may cause pollution are present along portions of the CPL North construction ROW. Bedrock formations that may cause pollution are associated with karst or acid-forming conditions include the following:

- Conestoga Formation
- Vintage Formation
- Buffalo Springs Formation
- Ledger Formation
- Zooks Corner Formation
- Snitz Creek Formation
- Millbach Formation
- Stonehenge Formation
- Epler Formation
- Richenbach Formation
- Ontelaunee Formation
- Annville Formation
- Hershey-Myerstown Formation
- Keyser-Tonoloway Formation

There are two bedrock formations that do not form significant karst terrain along the proposed CPL North pipelines, which include Hamburg Sequence/limestone unit and Hamilton Group/Tully limestone unit.

Acid-Producing Sulfide Bedrock Formations

In the review of the NRCS data for the proposed CPL North pipeline route, several acid-producing sulfide bedrock formations are located along the proposed route. These formations are as follows:

- Pottsville Formation (anthracite coal-bearing)
- Llewellyn Formation (anthracite coal bearing)

Formations containing variable amounts of pyrite or other sulfide minerals that may only locally be acid-producing are found along the proposed CPL North pipeline. These formations can be determined only by site-specific acid-drainage investigation, and are identified as follows:

- Octoraro schist
- Conestoga phyllite
- Antietam-Harpers schist
- Kinzers shale
- Cocalico shale
- Hamburg/Martinsburg shale

Table 6 in the Best Management Practices and Quantities Plan provides the locations of the acidic bedrock.

Acidic Soils

For the proposed CPL North pipeline, based on review of the attached NRCS Custom Soil Resource Report provided in **Appendix C, acidity levels of the soils** found along the proposed CPL North route ***do not fall within the pH range that is considered to be a potential source of pollution that must be mitigated. Should acidic soils with a pH of 4.0 or lower be encountered during the construction of the temporary and***

permanent access roads, the following Acid Producing Soils and Bedrock Control Plan shall be implemented. Table 5 in the Best Management Practices and Quantities Plan provides the locations of soils and their respective acidity levels. ***A road specific Soil Acidity Table is included for each road in the road specific appendices attached to this document.***

Acid Producing Soils and Bedrock Control Plan

The following acid producing soils control plan was developed to identify BMPs and procedures for minimizing the potential for pollution associated with the disturbance of the areas associated with the construction of the temporary and permanent access roads that contain acid-producing soils with a pH less than 4.0, as recommended by the Natural Resources Conservation Service (NRCS).

- 1. Contractor shall limit the excavation area and exposure time when high acid-producing soils are encountered. Locations where acidic soils are anticipated to be present along the access roads are provided in the road specific narratives included in this document and on the E&SC plans included in Section 2 of the ESCGP-2 NOI.***
- 2. Contractor shall separately store topsoil stripped from the site away from temporarily stockpiled high acid-producing soils and bedrock.***
- 3. Contractor shall stockpile high acid-producing soils and bedrock material on level ground to minimize its movement, especially when these materials have a high clay content.***
- 4. Contractor shall cover temporarily stockpiled high acid-producing soil and bedrock material to be exposed more than 7 days with properly anchored, heavy-grate sheets of polyethylene, where possible. If not possible, stockpiles shall be covered with a minimum of three to six inches of wood chips to minimize erosion of the stockpile. In addition, the contractor shall install silt fence at the toe of the stockpile slope to contain movement of material. Contractor shall not apply topsoil to the high acid-producing soil or bedrock stockpiles to prevent topsoil contamination.***
- 5. Contractor shall ultimately dispose of high acid-producing soils or bedrock with a pH of four or less, or containing iron sulfide (including borrow from cuts) by placing the material combined with limestone at the rate of 6 tons per acre (or 275 pounds per 1,000 square feet of surface area) and covering the mixture with a minimum of 12 inches of settled soils with a pH of five or more except as follows:***

- a. In the areas where trees or shrubs are to be planted, the contractor shall cover the limestone/soil mixture with a minimum of 24 inches of soils with a pH of five or more.***
 - b. Contractor shall not locate any disposal area within 24 inches of any surface of a slope or bank, such as berms, stream banks, ditches, and other surface waters to prevent potential lateral leaching damages.***
- 6. At the end of each day, contractor shall clean all equipment used to handle high acid-producing soils or bedrock to prevent spreading of high-acid materials to other parts of the proposed right-of-way, into streams, or stormwater conveyances, and to protect machinery from accelerated corrosion.***
- 7. Contractor shall provide and install non-vegetative erosion controls (stone tracking pads, strategically-place limestone check dams, silt fences, wood chips) to limit the movement of high acid-producing soils from, around, or off areas disturbed for access road construction.***
- 8. Following the burial or removal of high acid-producing soils and bedrock, top soiling, and seeding of the areas restored after the removal of the temporary access roads and permanent access roads that provide access to the pipeline right-of-way, Transco shall monitor the site for approximately six to 12 months to assure there is adequate stabilization and that no high-acid soil or bedrock problems emerge. Contractor shall correct any problems that are discovered within this time period.***
- 9. If problems occur where high acid-producing soils or bedrock have been placed or buried, the applicant shall monitor these areas for at least two years to assure there is no migration of potential acid leachate.***

1.14 Thermal Impacts

Thermal impacts associated with access roads will be avoided to the maximum extent practicable by implementing the following measures:

- Minimize changes in land cover to only that necessary to construct the required permanent access roads;
- Limit removal of vegetation, especially tree cover, to only that necessary for construction;
- Minimize permanent impervious surfaces;

- Install a gravel surface for the access roads rather than asphalt;
- Incorporate the use of stone at mainline valves and vegetated channels with earthen check dams to provide storage for stormwater runoff; and
- Minimize impacts to existing riparian corridors.

See the road-specific narratives for a road-specific discussion on thermal impacts.

1.15 E&SC Plan and PCSM/SR Plan Consistency

The E&SC Plans (**Section 2 of the ESCGP-2 NOI**) this E&SC *narrative*, and *the* PCSM (**Section 3 of the ESCGP-2 NOI**) narrative have been designed and will be constructed to be consistent with the PCSM/SR Plans. Following completion of construction, disturbed areas shall be stabilized and the long-term maintenance of the PCSM/SR BMPs will begin.

1.16 Riparian Buffer Waiver

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 2 of the ESCGP-2 NOI).

The following five temporary access roads within Luzerne County encroach the riparian buffer, but do not require a riparian buffer waiver:

- ***AR-LU-008 – The existing road encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. Timber matting will be installed over the existing road to protect the existing road from construction traffic wear. (Stream Information: WW-T02-15018, HQ-CWF, Perennial)***
- ***AR-LU-011 – The existing road encroaches the riparian buffer within the pipeline right of way. No earth disturbing improvements are proposed within the riparian buffer. A rock construction entrance with wash rack and driveway apron installed on top of geotextile are proposed to be installed within the riparian buffer. (Stream Information: WW-T03-17006, HQ-CWF, MF, Perennial)***
- ***AR-LU-012 - The existing road encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. Timber matting will be installed over the existing road to protect the existing road from construction traffic wear. (Stream Information: WW-T03-17005, HQ-CWF, MF, Perennial)***

- **AR-LU-020 - The existing road encroaches the riparian buffer. No improvements are proposed within the riparian buffer. The existing gravel road will be used. (Stream Information: WW-T24-18001, HQ-CWF, MF, Perennial)**
- **AR-LU-020.1 – The existing parking area encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. A rock construction entrance with wash rack installed on top of geotextile is proposed to be installed within the riparian buffer. (Stream Information: WW-17-18001, HQ-CWF, Perennial)**

No permanent access roads require a riparian buffer waiver.

1.17 Antidegradation Requirements

Antidegradation Best Available Combination of Technologies (ABACT) E&SC BMPs, such as a rock construction entrance with a wash rack, will be installed on the access roads within special protection watersheds (HQ or EV) and/or siltation impaired watersheds. Refer to the Temporary and Permanent Access Road Table above for a summary of the roads located within special protection watersheds (HQ or EV) and/or siltation impaired watersheds.

There are no opportunities for non-discharge alternatives such as connecting to a sewer system or capturing stormwater in rain barrels for reuse as irrigation.

1.18 TMDL

ABACT E&SC BMPs shall be used on the access roads that discharge to a stream with a Total Maximum Daily Load (TMDL). Road-specific TMDL discussions are provided in the road-specific narratives.

APPENDIX A

Intentionally Omitted by Applicant

APPENDIX B

Intentionally Omitted by Applicant

APPENDIX C

**United States Department of Agriculture Natural Resources
Conservation Service Custom Soil Resource Report**



United States
Department of
Agriculture

NRCS

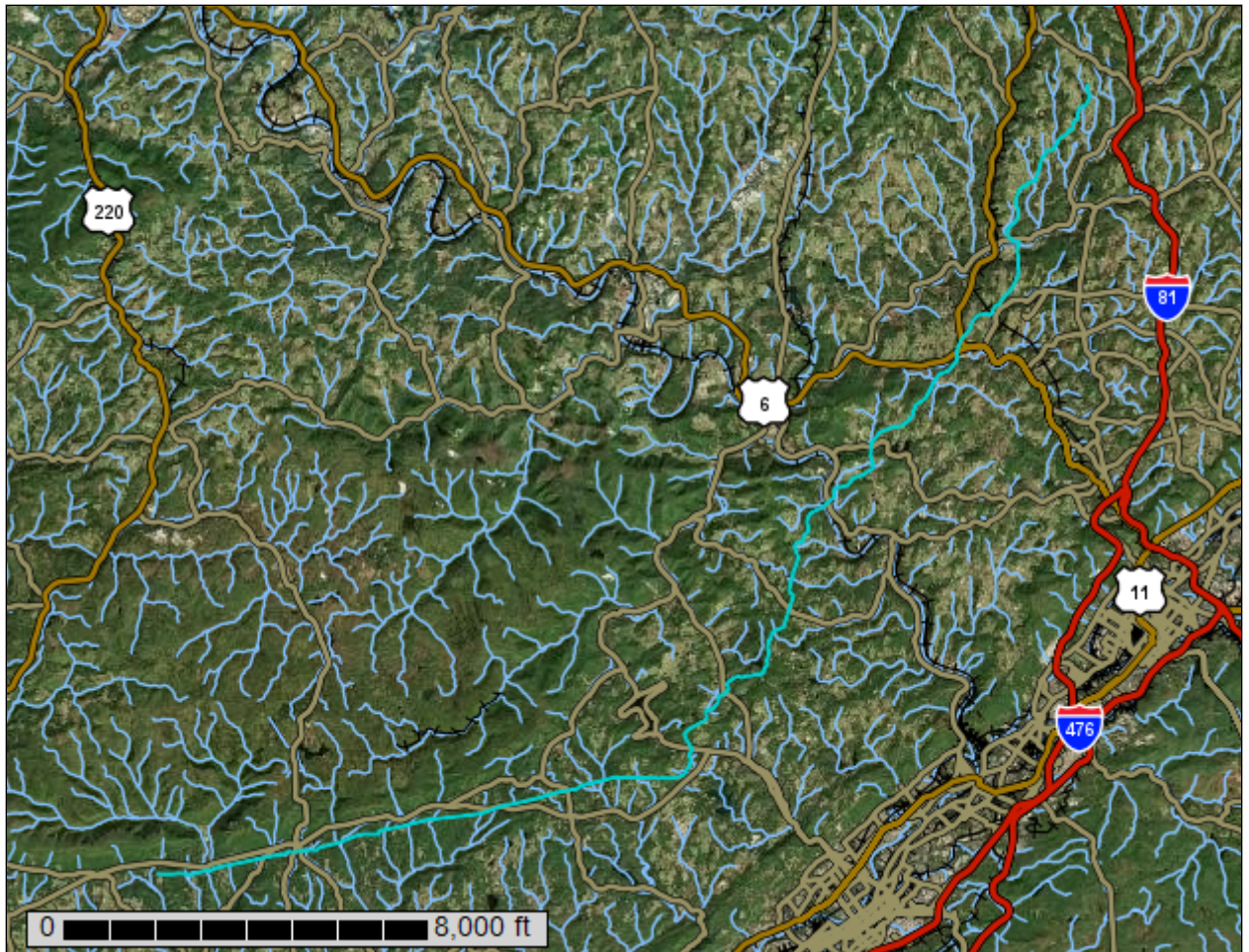
Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for ~~Columbia County,~~ ~~Pennsylvania,~~ **Luzerne** **County, Pennsylvania,** ~~Susquehanna County,~~ ~~Pennsylvania,~~ and ~~Wyoming~~ ~~County, Pennsylvania~~

CPLN

*****NOTE: REPORT HAS BEEN MODIFIED TO INCLUDE
INFORMATION FOR LUZERNE COUNTY ONLY TO
CONSERVE PAPER.*****



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

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individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

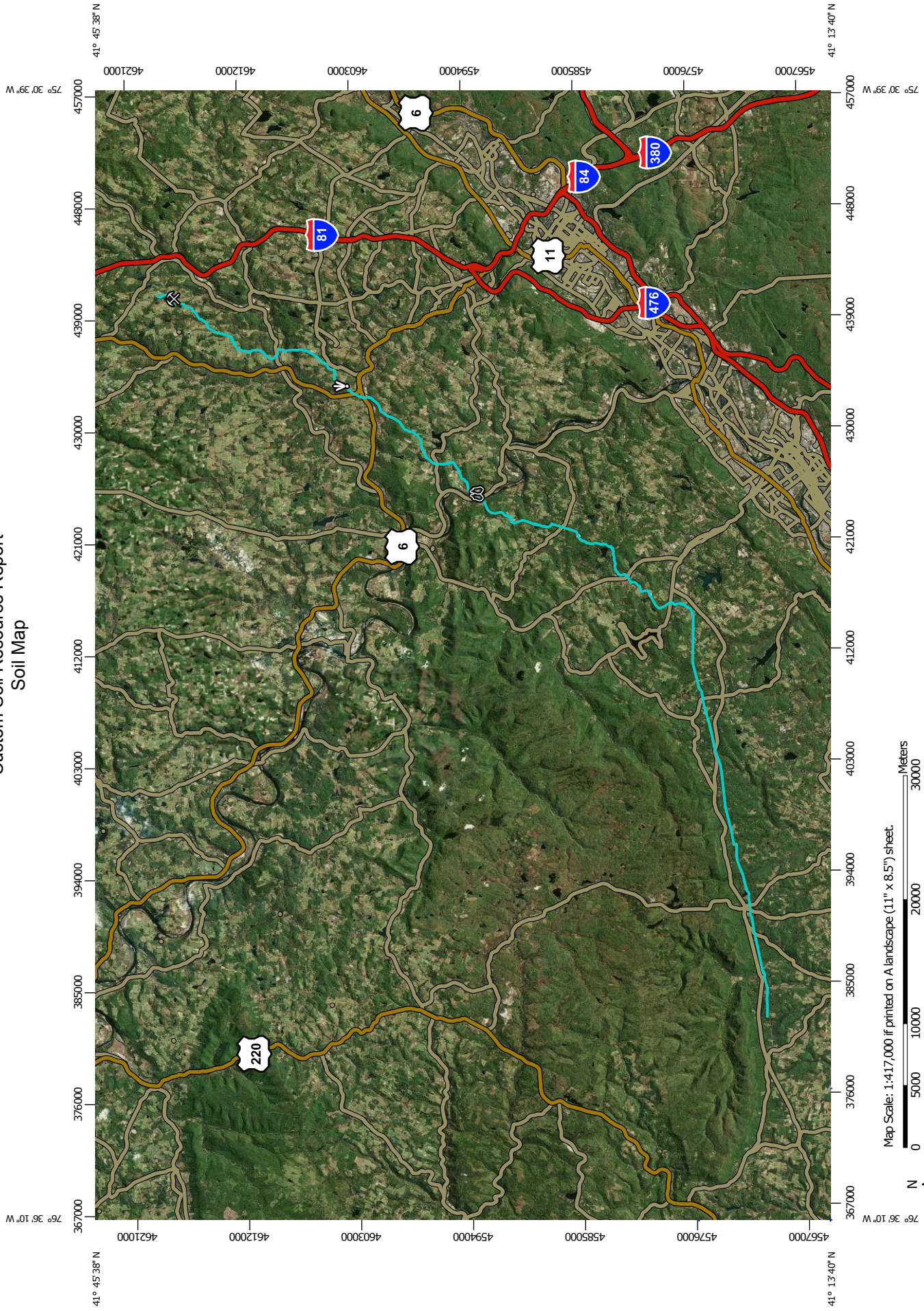
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:417,000 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Columbia County, Pennsylvania
 Survey Area Data: Version 9, Nov 16, 2015

Soil Survey Area: Luzerne County, Pennsylvania
 Survey Area Data: Version 8, Nov 16, 2015

Soil Survey Area: Susquehanna County, Pennsylvania
 Survey Area Data: Version 10, Nov 16, 2015

Soil Survey Area: Wyoming County, Pennsylvania
 Survey Area Data: Version 9, Nov 16, 2015





































Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
Special Point Features	 Special Line Features
 Blowout	Water Features
 Borrow Pit	 Streams and Canals
 Clay Spot	Transportation
 Closed Depression	 Rails
 Gravel Pit	 Interstate Highways
 Gravelly Spot	 US Routes
 Landfill	 Major Roads
 Lava Flow	 Local Roads
 Marsh or swamp	Background
 Mine or Quarry	 Aerial Photography
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

Map Unit Legend

Luzerne County, Pennsylvania (PA079)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ag	Alluvial land	0.2	0.0%

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Luzerne County, Pennsylvania (PA079)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	Atherton silt loam, gray subsoil variant	2.6	0.2%
Bf	Basher soils	3.5	0.2%
BkB	Bath channery silt loam, 3 to 8 percent slopes	2.1	0.1%
BkC	Bath channery silt loam, 8 to 15 percent slopes	0.4	0.0%
BkD	Bath channery silt loam, 15 to 25 percent slopes	1.2	0.1%
BrB	Braceville gravelly loam, 3 to 8 percent slopes	2.7	0.2%
ChA	Chenango gravelly loam, 0 to 3 percent slopes	1.7	0.1%
ChB	Chenango gravelly loam, 3 to 8 percent slopes	2.1	0.1%
ChC	Chenango gravelly loam, 8 to 15 percent slopes	5.1	0.4%
CIA	Chippewa silt loam, 0 to 3 percent slopes	2.5	0.2%
CIB	Chippewa silt loam, 3 to 8 percent slopes	0.6	0.0%
CnB	Chippewa silt loam, 0 to 8 percent slopes, extremely stony	7.9	0.6%
Ho	Holly silt loam	5.5	0.4%
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	21.3	1.5%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	5.7	0.4%
LaD	Lackawanna channery silt loam, 15 to 25 percent slopes	3.1	0.2%
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	59.1	4.2%
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	57.9	4.1%
LEF	Lackawanna and Bath soils, steep, extremely stony	4.2	0.3%
MaB	Mardin channery silt loam, 3 to 8 percent slopes	4.5	0.3%
MaC	Mardin channery silt loam, 8 to 15 percent slopes	1.1	0.1%
McB	Mardin channery silt loam, 3 to 8 percent slopes, very stony	3.7	0.3%
MoB	Morris channery silt loam, 0 to 8 percent slopes	33.0	2.3%
MoC	Morris channery silt loam, 8 to 15 percent slopes	4.4	0.3%

Custom Soil Resource Report

Luzerne County, Pennsylvania (PA079)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MsB	Morris channery silt loam, 0 to 8 percent slopes, extremely stony	25.4	1.8%
MsC	Morris channery silt loam, 8 to 15 percent slopes, extremely stony	1.9	0.1%
OIB	Oquaga and Lordstown channery silt loams, 3 to 8 percent slopes	6.6	0.5%
OIC	Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes	18.2	1.3%
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	7.7	0.5%
OpB	Oquaga and Lordstown extremely stony silt loams, 3 to 8 percent slopes	17.5	1.2%
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	78.8	5.6%
OXF	Oquaga and Lordstown extremely stony silt loams steep	61.4	4.3%
RdA	Rexford loam, 0 to 3 percent slopes	0.7	0.0%
VoB	Volusia channery silt loam, 0 to 8 percent slopes	1.3	0.1%
VrB	Volusia channery silt loam, 0 to 8 percent slopes, extremely stony	4.3	0.3%
W	Water	0.1	0.0%
Wa	Wayland silt loam	6.1	0.4%
WIB	Wellsboro channery silt loam, 3 to 8 percent slopes	31.7	2.2%
WIC	Wellsboro channery silt loam, 8 to 15 percent slopes	32.1	2.3%
WID	Wellsboro channery silt loam, 15 to 25 percent slopes	5.9	0.4%
WmB	Wellsboro channery silt loam, 3 to 8 percent slopes, extremely stony	23.8	1.7%
WmD	Wellsboro channery silt loam, 8 to 25 percent slopes, extremely stony	16.6	1.2%
WyD	Wyoming gravelly loam, 15 to 25 percent slopes	1.9	0.1%
WyF	Wyoming gravelly loam, 25 to 60 percent slopes	0.5	0.0%

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Luzerne County, Pennsylvania (PA079)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Subtotals for Soil Survey Area		578.5	40.8%
Totals for Area of Interest		1,418.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas

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for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of

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the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Luzerne County, Pennsylvania

Ag—Alluvial land

Map Unit Setting

National map unit symbol: 9yff
Elevation: 200 to 1,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 130 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluents, (alluvial land), and similar soils: 80 percent
Holly and similar soils: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluents, (alluvial Land)

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: gravelly sandy loam
H2 - 6 to 42 inches: sandy loam
H3 - 42 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 5 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: About 18 to 48 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Holly

Setting

Landform: Backswamps, depressions on flood plains
Landform position (two-dimensional): Toeslope

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Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 28 inches: silt loam
H3 - 28 to 43 inches: silt loam
H4 - 43 to 60 inches: stratified gravelly sand to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

At—Atherton silt loam, gray subsoil variant

Map Unit Setting

National map unit symbol: 9yfl
Elevation: 50 to 1,500 feet
Mean annual precipitation: 30 to 56 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 120 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Atherton, gray subsoil variant, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atherton, Gray Subsoil Variant

Setting

Landform: Outwash terraces
Parent material: Loamy glaciofluvial deposits

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Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 37 inches: silt loam
H3 - 37 to 60 inches: stratified gravelly sand to silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Braceville

Percent of map unit: 10 percent
Landform: Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bf—Basher soils

Map Unit Setting

National map unit symbol: 9yfm
Elevation: 400 to 840 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 120 to 187 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Basher and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Basher

Setting

Landform: Flood plains

Parent material: Reddish alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 10 inches: silt loam

H2 - 10 to 37 inches: loam

H3 - 37 to 53 inches: fine sandy loam

H4 - 53 to 62 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Depth to water table: About 12 to 36 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Holly

Percent of map unit: 10 percent

Landform: Backswamps, depressions on flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: Yes

BkB—Bath channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v30x

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Bath and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Side slope, interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam

Bw1 - 9 to 15 inches: channery silt loam

Bw2 - 15 to 25 inches: channery loam

E - 25 to 29 inches: channery loam

Bx - 29 to 52 inches: very channery silt loam

C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 26 to 38 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 24 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Mardin

Percent of map unit: 10 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Lordstown

Percent of map unit: 5 percent

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Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, concave
Across-slope shape: Linear
Hydric soil rating: No

BkC—Bath channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2v314
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bath and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw1 - 9 to 15 inches: channery silt loam
Bw2 - 15 to 25 inches: channery loam
E - 25 to 29 inches: channery loam
Bx - 29 to 52 inches: very channery silt loam
C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None

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Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

BkD—Bath channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2v316
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Bath and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope

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Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Ap - 0 to 9 inches: channery silt loam

Bw1 - 9 to 15 inches: channery silt loam

Bw2 - 15 to 25 inches: channery loam

E - 25 to 29 inches: channery loam

Bx - 29 to 52 inches: very channery silt loam

C - 52 to 72 inches: very channery silt loam

Properties and qualities

Slope: 15 to 25 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 26 to 38 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 24 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 10 percent

Landform: Ridges

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Base slope, side slope

Down-slope shape: Linear, concave

Across-slope shape: Linear

Hydric soil rating: No

Mardin

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Interfluvium, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

BrB—Braceville gravelly loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yfv
Mean annual precipitation: 34 to 56 inches
Mean annual air temperature: 40 to 54 degrees F
Frost-free period: 100 to 175 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Braceville and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Braceville

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy outwash

Typical profile

H1 - 0 to 3 inches: gravelly loam
H2 - 3 to 30 inches: gravelly silt loam
H3 - 30 to 55 inches: very gravelly loam
H4 - 55 to 60 inches: stratified sand and gravel

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 30 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Rexford, poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

ChA—Chenango gravelly loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9yg1
Elevation: 600 to 1,800 feet
Mean annual precipitation: 30 to 56 inches
Mean annual air temperature: 40 to 54 degrees F
Frost-free period: 100 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Chenango and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chenango

Setting

Landform: Outwash terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Gravelly outwash

Typical profile

H1 - 0 to 8 inches: gravelly loam
H2 - 8 to 32 inches: gravelly fine sandy loam
H3 - 32 to 72 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Custom Soil Resource Report

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Rexford, somewhat poorly drained

Percent of map unit: 5 percent

Landform: Depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: No

Braceville

Percent of map unit: 5 percent

Landform: Outwash terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear, convex

Across-slope shape: Linear, concave

Hydric soil rating: No

ChB—Chenango gravelly loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yg2

Elevation: 600 to 1,800 feet

Mean annual precipitation: 30 to 56 inches

Mean annual air temperature: 40 to 54 degrees F

Frost-free period: 100 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Chenango and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chenango

Setting

Landform: Outwash terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Gravelly outwash

Custom Soil Resource Report

Typical profile

H1 - 0 to 8 inches: gravelly loam
H2 - 8 to 32 inches: gravelly fine sandy loam
H3 - 32 to 72 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rexford, somewhat poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Braceville

Percent of map unit: 5 percent
Landform: Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, concave
Hydric soil rating: No

ChC—Chenango gravelly loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9yg3
Elevation: 600 to 1,800 feet
Mean annual precipitation: 30 to 56 inches
Mean annual air temperature: 40 to 54 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Chenango and similar soils: 93 percent

Minor components: 7 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chenango

Setting

Landform: Outwash terraces

Landform position (three-dimensional): Riser

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Parent material: Gravelly outwash

Typical profile

H1 - 0 to 8 inches: gravelly loam

H2 - 8 to 32 inches: gravelly fine sandy loam

H3 - 32 to 72 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Braceville

Percent of map unit: 5 percent

Landform: Outwash terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear, convex

Across-slope shape: Linear, concave

Hydric soil rating: No

Rexford, somewhat poorly drained

Percent of map unit: 2 percent

Landform: Depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: No

CIA—Chippewa silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2v32k
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chippewa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chippewa

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till dominated by siltstone, sandstone, and shale fragments

Typical profile

Ap - 0 to 7 inches: silt loam
Eg - 7 to 15 inches: channery silt loam
Bgx - 15 to 45 inches: channery silt loam
C - 45 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 3 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 8 to 20 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Chippewa, very poorly drained

Percent of map unit: 10 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Volusia

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluvium, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

CIB—Chippewa silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v32s
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chippewa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chippewa

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till dominated by siltstone, sandstone, and shale fragments

Typical profile

Ap - 0 to 7 inches: silt loam
Eg - 7 to 15 inches: channery silt loam
Bgx - 15 to 45 inches: channery silt loam
C - 45 to 72 inches: channery silt loam

Custom Soil Resource Report

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 8 to 20 inches to fragipan
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Volusia

Percent of map unit: 10 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Chippewa, very poorly drained

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

CnB—Chippewa silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vcjf
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chippewa, extremely stony, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chippewa, Extremely Stony

Setting

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Loamy till dominated by siltstone, sandstone, and shale fragments

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 5 inches: silt loam

Eg - 5 to 15 inches: channery silt loam

Bgx - 15 to 45 inches: channery silt loam

C - 45 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent

Percent of area covered with surface fragments: 7.0 percent

Depth to restrictive feature: 8 to 20 inches to fragipan

Natural drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 0 to 6 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Hydric soil rating: Yes

Minor Components

Volusia, extremely stony

Percent of map unit: 8 percent

Landform: Mountains, hills

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope, interfluvium, side slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Chippewa, extremely stony, very poorly drained

Percent of map unit: 7 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Custom Soil Resource Report

Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Ho—Holly silt loam

Map Unit Setting

National map unit symbol: 9ygb
Elevation: 200 to 1,000 feet
Mean annual precipitation: 30 to 45 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 120 to 187 days
Farmland classification: Not prime farmland

Map Unit Composition

Holly and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Holly

Setting

Landform: Backswamps, depressions on flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 28 inches: silt loam
H3 - 28 to 43 inches: silt loam
H4 - 43 to 60 inches: stratified gravelly sand to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Occasional
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w

Custom Soil Resource Report

Hydrologic Soil Group: B/D

Hydric soil rating: Yes

Minor Components

Linden

Percent of map unit: 5 percent

Hydric soil rating: No

LaB—Lackawanna channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w092

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Lackawanna and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam

Bw1 - 7 to 17 inches: channery silt loam

Bw2 - 17 to 26 inches: channery loam

Bx - 26 to 60 inches: channery loam

C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 17 to 36 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 16 to 36 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 8 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Oquaga

Percent of map unit: 4 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Morris

Percent of map unit: 3 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

LaC—Lackawanna channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w095

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Lackawanna and similar soils: 85 percent

Minor components: 15 percent

Custom Soil Resource Report

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam

Bw1 - 7 to 17 inches: channery silt loam

Bw2 - 17 to 26 inches: channery loam

Bx - 26 to 60 inches: channery loam

C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 17 to 36 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 16 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 10 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Oquaga

Percent of map unit: 3 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Morris

Percent of map unit: 2 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

LaD—Lackawanna channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2w097
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw1 - 7 to 17 inches: channery silt loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches

Custom Soil Resource Report

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Oquaga

Percent of map unit: 5 percent
Landform: Ridges, benches, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

LcB—Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w09m
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna, extremely stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder

Custom Soil Resource Report

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: channery silt loam

Bw1 - 3 to 17 inches: channery silt loam

Bw2 - 17 to 26 inches: channery loam

Bx - 26 to 60 inches: channery loam

C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 7.0 percent

Depth to restrictive feature: 17 to 36 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 16 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Wellsboro, extremely stony

Percent of map unit: 10 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Morris, extremely stony

Percent of map unit: 3 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Oquaga, rubbly

Percent of map unit: 2 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

LcD—Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w09n
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna, extremely stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw1 - 3 to 17 inches: channery silt loam
Bw2 - 17 to 26 inches: channery loam
Bx - 26 to 60 inches: channery loam
C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 17 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 16 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Morris, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Oquaga, rubbly

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wellsboro, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Convex, concave
Across-slope shape: Convex, linear
Hydric soil rating: No

LEF—Lackawanna and Bath soils, steep, extremely stony

Map Unit Setting

National map unit symbol: 2v31t
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna, extremely stony, and similar soils: 60 percent
Bath, extremely stony, and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna, Extremely Stony

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy till derived mainly from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: channery silt loam

Bw1 - 3 to 17 inches: channery silt loam

Bw2 - 17 to 26 inches: channery loam

Bx - 26 to 60 inches: channery loam

C - 60 to 72 inches: very channery loam

Properties and qualities

Slope: 25 to 50 percent

Percent of area covered with surface fragments: 7.0 percent

Depth to restrictive feature: 17 to 36 inches to fragipan

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 16 to 36 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Bath, Extremely Stony

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, nose slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: channery silt loam

Bw1 - 3 to 15 inches: channery silt loam

Bw2 - 15 to 25 inches: channery loam

E - 25 to 29 inches: channery loam

Bx - 29 to 52 inches: very channery silt loam

C - 52 to 72 inches: very channery silt loam

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Properties and qualities

Slope: 25 to 45 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Arnot

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Oquaga, extremely stony

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wellsboro, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluvium, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Lordstown, extremely stony

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

MaB—Mardin channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2srhb
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Mardin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mardin

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till

Typical profile

Ap - 0 to 8 inches: channery silt loam
BE - 8 to 12 inches: channery silt loam
Bw1 - 12 to 16 inches: channery silt loam
Bw2 - 16 to 20 inches: channery silt loam
Bx1 - 20 to 36 inches: channery silt loam
Bx2 - 36 to 57 inches: channery silt loam
C - 57 to 72 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Custom Soil Resource Report

Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, concave
Across-slope shape: Linear
Hydric soil rating: No

Bath

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Volusia

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

MaC—Mardin channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2srhj
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Mardin and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mardin

Setting

Landform: Mountains, hills

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Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 8 inches: channery silt loam
BE - 8 to 12 inches: channery silt loam
Bw1 - 12 to 16 inches: channery silt loam
Bw2 - 16 to 20 inches: channery silt loam
Bx1 - 20 to 36 inches: channery silt loam
Bx2 - 36 to 57 inches: channery silt loam
C - 57 to 72 inches: channery silt loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Bath

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Volusia

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Lordstown

Percent of map unit: 2 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder

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Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

McB—Mardin channery silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2srj1
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Mardin, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mardin, Very Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till

Typical profile

A - 0 to 4 inches: channery silt loam
BE - 4 to 12 inches: channery silt loam
Bw1 - 12 to 16 inches: channery silt loam
Bw2 - 16 to 20 inches: channery silt loam
Bx1 - 20 to 36 inches: channery silt loam
Bx2 - 36 to 57 inches: channery silt loam
C - 57 to 72 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lordstown, very stony

Percent of map unit: 6 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

Volusia, very stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Chippewa, very stony

Percent of map unit: 4 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MoB—Morris channery silt loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2vclq
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Morris and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bw - 8 to 12 inches: channery silt loam
Eg - 12 to 16 inches: channery silt loam
Bx - 16 to 60 inches: channery silt loam
C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Norwich

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MoC—Morris channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2vc1v

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Morris and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam

Bw - 8 to 12 inches: channery silt loam

Eg - 12 to 16 inches: channery silt loam

Bx - 16 to 60 inches: channery silt loam

C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 10 to 22 inches to fragipan

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 6 to 18 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Wellsboro

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Oquaga

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Norwich

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MsB—Morris channery silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vxct
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Morris, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope

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Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 5 inches: channery silt loam

Bw - 5 to 12 inches: channery silt loam

Eg - 12 to 16 inches: channery silt loam

Bx - 16 to 60 inches: channery silt loam

C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 0 to 8 percent

Percent of area covered with surface fragments: 7.0 percent

Depth to restrictive feature: 10 to 22 inches to fragipan

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 6 to 18 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Wellsboro, extremely stony

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Interfluvial, side slope, head slope

Down-slope shape: Convex, concave

Across-slope shape: Convex, linear

Hydric soil rating: No

Norwich, extremely stony

Percent of map unit: 5 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

MsC—Morris channery silt loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vxcx
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Morris, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morris, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: channery silt loam
Bw - 5 to 12 inches: channery silt loam
Eg - 12 to 16 inches: channery silt loam
Bx - 16 to 60 inches: channery silt loam
C - 60 to 72 inches: channery loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Norwich, extremely stony

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wellsboro, extremely stony

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluvium, side slope, head slope
Down-slope shape: Convex, concave
Across-slope shape: Convex, linear
Hydric soil rating: No

OIB—Oquaga and Lordstown channery silt loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yhh
Elevation: 600 to 1,800 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Oquaga and similar soils: 60 percent
Lordstown and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw - 7 to 30 inches: very channery loam
R - 30 to 42 inches: unweathered bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Till derived from sedimentary rock

Typical profile

A - 0 to 7 inches: channery silt loam
Bw - 7 to 26 inches: channery silt loam
C - 26 to 30 inches: very channery loam
2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

OIC—Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9yhj

Elevation: 600 to 1,800 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 110 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Oquaga and similar soils: 60 percent

Lordstown and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

Ap - 0 to 7 inches: channery silt loam

Bw - 7 to 30 inches: very channery loam

R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 26 inches: channery silt loam

C - 26 to 30 inches: very channery loam

2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Hydric soil rating: No

OID—Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9yhk

Elevation: 600 to 1,800 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 110 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Oquaga and similar soils: 60 percent

Lordstown and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

Ap - 0 to 7 inches: channery silt loam
Bw - 7 to 30 inches: very channery loam
R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam
Bw - 7 to 26 inches: channery silt loam
C - 26 to 30 inches: very channery loam
2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Hydric soil rating: No

OpB—Oquaga and Lordstown extremely stony silt loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9yh1

Elevation: 700 to 1,800 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 110 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Oquaga and similar soils: 60 percent

Lordstown and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 30 inches: very channery silt loam

R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 15.0 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Custom Soil Resource Report

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 26 inches: channery silt loam

C - 26 to 30 inches: very channery loam

2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

OpD—Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9yhm

Elevation: 700 to 1,800 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 110 to 180 days

Custom Soil Resource Report

Farmland classification: Not prime farmland

Map Unit Composition

Oquaga and similar soils: 55 percent

Lordstown and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 30 inches: very channery silt loam

R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent

Percent of area covered with surface fragments: 15.0 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 26 inches: channery silt loam

C - 26 to 30 inches: very channery loam

2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent

Custom Soil Resource Report

Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

OXF—Oquaga and Lordstown extremely stony silt loams steep

Map Unit Setting

National map unit symbol: 9yhg
Elevation: 700 to 1,800 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Oquaga and similar soils: 55 percent
Lordstown and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oquaga

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

A - 0 to 7 inches: channery silt loam
Bw - 7 to 30 inches: very channery silt loam
R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 15.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Custom Soil Resource Report

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Lordstown

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex, linear

Typical profile

A - 0 to 7 inches: channery silt loam

Bw - 7 to 26 inches: channery silt loam

C - 26 to 30 inches: very channery loam

2R - 30 to 42 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Hydric soil rating: No

RdA—Rexford loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9yhv

Mean annual precipitation: 34 to 51 inches

Mean annual air temperature: 40 to 50 degrees F

Frost-free period: 100 to 160 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Rexford, somewhat poorly drained, and similar soils: 40 percent

Rexford, poorly drained, and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rexford, Somewhat Poorly Drained

Setting

Landform: Depressions

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Coarse-loamy outwash derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam

Bw - 8 to 18 inches: silt loam

Bx - 18 to 40 inches: gravelly loam

2C - 40 to 63 inches: Error

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 15 to 24 inches to fragipan

Natural drainage class: Somewhat poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 2 to 10 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Rexford, Poorly Drained

Setting

Landform: Depressions

Custom Soil Resource Report

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Coarse-loamy outwash derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: silt loam

Bw - 8 to 18 inches: silt loam

Bx - 18 to 40 inches: gravelly loam

2C - 40 to 63 inches: Error

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 15 to 24 inches to fragipan

Natural drainage class: Poorly drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Hydric soil rating: Yes

VoB—Volusia channery silt loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2srff

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Volusia and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Volusia

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope, interfluvium, side slope

Down-slope shape: Concave

Across-slope shape: Linear

Custom Soil Resource Report

Parent material: Loamy till derived from interbedded sedimentary rock

Typical profile

Ap - 0 to 9 inches: channery silt loam
Bw - 9 to 15 inches: channery silt loam
Eg - 15 to 17 inches: channery silt loam
Bx1 - 17 to 29 inches: channery loam
Bx2 - 29 to 54 inches: channery loam
C - 54 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Chippewa

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Mardin

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluvium, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

VrB—Volusia channery silt loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2srfw
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Volusia, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Volusia, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interflue, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till derived from interbedded sedimentary rock

Typical profile

A - 0 to 4 inches: channery silt loam
Bw - 4 to 15 inches: channery silt loam
Eg - 15 to 17 inches: channery silt loam
Bx1 - 17 to 29 inches: channery loam
Bx2 - 29 to 54 inches: channery loam
C - 54 to 72 inches: channery silt loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 10 to 22 inches to fragipan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Chippewa, extremely stony

Percent of map unit: 5 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Mardin, extremely stony

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 9yj6

Mean annual precipitation: 34 to 51 inches

Mean annual air temperature: 40 to 50 degrees F

Frost-free period: 100 to 160 days

Farmland classification: Not prime farmland

Map Unit Composition

Bodies of water 2 to: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Wa—Wayland silt loam

Map Unit Setting

National map unit symbol: 9yj7

Elevation: 200 to 1,500 feet

Mean annual precipitation: 30 to 56 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 110 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Wayland and similar soils: 90 percent

Custom Soil Resource Report

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wayland

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Talf

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Recent alluvium

Typical profile

H1 - 0 to 3 inches: silt loam

H2 - 3 to 42 inches: silty clay loam

H3 - 42 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: Frequent

Frequency of ponding: Frequent

Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C/D

Hydric soil rating: Yes

Minor Components

Braceville

Percent of map unit: 5 percent

Hydric soil rating: No

WIB—Wellsboro channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2vck5

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Wellsboro and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam

Bw - 8 to 22 inches: channery silt loam

Bx - 22 to 55 inches: channery loam

C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 14 to 30 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 13 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Morris

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Lackawanna

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Custom Soil Resource Report

Across-slope shape: Linear

Hydric soil rating: No

Oquaga

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

WIC—Wellsboro channery silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2vck6

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Wellsboro and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam

Bw - 8 to 22 inches: channery silt loam

Bx - 22 to 55 inches: channery loam

C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 14 to 30 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 13 to 24 inches

Custom Soil Resource Report

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lackawanna

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Morris

Percent of map unit: 5 percent
Landform: Mountains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

WID—Wellsboro channery silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2vck7
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Wellsboro and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope

Custom Soil Resource Report

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Ap - 0 to 8 inches: channery silt loam

Bw - 8 to 22 inches: channery silt loam

Bx - 22 to 55 inches: channery loam

C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 15 to 25 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 14 to 30 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 13 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Oquaga

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Lackawanna

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Nose slope, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Morris

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Foothlope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

WmB—Wellsboro channery silt loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vckl
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Wellsboro, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: channery silt loam
Bw - 3 to 22 inches: channery silt loam
Bx - 22 to 55 inches: channery loam
C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 7.0 percent
Depth to restrictive feature: 14 to 30 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Morris, extremely stony

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Oquaga, extremely stony

Percent of map unit: 5 percent

Landform: Till plains

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

WmD—Wellsboro channery silt loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2vckp

Elevation: 330 to 2,460 feet

Mean annual precipitation: 31 to 70 inches

Mean annual air temperature: 39 to 52 degrees F

Frost-free period: 105 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Wellsboro, extremely stony, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wellsboro, Extremely Stony

Setting

Landform: Mountains, hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Interfluve, side slope, head slope

Down-slope shape: Convex, concave

Across-slope shape: Convex, linear

Parent material: Loamy till from reddish sandstone, siltstone, and shale

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: channery silt loam

Bw - 3 to 22 inches: channery silt loam

Custom Soil Resource Report

Bx - 22 to 55 inches: channery loam

C - 55 to 72 inches: very channery loam

Properties and qualities

Slope: 8 to 25 percent

Percent of area covered with surface fragments: 7.0 percent

Depth to restrictive feature: 14 to 30 inches to fragipan

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)

Depth to water table: About 13 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Oquaga, extremely stony

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Lackawanna, extremely stony

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Interfluvium, side slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Morris, extremely stony

Percent of map unit: 5 percent

Landform: Mountains, hills

Landform position (two-dimensional): Summit, footslope

Landform position (three-dimensional): Interfluvium, base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

WyD—Wyoming gravelly loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9yjp
Elevation: 400 to 1,800 feet
Mean annual precipitation: 42 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Wyoming and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wyoming

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Water sorted gravelly outwash derived from sandstone and siltstone and/or shale

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 22 inches: very gravelly sandy loam
H3 - 22 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

WyF—Wyoming gravelly loam, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: 9yjq
Elevation: 400 to 1,800 feet
Mean annual precipitation: 42 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Wyoming and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wyoming

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Water sorted gravelly outwash derived from sandstone and siltstone and/or shale

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 22 inches: very gravelly sandy loam
H3 - 22 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Chemical Properties

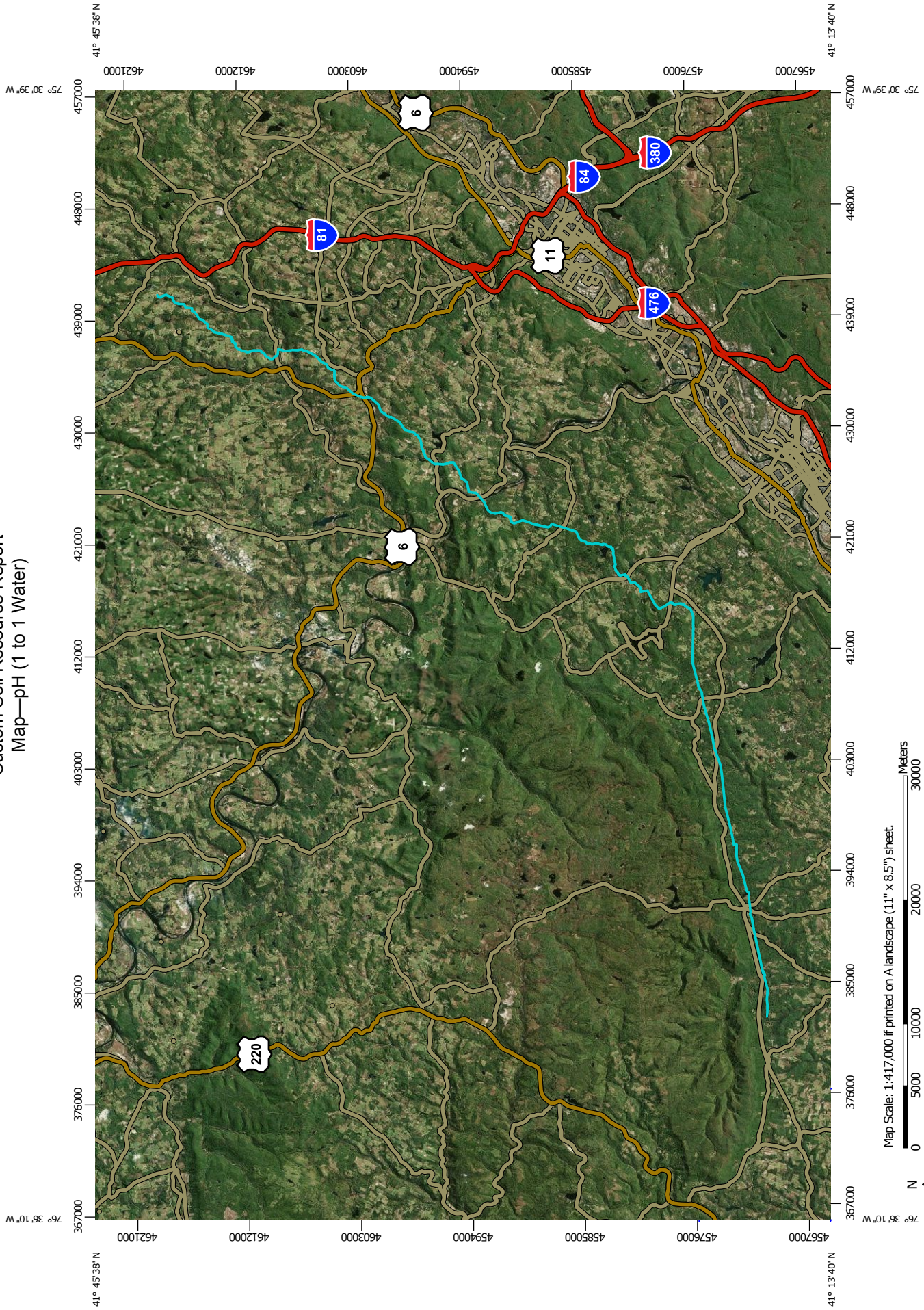
Soil Chemical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

pH (1 to 1 Water)

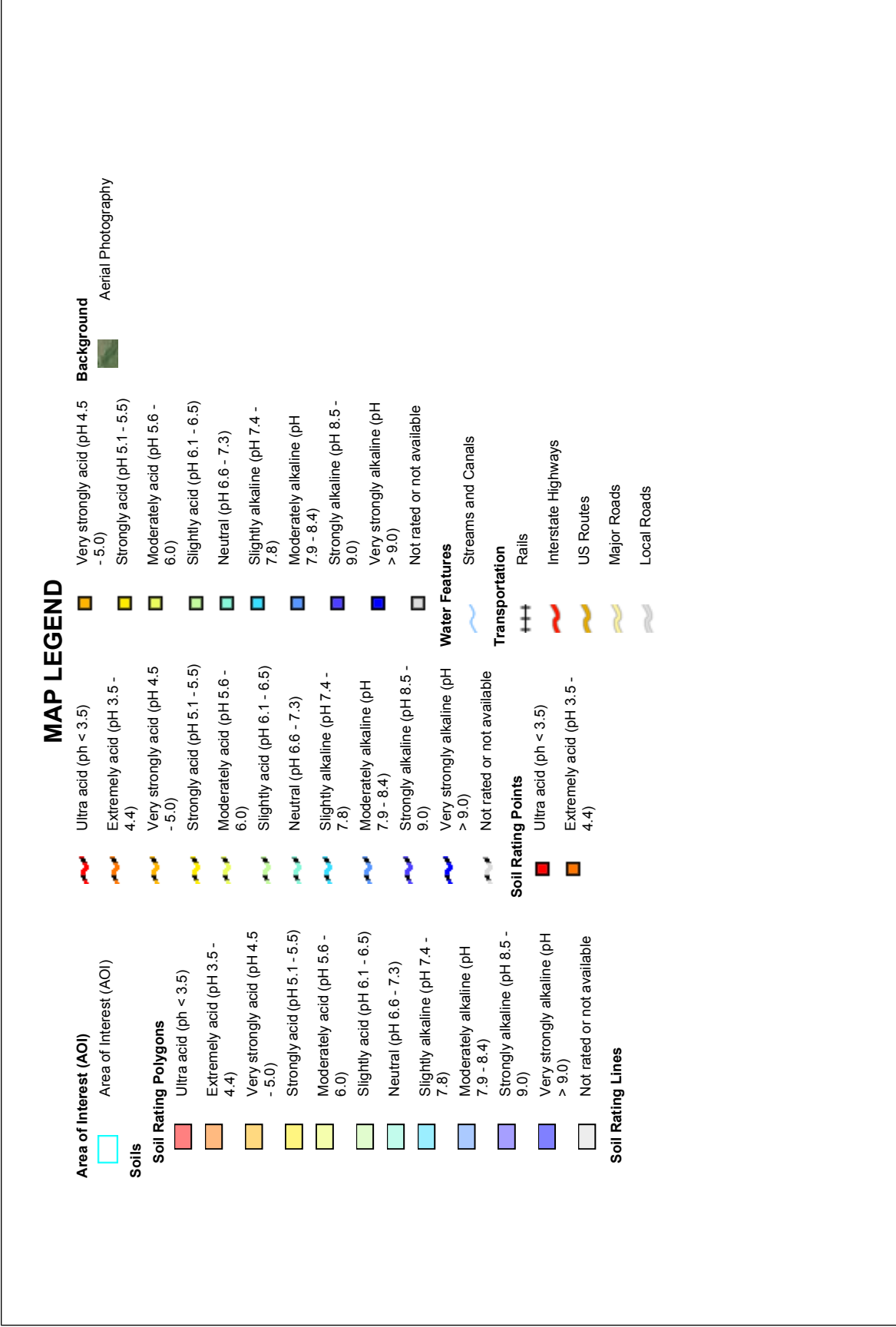
Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion. In general, soils that are either highly alkaline or highly acid are likely to be very corrosive to steel. The most common soil laboratory measurement of pH is the 1:1 water method. A crushed soil sample is mixed with an equal amount of water, and a measurement is made of the suspension.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—pH (1 to 1 Water)



Custom Soil Resource Report



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Columbia County, Pennsylvania
Survey Area Data: Version 9, Nov 16, 2015

Soil Survey Area: Luzerne County, Pennsylvania
Survey Area Data: Version 8, Nov 16, 2015

Soil Survey Area: Susquehanna County, Pennsylvania
Survey Area Data: Version 10, Nov 16, 2015

Soil Survey Area: Wyoming County, Pennsylvania
Survey Area Data: Version 9, Nov 16, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Custom Soil Resource Report

pH (1 to 1 Water)— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ag	Alluvial land	5.5	0.2	0.0%
At	Atherton silt loam, gray subsoil variant	6.7	2.6	0.2%
Bf	Basher soils	5.1	3.5	0.2%
BkB	Bath channery silt loam, 3 to 8 percent slopes	5.8	2.1	0.1%
BkC	Bath channery silt loam, 8 to 15 percent slopes	5.8	0.4	0.0%
BkD	Bath channery silt loam, 15 to 25 percent slopes	5.8	1.2	0.1%
BrB	Braceville gravelly loam, 3 to 8 percent slopes	5.6	2.7	0.2%
ChA	Chenango gravelly loam, 0 to 3 percent slopes	6.0	1.7	0.1%
ChB	Chenango gravelly loam, 3 to 8 percent slopes	6.0	2.1	0.1%
ChC	Chenango gravelly loam, 8 to 15 percent slopes	6.0	5.1	0.4%
CIA	Chippewa silt loam, 0 to 3 percent slopes	6.0	2.5	0.2%
CIB	Chippewa silt loam, 3 to 8 percent slopes	6.0	0.6	0.0%
CnB	Chippewa silt loam, 0 to 8 percent slopes, extremely stony	6.0	7.9	0.6%
Ho	Holly silt loam	6.5	5.5	0.4%
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	5.1	21.3	1.5%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	5.1	5.7	0.4%
LaD	Lackawanna channery silt loam, 15 to 25 percent slopes	5.1	3.1	0.2%
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	5.1	59.1	4.2%
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	5.1	57.9	4.1%

Custom Soil Resource Report

pH (1 to 1 Water)— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LEF	Lackawanna and Bath soils, steep, extremely stony	5.1	4.2	0.3%
MaB	Mardin channery silt loam, 3 to 8 percent slopes	5.4	4.5	0.3%
MaC	Mardin channery silt loam, 8 to 15 percent slopes	5.4	1.1	0.1%
McB	Mardin channery silt loam, 3 to 8 percent slopes, very stony	5.4	3.7	0.3%
MoB	Morris channery silt loam, 0 to 8 percent slopes	5.4	33.0	2.3%
MoC	Morris channery silt loam, 8 to 15 percent slopes	5.4	4.4	0.3%
MsB	Morris channery silt loam, 0 to 8 percent slopes, extremely stony	5.4	25.4	1.8%
MsC	Morris channery silt loam, 8 to 15 percent slopes, extremely stony	5.4	1.9	0.1%
OIB	Oquaga and Lordstown channery silt loams, 3 to 8 percent slopes	4.8	6.6	0.5%
OIC	Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes	4.8	18.2	1.3%
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	4.8	7.7	0.5%
OpB	Oquaga and Lordstown extremely stony silt loams, 3 to 8 percent slopes	4.8	17.5	1.2%
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	4.8	78.8	5.6%
OXF	Oquaga and Lordstown extremely stony silt loams steep	4.8	61.4	4.3%
RdA	Rexford loam, 0 to 3 percent slopes	5.7	0.7	0.0%
VoB	Volusia channery silt loam, 0 to 8 percent slopes	5.8	1.3	0.1%
VrB	Volusia channery silt loam, 0 to 8 percent slopes, extremely stony	5.8	4.3	0.3%
W	Water		0.1	0.0%
Wa	Wayland silt loam	6.8	6.1	0.4%

Custom Soil Resource Report

pH (1 to 1 Water)— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WIB	Wellsboro channery silt loam, 3 to 8 percent slopes	5.3	31.7	2.2%
WIC	Wellsboro channery silt loam, 8 to 15 percent slopes	5.3	32.1	2.3%
WID	Wellsboro channery silt loam, 15 to 25 percent slopes	5.3	5.9	0.4%
WmB	Wellsboro channery silt loam, 3 to 8 percent slopes, extremely stony	5.3	23.8	1.7%
WmD	Wellsboro channery silt loam, 8 to 25 percent slopes, extremely stony	5.3	16.6	1.2%
WyD	Wyoming gravelly loam, 15 to 25 percent slopes	4.8	1.9	0.1%
WyF	Wyoming gravelly loam, 25 to 60 percent slopes	4.8	0.5	0.0%
Subtotals for Soil Survey Area			578.5	40.8%
Totals for Area of Interest			1,418.8	100.0%

Rating Options—pH (1 to 1 Water)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)

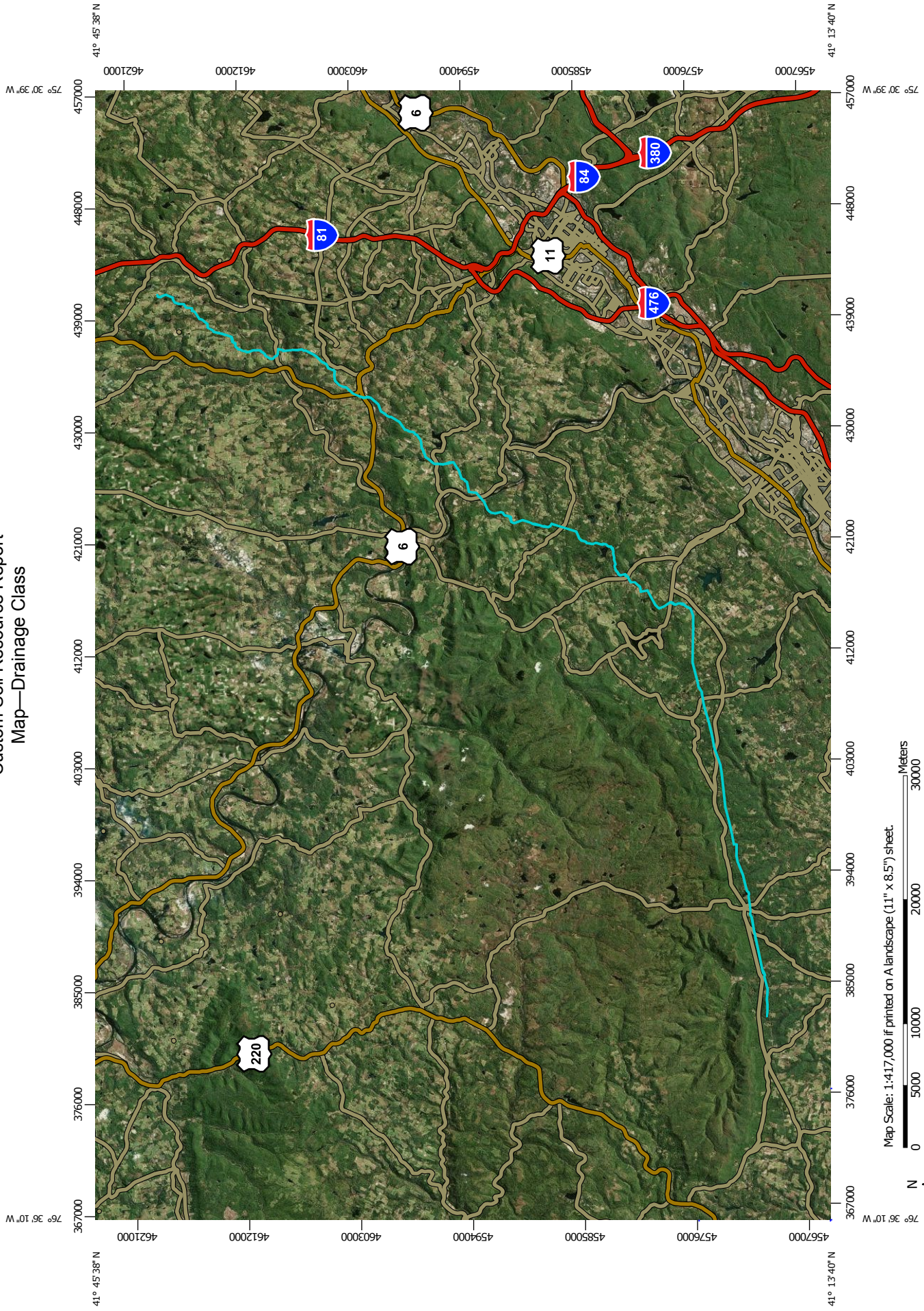
Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Drainage Class

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report Map—Drainage Class



Map Scale: 1:417,000 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

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 Survey Area Data: Version 8, Nov 16, 2015

Soil Survey Area: Susquehanna County, Pennsylvania
 Survey Area Data: Version 10, Nov 16, 2015

Soil Survey Area: Wyoming County, Pennsylvania
 Survey Area Data: Version 9, Nov 16, 2015






































Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 1, 1999—Dec 31, 2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

MAP LEGEND

Area of Interest (AOI)		Excessively drained
		Somewhat excessively drained
Soils		Well drained
Soil Rating Polygons		Moderately well drained
		Somewhat poorly drained
		Poorly drained
		Very poorly drained
		Subaqueous
		Not rated or not available
Soil Rating Lines		Water Features
		Streams and Canals
		Transportation
		Rails
		Interstate Highways
		US Routes
		Major Roads
		Local Roads
		Background
		Aerial Photography
		
		
		
		
		
		

Custom Soil Resource Report

Drainage Class— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ag	Alluvial land	Moderately well drained	0.2	0.0%
At	Atherton silt loam, gray subsoil variant	Poorly drained	2.6	0.2%
Bf	Basher soils	Moderately well drained	3.5	0.2%
BkB	Bath channery silt loam, 3 to 8 percent slopes	Well drained	2.1	0.1%
BkC	Bath channery silt loam, 8 to 15 percent slopes	Well drained	0.4	0.0%
BkD	Bath channery silt loam, 15 to 25 percent slopes	Well drained	1.2	0.1%
BrB	Braceville gravelly loam, 3 to 8 percent slopes	Moderately well drained	2.7	0.2%
ChA	Chenango gravelly loam, 0 to 3 percent slopes	Well drained	1.7	0.1%
ChB	Chenango gravelly loam, 3 to 8 percent slopes	Well drained	2.1	0.1%
ChC	Chenango gravelly loam, 8 to 15 percent slopes	Well drained	5.1	0.4%
CIA	Chippewa silt loam, 0 to 3 percent slopes	Poorly drained	2.5	0.2%
CIB	Chippewa silt loam, 3 to 8 percent slopes	Poorly drained	0.6	0.0%
CnB	Chippewa silt loam, 0 to 8 percent slopes, extremely stony	Poorly drained	7.9	0.6%
Ho	Holly silt loam	Poorly drained	5.5	0.4%
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	Well drained	21.3	1.5%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	Well drained	5.7	0.4%
LaD	Lackawanna channery silt loam, 15 to 25 percent slopes	Well drained	3.1	0.2%
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	Well drained	59.1	4.2%
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	Well drained	57.9	4.1%

Custom Soil Resource Report

Drainage Class— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LEF	Lackawanna and Bath soils, steep, extremely stony	Well drained	4.2	0.3%
MaB	Mardin channery silt loam, 3 to 8 percent slopes	Moderately well drained	4.5	0.3%
MaC	Mardin channery silt loam, 8 to 15 percent slopes	Moderately well drained	1.1	0.1%
McB	Mardin channery silt loam, 3 to 8 percent slopes, very stony	Moderately well drained	3.7	0.3%
MoB	Morris channery silt loam, 0 to 8 percent slopes	Somewhat poorly drained	33.0	2.3%
MoC	Morris channery silt loam, 8 to 15 percent slopes	Somewhat poorly drained	4.4	0.3%
MsB	Morris channery silt loam, 0 to 8 percent slopes, extremely stony	Somewhat poorly drained	25.4	1.8%
MsC	Morris channery silt loam, 8 to 15 percent slopes, extremely stony	Somewhat poorly drained	1.9	0.1%
OIB	Oquaga and Lordstown channery silt loams, 3 to 8 percent slopes	Well drained	6.6	0.5%
OIC	Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes	Well drained	18.2	1.3%
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	Well drained	7.7	0.5%
OpB	Oquaga and Lordstown extremely stony silt loams, 3 to 8 percent slopes	Well drained	17.5	1.2%
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	Well drained	78.8	5.6%
OXF	Oquaga and Lordstown extremely stony silt loams steep	Well drained	61.4	4.3%
RdA	Rexford loam, 0 to 3 percent slopes	Somewhat poorly drained	0.7	0.0%
VoB	Volusia channery silt loam, 0 to 8 percent slopes	Somewhat poorly drained	1.3	0.1%
VrB	Volusia channery silt loam, 0 to 8 percent slopes, extremely stony	Somewhat poorly drained	4.3	0.3%
W	Water		0.1	0.0%
Wa	Wayland silt loam	Very poorly drained	6.1	0.4%

Custom Soil Resource Report

Drainage Class— Summary by Map Unit — Luzerne County, Pennsylvania (PA079)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WIB	Wellsboro channery silt loam, 3 to 8 percent slopes	Moderately well drained	31.7	2.2%
WIC	Wellsboro channery silt loam, 8 to 15 percent slopes	Moderately well drained	32.1	2.3%
WID	Wellsboro channery silt loam, 15 to 25 percent slopes	Moderately well drained	5.9	0.4%
WmB	Wellsboro channery silt loam, 3 to 8 percent slopes, extremely stony	Moderately well drained	23.8	1.7%
WmD	Wellsboro channery silt loam, 8 to 25 percent slopes, extremely stony	Moderately well drained	16.6	1.2%
WyD	Wyoming gravelly loam, 15 to 25 percent slopes	Somewhat excessively drained	1.9	0.1%
WyF	Wyoming gravelly loam, 25 to 60 percent slopes	Somewhat excessively drained	0.5	0.0%
Subtotals for Soil Survey Area			578.5	40.8%
Totals for Area of Interest			1,418.8	100.0%

Rating Options—Drainage Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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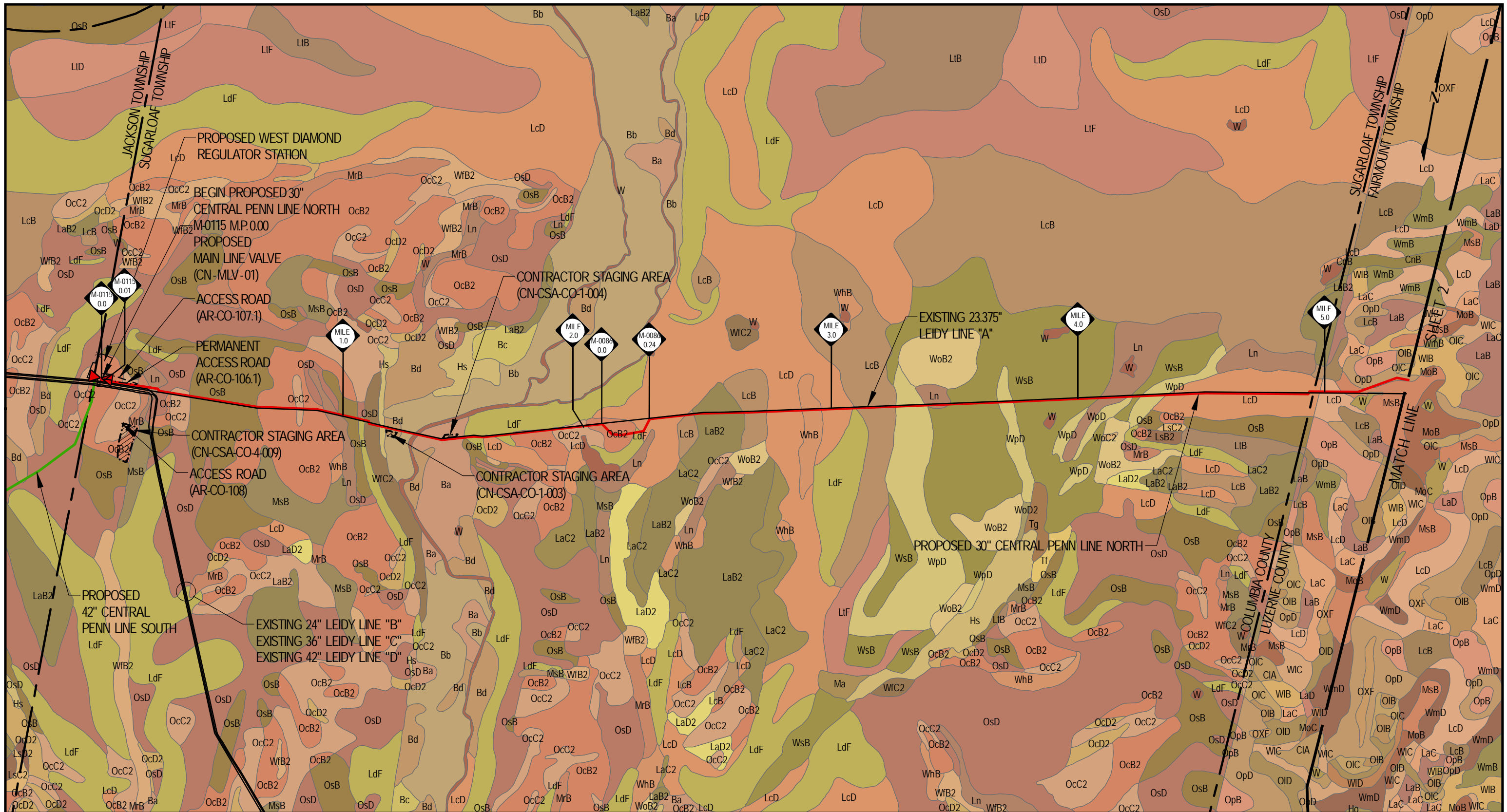
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Custom Soil Resource Report

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LEGEND

- PROPOSED 30" CENTRAL PENN LINE NORTH
- PROPOSED 42" CENTRAL PENN LINE SOUTH
- EXISTING PIPELINE
- X- FENCE LINE
- - - ACCESS ROADS
- - - - - COUNTY/TOWNSHIP BOUNDARY
- CONTRACTOR STAGING AREA
- CONTRACTOR YARD/PIPE YARD

NOTES:
SOIL GEOGRAPHIC DATABASE BY USDA

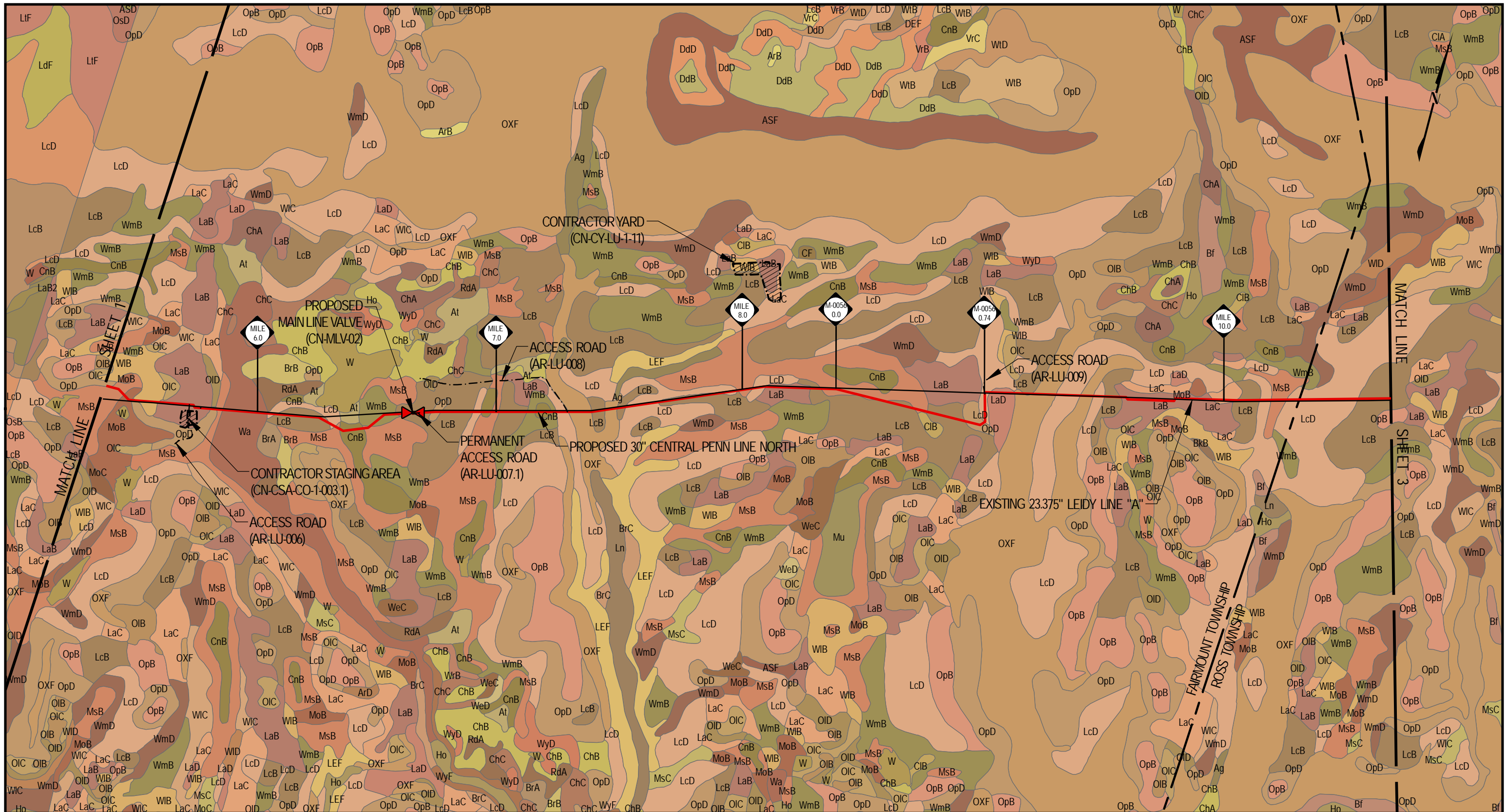
WOOD GROUP MUSTANG

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2	12/18/15	JTN	ISSUED FOR SUPPLEMENTAL FILING #2
3	09/23/16	JTN	EXHIBITS FOR PADEP

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SOIL ASSOCIATION MAP
ATLANTIC SUNRISE PROJECT
PROPOSED 30" CENTRAL PENN LINE NORTH
M-0115 M.P. 0.00 TO M-0119 M.P. 0.01
COLUMBIA & LUZERNE COUNTIES, PENNSYLVANIA


DRAWN BY: JHD	DATE: 9/22/14	ISSUED FOR BID:	SCALE: 1"=2,000'
CHECKED BY: EL	DATE: 10/3/14	ISSUED FOR CONSTRUCTION:	REVISION: 3
APPROVED BY: MJH	DATE: 10/3/14	DRAWING NUMBER: F-FS-CPLN-A-01	SHEET 1
WO: 1161481		3:01 PM 9/1/2016	OF 11



LEGEND

- PROPOSED 30" CENTRAL PENN LINE NORTH
- PROPOSED 42" CENTRAL PENN LINE SOUTH
- EXISTING PIPELINE
- X- FENCE LINE
- - - ACCESS ROADS
- - - - COUNTY/TOWNSHIP BOUNDARY
- CONTRACTOR STAGING AREA
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NOTES:
SOIL GEOGRAPHIC DATABASE BY USDA




WOOD GROUP MUSTANG

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NO.	DATE	BY	REVISION DESCRIPTION
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2	12/18/15	JTN	ISSUED FOR SUPPLEMENTAL FILING #3
3	09/23/16	JTN	EXHIBITS FOR PADEP

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SOIL ASSOCIATION MAP
ATLANTIC SUNRISE PROJECT
PROPOSED 30" CENTRAL PENN LINE NORTH
M-0115 M.P. 0.00 TO M-0119 M.P. 0.01
LUZERNE COUNTY, PENNSYLVANIA




DRAWN BY: JHD	DATE: 9/22/14	ISSUED FOR BID:	SCALE: 1"=2,000'
CHECKED BY: EL	DATE: 10/3/14	ISSUED FOR CONSTRUCTION:	REVISION: 3
APPROVED BY: MJH	DATE: 10/3/14	DRAWING NUMBER: F-FS-CPLN-A-01	SHEET 2
WO: 1161481		3:19 PM 9/1/2016	OF 11



LEGEND

- PROPOSED 30" CENTRAL PENN LINE NORTH
- PROPOSED 42" CENTRAL PENN LINE SOUTH
- EXISTING PIPELINE
- X- FENCE LINE
- - - ACCESS ROADS
- COUNTY/TOWNSHIP BOUNDARY
- CONTRACTOR STAGING AREA
- CONTRACTOR YARD/PIPE YARD

NOTES:
SOIL GEOGRAPHIC DATABASE BY USDA




WOOD GROUP MUSTANG

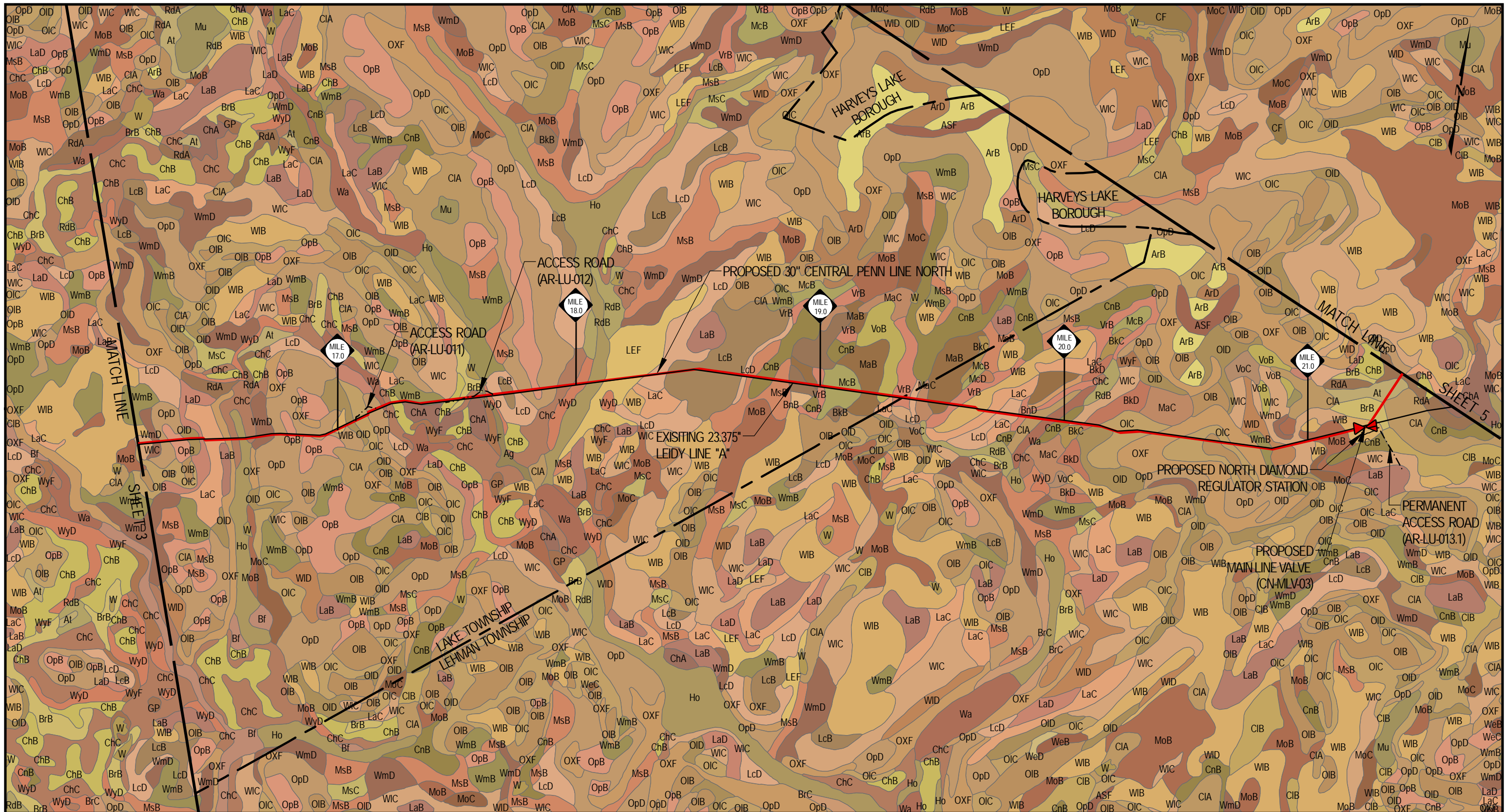
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2	12/18/15	JTN	ISSUED FOR SUPPLEMENTAL FILING #2
3	09/23/16	JTN	EXHIBITS FOR PADEP

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SOIL ASSOCIATION MAP
ATLANTIC SUNRISE PROJECT
PROPOSED 30" CENTRAL PENN LINE NORTH
M-0115 M.P. 0.00 TO M-0119 M.P. 0.01
LUZERNE COUNTY, PENNSYLVANIA



DRAWN BY: JHD	DATE: 9/22/14	ISSUED FOR BID:	SCALE: 1"=2,000'
CHECKED BY: EL	DATE: 10/3/14	ISSUED FOR CONSTRUCTION:	REVISION: 3
APPROVED BY: MJH	DATE: 10/3/14	DRAWING NUMBER: F-FS-CPLN-A-01	SHEET 3
WO: 1161481		3:32 PM 9/1/2016	OF 11



LEGEND

- PROPOSED 30" CENTRAL PENN LINE NORTH
- PROPOSED 42" CENTRAL PENN LINE SOUTH
- EXISTING PIPELINE
- FENCE LINE
- ACCESS ROADS
- COUNTY/TOWNSHIP BOUNDARY
- CONTRACTOR STAGING AREA
- CONTRACTOR YARD/PIPE YARD

NOTES:
SOIL GEOGRAPHIC DATABASE BY USDA

WOOD GROUP MUSTANG

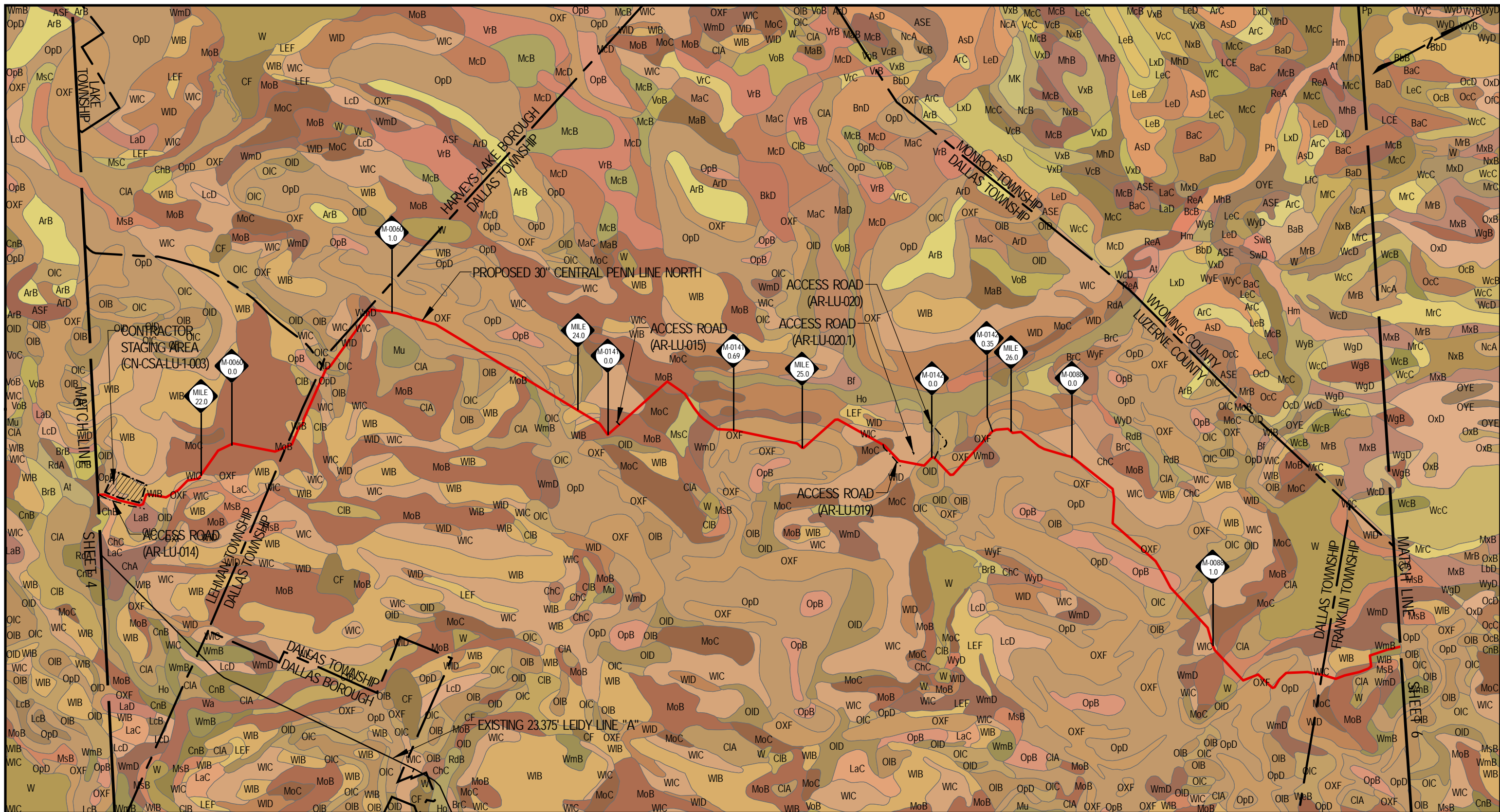
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2	12/18/15	JTN	ISSUED FOR SUPPLEMENTAL FILING #2
3	09/23/16	JTN	ISSUED FOR SUPPLEMENTAL FILING #3

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SOIL ASSOCIATION MAP
ATLANTIC SUNRISE PROJECT
PROPOSED 30" CENTRAL PENN LINE NORTH
M-0115 M.P. 0.00 TO M-0119 M.P. 0.01
LUZERNE COUNTY, PENNSYLVANIA

Williams

DRAWN BY: JHD	DATE: 9/22/14	ISSUED FOR BID:	SCALE: 1"=2,000'
CHECKED BY: EL	DATE: 10/3/14	ISSUED FOR CONSTRUCTION:	REVISION: 3
APPROVED BY: MJH	DATE: 10/3/14	DRAWING NUMBER: F-FS-CPLN-A-01	SHEET 4
WO: 1161481		3:35 PM 9/11/2016	OF 11



LEGEND

- PROPOSED 30" CENTRAL PENN LINE NORTH
- PROPOSED 42" CENTRAL PENN LINE SOUTH
- EXISTING PIPELINE
- FENCE LINE
- ACCESS ROADS
- COUNTY/TOWNSHIP BOUNDARY
- CONTRACTOR STAGING AREA
- CONTRACTOR YARD/PIPE YARD

NOTES:
SOIL GEOGRAPHIC DATABASE BY USDA

WOOD GROUP MUSTANG

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SCALE IN FEET

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3	09/23/16	JTN	EXHIBITS FOR PADEP	1161481	CLR	MJH

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
SOIL ASSOCIATION MAP
ATLANTIC SUNRISE PROJECT
PROPOSED 30" CENTRAL PENN LINE NORTH
M-0115 M.P. 0.00 TO M-0119 M.P. 0.01
LUZERNE & WYOMING COUNTIES, PENNSYLVANIA

Williams

DRAWN BY: JHD	DATE: 9/22/14	ISSUED FOR BID:	SCALE: 1"=2,000'
CHECKED BY: EL	DATE: 10/3/14	ISSUED FOR CONSTRUCTION:	REVISION: 3
APPROVED BY: MJH	DATE: 10/3/14	DRAWING NUMBER: F-FS-CPLN-A-01	SHEET 5
WO: 1161481		3:41 PM 9/1/2016	OF 11

APPENDIX D

Supporting Information

Appendix D.1 – Preparer Qualifications

Appendix D.2 – North American Green Product Data

Appendix D.1 – Preparer Qualifications

**STANDARD E&S WORKSHEET # 22
 PLAN PREPARER RECORD OF TRAINING AND EXPERIENCE IN EROSION AND
 SEDIMENT POLLUTION CONTROL METHODS AND TECHNIQUES**

NAME OF PLAN PREPARER: Suzanne Marie King, PE

FORMAL EDUCATION:

Name of College or Technical Institute: Roger Williams University / Stanford University

Curriculum or Program: General Engineering / Structural Engineering

Dates of Attendance: **From:** RWU: 9/1998 / SU: 9/2002 **To:** RWU: 5/2002 / SU: 5/2003

Degree Received RWU: Bachelor of Science - General Engineering
SU: Masters of Science - Structural Engineering

OTHER TRAINING:

Name of Training: _____

Presented By: _____

Date: _____

EMPLOYMENT HISTORY:

Current Employer: BL Companies

Telephone: 781-619-9500

Former Employer: Woodard & Curran BKF Engineers

Telephone: 401-273-1007 650-482-6300

RECENT E&S PLANS PREPARED:

Name of Project:	<u>Treasure Island Redevelopment</u>	<u>Canal Street Improvements</u>	<u>Beechwood Museum</u>
County:	<u>San Francisco</u>	<u>Essex</u>	<u>Newport</u>
Municipality:	<u>San Francisco, CA</u>	<u>Salem, MA</u>	<u>Newport, RI</u>
Permit Number:	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Approving Agency:	<u>Treasure Island Development Authority (TIDA)</u>	<u>City of Salem & Massachusetts Emergency Management Agency</u>	<u>City of Newport & Coastal Resources Management Council</u>

Appendix D.2 – North American Green Product Data



Specification Sheet – EroNet™ DS75™ Erosion Control Blanket

DESCRIPTION

The ultra short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 45 days. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The DS75 shall meet Type 1.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable with photo accelerators	1.5 lb/1000 sq ft (0.73 g/sm)
Thread	Degradable	

Standard Roll Sizes			
Width	6.67 (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	96 lbs (43.54 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.5 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.45 in. (11.43 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	375%
Mass/Unit Area	ASTM 6475	8.57 oz/sy (291 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	10%
Tensile Strength - MD	ASTM D6818	105.6 lbs/ft (1.57 kN/m)
Elongation - MD	ASTM D6818	34%
Tensile Strength - TD	ASTM D6818	42.0 lbs/ft (0.62 kN/m)
Elongation - TD	ASTM D6818	25.2%
Biomass Improvement	ASTM D7322	286%

Design Permissible Shear Stress	
Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors			
Slope Gradients (S)			
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021



ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ C125® Erosion Control Blanket

DESCRIPTION

The long-term double net erosion control blanket shall be a machine-produced mat of 100% coconut fiber with a functional longevity of up to 36 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The C125 shall meet Type 4 specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content

Matrix	100% Coconut Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 g/sm)
Thread	Black polypropylene	

Standard Roll Sizes

Width	6.67 (2.03 m)	8 ft (2.44 m)
Length	108 ft (32.92 m)	112 ft (35.14 m)
Weight ± 10%	44 lbs (19.95 kg)	56.25 (25.5 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.22 in. (5.59 mm)
Resiliency	ECTC Guidelines	82%
Water Absorbency	ASTM D1117	167%
Mass/Unit Area	ASTM 6475	7.73 oz/sy (262.8 g/sm)
Swell	ECTC Guidelines	13%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	0.75 oz-in
Light Penetration	ASTM D6567	16.6%
Tensile Strength - MD	ASTM D6818	472.8 lbs/ft (7.01 kN/m)
Elongation - MD	ASTM D6818	25.6%
Tensile Strength - TD	ASTM D6818	225.6 lbs/ft (3.35 kN/m)
Elongation - TD	ASTM D6818	33.9%
Biomass Improvement	ASTM 7322	257%

Design Permissible Shear Stress

Unvegetated Shear Stress	2.25 psf (108 Pa)
Unvegetated Velocity	10.0 fps (3.05 m/s)

Slope Design Data: C Factors

Slope Gradients (S)

Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.082
20-50 ft	0.036	0.060	0.096
≥ 50 ft (15.2 m)	0.070	0.090	0.110

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.022
0.50 – 2.0 ft	0.022-0.014
≥ 2.0 ft (0.60 m)	0.014

Tensar
NORTH AMERICAN GREEN®

Tensar International Corporation
2500 Northwinds Parkway
Suite 500
Alpharetta, GA 30009
800-TENSAR-1
tensarcorp.com

Tensar International Corporation warrants that at the time of delivery the product furnished hereunder shall conform to the specification stated herein. Any other warranty including merchantability and fitness for a particular purpose, are hereby executed. If the product does not meet specifications on this page and Tensar is notified prior to installation, Tensar will replace the product at no cost to the customer. **This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to January 1, 2012.**

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ S75® Erosion Control Blanket

DESCRIPTION

The short-term single net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 12 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a lightweight photodegradable polypropylene netting having an approximate 0.50 x 0.50 in. (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The S75 shall meet Type 2.C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content

Matrix	100% Straw Fiber	0.5 lbs/sq yd (0.27 kg/sm)
Netting	Top side only, lightweight photodegradable	1.5 lb/1000 sq ft (0.73 kg/100 sm)
Thread	Degradable	

Standard Roll Sizes

Width	6.67 ft (2.03 m)	8.0 ft (2.4 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	40 lbs (18.14 kg)	50 lbs (22.68 kg)	96 lbs (43.54 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.5 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.50 in. (12.7 mm)
Resiliency	ECTC Guidelines	78.8%
Water Absorbency	ASTM D1117	301%
Mass/Unit Area	ASTM D6475	9.76 oz/sy (332 g/sm)
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.31 oz-in
Light Penetration	ASTM D6567	6.0%
Tensile Strength - MD	ASTM D6818	122.4 lbs/ft (1.81 kN/m)
Elongation - MD	ASTM D6818	36.1%
Tensile Strength - TD	ASTM D6818	79.2 lbs/ft (1.17 kN/m)
Elongation - TD	ASTM D6818	26.8%
Biomass Improvement	ASTM D7322	301%

Design Permissible Shear Stress

Unvegetated Shear Stress	1.55 psf (74 Pa)
Unvegetated Velocity	5.00 fps (1.52 m/s)

Slope Design Data: C Factors

Slope Gradients (S)

Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.029	N/A	N/A
20-50 ft	0.11	N/A	N/A
≥ 50 ft (15.2 m)	0.19	N/A	N/A

NTPEP Large-Scale Slope Testing
ASTM D6459 - C-factor = 0.012

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055-0.021
≥ 2.0 ft (0.60 m)	0.021

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – EroNet™ SC150® Erosion Control Blanket

DESCRIPTION

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 in (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The SC150 shall meet Type 3.B specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content

Matrix	70% Straw Fiber	0.35 lbs/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top: Heavyweight photodegradable with UV additives	3 lbs/1000 sq ft (1.47 kg/100 sm)
	Bottom: lightweight photodegradable	1.5 lb/1000 sq ft (0.73 kg/100 sm)
Thread	Degradable	

Standard Roll Sizes

Width	6.67 ft (2.03 m)	8 ft (2.4 m)	16.0 ft (4.87 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	108 ft (32.92 m)
Weight ± 10%	44 lbs (19.95 kg)	55 lbs (24.95 kg)	105.6 lbs (47.9 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	192 sq yd (165.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.35 in. (8.89 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	342%
Mass/Unit Area	ASTM D6475	7.87 oz/sy (267.6 g/sm)
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ASTM D6567	6.2%
Tensile Strength - MD	ASTM D6818	362.4 lbs/ft (5.37 kN/m)
Elongation - MD	ASTM D6818	29.4%
Tensile Strength - TD	ASTM D6818	136.8 lbs/ft (2.03 kN/m)
Elongation - TD	ASTM D6818	27.6%
Biomass Improvement	ASTM D7322	481%

Design Permissible Shear Stress

Unvegetated Shear Stress	2.00 psf (96 Pa)
Unvegetated Velocity	8.0 fps (2.44 m/s)

Slope Design Data: C Factors

Slope Gradients (S)

Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20-50 ft	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.10	0.110	0.190

NTPEP Large-Scale Slope
ASTM D6459 - C-factor = 0.031

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 – 2.0 ft	0.050-0.018
≥ 2.0 ft (0.60 m)	0.018

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ROLLMAX™
ROLLED EROSION CONTROL

Specification Sheet – BioNet® SC150BN™ Erosion Control Blanket

DESCRIPTION

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 18 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a 100% biodegradable woven natural organic fiber netting. The netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as Leno weave) to form an approximate 0.50 x 1.0 in. (1.27 x 2.54 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The SC150BN shall meet Type 3.B specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.17

Material Content		
Matrix	70% Straw Fiber	0.35 lbs/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top: Leno woven 100% biodegradable jute	9.35 lb/1000 sq ft (4.5 kg/100 sm)
	Bottom: 100% biodegradable organic jute	7.7 lb/1000 sq ft (3.76 kg/100 sm)
Thread	Biodegradable	

Standard Roll Sizes			
Width	6.67 ft (2.03 m)	8.0 ft (2.4 m)	15.5 ft (4.72 m)
Length	108 ft (32.92 m)	112 ft (34.14 m)	90 ft (27.43 m)
Weight ± 10%	52.22 lbs (23.69 kg)	65.28 lbs (29.61 kg)	101.2 lbs (45.9 kg)
Area	80 sq yd (66.9 sm)	100 sq yd (83.61 sm)	155 sq yd (129.6 sm)
	Leno weave top only	Leno top and bottom	Leno top and bottom

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.25 in. (6.35 mm)
Resiliency	ECTC Guidelines	86%
Water Absorbency	ASTM D1117	311%
Mass/Unit Area	ASTM D6475	8.32 oz/sy (282.9 g/sm)
Swell	ECTC Guidelines	46%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	0.42 oz-in
Light Penetration	ASTM D6567	7.6%
Tensile Strength - MD	ASTM D6818	201.6 lbs/ft (2.99 kN/m)
Elongation - MD	ASTM D6818	13.4%
Tensile Strength - TD	ASTM D6818	164.4 lbs/ft (2.44 kN/m)
Elongation - TD	ASTM D6818	14.2%
Biomass Improvement	ASTM D7322	641 %

Design Permissible Shear Stress	
Unvegetated Shear Stress	2.10 psf (100 Pa)
Unvegetated Velocity	8.00 fps (2.44 m/s)

Slope Design Data: C Factors			
Slope Gradients (S)			
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.029	0.063
20-50 ft	0.051	0.055	0.092
≥ 50 ft (15.2 m)	0.10	0.080	0.120

Roughness Coefficients – Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 – 2.0 ft	0.050-0.018
≥ 2.0 ft (0.60 m)	0.018

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Specification Sheet – VMax® P550® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stable polypropylene fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The P550 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content

Matrix	100% UV stable polypropylene fiber	0.5 lb/sy (0.27 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes

Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	52 lbs (23.59 kg)
Area	40 sy (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.72 in. (18.29 mm)
Resiliency	ASTM 6524	95%
Density	ASTM D792	0.892 g/cm ³
Mass/Unit Area	ASTM 6566	21.25 oz/sy (723 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	96%
Stiffness	ASTM D1388	366.3 oz-in.
Light Penetration	ASTM D6567	16.5%
Tensile Strength - MD	ASTM D6818	1421 lbs/ft (21.07 kN/m)
Elongation - MD	ASTM D6818	40.5%
Tensile Strength - TD	ASTM D6818	1191.6 lbs/ft (17.67 kN/m)
Elongation - TD	ASTM D6818	28.8%
Biomass Improvement	ASTM D7322	378%

Design Permissible Shear Stress

	Short Duration	Long Duration
Phase 1: Unvegetated	4.0 psf (191 Pa)	3.25 psf (156 Pa)
Phase 2: Partially Veg.	12.0 psf (576 Pa)	12.0 psf (576 Pa)
Phase 3: Fully Veg.	14.0 psf (672 Pa)	12.0 psf (576 Pa)
Unvegetated Velocity	12.5 fps (3.8 m/s)	
Vegetated Velocity	25 fps (7.6 m/s)	

NTPEP ASTM D6460 Large Scale Channel

Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

Slope Design Data: C Factors

Slope Length (L)	Slope Gradients (S)		
	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0005	0.015	0.043
20-50 ft	0.0173	0.031	0.050
≥ 50 ft (15.2 m)	0.035	0.047	0.057

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.041
0.50 – 2.0 ft	0.040-0.013
≥ 2.0 ft (0.60 m)	0.013

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Specification Sheet – VMax® SC250® Turf Reinforcement Mat

DESCRIPTION

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with a colored thread stitched along both outer edges as an overlap guide for adjacent mats.

The SC250 shall meet Type 5A, 5B, and 5C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18

Material Content		
Matrix	70% Straw Fiber	0.35 lb/sq yd (0.19 kg/sm)
	30% Coconut Fiber	0.15 lbs/sq yd (0.08 kg/sm)
Netting	Top and Bottom, UV-Stabilized Polypropylene	5 lb/1000 sq ft (2.44 kg/100 sm)
	Middle, Corrugated UV-Stabilized Polypropylene	24 lb/1000 sf (11.7 kg/100 sm)
Thread	Polypropylene, UV Stable	

Standard Roll Sizes	
Width	6.5 ft (2.0 m)
Length	55.5 ft (16.9 m)
Weight ± 10%	34 lbs (15.42 kg)
Area	40 sq yd (33.4 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.62 in. (15.75 mm)
Resiliency	ASTM 6524	95.2%
Density	ASTM D792	0.891 g/cm ³
Mass/Unit Area	ASTM 6566	16.13 oz/sy (548 g/sm)
UV Stability	ASTM D4355/ 1000 HR	100%
Porosity	ECTC Guidelines	99%
Stiffness	ASTM D1388	222.65 oz-in.
Light Penetration	ASTM D6567	4.1%
Tensile Strength - MD	ASTM D6818	709 lbs/ft (10.51 kN/m)
Elongation - MD	ASTM D6818	23.9%
Tensile Strength - TD	ASTM D6818	712 lbs/ft (10.56 kN/m)
Elongation - TD	ASTM D6818	36.9%
Biomass Improvement	ASTM D7322	441%

Design Permissible Shear Stress		
	Short Duration	Long Duration
Phase 1: Unvegetated	3.0 psf (144 Pa)	2.5 psf (120 Pa)
Phase 2: Partially Veg.	8.0 psf (383 Pa)	8.0 psf (383 Pa)
Phase 3: Fully Veg.	10.0 psf (480 Pa)	8.0 psf (383 Pa)
Unvegetated Velocity	9.5 fps (2.9 m/s)	
Vegetated Velocity	15 fps (4.6 m/s)	

Slope Design Data: C Factors

Slope Length (L)	Slope Gradients (S)		
	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients – Unveg.

Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040-0.012
≥ 2.0 ft (0.60 m)	0.011

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Specification Sheet – VMax® W3000™ High-Performance Turf Reinforcement Mat

DESCRIPTION

The VMax® W3000™ high performance turf reinforcement mat (HPTRM) is a machine-produced mat of 100% UV-stabilized high denier poly yarns woven into permanent, high strength three-dimensional turf reinforcement matting. The mat consists of a woven bottom layer integrally interlaced into a woven corrugated middle layer, with poly tendons on the top side spanning the entire machine direction. The mat is designed to provide sufficient thickness, optimum open area and three-dimensionality for effective erosion control and vegetation reinforcement against high flow induced shear forces. The mat has high tensile strength providing excellent damage resistance and increased bearing capacity of vegetated soils subject to heavy loads from maintenance equipment and other vehicular traffic. The corrugated structure provides a highly frictional surface to prevent sod slippage when sod is installed over the mat. When used as surface protection without sod overlay, the corrugated structure encapsulates the seed and soil in place while promoting self-soil infilling of the system.

Material Content

Bottom	100% UV stable poly fiber weave	Black/Green
Corrugated Middle	100% UV stable poly fiber weave	Black/Green
Top	100% UV stable Poly Tendons	Green

Standard Roll Sizes

Width	10 ft (3.05 m)
Length	90 ft (27.4 m)
Weight ± 10%	90 lbs (41.0 kg)
Area	100 sy (83.6 sm)

Index Property	Test Method	Typical
Thickness	ASTM D6525	0.40 in. (10.2 mm)
Resiliency	ASTM D6524	98%
Mass/Unit Area	ASTM 6566	14.7oz/sy (495 g/m ²)
Tensile Strength - MD	ASTM D6818	3600 lbs/ft (52.6 kN/m)
Elongation - MD	ASTM D6818	35%*
Tensile Strength - TD	ASTM D6818	3800 lbs/ft (55.5 kN/m)
Elongation - TD	ASTM D6818	20%*
Light Penetration	ASTM D6567	12%
UV Stability	ASTM D4355	>80% @3000 hrs

* Measured on fabric prior to corrugation for true measurement of base fabric elongation

Design Permissible Shear Stress*

Vegetated Shear Stress	16 psf (766 Pa)
Vegetated Velocity	25 fps (7.6 m/s)

*Values extrapolated through ASTM D6460 testing

ASTM D6460 Large Scale Channel

Vegetated Shear Stress	>13.2 psf (632 Pa)
Vegetated Velocity	>24.5 fps (7.47 m/s)

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APPENDIX E

AR-LU-006 Specific Narrative and Calculations

E.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

E.2 Location Map

E.3 Sediment Barrier Table

- a. E&S Worksheet 1

E.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-006

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-006 is a proposed temporary access road (TAR) located in Fairmount Township, Luzerne County Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Hartman Road and terminates at the Contractor Staging Area (CN-CSA-CO-1-003.1) located at the pipeline right-of-way at approximate mile post 5.7.

The TAR follows an existing road for approximately 650 feet with no proposed **earth disturbing** improvements; therefore, **no sediment barriers are proposed along the road**. A temporary construction entrance will be installed at the Contractor Staging Area entrance **with compost filter sock** and construction equipment mats will be installed at the existing culvert crossing, these will be removed upon completion of the construction activities.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads. AR-LU-006 is an existing temporary access road. All construction traffic will utilize the existing road, therefore, soil compaction impacts have been eliminated.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-006 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***The entire 650 linear feet of road follows an existing gravel road. The use of an existing road corridor eliminates the need for additional tree removal and for additional widening of the roadway. The ability to use this road without the removal of additional trees minimizes the thermal impact of this road.***

- **Temporary construction phase improvements for this road are limited to equipment mats over an existing culvert and a rock construction entrance. Runoff from these temporary improvements is directed to stabilized, well vegetated areas that will promote infiltration of the runoff. Infiltration of runoff prior to entering of receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.**
- **The proposed gravel surfacing outside of the limits of the existing road footprint is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surfaces outside the existing gravel road areas. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.**

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-006 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
LaB	Lackawanna channery loam, 3 to 8 percent slopes	5.1
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	4.8

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-006**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Install the rock construction entrance with wash rack.**
- 8. Install construction mats over existing culvert as shown on plans.**
- 9. Remove brush to effectively install perimeter controls, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 10. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 11. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**

- 12. Proceed with major clearing and grubbing.**
- 13. Begin construction staking for layout of limits of access road.**
- 14. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 15. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**
- 16. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections. Dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. E&SC BMPs will remain in place and functional.**
- 17. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the access road to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.**
- 18. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.**

- 19. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fence.***

- 20. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***

- 21. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 2-Dec-15

Project Name: Atlantic Sunrise Pipeline AR-LU-006

Municipality: Fairmount Township

County: Luzerne

Total Area (acres): 0.81

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Fishing Creek

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: Maple Run

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterM](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm) No

[anagement/GeneralPermits/default.htm](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm)

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

Approved Act 167 Plan? Yes

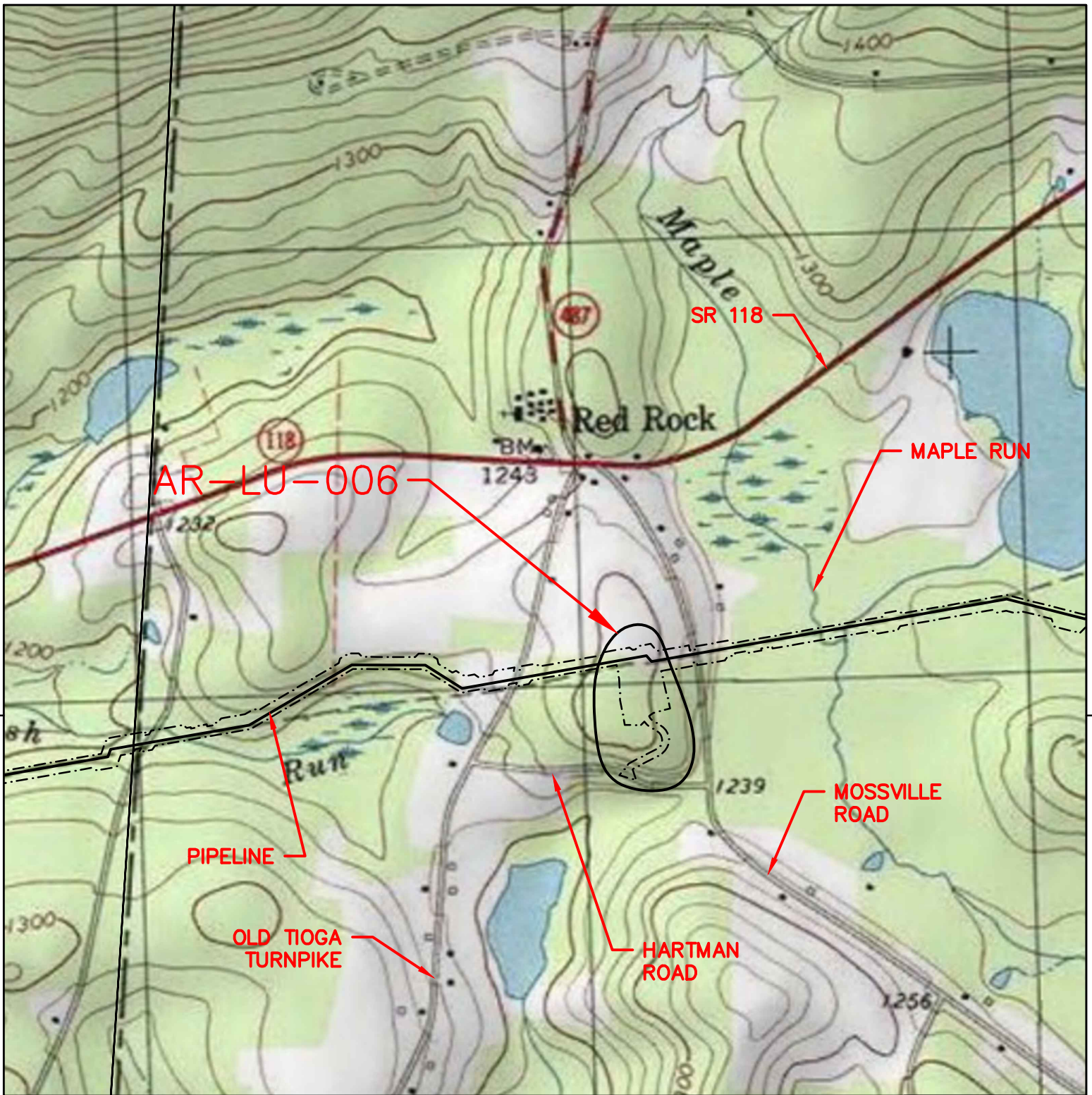
[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagem](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html) No

[ent/Approved_1.html](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html)

Existing River Conservation Plan? Yes


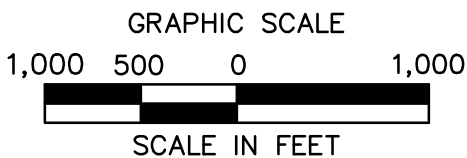
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

E.2 Location Map



RED ROCK QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-006
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



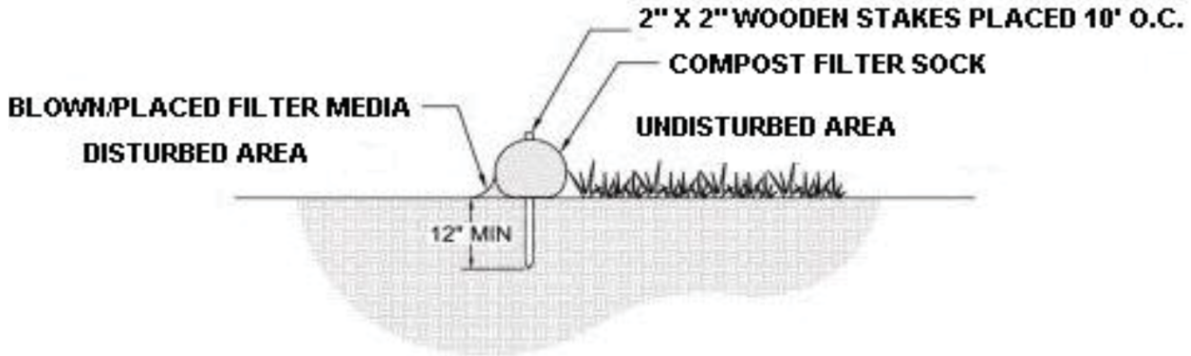
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				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-006	SHEET 1 OF 1
							WO: 1161481			

E.3 Sediment Barrier Table

a. E&S Worksheet 1

E&S WORKSHEET #1 Compost Filter Sock

PROJECT NAME: Atlantic Sunrise
 LOCATION: AR-LU-006
 PREPARED BY: EAW DATE: 9/21/16,
 CHECKED BY: BJP, SMK DATE: 9/21/16,



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)	SOCK LENGTH
1-2	12	STA 4+75 to STA 5+75	4	60	100

SOURCE: Pennsylvania Erosion and Sediment Pollution Control Manual, Page 372

APPENDIX F

Intentionally Omitted by Applicant

APPENDIX G

AR-LU-007.1 Specific Narrative and Calculations

- G.1 Site Specific Narrative
 - a. Narrative
 - b. TMDL Discussion**
 - c. Minimized Soil Compaction**
 - d. Thermal Impact Analysis**
 - e. Acidic Soil Management Plan**
 - f. Road Specific Construction Sequence**
 - g. Permanent Access Road Summary Sheet (NOI PCSM Table)
- G.2 Location Map
- G.3 Predevelopment Calculations
 - a. Predevelopment Drainage Area Map
 - b. 1-Year Rainfall Event
 - c. 2-Year Rainfall Event
 - d. 5-Year Rainfall Event
 - e. 10-Year Rainfall Event
 - f. 25-Year Rainfall Event
 - g. 50-year Rainfall Event
 - h. 100-Year Rainfall Event
- G.4 Post Development Calculations
 - a. Post Development Drainage Area Map
 - b. 1-Year Rainfall Event
 - c. 2-Year Rainfall Event
 - d. 5-Year Rainfall Event
 - e. 10-Year Rainfall Event
 - f. 25-Year Rainfall Event
 - g. 50-year Rainfall Event
 - h. 100-Year Rainfall Event
- G.5 Conveyance Calculations
 - a. E&S Worksheet 11
 - b. NAG Swale Lining Analysis
 - c. Figure 9.3-Riprap Apron Design
- G.6 PCSM BMP Calculations
 - a. Check Dam Volume Calculations
- G.7 Water Quality Worksheets
 - a. Flow Chart A – Stormwater Calculation Process
 - b. Worksheet 1. General Site Information
 - c. Worksheet 2. Sensitive Natural Resources
 - d. Worksheet 3. Nonstructural BMP Credits
 - e. Flow Chart B – Control Guideline 1 Process
 - f. Worksheet 4. Change in Runoff Volume for 2-Yr Storm Event
 - g. Worksheet 5. Structural BMP Volume Credits
 - h. Worksheet 10. Water Quality Compliance for Nitrate
- G.8 Infiltration Information
 - a. Field Observation Report
- G.9 Off-Site Discharge Analysis**
 - a. Adequacy of Off-Site Discharge**
- G.10 Storage Volume Analysis**
 - a. Storage Volume Analysis**

G.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. Permanent Access Road Summary Sheet (NOI PCSM Table)

ACCESS ROAD: AR-LU-007.1

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-007.1 is a proposed permanent access road (PAR) located in Fairmount Township, Luzerne County, Pennsylvania. The intent of this PAR is to provide permanent maintenance and operational access to the proposed Main Line Valve 02 (CN-MLV-02) located on the proposed 30" Central Penn Line North Pipeline. The PAR is approximately 100 feet long over relatively hilly terrain. The proposed permanent access road begins at Tripp Road and terminates at the MLV site at approximate milepost 6.7. The access road will be entirely located within the pipeline permanent right of way. **Within the pipeline right of way, the proposed temporary sediment barriers are included in the Pipeline E&S Plan and shown in grey on the Access Road Plan for coordination purposes.**

During construction, the access road will be 14 feet wide with a temporary rock construction entrance and driveway apron sized for the anticipated vehicles and equipment using the road during construction. Upon completion of the construction activities, the temporary construction entrance and driveway apron will be removed and a permanent access road will be constructed. The permanent road will have a width of 14 feet and a cross slope of 2% directing runoff in a northerly direction into a **vegetated channel for infiltration** with check dams. A **vegetated channel for diversion purposes** with check dams will be constructed on the south side of the proposed road and MLV pad in order to capture and divert uphill runoff.

Runoff from a portion of the disturbed site will be directed to the proposed MLV site. The MLV site will be constructed with a 6-inch thick layer of AASHTO #8 stone on top of nonwoven geotextile and an 18-inch thick layer of AASHTO #57 stone. As summarized in the infiltration calculations added to the bottom of Worksheet #5, the detained water stored in the voids of the MLV stone pad will infiltrate to the surrounding ground over approximately 10 hours and the water detained behind the check dams will infiltrate to the surrounding ground over approximately 5 hours.

Water Quality Worksheet #4 was used to complete the Control Guideline 1 (CG-1) volume analysis for the 2 year 24-hour storm. The storage volume provided by the MLV pad is greater than the required volume per Worksheet #4.

Pre-development and post-development runoff hydrographs were developed for the 1, 2, 5, 10, 25, 50 and 100 year 24-hour storm events using the SCS TR-20 method. Directing

runoff from the proposed gravel road to the **vegetated channel for infiltration** and MLV pad mitigates the potential impact from the proposed development.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads. AR-LU-007.1 is a proposed permanent access road for Main Line Valve 02. Construction and operations traffic will utilize the proposed road. The permanent access road is situated completely within the permanent right of way of the pipeline reducing the area of impact. The roadway width has also been minimized to 14 feet. Additionally, infiltration and evaporation are encouraged in the MLV site pad and in the vegetated channels for infiltration proposed in the permanent road construction.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-007.1 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-007.1 is a permanent access road constructed of impervious pavement. This roadway surface minimizes the thermal impact because it allows for runoff to flow unimpeded over the roadway surface to the proposed perimeter BMPs such as the compost filter sock, vegetated channel for infiltration and MLV pad.***
- ***This road is proposed in a location that minimizes tree removal. The ability to use this road without the removal of additional trees acts to minimize the thermal impact of this road.***
- ***Vegetated channels for infiltration with check dams are proposed adjacent to the proposed permanent access road. The vegetated channels for infiltration and check dams promote infiltration of the runoff from the proposed impervious road. Infiltration allows the runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-007.1 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	5.1

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

ANTIDEGGRADATION REQUIREMENTS:

AR-LU-007.1 is located within a special protection watershed. There are no opportunities for non-discharge alternatives such as connecting to a sewer system or capturing stormwater in rain barrels for reuse as irrigation.

AR-LU-007.1 has been designed to maintain pre-construction rates of runoff by detaining and infiltrating stormwater within the MLV site and vegetated channels.

During construction, Antidegradation Best Available Combination of Technologies (ABACT) E&SC BMPs, such as rock construction entrances with wash racks and rock filters with a compost layer on the uphill side, are proposed to be installed on the access roads.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-007.1**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (i.e., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install rock construction entrance with wash rack and gravel driveway apron.**
- 9. Remove brush to effectively install perimeter E&SC BMPs.**
- 10. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 11. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**

- 12. Proceed with major clearing and grubbing.**
- 13. Begin construction staking for layout of access road.**
- 14. Grade the access road as shown on the E&SC Plans.**
- 15. Install vegetated channels for infiltration with check dams and infiltration berm where specified on the E&SC & PCSM Plans (Section 2 of the ESCGP-2 NOI). Note: this is a critical stage of PCSM plan to be observed by a licensed professional or designee. Begin vegetated channel construction only when the upgradient temporary erosion and sediment control measures are in place. Vegetated channels should be constructed and stabilized early in the construction schedule, preferably before mass earthwork and paving increase the rate and volume of runoff. (Erosion and sediment control methods shall adhere to the Pennsylvania Department of Environmental Protection's Erosion and Sediment Pollution Control Program Manual, March 2000 or latest edition.)**
- 16. Rough grade the vegetated channel. Equipment shall avoid excessive compaction and/or land disturbance. Excavating equipment should operate from the side of the channel and never on the bottom. If excavation leads to substantial compaction of the subgrade (where an infiltration trench is not proposed), 18 inches shall be removed and replaced with a blend of topsoil and sand to promote infiltration and biological growth. At the very least, topsoil shall be thoroughly deep plowed into the subgrade in order to penetrate the compacted zone and promote aeration and the formation of macropores. Following this, the area should be disked prior to final grading of topsoil.**
- 17. Construct check dams, if required.**
- 18. Fine grade the vegetated channel. Accurate grading is crucial for channels. Even the smallest nonconformities may compromise flow conditions.**
- 19. Seed, vegetate and install protective lining as per approved plans and according to final planting list. Vegetation should be established as soon as possible to prevent erosion and scour. Seed mix and season of planting are provided under separate cover in the Best Management Practices and Quantities Plan Set.**
- 20. Once all tributary areas are sufficiently stabilized, remove temporary erosion and sediment controls. It is very important that the channel be stabilized before receiving upland stormwater flow. NOTE: If a vegetated channel is used for runoff conveyance during construction, it should be regraded and reseeded immediately after construction and stabilization has**

occurred. Any damaged areas should be fully restored to ensure future functionality of the channel.

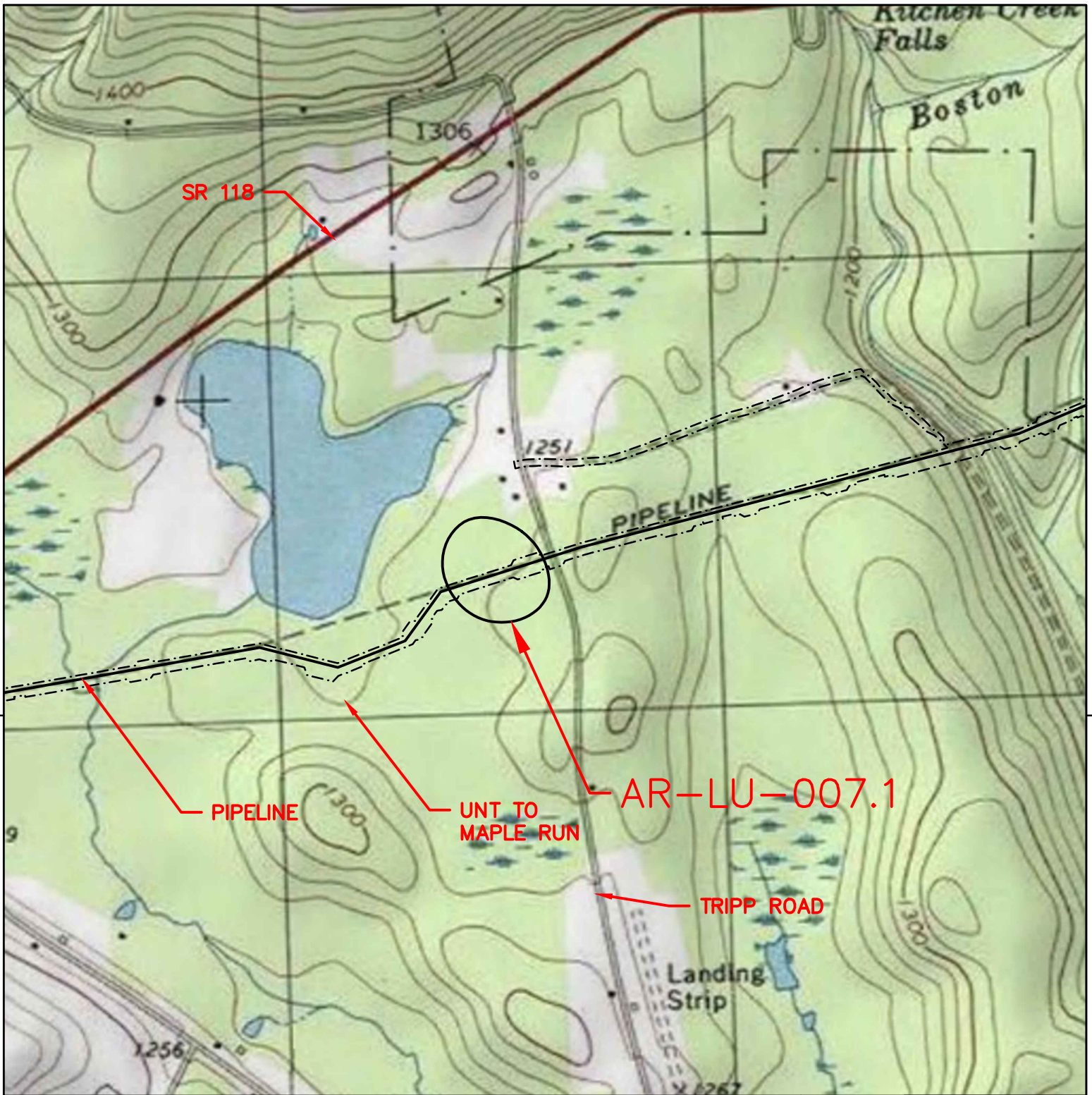
- 21. Rough grade the MLV pad. Equipment shall avoid excessive compaction and/or land disturbance. If excavation leads to substantial compaction of the subgrade (where an infiltration trench is not proposed), 18 inches shall be removed and replaced with a blend of topsoil and sand to promote infiltration and biological growth. At the very least, topsoil shall be thoroughly deep plowed into the subgrade in order to penetrate the compacted zone and promote aeration and the formation of macropores. Following this, the area should be disked prior to final grading.***
- 22. Caution shall be observed when excavating above the recently installed gas pipeline. Prior to excavation over the gas pipeline, confirm the depth of cover over the pipe. Decompress the pipe trench backfill as described in the previous Step.***
- 23. Place the stone and geotextile fabric within the MLV pad as specified on the E&SC & PCSM Plans. NOTE: This is a critical stage of PCSM Plan to be observed by a licensed professional or designee.***
- 24. Immediately stabilize the access road with geotextile and gravel surfacing where indicated in the E&SC Plans.***
- 25. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, the disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable E&SC BMPs, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).***
- 26. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***

- 27. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier and temporary compost filter sock diversions. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 28. Complete access road ROW stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 29. Upon completion of all earth disturbance activities, removal of all temporary E&SC BMPs, and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Permanent Access Road Summary Sheet

Access Road Number:	AR-LU-007.1			
Watershed Name:	Maple Run, CWF, MF			
Act 167 Plan Name:	Luzerne County Act 167	Date Adopted:	June 2010	
Design Storm Frequency	2 year	Pre-construction	Post-construction	Net Change
Rainfall Amount	2.88 inches			
Impervious area (acres)		0.000	0.148	0.148
Volume of stormwater runoff (cf) without planned stormwater BMPs		1,812	2,830	1,018
Volume of stormwater runoff (cf) with planned stormwater BMPs			577	(1,235)
Pre- vs. Post-construction Peak Rate of Flow Summary				
Stormwater discharge rate for the design frequency storm (cfs)		Pre-construction	Post-construction	Net Change
1) 1-Year/24-Hour		0.70	0.20	(0.50)
2) 2-Year/24-Hour		1.20	0.45	(0.75)
3) 5-Year/24-Hour		2.01	1.00	(1.01)
4) 10-Year/24-Hour		2.79	1.72	(1.07)
5) 25-Year/24-Hour		4.07	2.28	(1.79)
6) 50-Year/24-Hour		5.29	3.36	(1.93)
7) 100-Year/24-Hour		6.76	4.87	(1.89)
Summary Description of Restoration BMPs - Permanent Access Roads				
BMP	Function	Volume of stormwater treated (cf)	Acres treated	
Natural area conservation: Pre-construction drainage pattern intact		0	0.00	
Access road design: Ditches Culverts	Infiltration/ Recharge/Storage	125 <small>Included in Ditches</small>	0.08 <small>Included in Ditches</small>	
Stormwater energy dissipaters: Riprap Aprons	Infiltration/ Recharge/Storage	0	0.00	
Other: MLV Stone Pad Void Storage	Infiltration/ Recharge/Storage	2,128	0.20	
Off-site Discharge Analysis:				
The point of interest (POI) for the access road stormwater design is the downstream point where the access road watershed currently discharges off-site. As shown in the tables above, there is no increase in volume or peak rate of runoff at the POI. Therefore, the existing drainage pattern will be unchanged and erosion, damage, or nuisance to off-site properties is not anticipated to be caused by the Project improvements.				
Loading Ratio:		Channel	MLV Pad	
Maximum Impervious Loading Ratio	4.0	:1 (5:1 Max)	1.5 :1 (5:1 Max)	
Maximum Total Loading Ratio	7.9	:1 (8:1 Max)	2.6 :1 (8:1 Max)	
Supporting Areas	Channel	MLV Pad	Unit	
Impervious Drainage Area	0.04	0.12	Acres	
Infiltration Area	0.01	0.08	Acres	
Total Drainage Area	0.08	0.20	Acres	

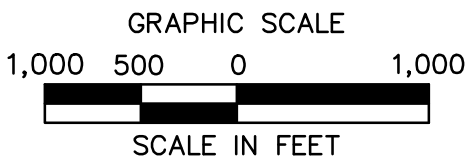
G.2 Location Map



RED
ROCK
QUADRANGLE

SWEET
VALLEY
QUAD

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING



ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
PERMANENT AR-LU-007.1
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
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							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-007.1	SHEET 1 OF 1
							WO: 1161481			

G.3 Predevelopment Calculations

- a. Predevelopment Drainage Area Map
- b. 1-Year Rainfall Event
- c. 2-Year Rainfall Event
- d. 5-Year Rainfall Event
- e. 10-Year Rainfall Event
- f. 25-Year Rainfall Event
- g. 50-year Rainfall Event
- h. 100-Year Rainfall Event



PRE-DEVELOPMENT DRAINAGE AREA MAP




ISSUED FOR PERMITTING

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING
BL
Companies

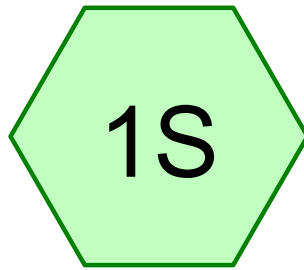
LEGEND

TIME OF CONCENTRATION-SHEET FLOW	
TIME OF CONCENTRATION-SHALLOW CONCENTRATED FLOW	
DRAINAGE AREA	
PROPOSED GAS PIPELINE	

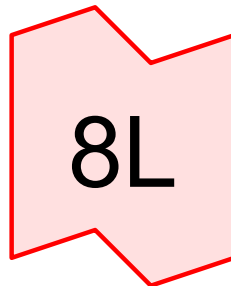
ATLANTIC SUNRISE PROJECT -
CENTRAL PENN LINE NORTH
PROPOSED 30" NATURAL GAS PIPELINE
ACCESS ROAD DRAINAGE AREA MAP
AR-LY-007.1 PRE
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



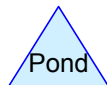
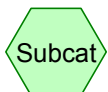
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							BJP	11/11/15	DRAWING NUMBER:	AR-LU-007.1 PRE
							WO:			



OVERALL DA
PRE-DEVELOPMENT



Existing Conditions



Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
13,102	71	Meadow, non-grazed, HSG C (1S)
1,524	98	Paved parking, HSG C (1S)
40,385	70	Woods, Good, HSG C (1S)
55,011	71	TOTAL AREA

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
55,011	HSG C	1S
0	HSG D	
0	Other	
55,011		TOTAL AREA

AR-LU-007-1

Prepared by Microsoft

HydroCAD® 10.00 s/n 01334 © 2013 HydroCAD Software Solutions LLC

Type II 24-hr 1-Year Rainfall=2.40"

Printed 10/3/2016

Page 4

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=0.44"
Flow Length=372' Tc=10.9 min CN=71 Runoff=0.70 cfs 2,027 cf

Link 8L: Existing Conditions

Inflow=0.70 cfs 2,027 cf
Primary=0.70 cfs 2,027 cf

Total Runoff Area = 55,011 sf Runoff Volume = 2,027 cf Average Runoff Depth = 0.44"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 0.70 cfs @ 12.05 hrs, Volume= 2,027 cf, Depth= 0.44"

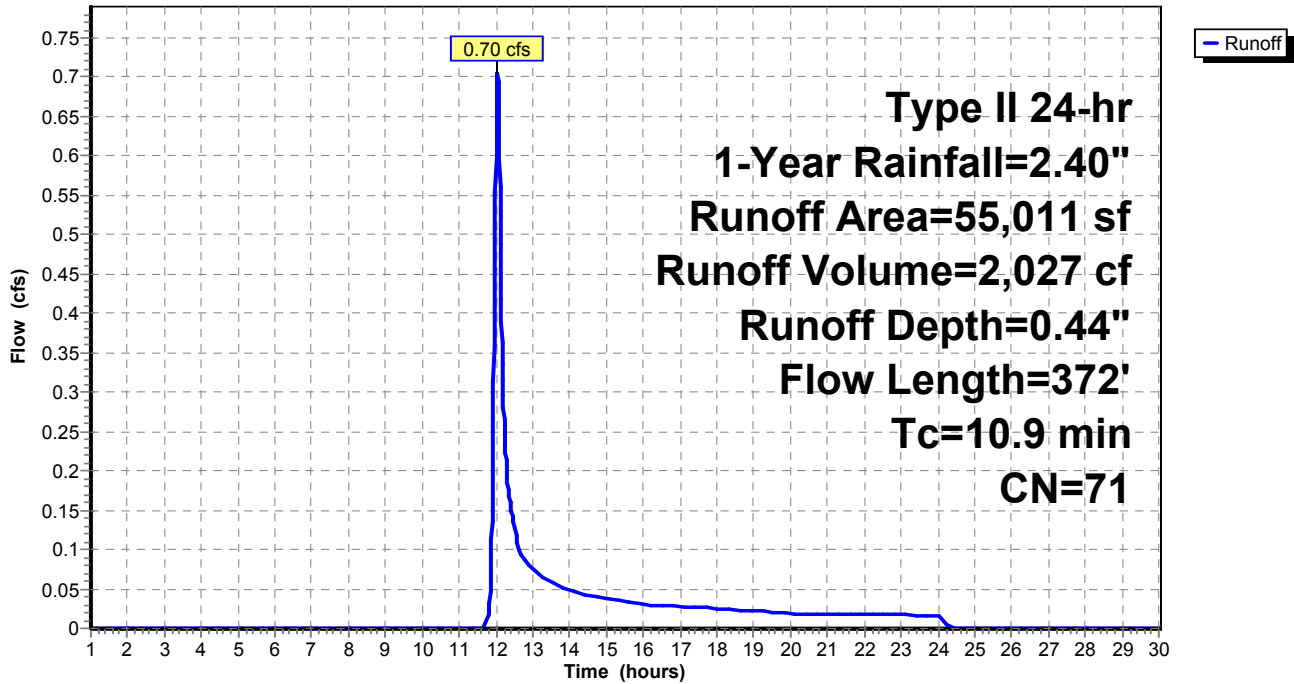
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



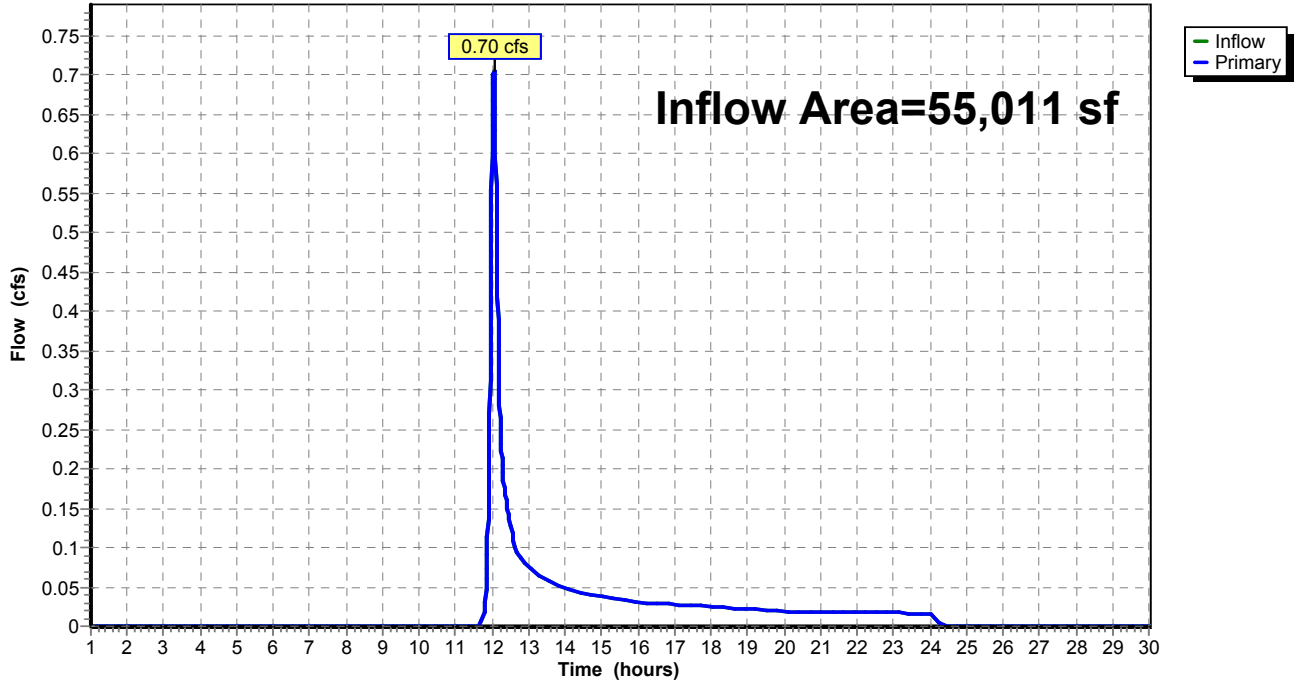
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 0.44" for 1-Year event
Inflow = 0.70 cfs @ 12.05 hrs, Volume= 2,027 cf
Primary = 0.70 cfs @ 12.05 hrs, Volume= 2,027 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



AR-LU-007-1

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Type II 24-hr 2-Year Rainfall=2.88"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=0.69"
Flow Length=372' Tc=10.9 min CN=71 Runoff=1.20 cfs 3,174 cf

Link 8L: Existing Conditions

Inflow=1.20 cfs 3,174 cf
Primary=1.20 cfs 3,174 cf

Total Runoff Area = 55,011 sf Runoff Volume = 3,174 cf Average Runoff Depth = 0.69"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 1.20 cfs @ 12.04 hrs, Volume= 3,174 cf, Depth= 0.69"

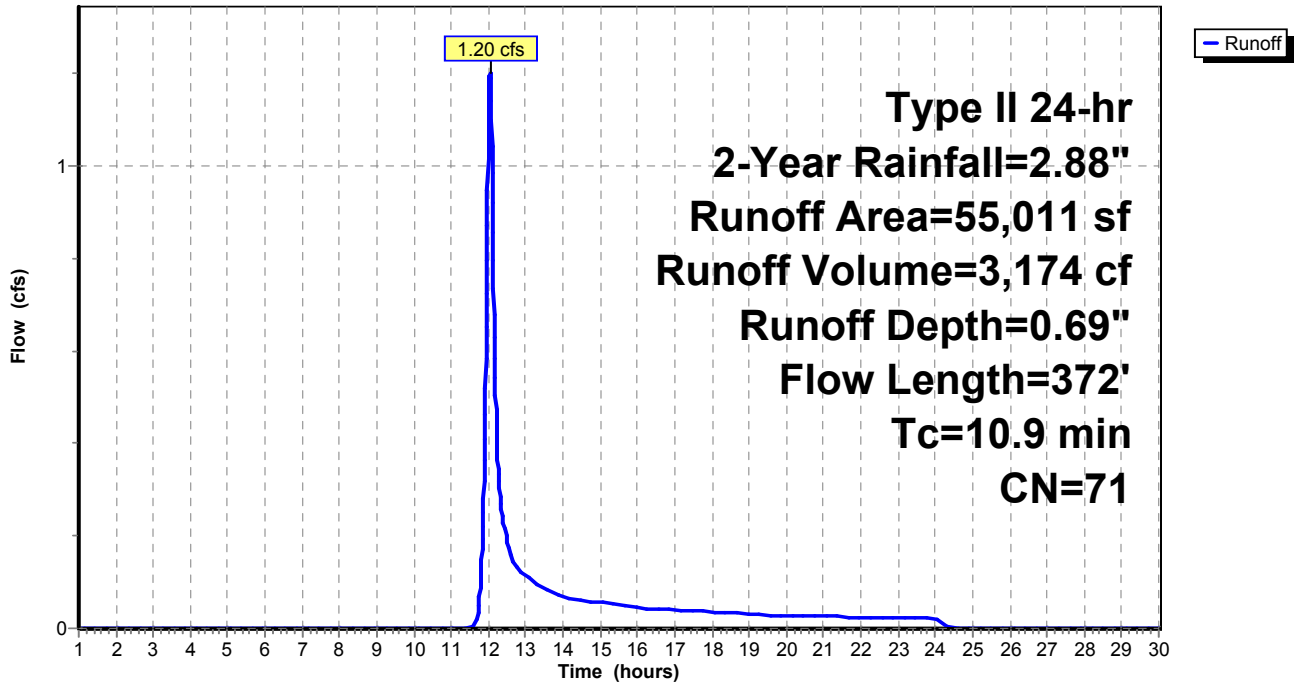
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



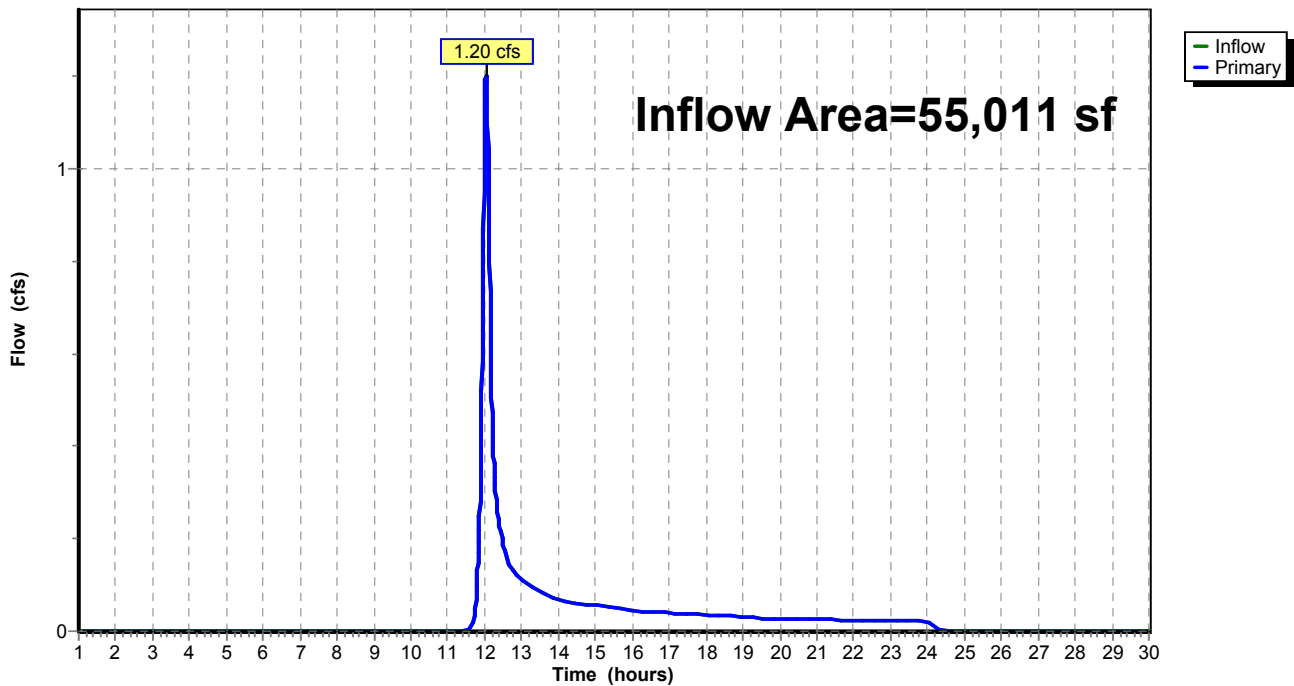
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 0.69" for 2-Year event
Inflow = 1.20 cfs @ 12.04 hrs, Volume= 3,174 cf
Primary = 1.20 cfs @ 12.04 hrs, Volume= 3,174 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



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Type II 24-hr 5-Year Rainfall=3.56"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=1.10"
Flow Length=372' Tc=10.9 min CN=71 Runoff=2.01 cfs 5,052 cf

Link 8L: Existing Conditions

Inflow=2.01 cfs 5,052 cf
Primary=2.01 cfs 5,052 cf

Total Runoff Area = 55,011 sf Runoff Volume = 5,052 cf Average Runoff Depth = 1.10"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 2.01 cfs @ 12.04 hrs, Volume= 5,052 cf, Depth= 1.10"

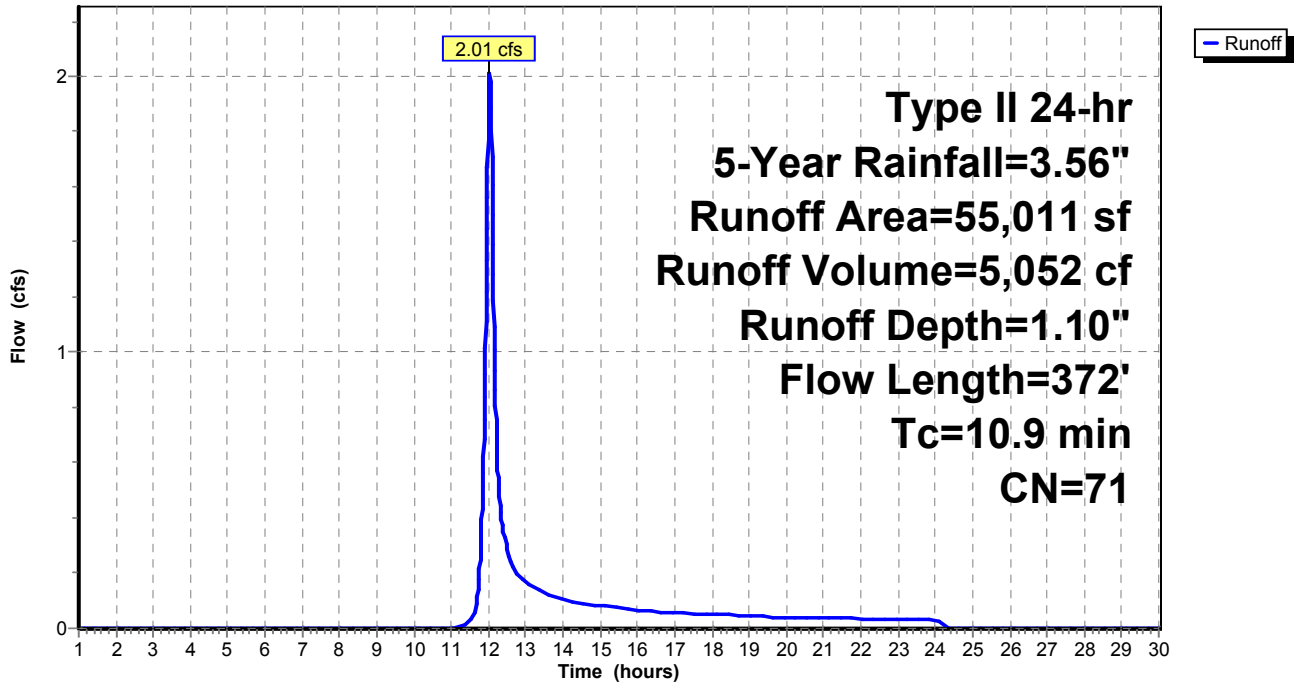
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



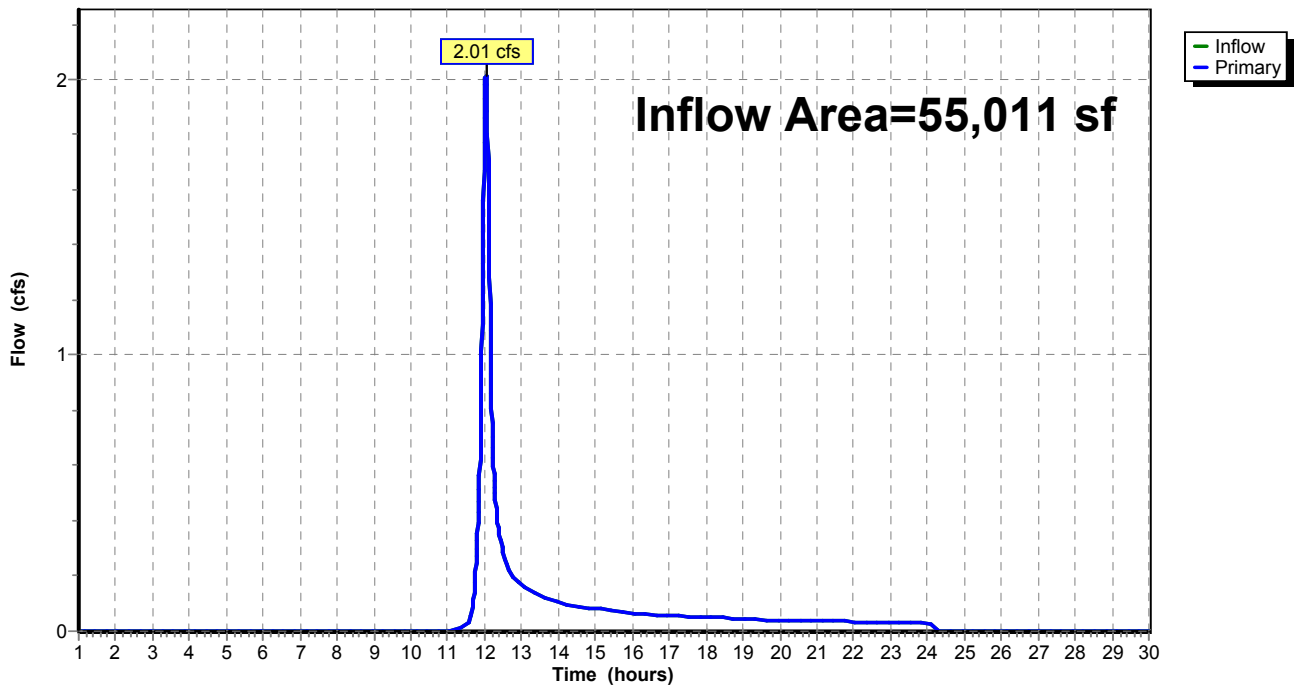
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 1.10" for 5-Year event
Inflow = 2.01 cfs @ 12.04 hrs, Volume= 5,052 cf
Primary = 2.01 cfs @ 12.04 hrs, Volume= 5,052 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



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Type II 24-hr 10-Year Rainfall=4.15"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=1.50"
Flow Length=372' Tc=10.9 min CN=71 Runoff=2.79 cfs 6,866 cf

Link 8L: Existing Conditions

Inflow=2.79 cfs 6,866 cf
Primary=2.79 cfs 6,866 cf

Total Runoff Area = 55,011 sf Runoff Volume = 6,866 cf Average Runoff Depth = 1.50"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 2.79 cfs @ 12.03 hrs, Volume= 6,866 cf, Depth= 1.50"

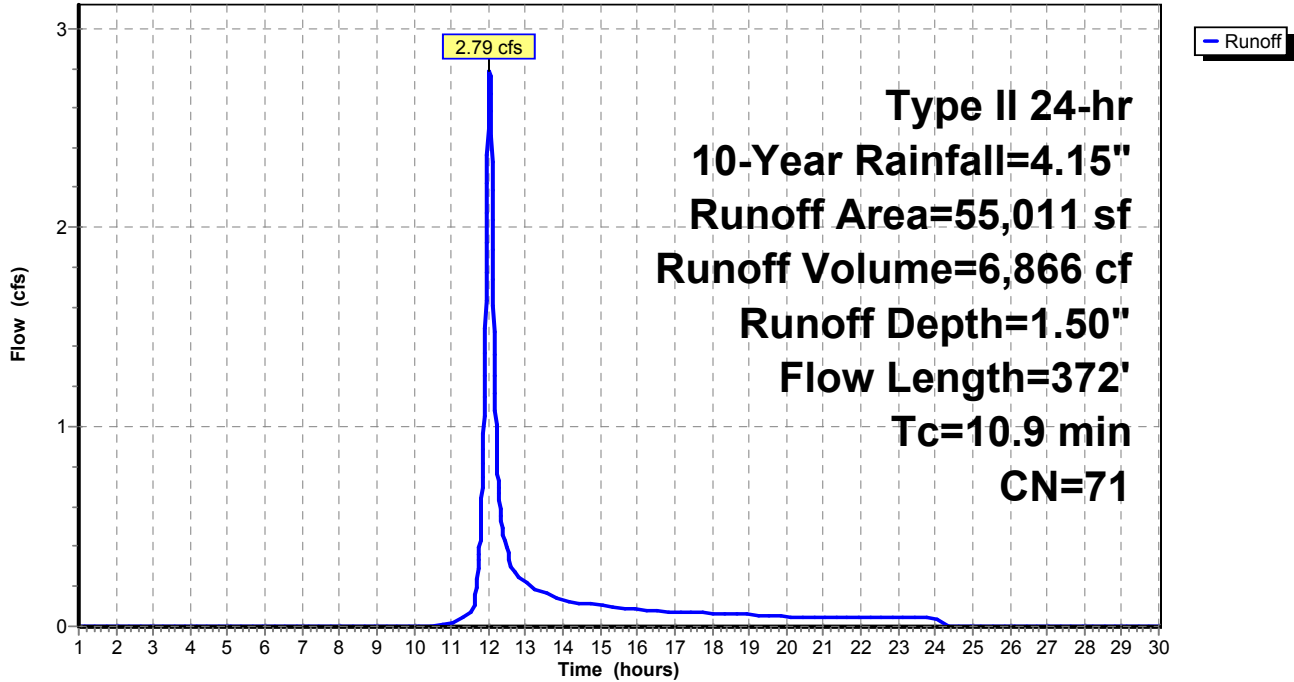
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



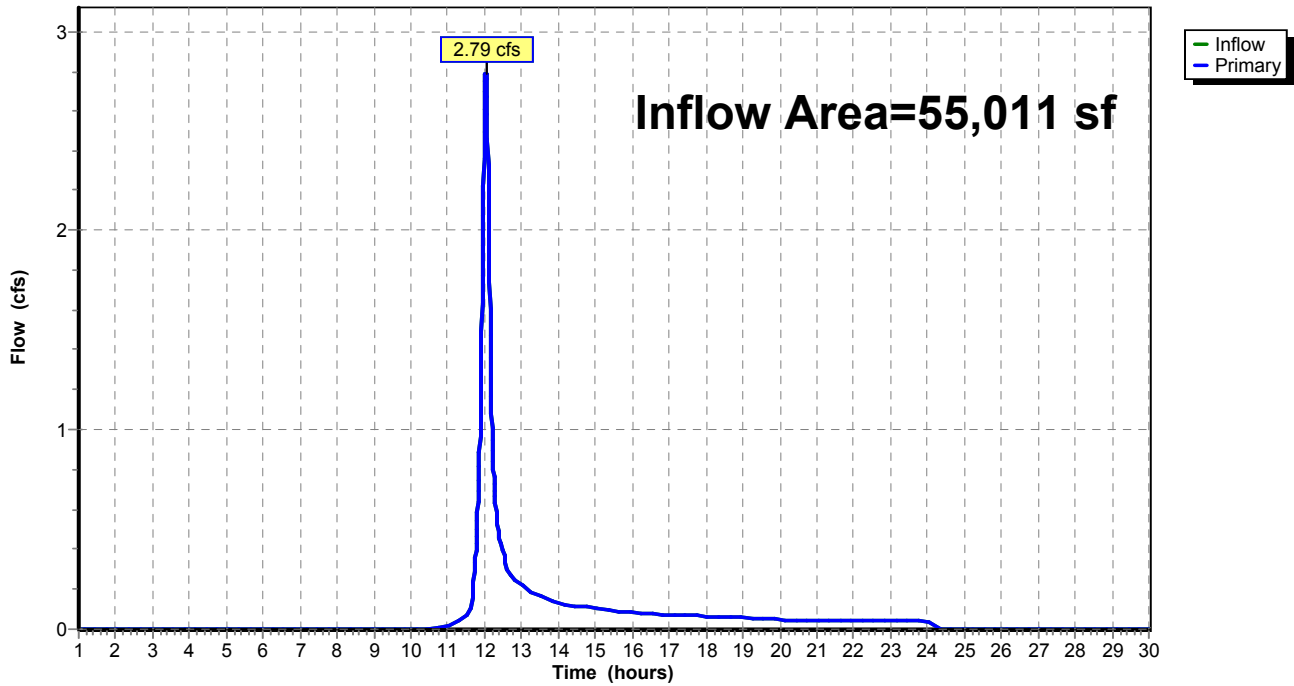
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 1.50" for 10-Year event
Inflow = 2.79 cfs @ 12.03 hrs, Volume= 6,866 cf
Primary = 2.79 cfs @ 12.03 hrs, Volume= 6,866 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



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Type II 24-hr 25-Year Rainfall=5.06"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=2.16"
Flow Length=372' Tc=10.9 min CN=71 Runoff=4.07 cfs 9,911 cf

Link 8L: Existing Conditions

Inflow=4.07 cfs 9,911 cf
Primary=4.07 cfs 9,911 cf

Total Runoff Area = 55,011 sf Runoff Volume = 9,911 cf Average Runoff Depth = 2.16"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 4.07 cfs @ 12.03 hrs, Volume= 9,911 cf, Depth= 2.16"

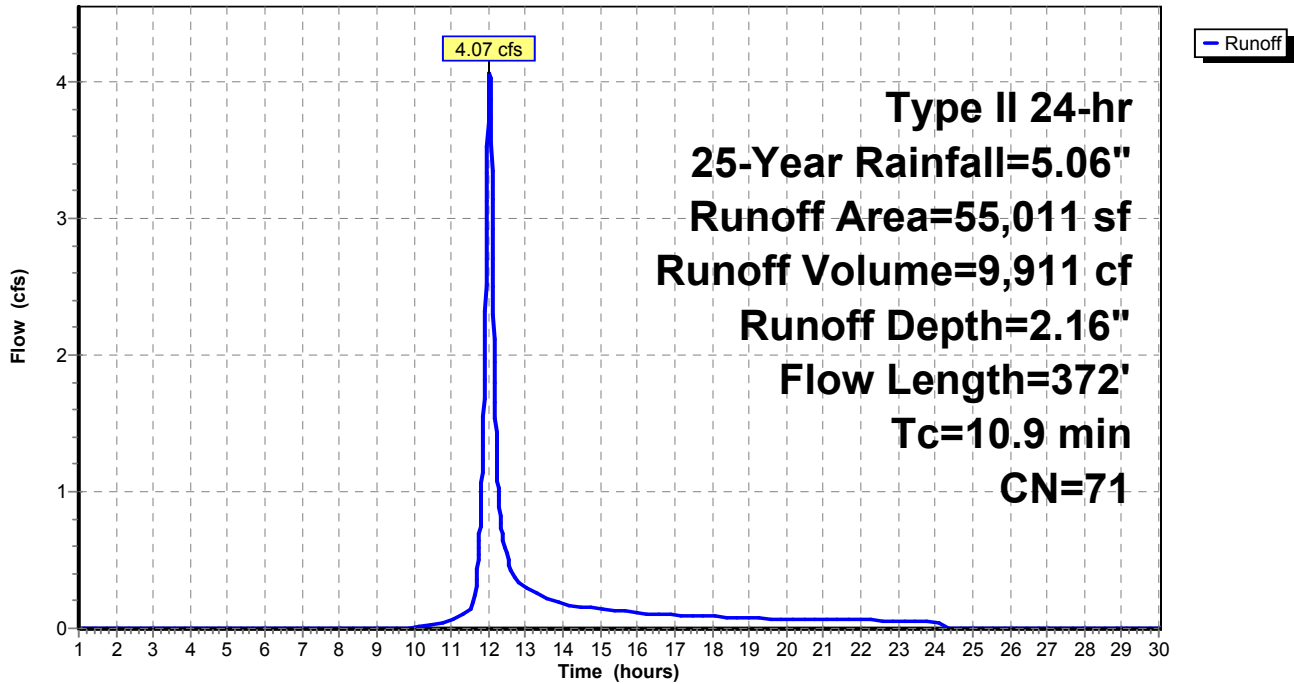
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



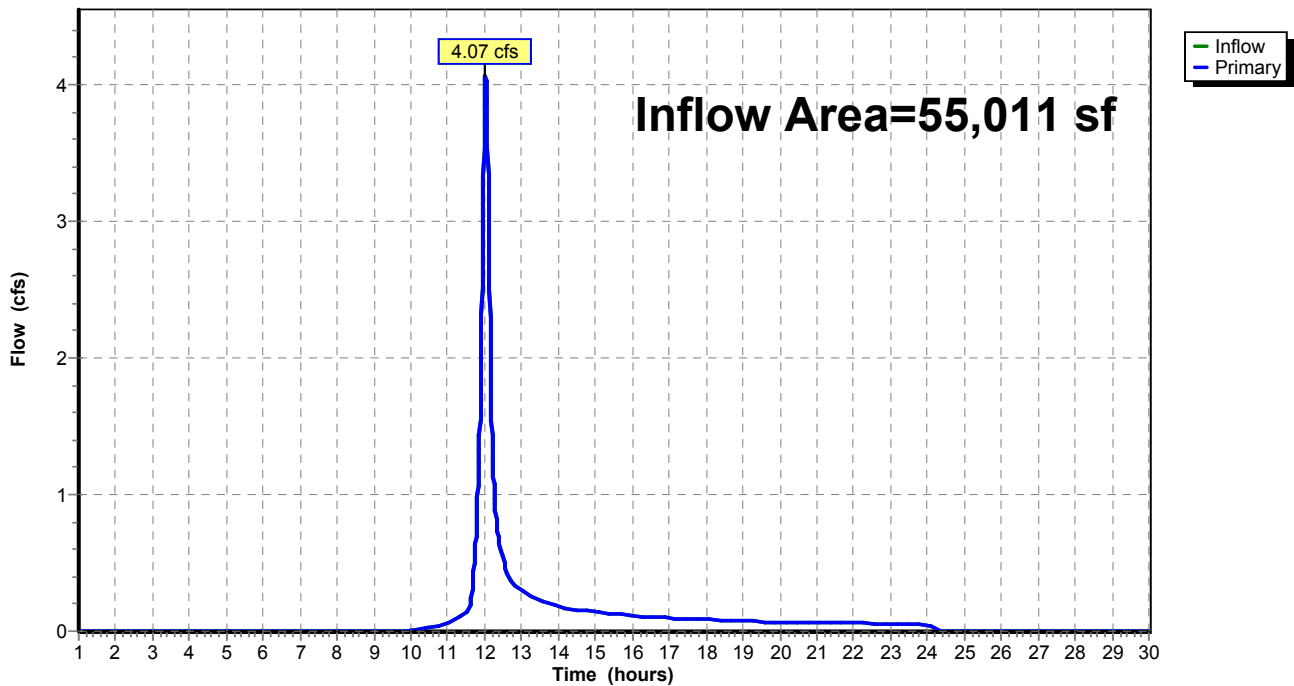
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 2.16" for 25-Year event
Inflow = 4.07 cfs @ 12.03 hrs, Volume= 9,911 cf
Primary = 4.07 cfs @ 12.03 hrs, Volume= 9,911 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



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Type II 24-hr 50-Year Rainfall=5.88"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=2.80"
Flow Length=372' Tc=10.9 min CN=71 Runoff=5.29 cfs 12,847 cf

Link 8L: Existing Conditions

Inflow=5.29 cfs 12,847 cf
Primary=5.29 cfs 12,847 cf

Total Runoff Area = 55,011 sf Runoff Volume = 12,847 cf Average Runoff Depth = 2.80"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 5.29 cfs @ 12.03 hrs, Volume= 12,847 cf, Depth= 2.80"

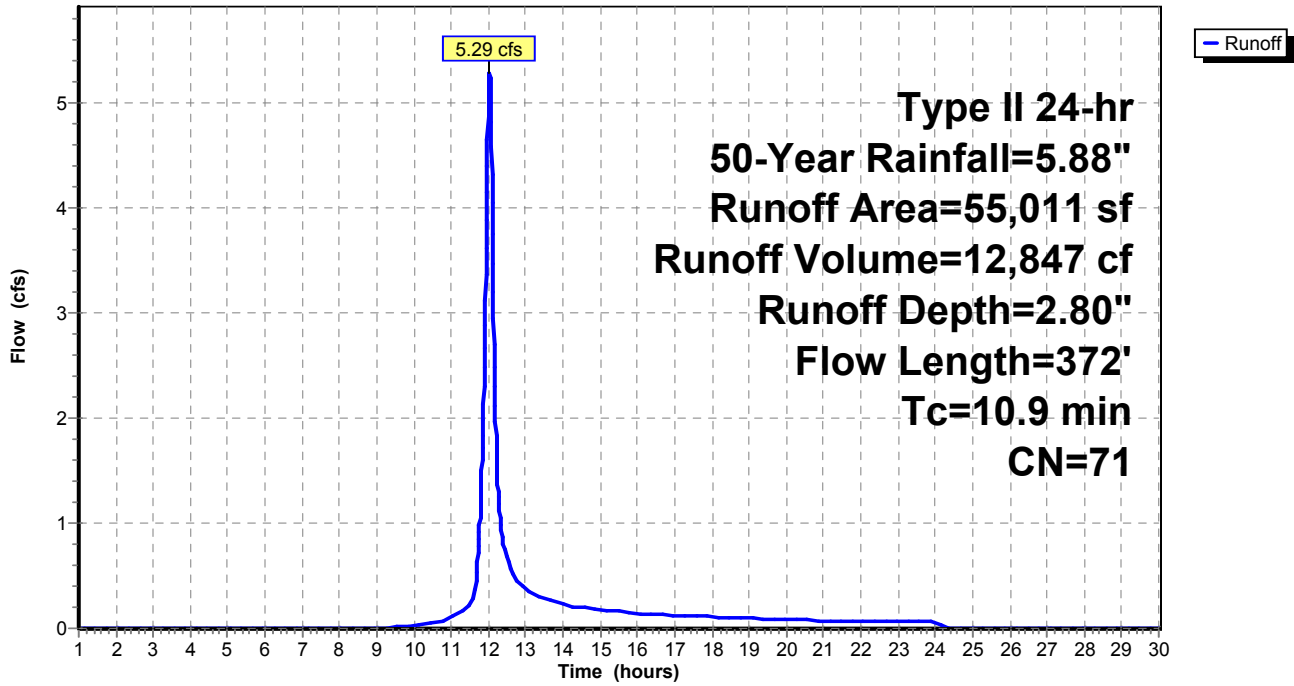
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



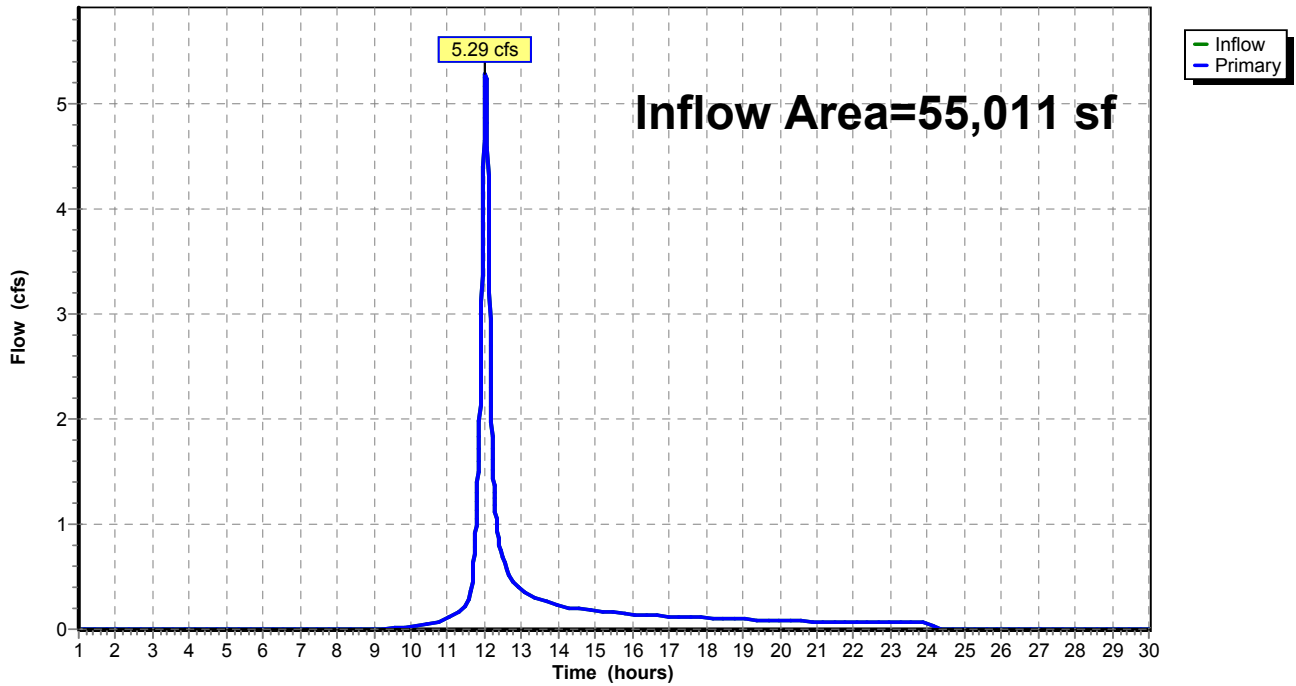
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 2.80" for 50-Year event
Inflow = 5.29 cfs @ 12.03 hrs, Volume= 12,847 cf
Primary = 5.29 cfs @ 12.03 hrs, Volume= 12,847 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



AR-LU-007-1

Type II 24-hr 100-Year Rainfall=6.84"

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Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OVERALL DA

Runoff Area=55,011 sf 2.77% Impervious Runoff Depth=3.59"
Flow Length=372' Tc=10.9 min CN=71 Runoff=6.76 cfs 16,454 cf

Link 8L: Existing Conditions

Inflow=6.76 cfs 16,454 cf
Primary=6.76 cfs 16,454 cf

Total Runoff Area = 55,011 sf Runoff Volume = 16,454 cf Average Runoff Depth = 3.59"
97.23% Pervious = 53,487 sf 2.77% Impervious = 1,524 sf

Summary for Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Runoff = 6.76 cfs @ 12.03 hrs, Volume= 16,454 cf, Depth= 3.59"

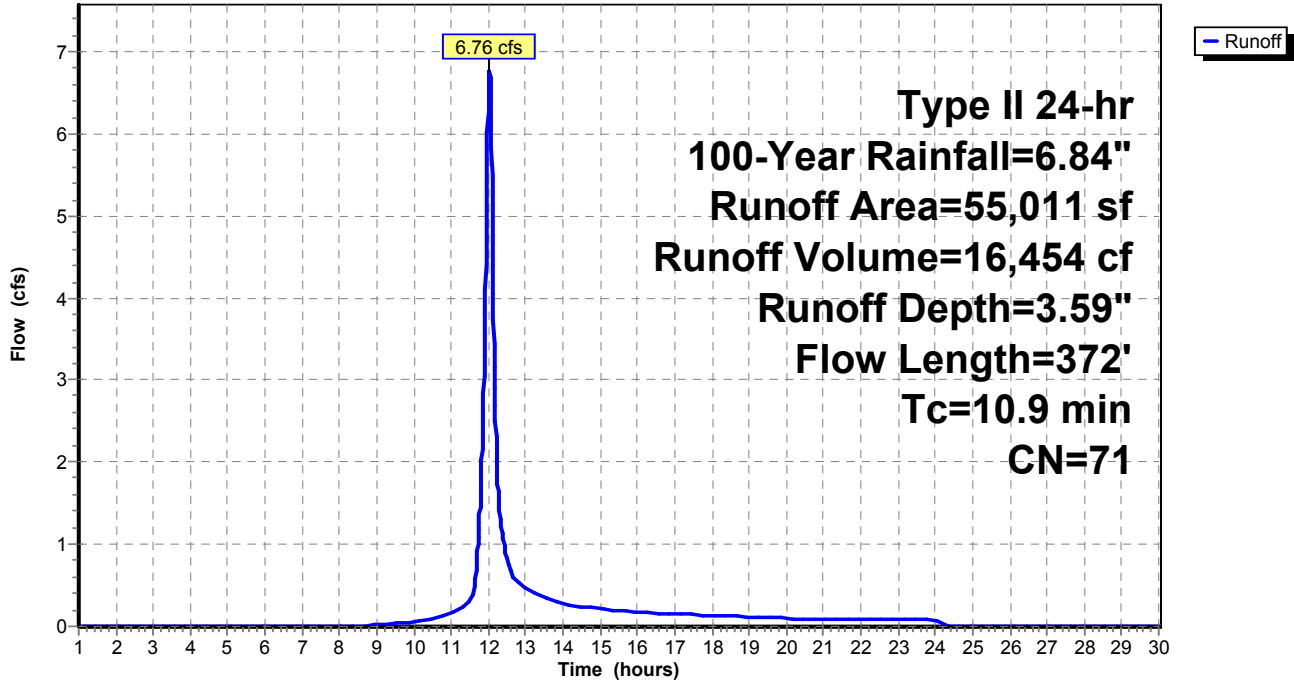
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
40,385	70	Woods, Good, HSG C
13,102	71	Meadow, non-grazed, HSG C
1,524	98	Paved parking, HSG C
55,011	71	Weighted Average
53,487		97.23% Pervious Area
1,524		2.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.8	7	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
5.7	23	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.6	67	0.1200	1.73		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.6	64	0.0600	1.71		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
2.5	141	0.0350	0.94		Shallow Concentrated Flow, SC3 Woodland Kv= 5.0 fps
10.9	372	Total			

Subcatchment 1S: OVERALL DA PRE-DEVELOPMENT

Hydrograph



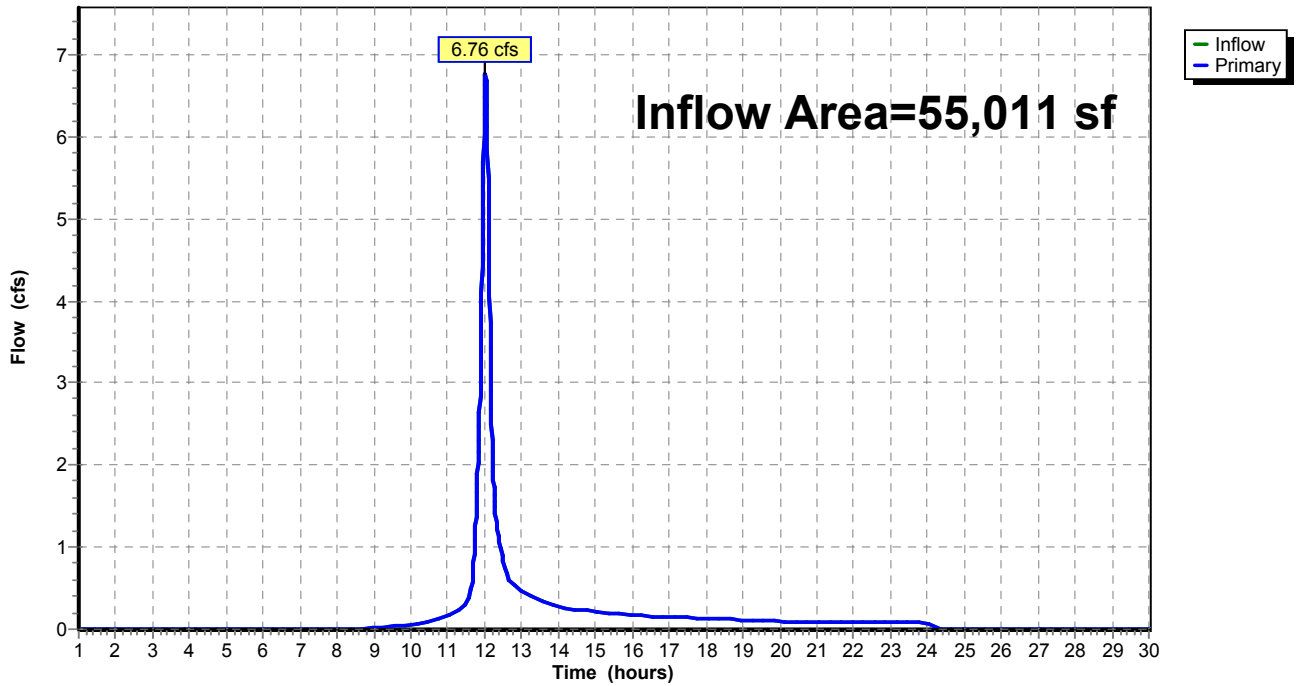
Summary for Link 8L: Existing Conditions

Inflow Area = 55,011 sf, 2.77% Impervious, Inflow Depth = 3.59" for 100-Year event
Inflow = 6.76 cfs @ 12.03 hrs, Volume= 16,454 cf
Primary = 6.76 cfs @ 12.03 hrs, Volume= 16,454 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 8L: Existing Conditions

Hydrograph



G.4 Post Development Calculations

- a. Post Development Drainage Area Map
- b. 1-Year Rainfall Event
- c. 2-Year Rainfall Event
- d. 5-Year Rainfall Event
- e. 10-Year Rainfall Event
- f. 25-Year Rainfall Event
- g. 50-year Rainfall Event
- h. 100-Year Rainfall Event



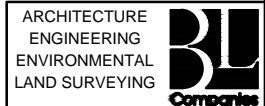
POST-DEVELOPMENT DRAINAGE AREA MAP

LEGEND

TIME OF CONCENTRATION-SHEET FLOW	
TIME OF CONCENTRATION-SHALLOW CONCENTRATED FLOW	
DRAINAGE AREA	
PROPOSED GAS PIPELINE	



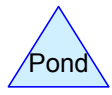
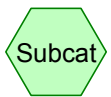
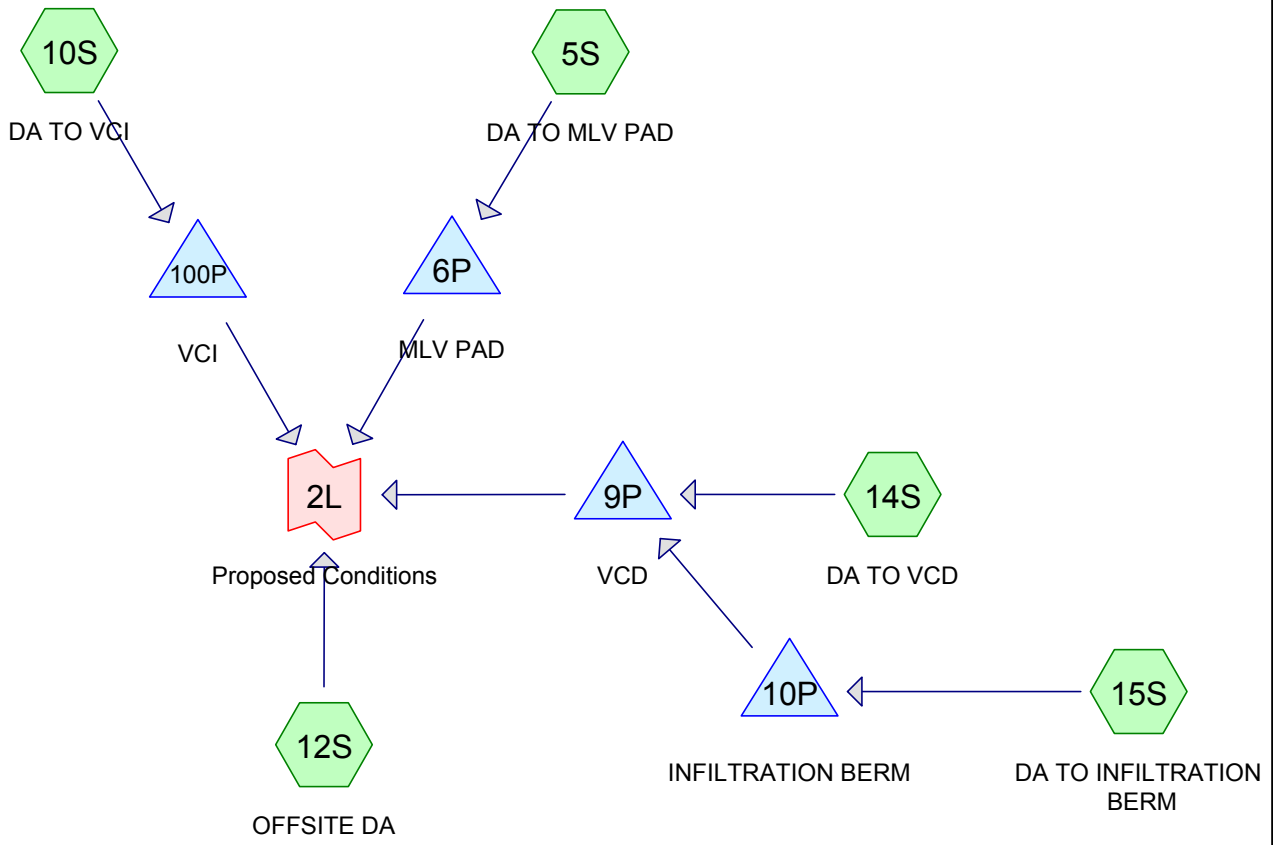
ISSUED FOR PERMITTING



ATLANTIC SUNRISE PROJECT -
CENTRAL PENN LINE NORTH
PROPOSED 30" NATURAL GAS PIPELINE
ACCESS ROAD DRAINAGE AREA MAP
AR-LY-007.1 POST
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: OLC	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1" = 50'
							CHECKED BY: BJP	DATE: 11/11/15	ISSUED FOR CONSTRUCTION:	
							APPROVED BY: BJP	DATE: 11/11/15	DRAWING NUMBER:	AR-LU-007.1 POST
							WO:			



Routing Diagram for AR-LU-007-1
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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,040	98	Crushed Stone Pad, HSG C (5S)
1,419	89	Gravel roads, HSG C (5S, 10S)
5,467	71	Meadow Fair, HSG C (5S, 10S)
19,015	71	Meadow, non-grazed, HSG C (12S, 14S, 15S)
1,325	98	Paved parking, HSG C (12S, 14S, 15S)
464	98	Paved road, HSG C (10S)
115	98	Paved roads , HSG C (5S)
22,166	70	Woods, Good, HSG C (12S, 14S, 15S)
55,011	74	TOTAL AREA

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
55,011	HSG C	5S, 10S, 12S, 14S, 15S
0	HSG D	
0	Other	
55,011		TOTAL AREA

Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD	Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=1.23" Flow Length=145' Tc=9.4 min CN=87 Runoff=0.40 cfs 911 cf
Subcatchment10S: DA TO VCI	Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=0.87" Flow Length=165' Tc=2.4 min CN=81 Runoff=0.15 cfs 262 cf
Subcatchment12S: OFFSITE DA	Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=0.44" Flow Length=287' Tc=12.1 min CN=71 Runoff=0.20 cfs 619 cf
Subcatchment14S: DA TO VCD	Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=0.51" Flow Length=358' Tc=6.3 min CN=73 Runoff=0.20 cfs 433 cf
Subcatchment15S: DA TO INFILTRATION	Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=0.44" Flow Length=147' Tc=33.7 min CN=71 Runoff=0.10 cfs 575 cf
Pond 6P: MLV PAD	Peak Elev=1,264.33' Storage=911 cf Inflow=0.40 cfs 911 cf Outflow=0.00 cfs 0 cf
Pond 9P: VCD	Peak Elev=1,263.00' Storage=350 cf Inflow=0.20 cfs 433 cf Outflow=0.01 cfs 83 cf
Pond 10P: INFILTRATIONBERM	Peak Elev=1,270.08' Storage=575 cf Inflow=0.10 cfs 575 cf Outflow=0.00 cfs 0 cf
Pond 100P: VCI	Peak Elev=1,263.01' Storage=125 cf Inflow=0.15 cfs 262 cf Outflow=0.02 cfs 137 cf
Link 2L: Proposed Conditions	Inflow=0.20 cfs 838 cf Primary=0.20 cfs 838 cf

Total Runoff Area = 55,011 sf Runoff Volume = 2,800 cf Average Runoff Depth = 0.61"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 0.40 cfs @ 12.01 hrs, Volume= 911 cf, Depth= 1.23"

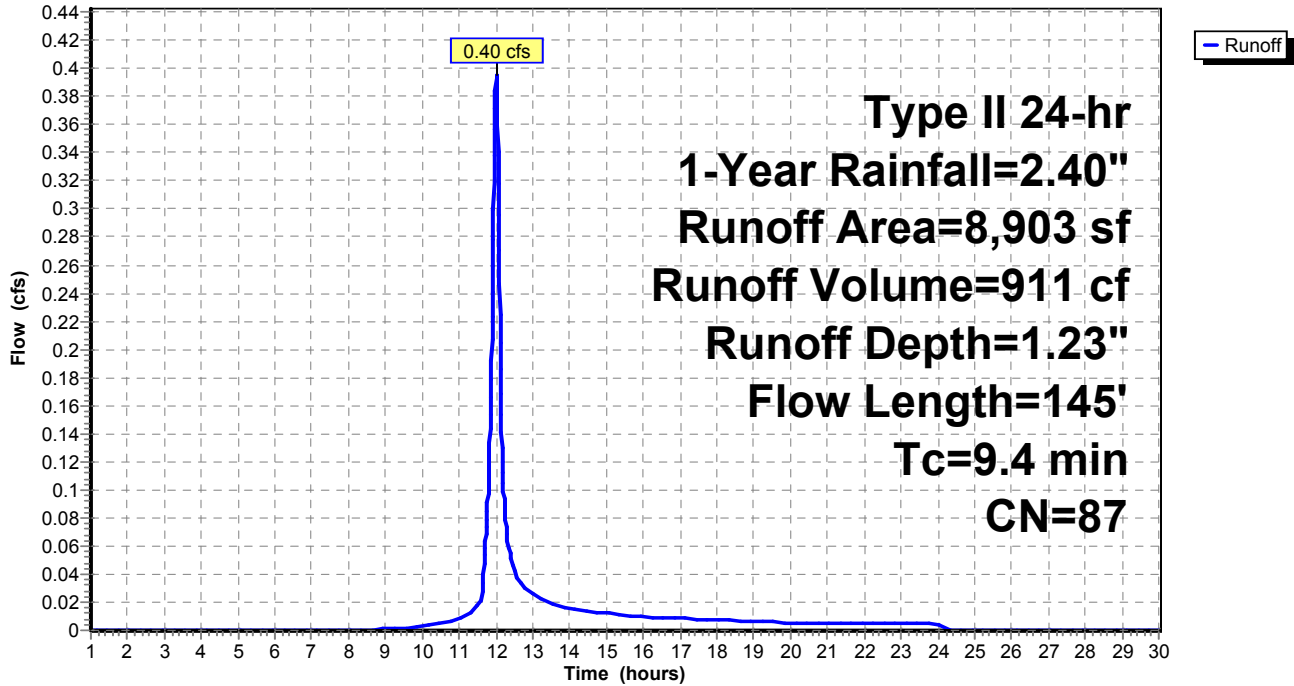
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.15 cfs @ 11.93 hrs, Volume= 262 cf, Depth= 0.87"

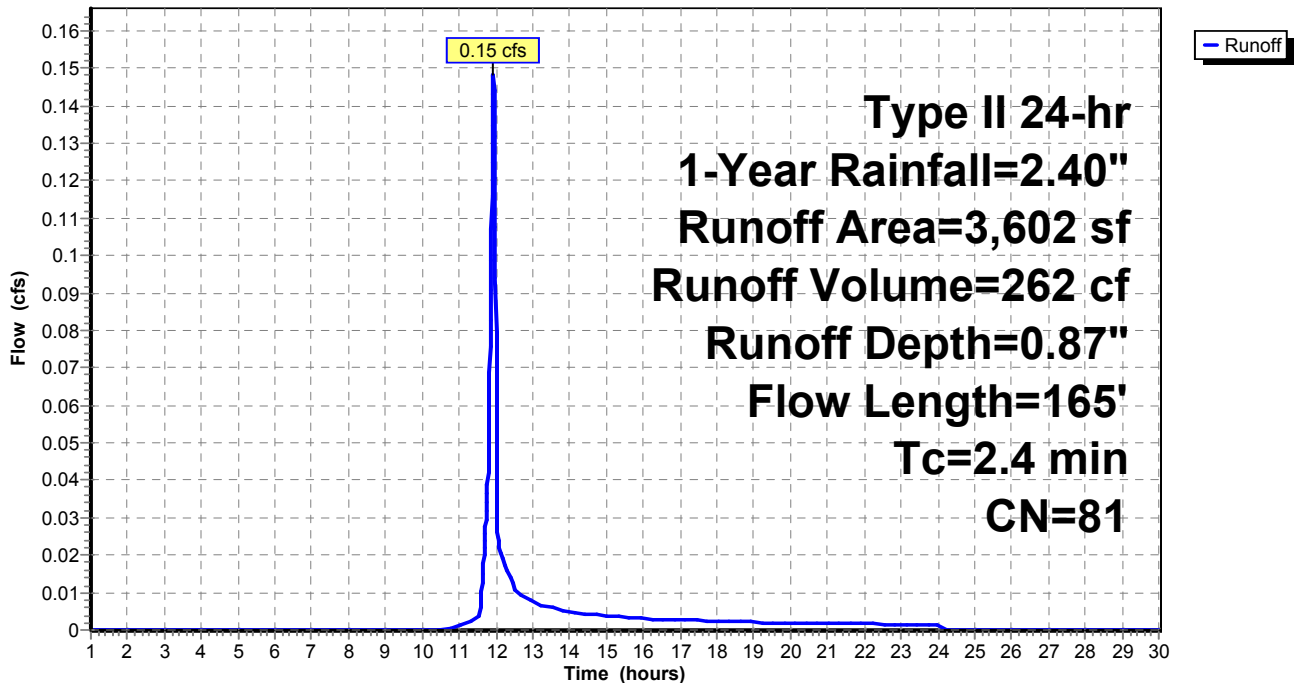
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 0.20 cfs @ 12.06 hrs, Volume= 619 cf, Depth= 0.44"

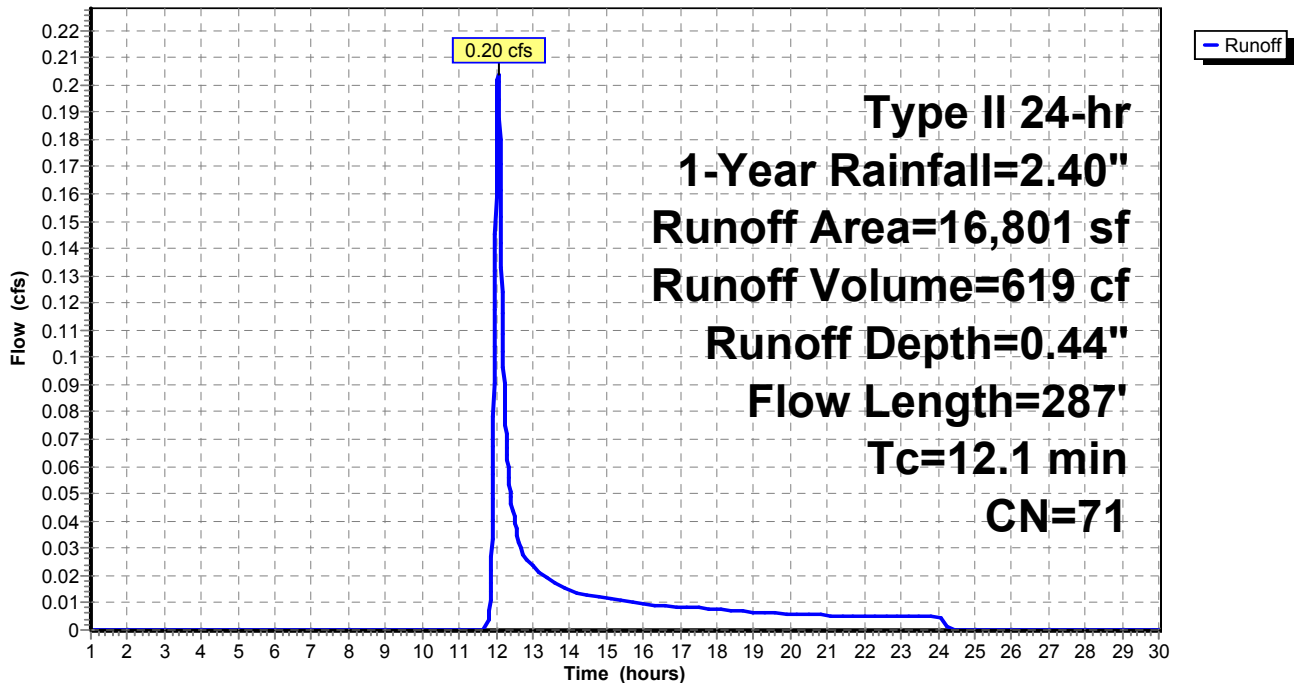
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 0.20 cfs @ 11.99 hrs, Volume= 433 cf, Depth= 0.51"

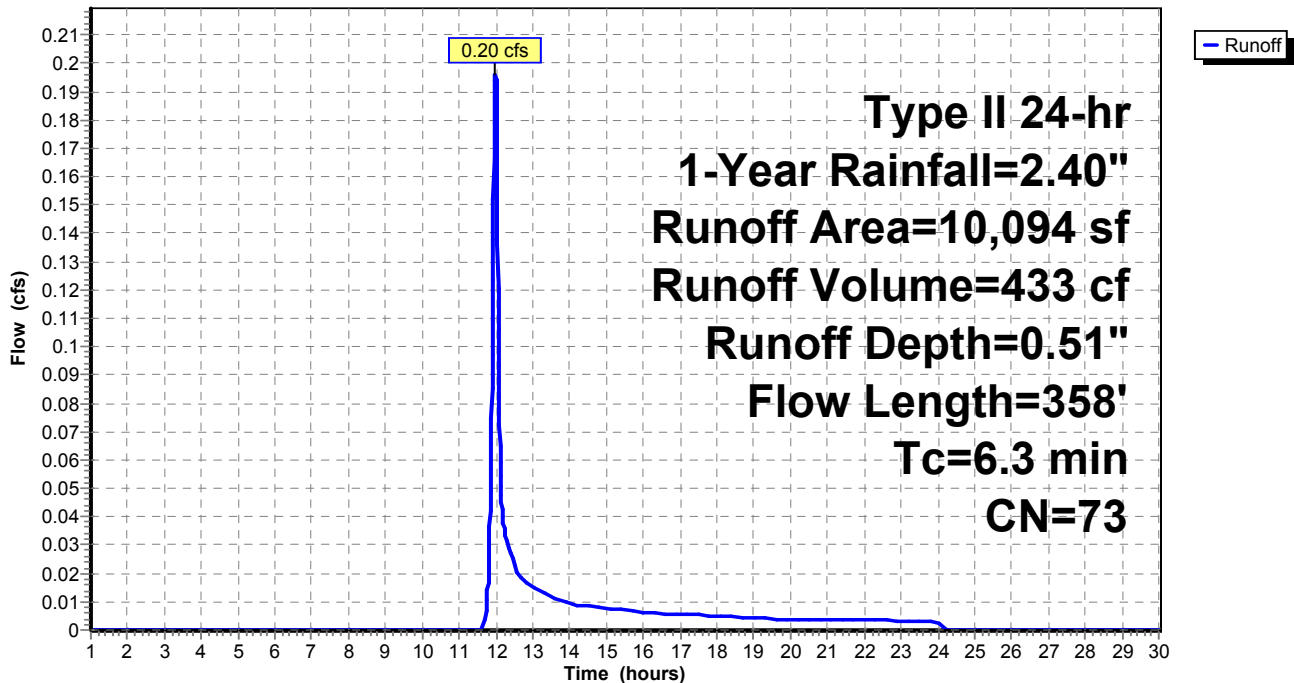
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.10 cfs @ 12.35 hrs, Volume= 575 cf, Depth= 0.44"

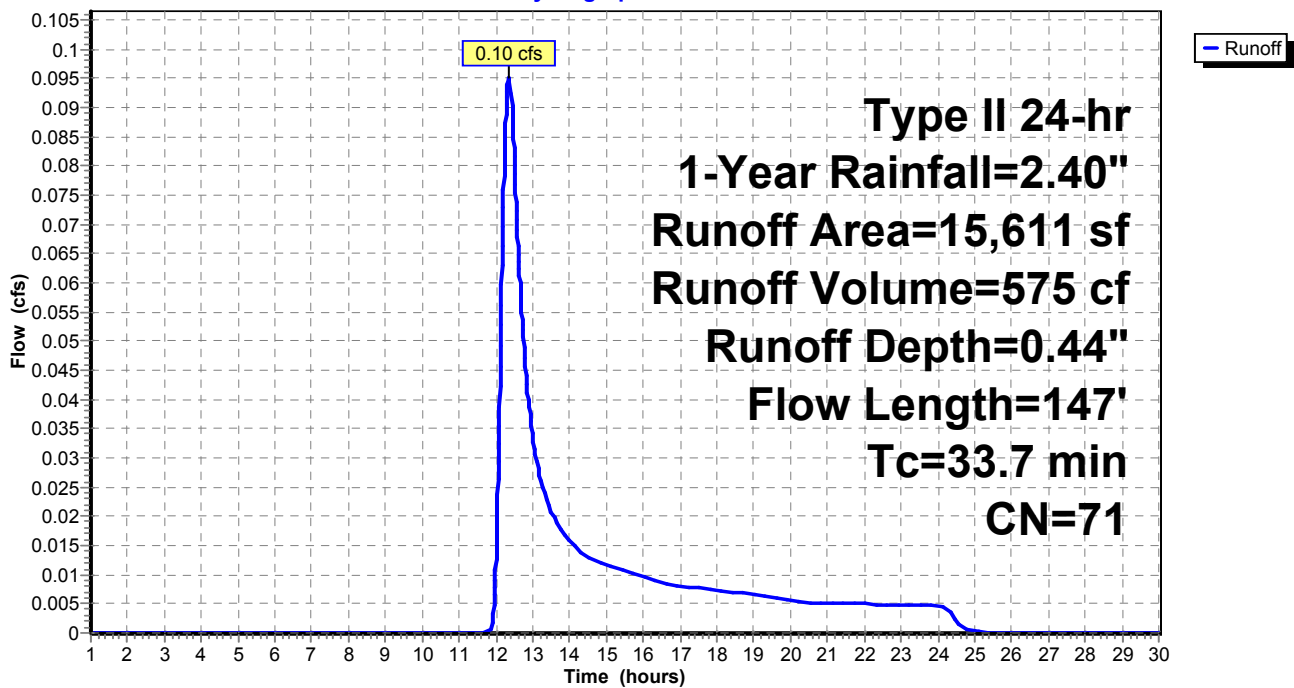
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 1-Year Rainfall=2.40"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 1.23" for 1-Year event
 Inflow = 0.40 cfs @ 12.01 hrs, Volume= 911 cf
 Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.33' @ 24.53 hrs Surf.Area= 4,053 sf Storage= 911 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

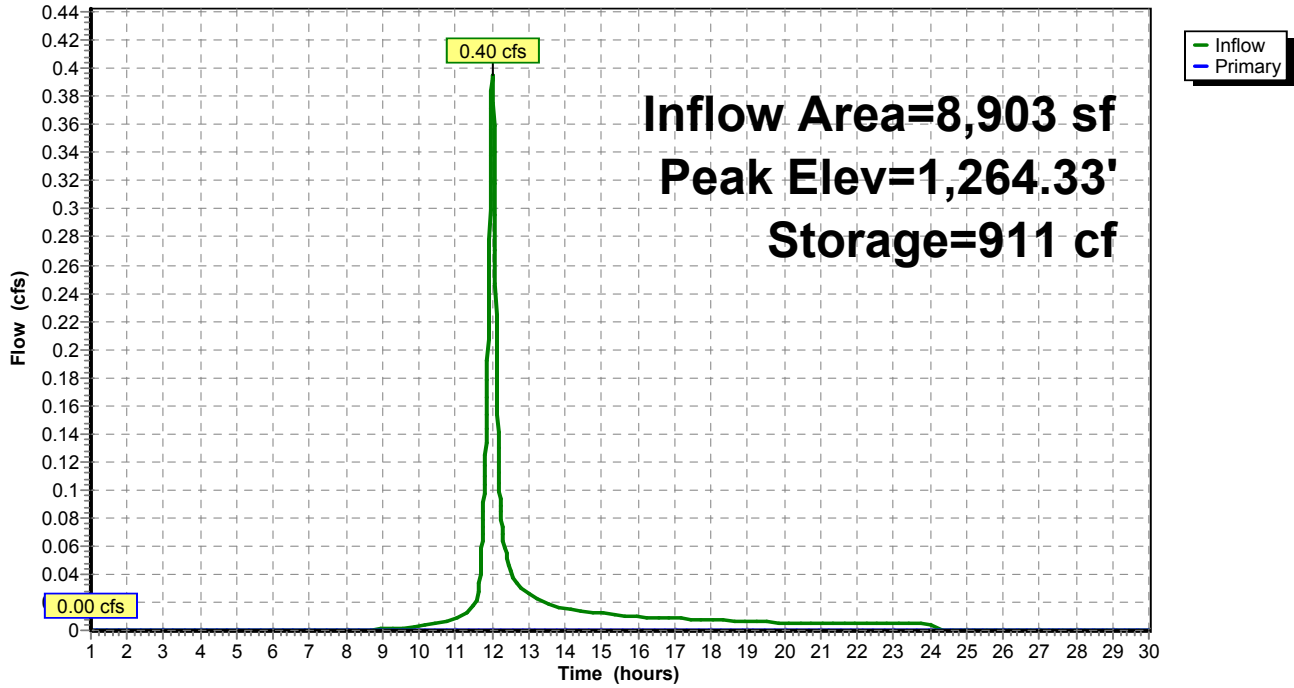
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,263.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 0.20" for 1-Year event
 Inflow = 0.20 cfs @ 11.99 hrs, Volume= 433 cf
 Outflow = 0.01 cfs @ 17.99 hrs, Volume= 83 cf, Atten= 97%, Lag= 360.2 min
 Primary = 0.01 cfs @ 17.99 hrs, Volume= 83 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.00' @ 17.99 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 534.1 min calculated for 83 cf (19% of inflow)
 Center-of-Mass det. time= 365.2 min (1,249.9 - 884.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

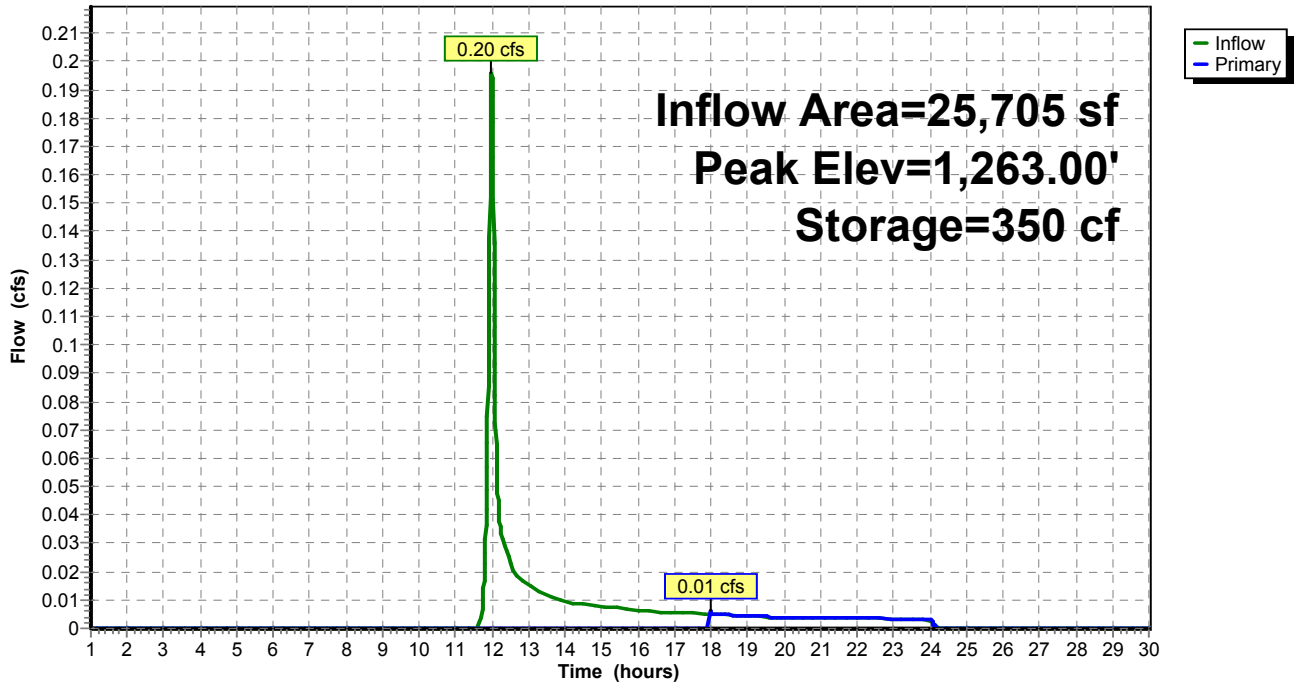
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 17.99 hrs HW=1,263.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.00 cfs @ 0.14 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 0.44" for 1-Year event
 Inflow = 0.10 cfs @ 12.35 hrs, Volume= 575 cf
 Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,270.08' @ 25.92 hrs Surf.Area= 1,078 sf Storage= 575 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,269.00	94	74.7	0	0	94
1,269.50	443	134.5	124	124	1,091
1,270.00	977	192.5	346	470	2,602
1,270.50	1,587	229.6	635	1,105	3,853
1,271.00	2,347	279.8	977	2,082	5,892
1,271.50	3,234	306.5	1,389	3,471	7,146

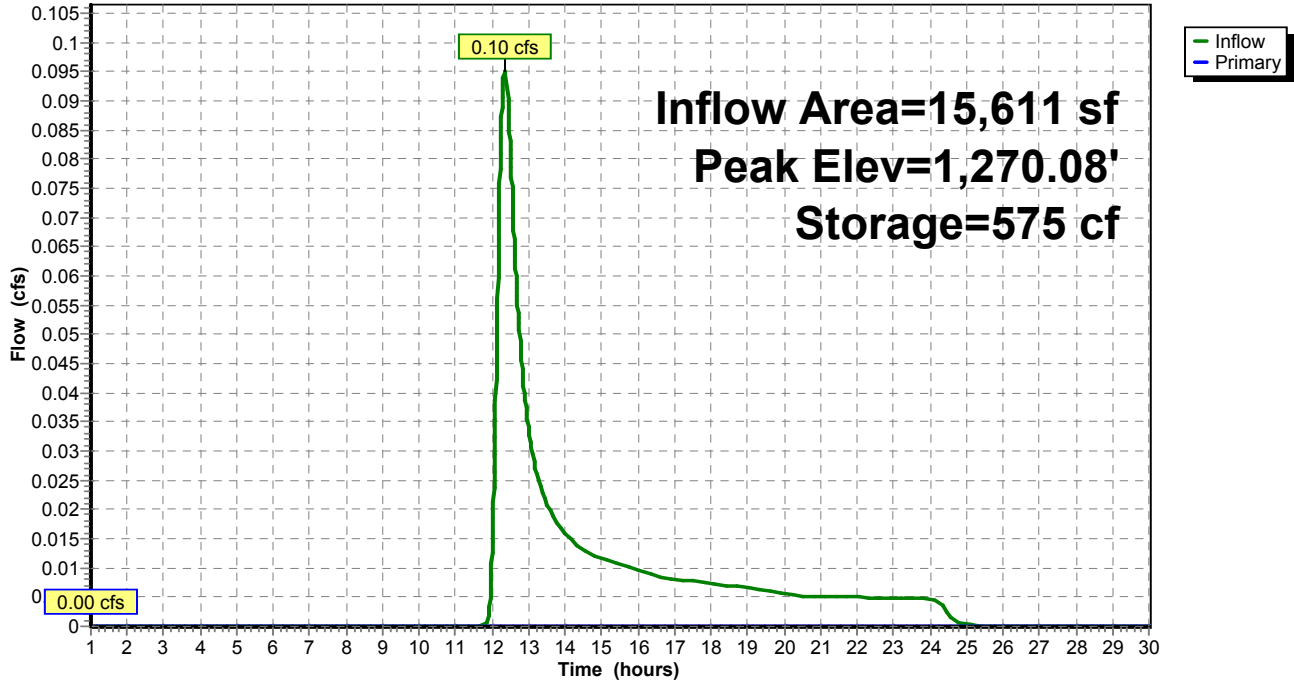
Device	Routing	Invert	Outlet Devices
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,269.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 0.87" for 1-Year event
 Inflow = 0.15 cfs @ 11.93 hrs, Volume= 262 cf
 Outflow = 0.02 cfs @ 12.29 hrs, Volume= 137 cf, Atten= 89%, Lag= 21.4 min
 Primary = 0.02 cfs @ 12.29 hrs, Volume= 137 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.01' @ 12.29 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 256.3 min calculated for 137 cf (52% of inflow)
 Center-of-Mass det. time= 123.7 min (972.0 - 848.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

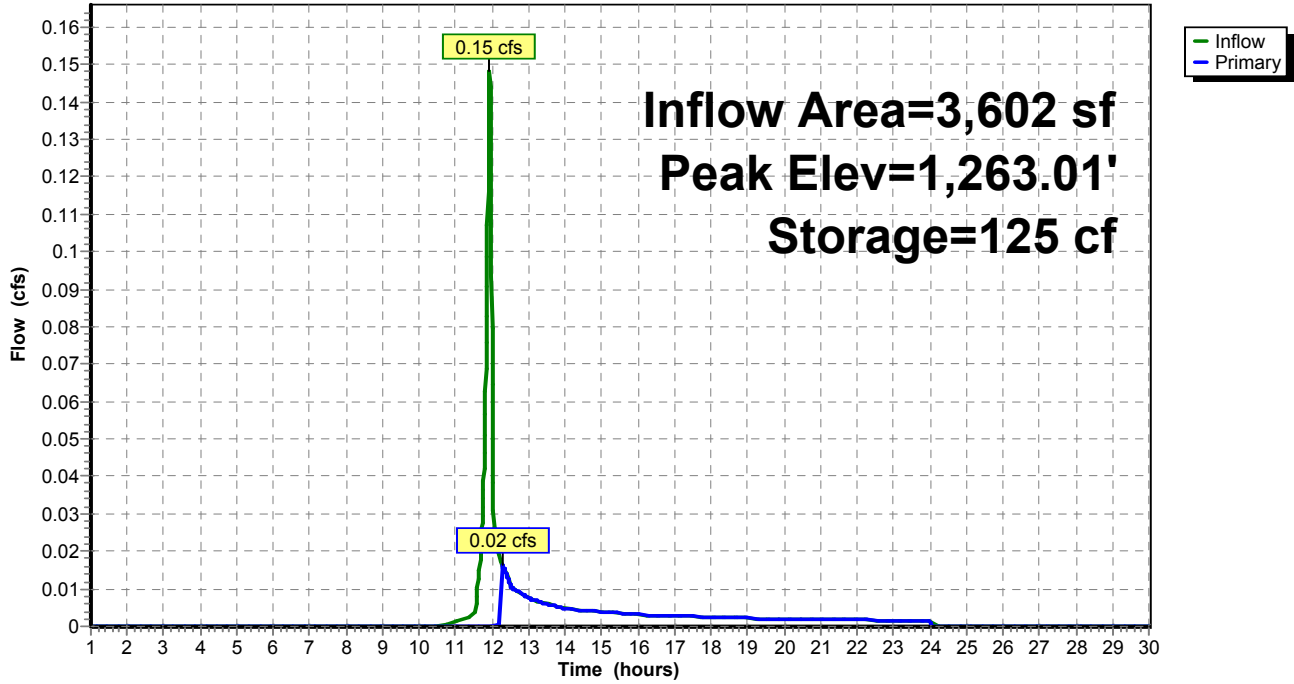
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.01 cfs @ 12.29 hrs HW=1,263.01' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.01 cfs @ 0.22 fps)

Pond 100P: VCI

Hydrograph



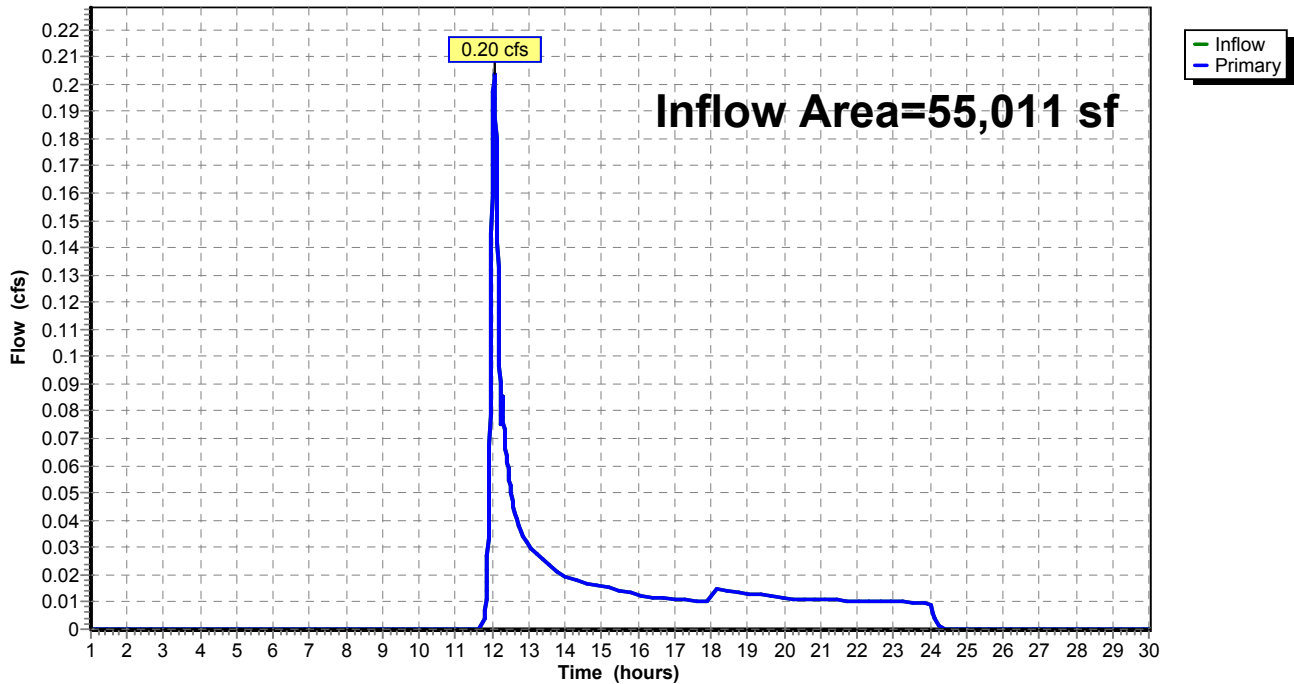
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 0.18" for 1-Year event
Inflow = 0.20 cfs @ 12.06 hrs, Volume= 838 cf
Primary = 0.20 cfs @ 12.06 hrs, Volume= 838 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD	Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=1.63" Flow Length=145' Tc=9.4 min CN=87 Runoff=0.52 cfs 1,213 cf
Subcatchment10S: DA TO VCI	Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=1.22" Flow Length=165' Tc=2.4 min CN=81 Runoff=0.21 cfs 367 cf
Subcatchment12S: OFFSITE DA	Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=0.69" Flow Length=287' Tc=12.1 min CN=71 Runoff=0.35 cfs 969 cf
Subcatchment14S: DA TO VCD	Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=0.78" Flow Length=358' Tc=6.3 min CN=73 Runoff=0.31 cfs 660 cf
Subcatchment15S: DA TO INFILTRATION	Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=0.69" Flow Length=147' Tc=33.7 min CN=71 Runoff=0.17 cfs 901 cf
Pond 6P: MLV PAD	Peak Elev=1,264.50' Storage=1,202 cf Inflow=0.52 cfs 1,213 cf Outflow=0.01 cfs 14 cf
Pond 9P: VCD	Peak Elev=1,263.01' Storage=350 cf Inflow=0.31 cfs 660 cf Outflow=0.02 cfs 310 cf
Pond 10P: INFILTRATIONBERM	Peak Elev=1,270.34' Storage=901 cf Inflow=0.17 cfs 901 cf Outflow=0.00 cfs 0 cf
Pond 100P: VCI	Peak Elev=1,263.06' Storage=125 cf Inflow=0.21 cfs 367 cf Outflow=0.25 cfs 247 cf
Link 2L: Proposed Conditions	Inflow=0.45 cfs 1,539 cf Primary=0.45 cfs 1,539 cf

Total Runoff Area = 55,011 sf Runoff Volume = 4,110 cf Average Runoff Depth = 0.90"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 0.52 cfs @ 12.01 hrs, Volume= 1,213 cf, Depth= 1.63"

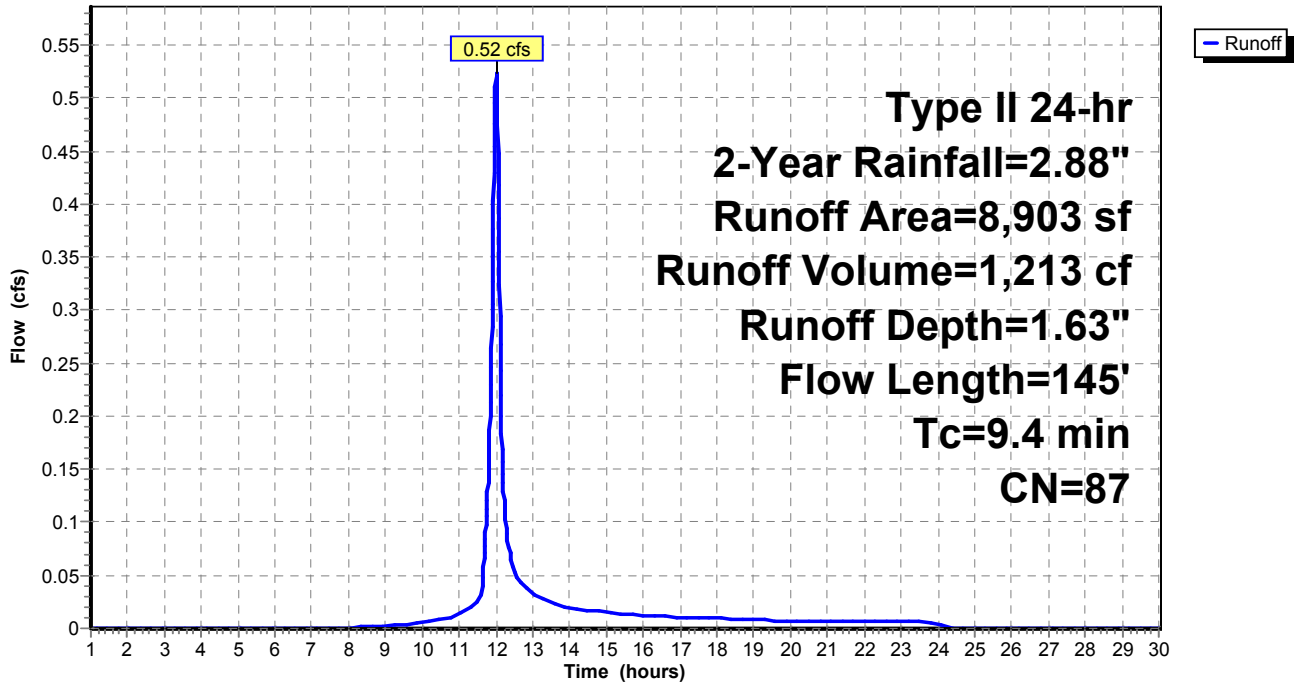
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.21 cfs @ 11.93 hrs, Volume= 367 cf, Depth= 1.22"

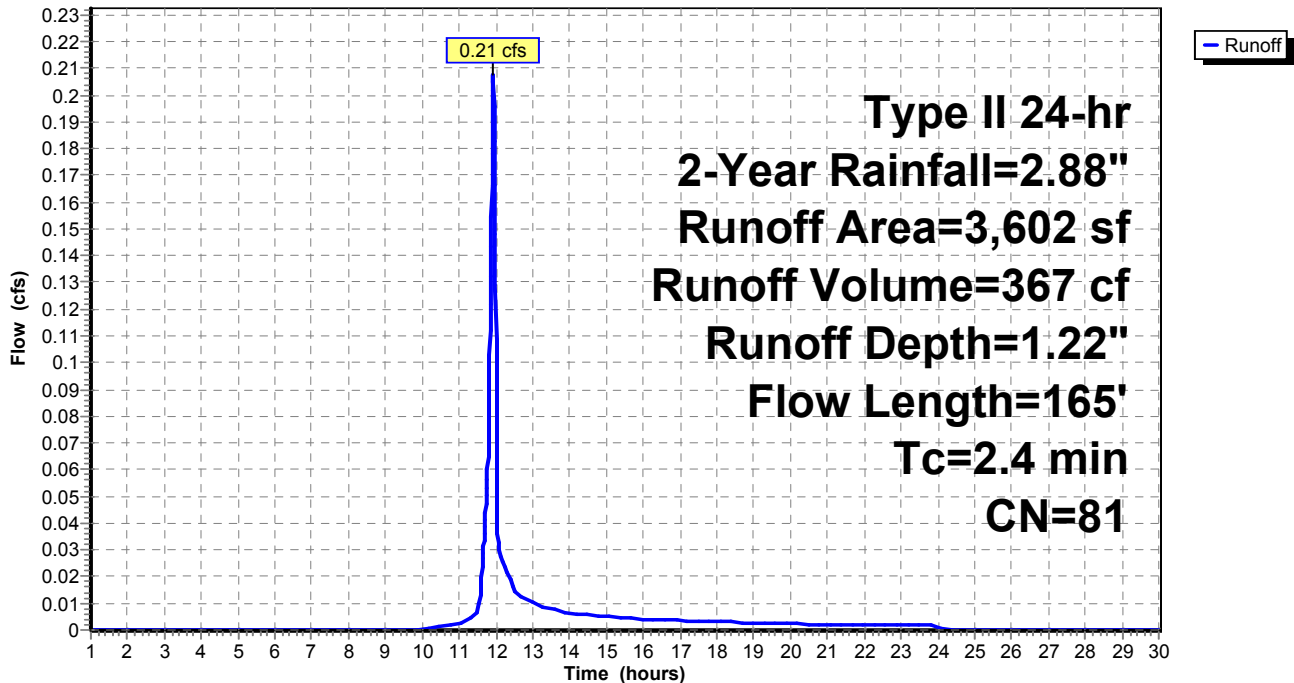
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 0.35 cfs @ 12.06 hrs, Volume= 969 cf, Depth= 0.69"

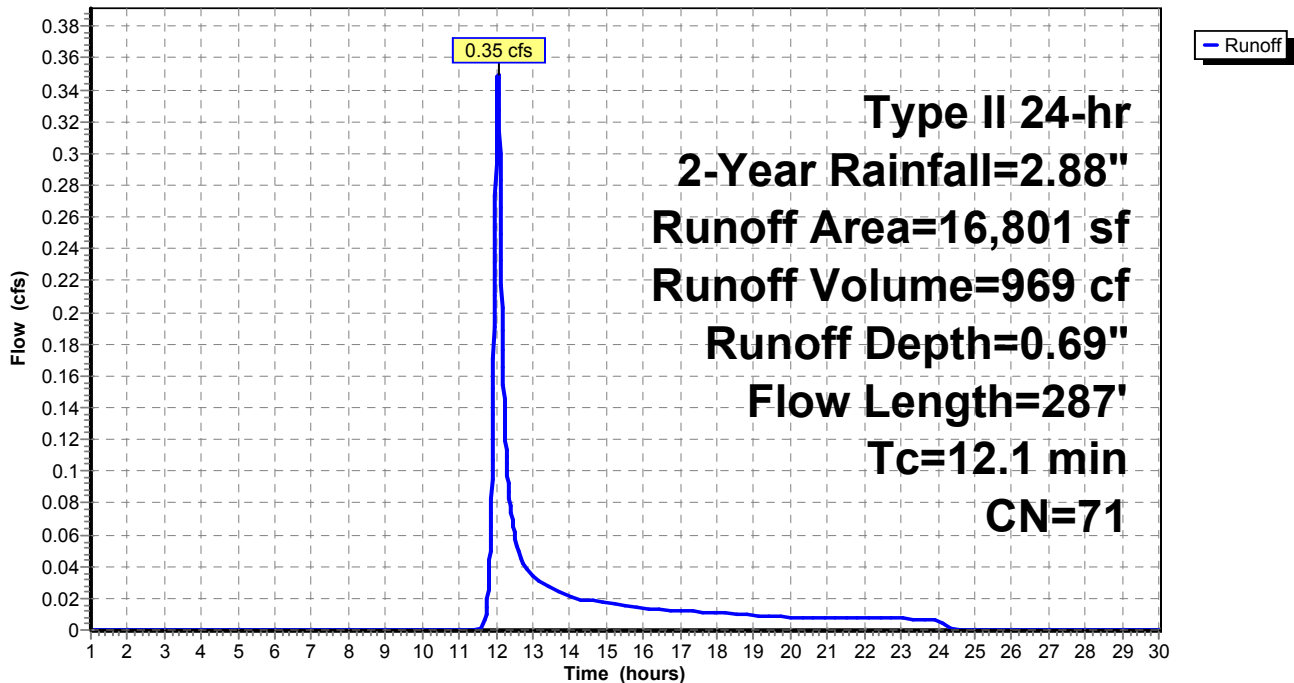
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 0.31 cfs @ 11.99 hrs, Volume= 660 cf, Depth= 0.78"

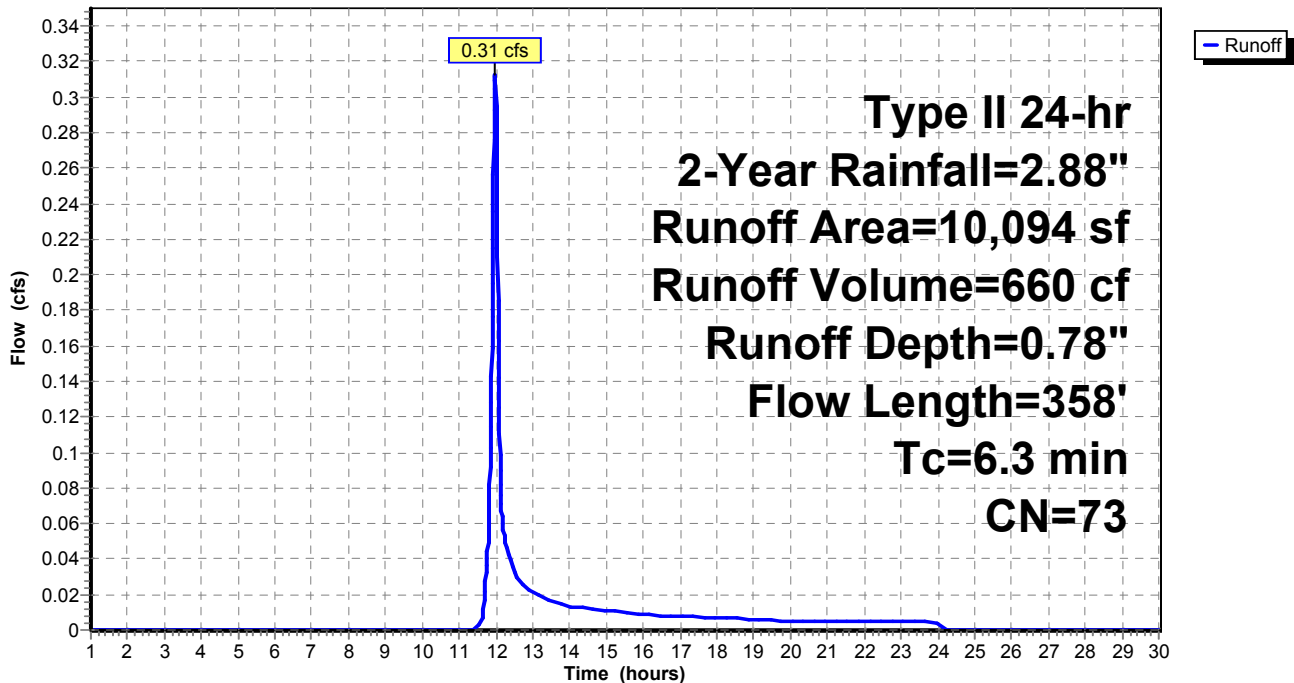
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.17 cfs @ 12.32 hrs, Volume= 901 cf, Depth= 0.69"

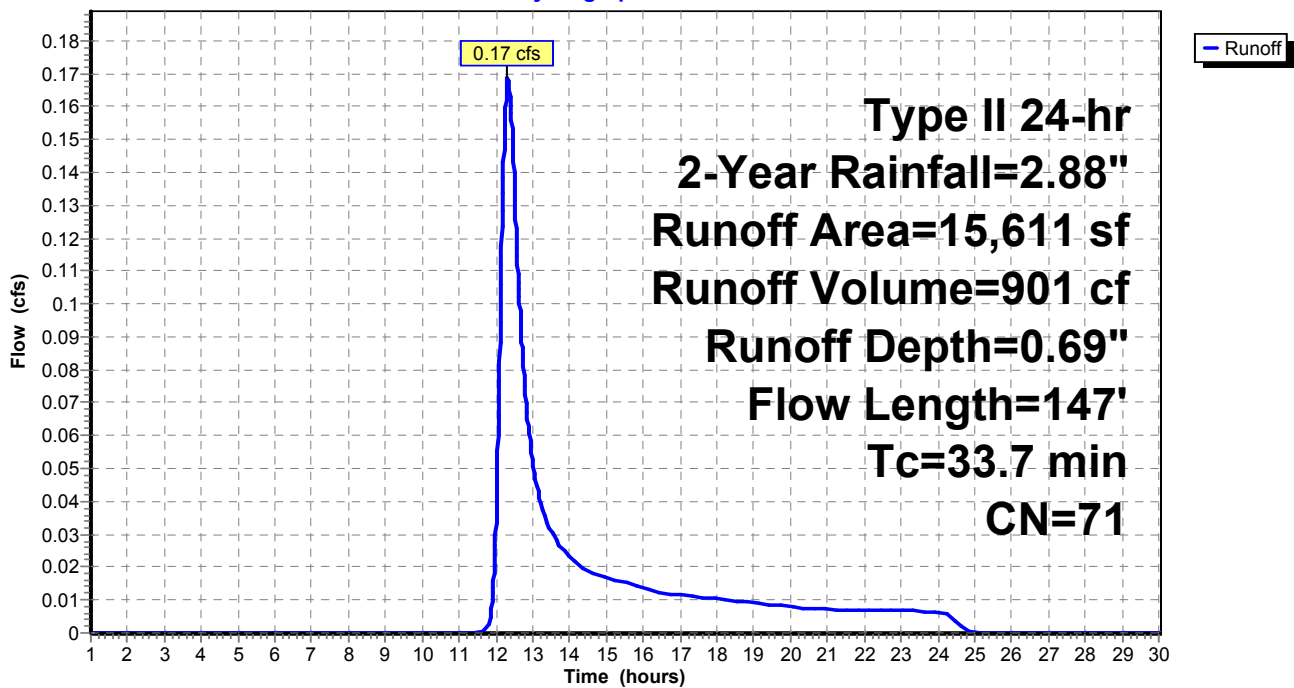
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 2-Year Rainfall=2.88"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 1.63" for 2-Year event
 Inflow = 0.52 cfs @ 12.01 hrs, Volume= 1,213 cf
 Outflow = 0.01 cfs @ 24.04 hrs, Volume= 14 cf, Atten= 99%, Lag= 721.9 min
 Primary = 0.01 cfs @ 24.04 hrs, Volume= 14 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.50' @ 24.04 hrs Surf.Area= 4,644 sf Storage= 1,202 cf

Plug-Flow detention time= 897.3 min calculated for 14 cf (1% of inflow)
 Center-of-Mass det. time= 614.5 min (1,438.0 - 823.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

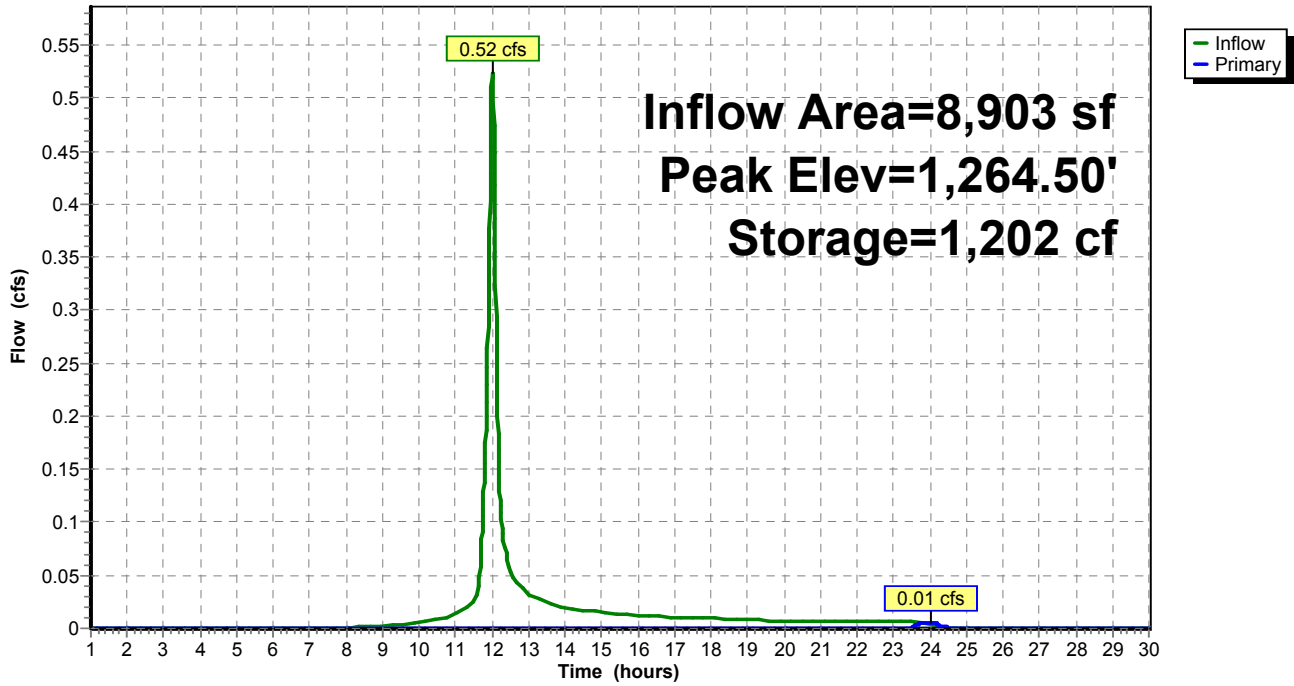
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 24.04 hrs HW=1,264.50' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.10 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 0.31" for 2-Year event
 Inflow = 0.31 cfs @ 11.99 hrs, Volume= 660 cf
 Outflow = 0.02 cfs @ 13.01 hrs, Volume= 310 cf, Atten= 93%, Lag= 61.4 min
 Primary = 0.02 cfs @ 13.01 hrs, Volume= 310 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.01' @ 13.01 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 308.5 min calculated for 310 cf (47% of inflow)
 Center-of-Mass det. time= 161.1 min (1,030.8 - 869.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

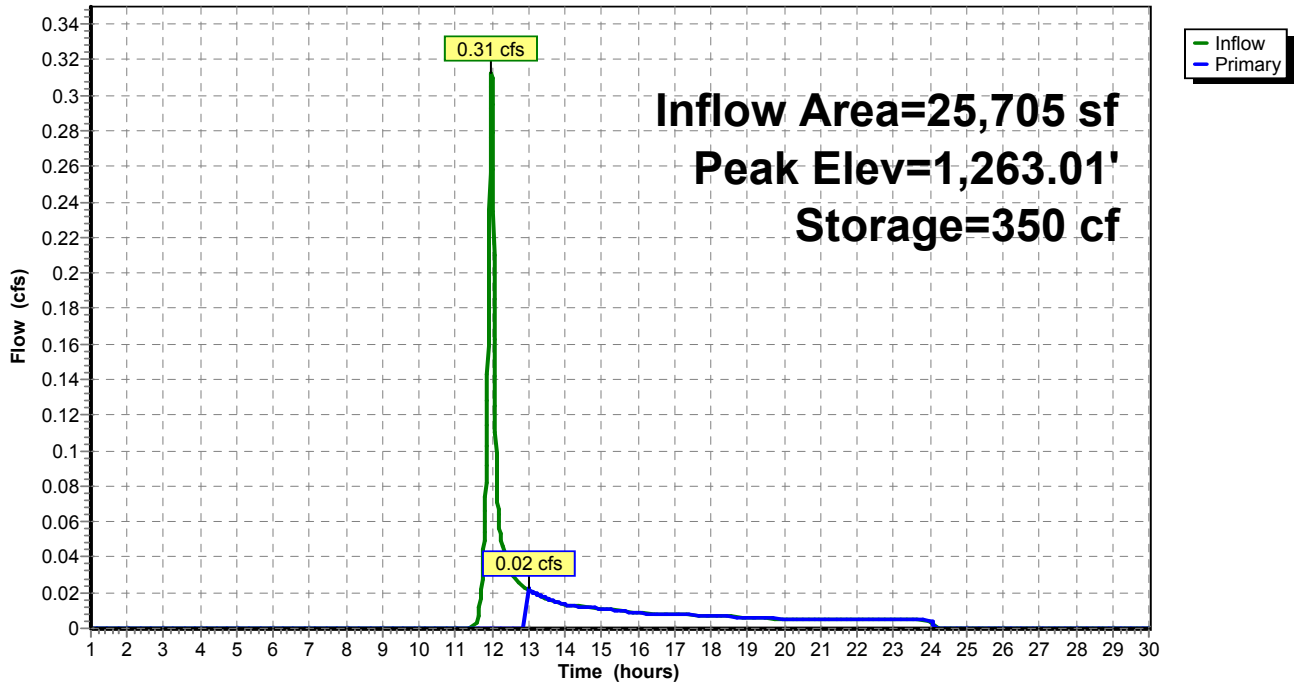
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.02 cfs @ 13.01 hrs HW=1,263.01' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.02 cfs @ 0.22 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 0.69" for 2-Year event
 Inflow = 0.17 cfs @ 12.32 hrs, Volume= 901 cf
 Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,270.34' @ 25.92 hrs Surf.Area= 1,391 sf Storage= 901 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,269.00	94	74.7	0	0	94
1,269.50	443	134.5	124	124	1,091
1,270.00	977	192.5	346	470	2,602
1,270.50	1,587	229.6	635	1,105	3,853
1,271.00	2,347	279.8	977	2,082	5,892
1,271.50	3,234	306.5	1,389	3,471	7,146

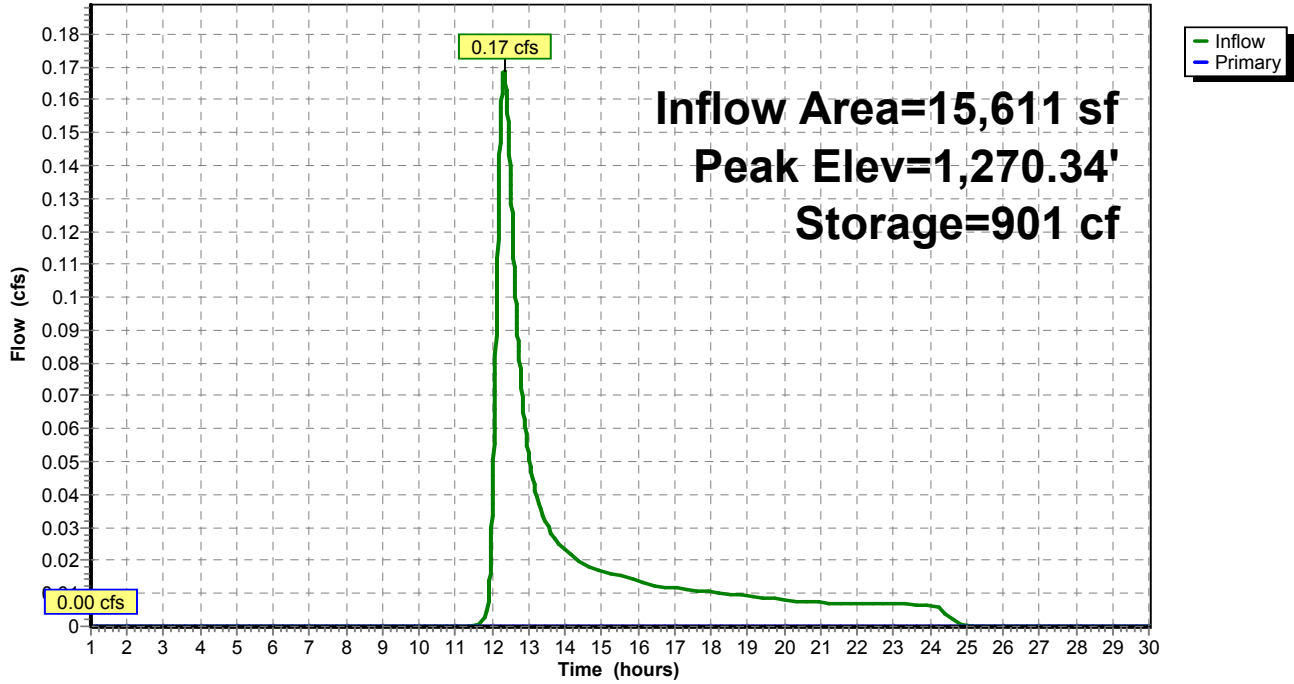
Device	Routing	Invert	Outlet Devices
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,269.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 1.22" for 2-Year event
 Inflow = 0.21 cfs @ 11.93 hrs, Volume= 367 cf
 Outflow = 0.25 cfs @ 11.95 hrs, Volume= 247 cf, Atten= 0%, Lag= 1.3 min
 Primary = 0.25 cfs @ 11.95 hrs, Volume= 247 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.06' @ 11.95 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 177.4 min calculated for 247 cf (67% of inflow)
 Center-of-Mass det. time= 65.1 min (903.4 - 838.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

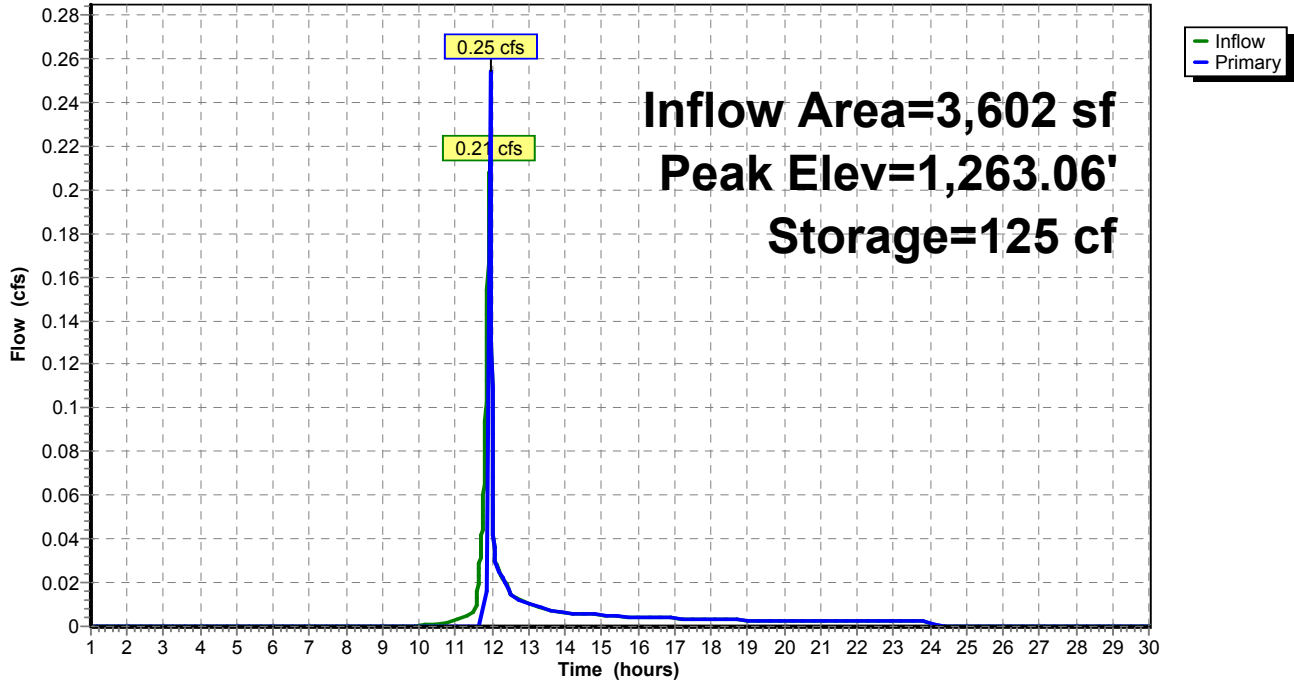
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.22 cfs @ 11.95 hrs HW=1,263.05' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.22 cfs @ 0.55 fps)

Pond 100P: VCI

Hydrograph



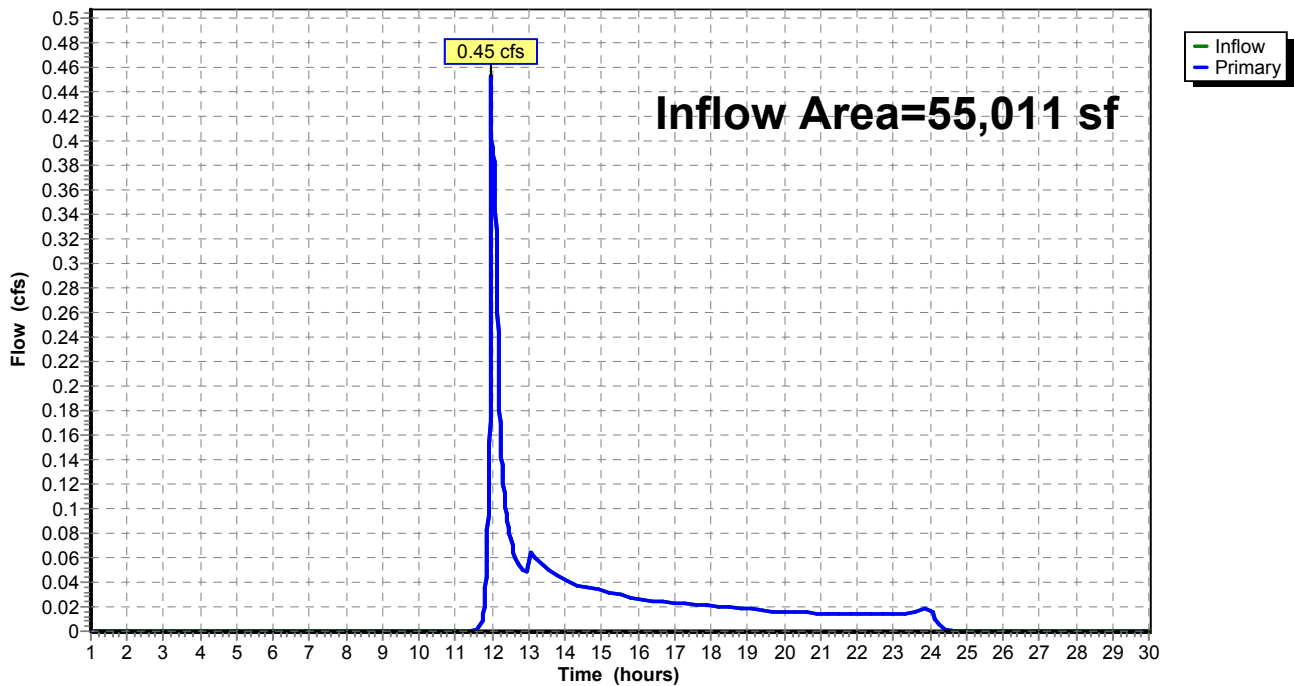
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 0.34" for 2-Year event
Inflow = 0.45 cfs @ 11.95 hrs, Volume= 1,539 cf
Primary = 0.45 cfs @ 11.95 hrs, Volume= 1,539 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD	Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=2.24" Flow Length=145' Tc=9.4 min CN=87 Runoff=0.71 cfs 1,659 cf
Subcatchment10S: DA TO VCI	Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=1.76" Flow Length=165' Tc=2.4 min CN=81 Runoff=0.30 cfs 527 cf
Subcatchment12S: OFFSITE DA	Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=1.10" Flow Length=287' Tc=12.1 min CN=71 Runoff=0.59 cfs 1,543 cf
Subcatchment14S: DA TO VCD	Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=1.22" Flow Length=358' Tc=6.3 min CN=73 Runoff=0.50 cfs 1,026 cf
Subcatchment15S: DA TO INFILTRATION	Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=1.10" Flow Length=147' Tc=33.7 min CN=71 Runoff=0.29 cfs 1,434 cf
Pond 6P: MLV PAD	Peak Elev=1,264.51' Storage=1,212 cf Inflow=0.71 cfs 1,659 cf Outflow=0.02 cfs 460 cf
Pond 9P: VCD	Peak Elev=1,263.06' Storage=350 cf Inflow=0.50 cfs 1,026 cf Outflow=0.37 cfs 673 cf
Pond 10P: INFILTRATIONBERM	Peak Elev=1,270.67' Storage=1,434 cf Inflow=0.29 cfs 1,434 cf Outflow=0.00 cfs 0 cf
Pond 100P: VCI	Peak Elev=1,263.06' Storage=125 cf Inflow=0.30 cfs 527 cf Outflow=0.30 cfs 398 cf
Link 2L: Proposed Conditions	Inflow=1.00 cfs 3,073 cf Primary=1.00 cfs 3,073 cf

Total Runoff Area = 55,011 sf Runoff Volume = 6,190 cf Average Runoff Depth = 1.35"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 0.71 cfs @ 12.01 hrs, Volume= 1,659 cf, Depth= 2.24"

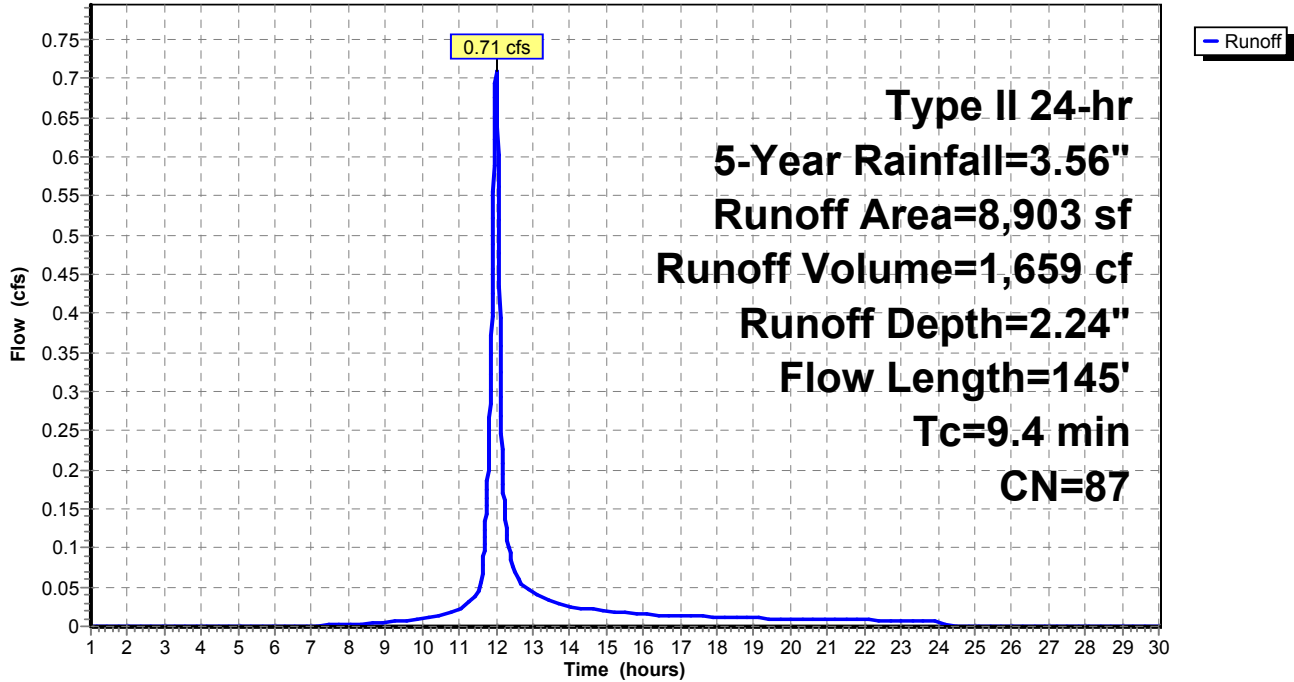
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.30 cfs @ 11.93 hrs, Volume= 527 cf, Depth= 1.76"

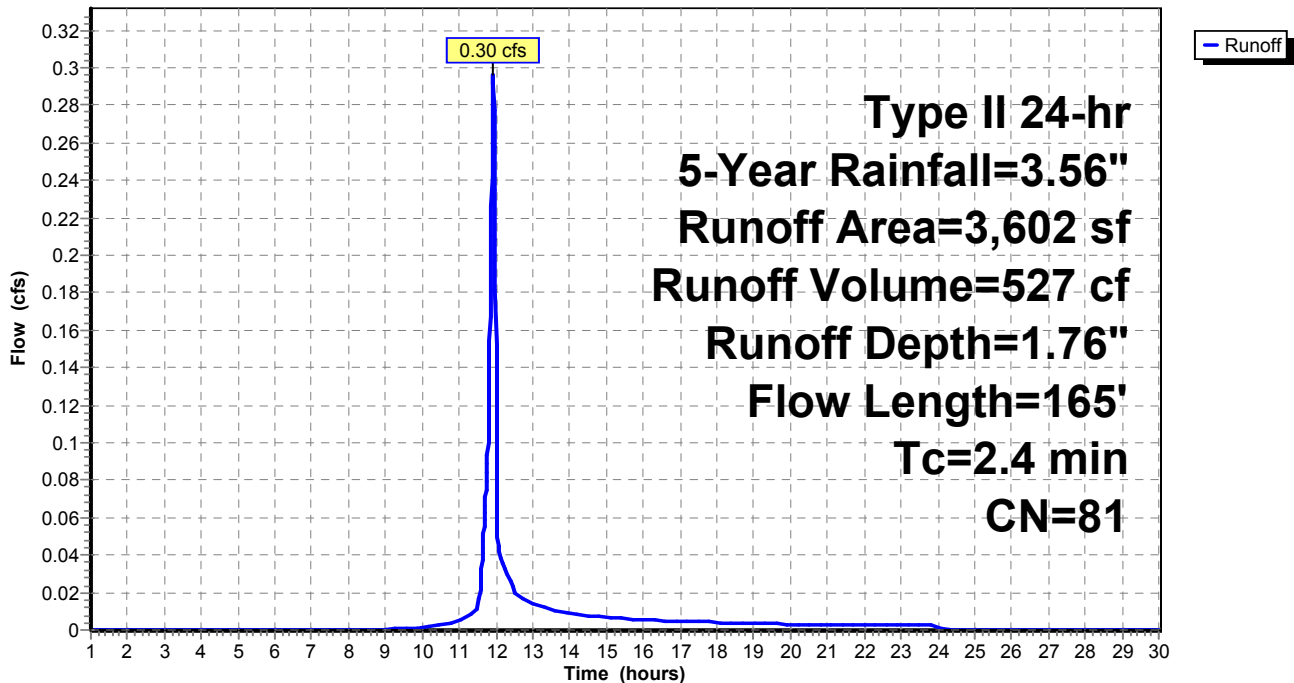
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 0.59 cfs @ 12.05 hrs, Volume= 1,543 cf, Depth= 1.10"

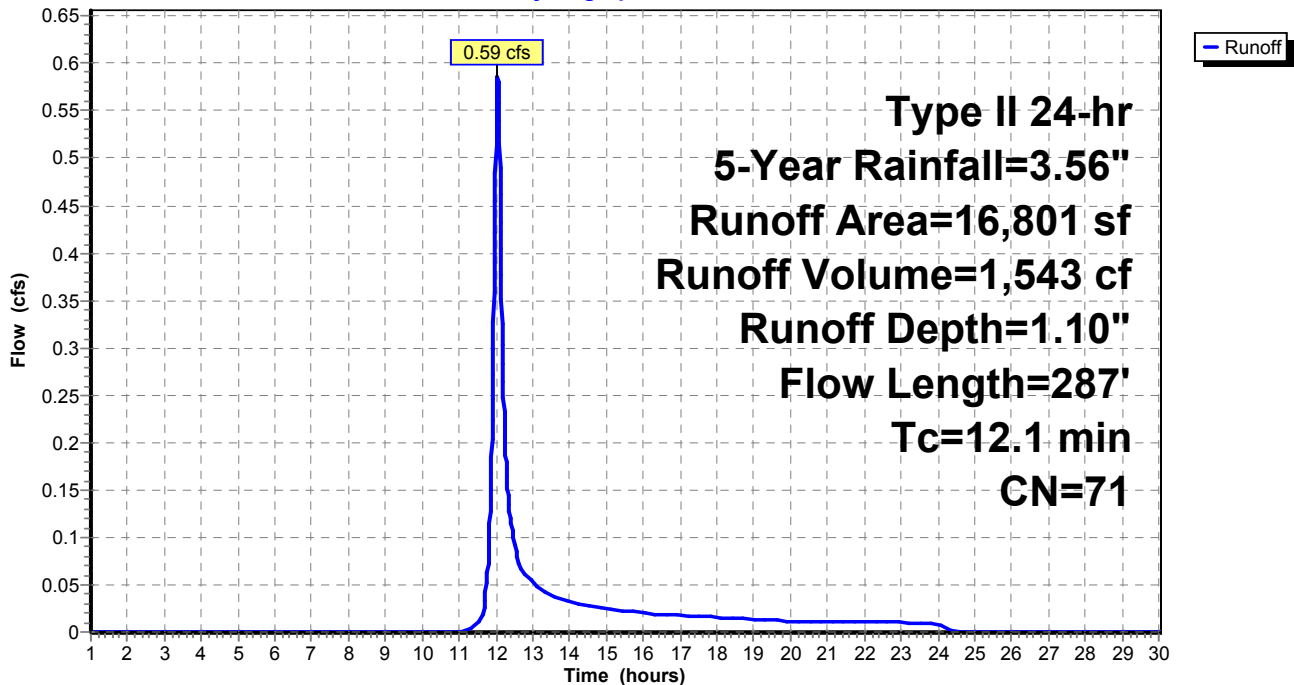
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 0.50 cfs @ 11.98 hrs, Volume= 1,026 cf, Depth= 1.22"

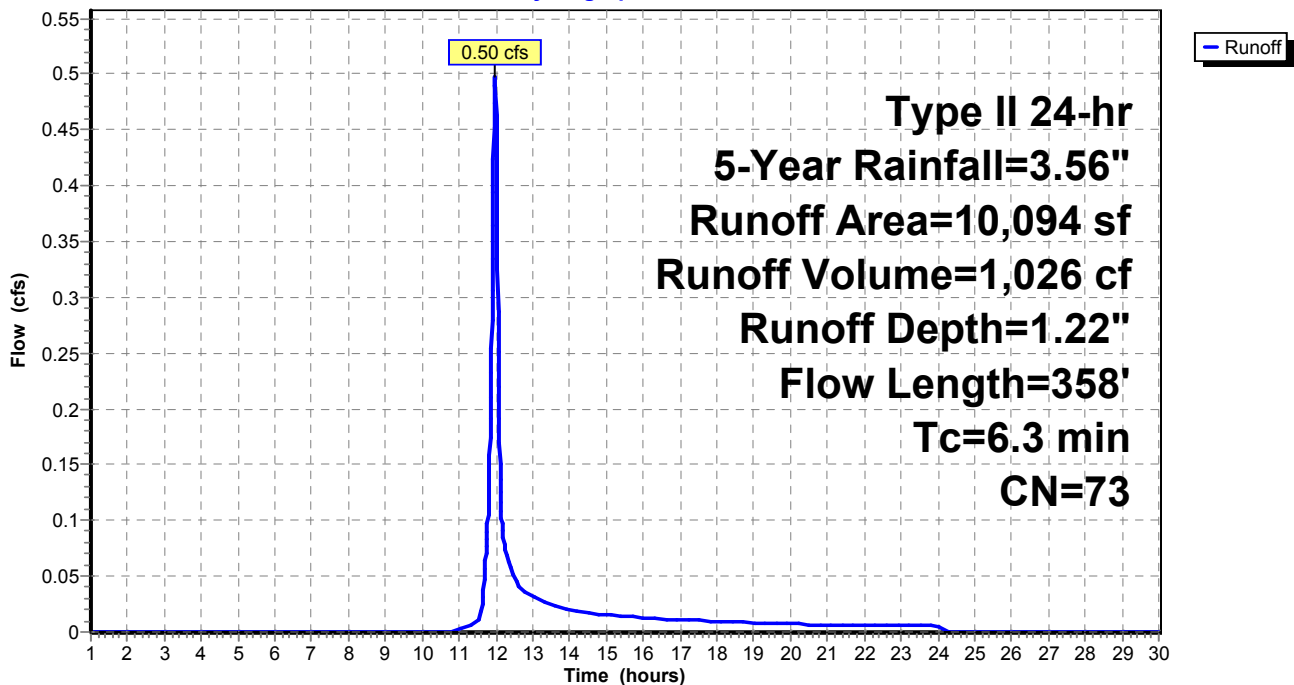
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.29 cfs @ 12.32 hrs, Volume= 1,434 cf, Depth= 1.10"

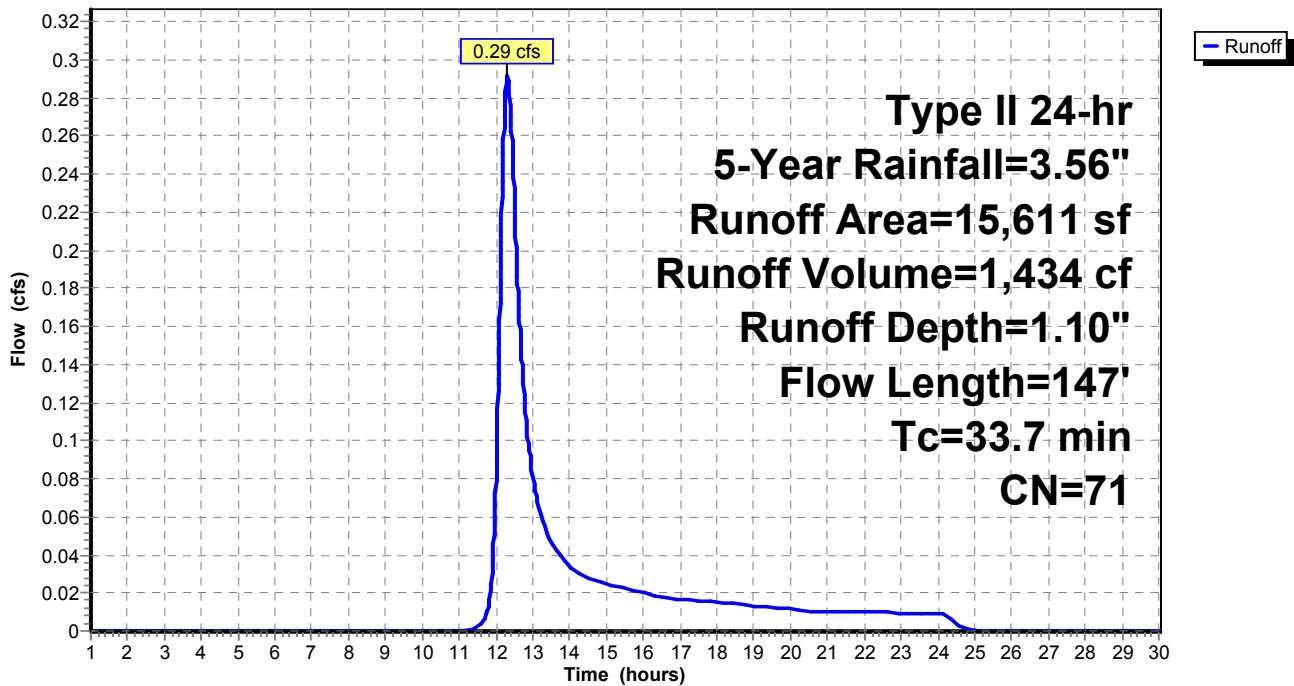
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 5-Year Rainfall=3.56"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 2.24" for 5-Year event
 Inflow = 0.71 cfs @ 12.01 hrs, Volume= 1,659 cf
 Outflow = 0.02 cfs @ 14.18 hrs, Volume= 460 cf, Atten= 97%, Lag= 130.2 min
 Primary = 0.02 cfs @ 14.18 hrs, Volume= 460 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.51' @ 14.18 hrs Surf.Area= 4,644 sf Storage= 1,212 cf

Plug-Flow detention time= 393.9 min calculated for 460 cf (28% of inflow)
 Center-of-Mass det. time= 260.9 min (1,075.4 - 814.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

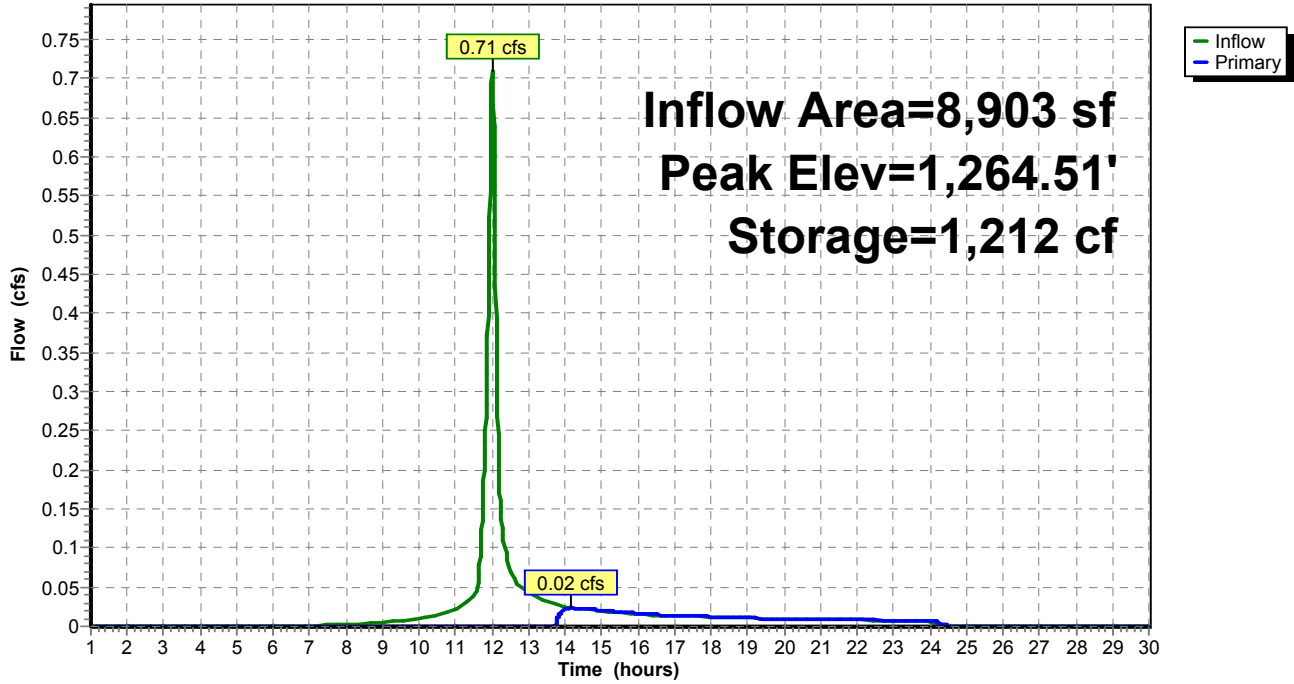
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.01 cfs @ 14.18 hrs HW=1,264.51' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.01 cfs @ 0.20 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 0.48" for 5-Year event
 Inflow = 0.50 cfs @ 11.98 hrs, Volume= 1,026 cf
 Outflow = 0.37 cfs @ 12.05 hrs, Volume= 673 cf, Atten= 26%, Lag= 4.3 min
 Primary = 0.37 cfs @ 12.05 hrs, Volume= 673 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.06' @ 12.05 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 194.6 min calculated for 673 cf (66% of inflow)
 Center-of-Mass det. time= 74.6 min (930.2 - 855.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

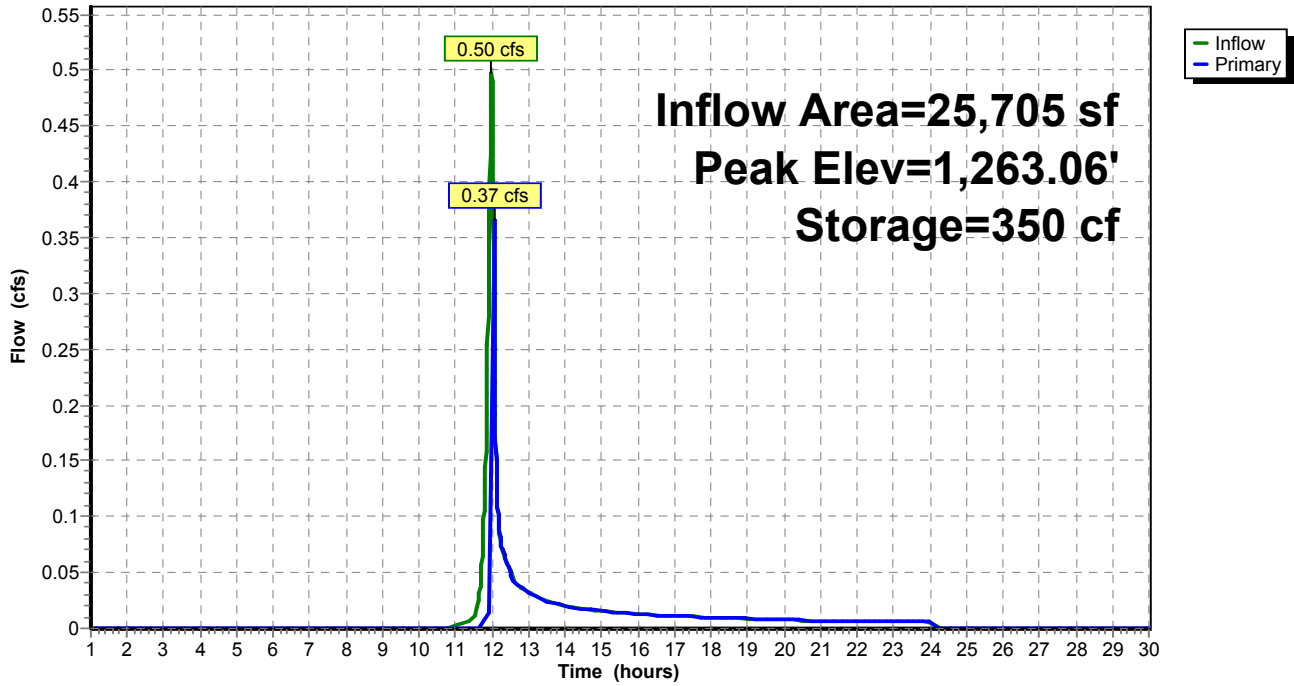
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.32 cfs @ 12.05 hrs HW=1,263.06' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.32 cfs @ 0.57 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 1.10" for 5-Year event
 Inflow = 0.29 cfs @ 12.32 hrs, Volume= 1,434 cf
 Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,270.67' @ 25.92 hrs Surf.Area= 1,843 sf Storage= 1,434 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,269.00	94	74.7	0	0	94
1,269.50	443	134.5	124	124	1,091
1,270.00	977	192.5	346	470	2,602
1,270.50	1,587	229.6	635	1,105	3,853
1,271.00	2,347	279.8	977	2,082	5,892
1,271.50	3,234	306.5	1,389	3,471	7,146

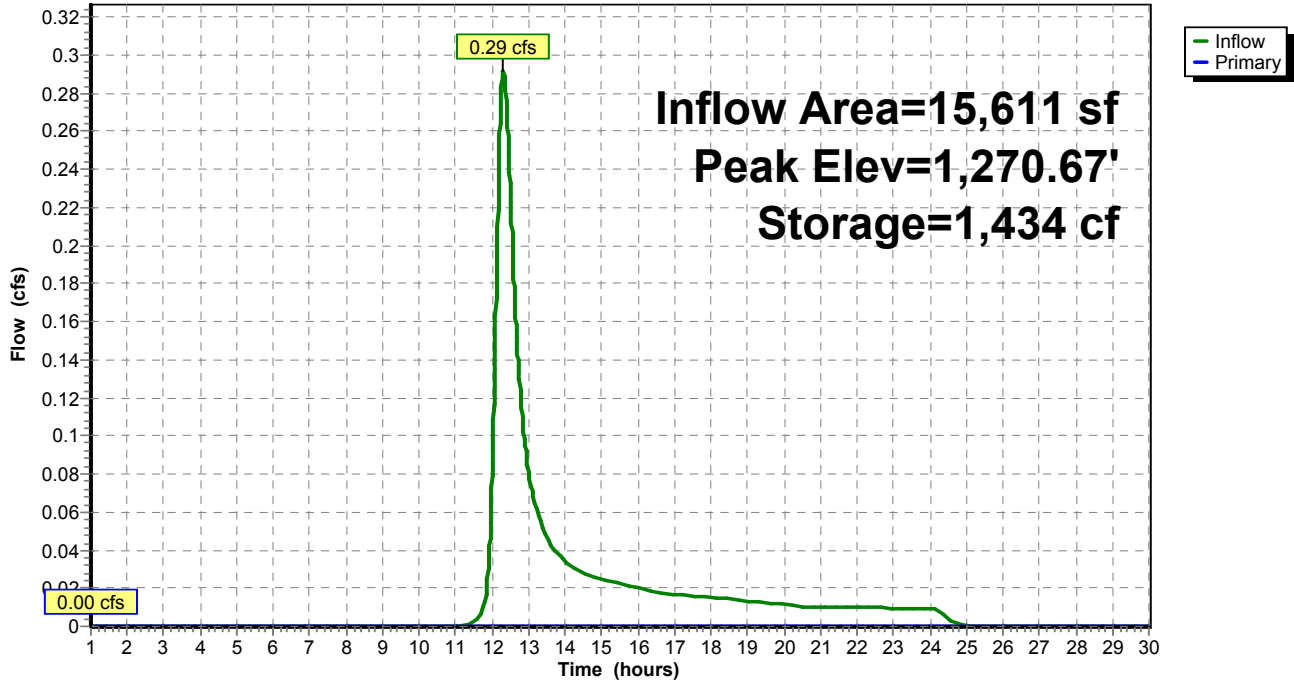
Device	Routing	Invert	Outlet Devices
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,269.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 1.76" for 5-Year event
 Inflow = 0.30 cfs @ 11.93 hrs, Volume= 527 cf
 Outflow = 0.30 cfs @ 11.93 hrs, Volume= 398 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.30 cfs @ 11.93 hrs, Volume= 398 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.06' @ 11.93 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 138.8 min calculated for 398 cf (75% of inflow)
 Center-of-Mass det. time= 43.8 min (871.6 - 827.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

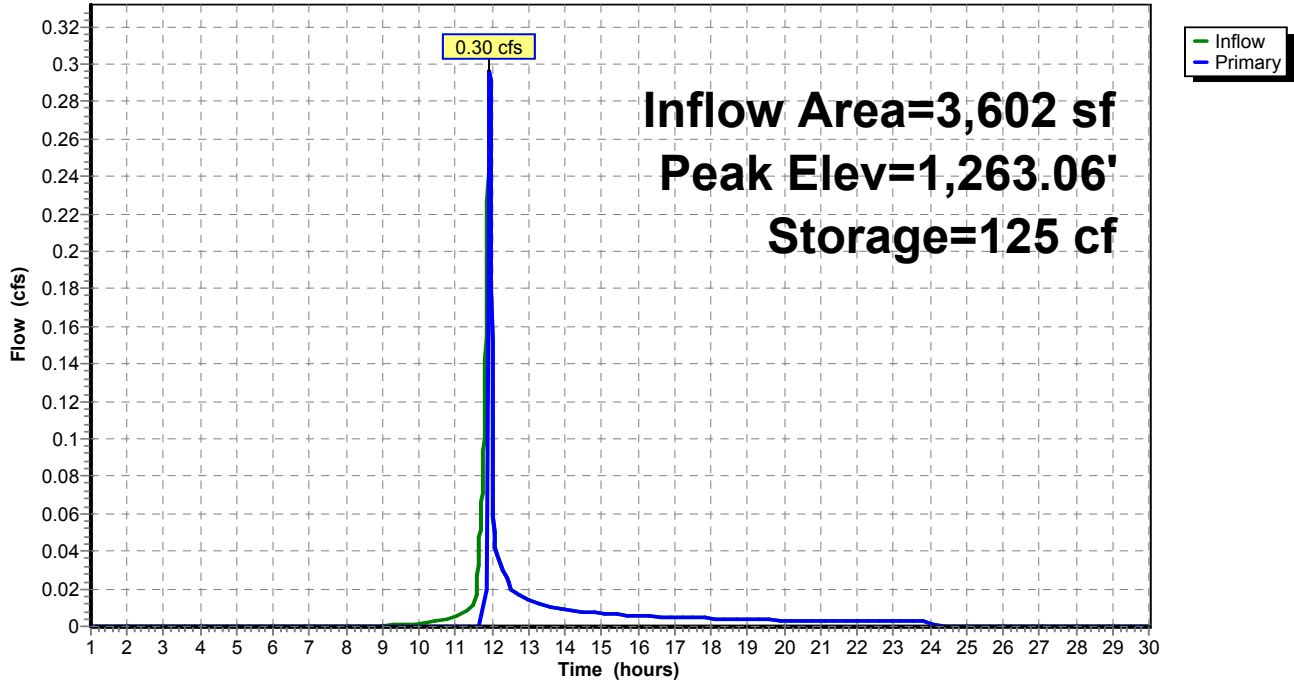
Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.29 cfs @ 11.93 hrs HW=1,263.06' (Free Discharge)
 ↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.29 cfs @ 0.60 fps)

Pond 100P: VCI

Hydrograph



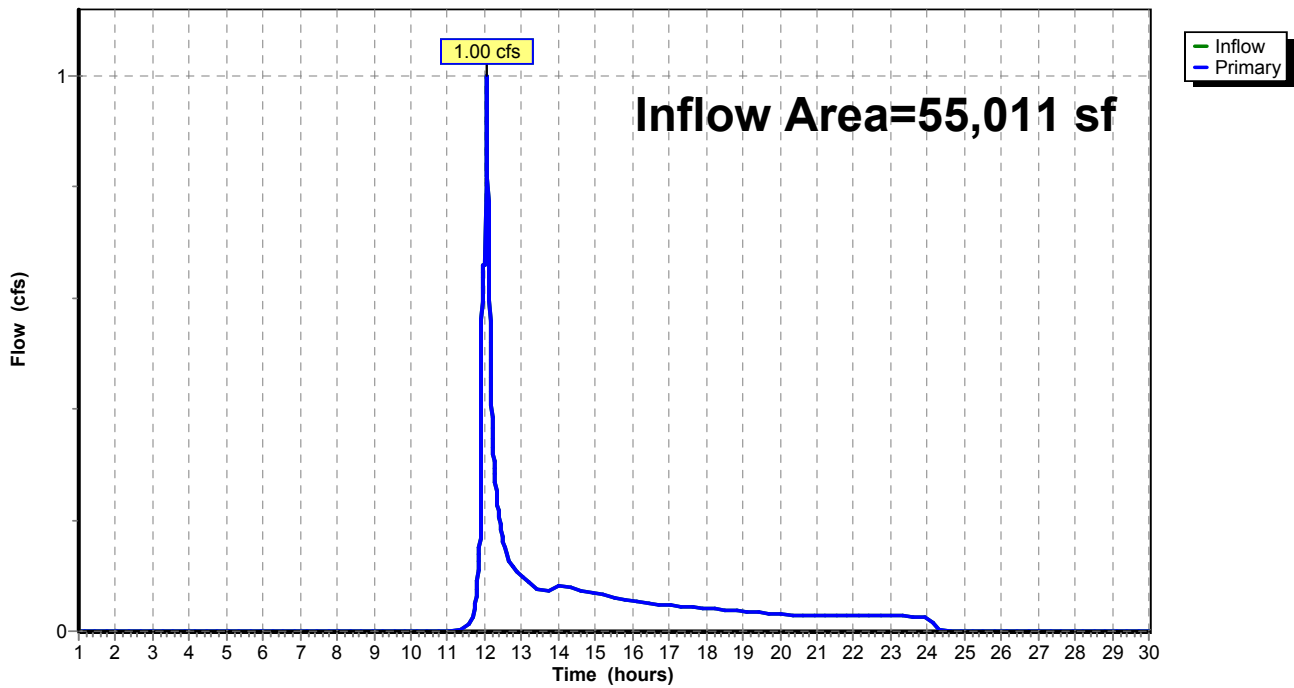
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 0.67" for 5-Year event
Inflow = 1.00 cfs @ 12.05 hrs, Volume= 3,073 cf
Primary = 1.00 cfs @ 12.05 hrs, Volume= 3,073 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD	Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=2.77" Flow Length=145' Tc=9.4 min CN=87 Runoff=0.87 cfs 2,059 cf
Subcatchment10S: DA TO VCI	Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=2.25" Flow Length=165' Tc=2.4 min CN=81 Runoff=0.38 cfs 675 cf
Subcatchment12S: OFFSITE DA	Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=1.50" Flow Length=287' Tc=12.1 min CN=71 Runoff=0.81 cfs 2,097 cf
Subcatchment14S: DA TO VCD	Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=1.64" Flow Length=358' Tc=6.3 min CN=73 Runoff=0.67 cfs 1,376 cf
Subcatchment15S: DA TO INFILTRATION	Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=1.50" Flow Length=147' Tc=33.7 min CN=71 Runoff=0.41 cfs 1,948 cf
Pond 6P: MLV PAD	Peak Elev=1,264.52' Storage=1,241 cf Inflow=0.87 cfs 2,059 cf Outflow=0.08 cfs 859 cf
Pond 9P: VCD	Peak Elev=1,263.10' Storage=350 cf Inflow=0.67 cfs 1,376 cf Outflow=0.82 cfs 1,040 cf
Pond 10P: INFILTRATIONBERM	Peak Elev=1,270.93' Storage=1,948 cf Inflow=0.41 cfs 1,948 cf Outflow=0.00 cfs 0 cf
Pond 100P: VCI	Peak Elev=1,263.07' Storage=125 cf Inflow=0.38 cfs 675 cf Outflow=0.38 cfs 546 cf
Link 2L: Proposed Conditions	Inflow=1.72 cfs 4,543 cf Primary=1.72 cfs 4,543 cf

Total Runoff Area = 55,011 sf Runoff Volume = 8,155 cf Average Runoff Depth = 1.78"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 0.87 cfs @ 12.01 hrs, Volume= 2,059 cf, Depth= 2.77"

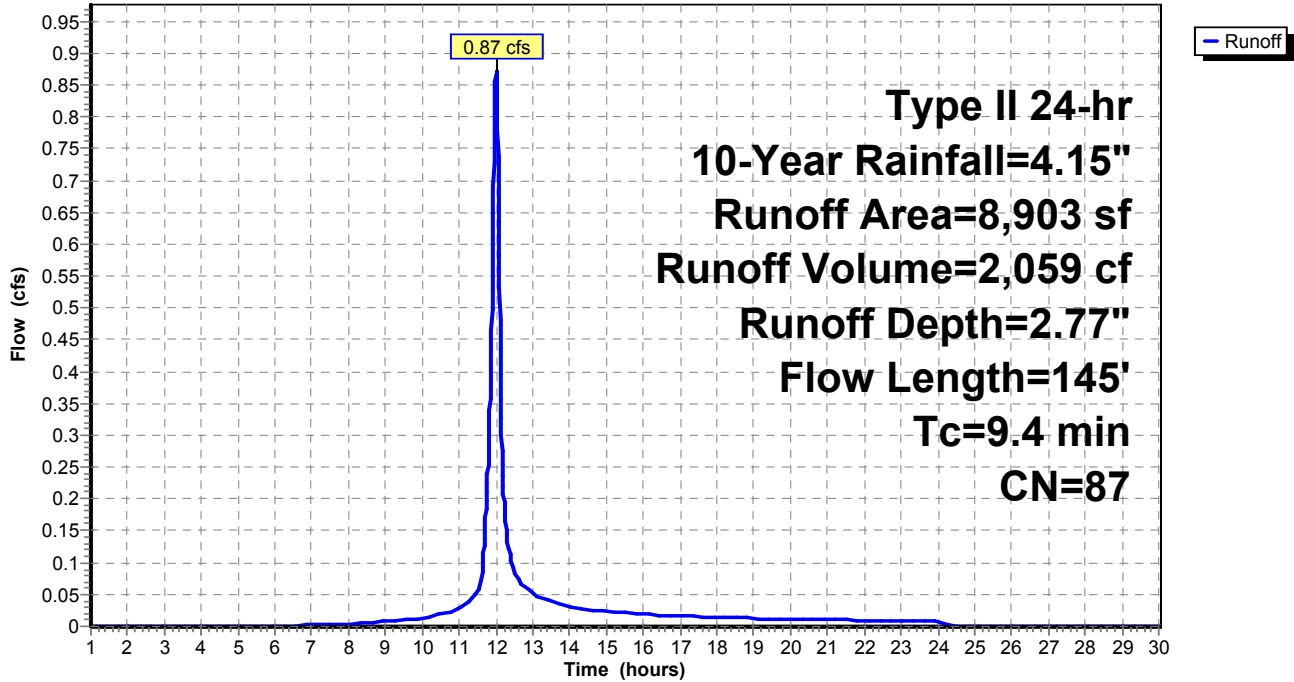
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.38 cfs @ 11.93 hrs, Volume= 675 cf, Depth= 2.25"

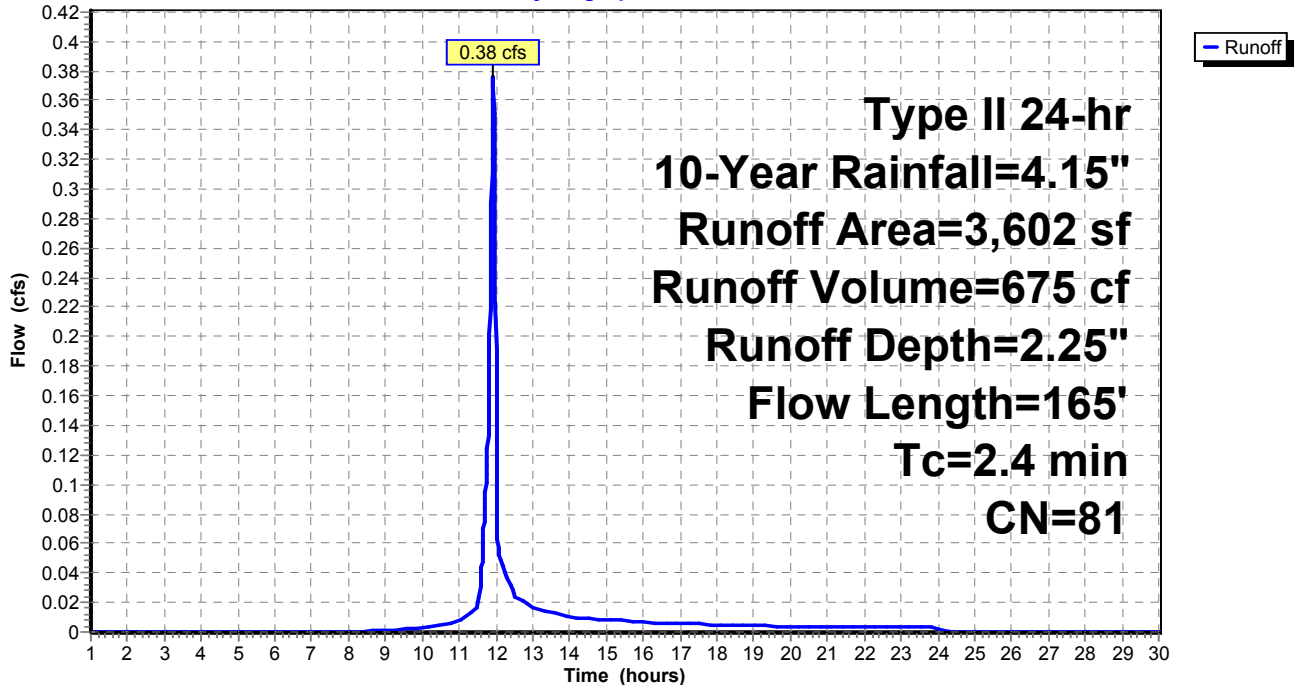
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 0.81 cfs @ 12.05 hrs, Volume= 2,097 cf, Depth= 1.50"

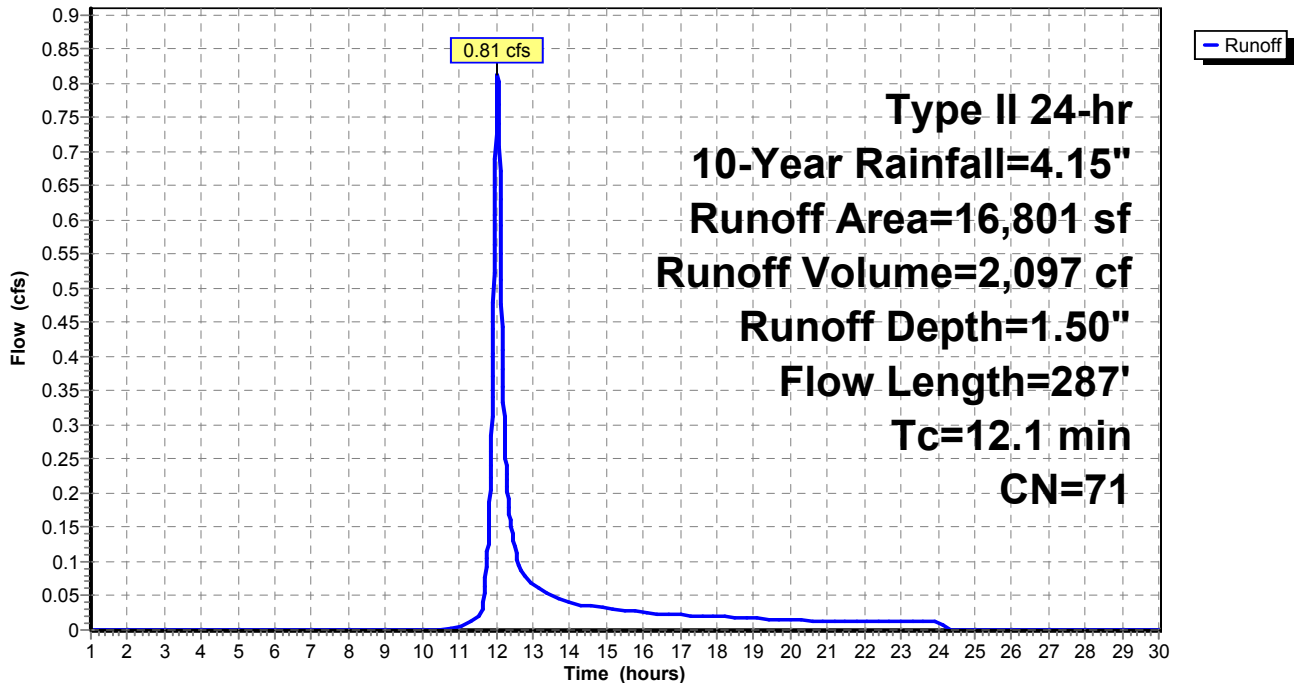
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 0.67 cfs @ 11.98 hrs, Volume= 1,376 cf, Depth= 1.64"

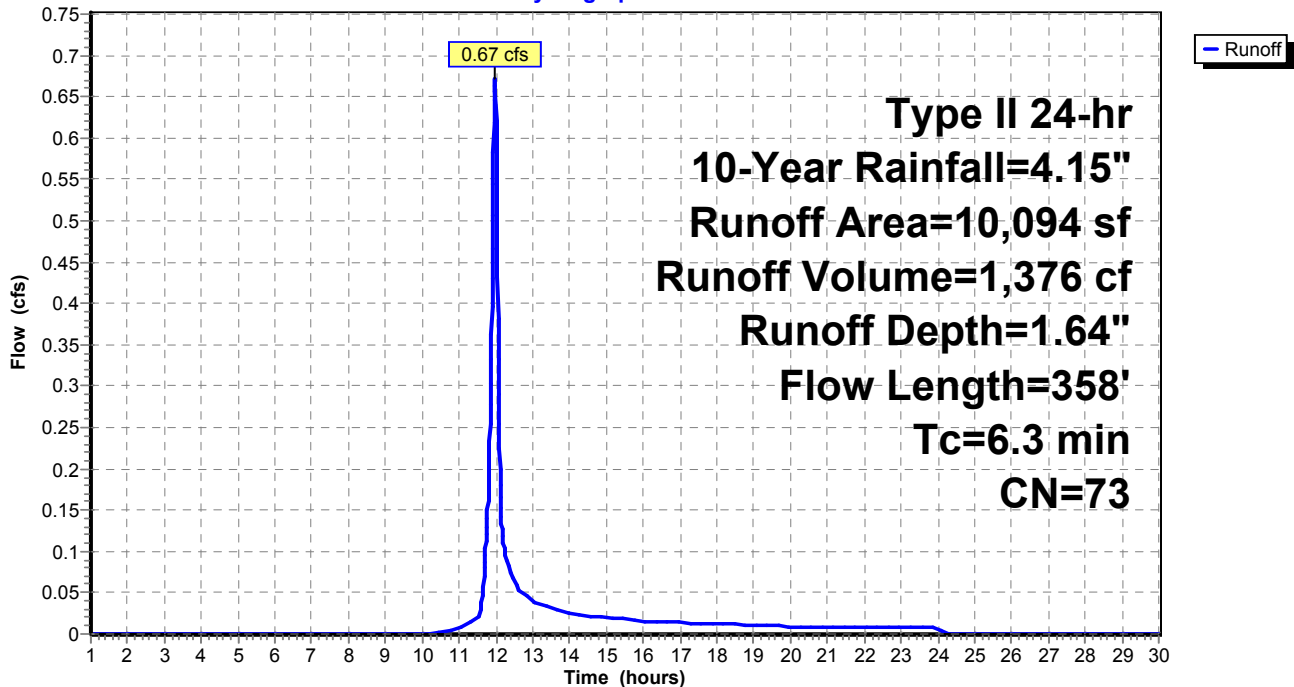
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.41 cfs @ 12.32 hrs, Volume= 1,948 cf, Depth= 1.50"

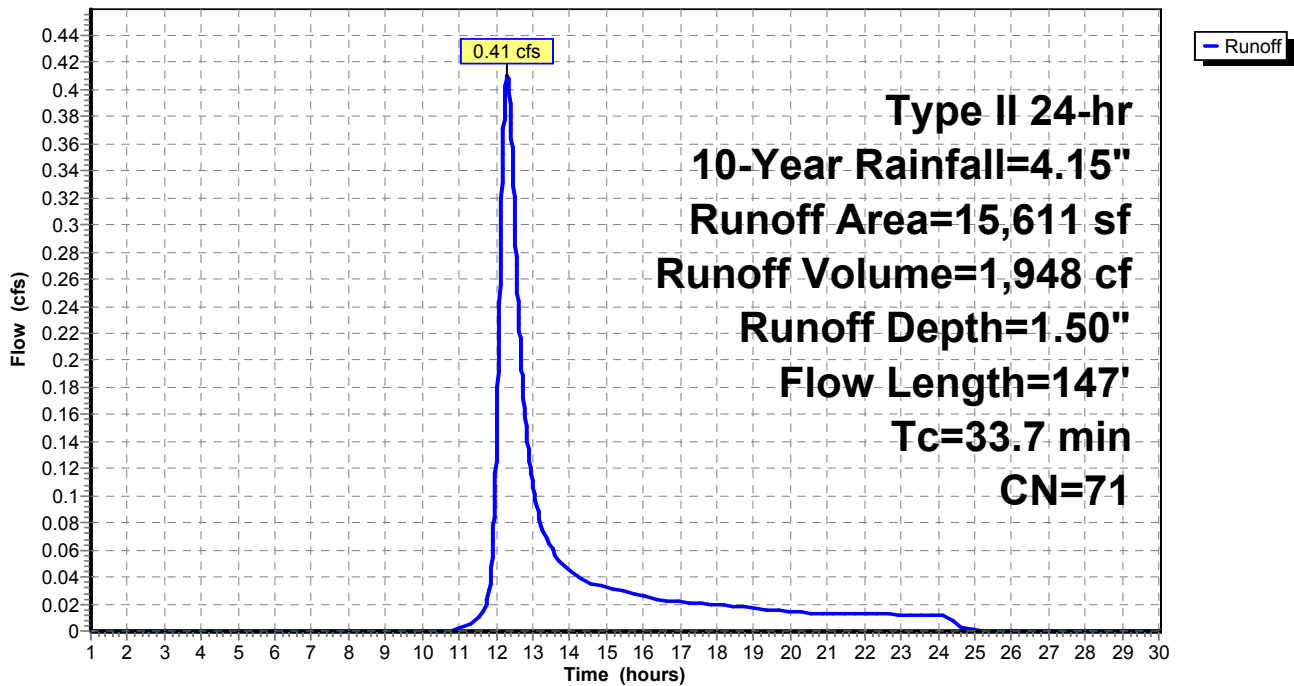
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 10-Year Rainfall=4.15"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 2.77" for 10-Year event
 Inflow = 0.87 cfs @ 12.01 hrs, Volume= 2,059 cf
 Outflow = 0.08 cfs @ 12.53 hrs, Volume= 859 cf, Atten= 90%, Lag= 31.3 min
 Primary = 0.08 cfs @ 12.53 hrs, Volume= 859 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.52' @ 12.53 hrs Surf.Area= 4,644 sf Storage= 1,241 cf

Plug-Flow detention time= 280.6 min calculated for 859 cf (42% of inflow)
 Center-of-Mass det. time= 160.7 min (969.1 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

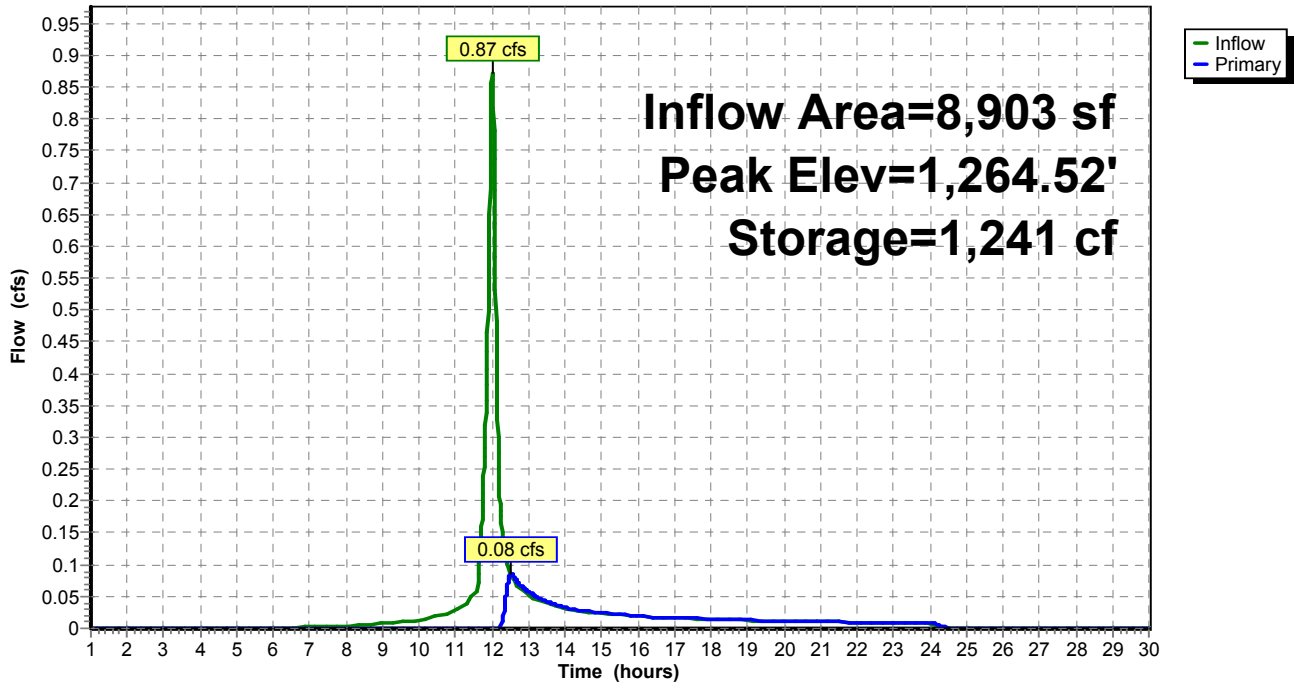
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.08 cfs @ 12.53 hrs HW=1,264.52' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.08 cfs @ 0.37 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 0.64" for 10-Year event
 Inflow = 0.67 cfs @ 11.98 hrs, Volume= 1,376 cf
 Outflow = 0.82 cfs @ 11.97 hrs, Volume= 1,040 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.82 cfs @ 11.97 hrs, Volume= 1,040 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.10' @ 11.97 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 142.9 min calculated for 1,040 cf (76% of inflow)
 Center-of-Mass det. time= 45.1 min (891.8 - 846.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

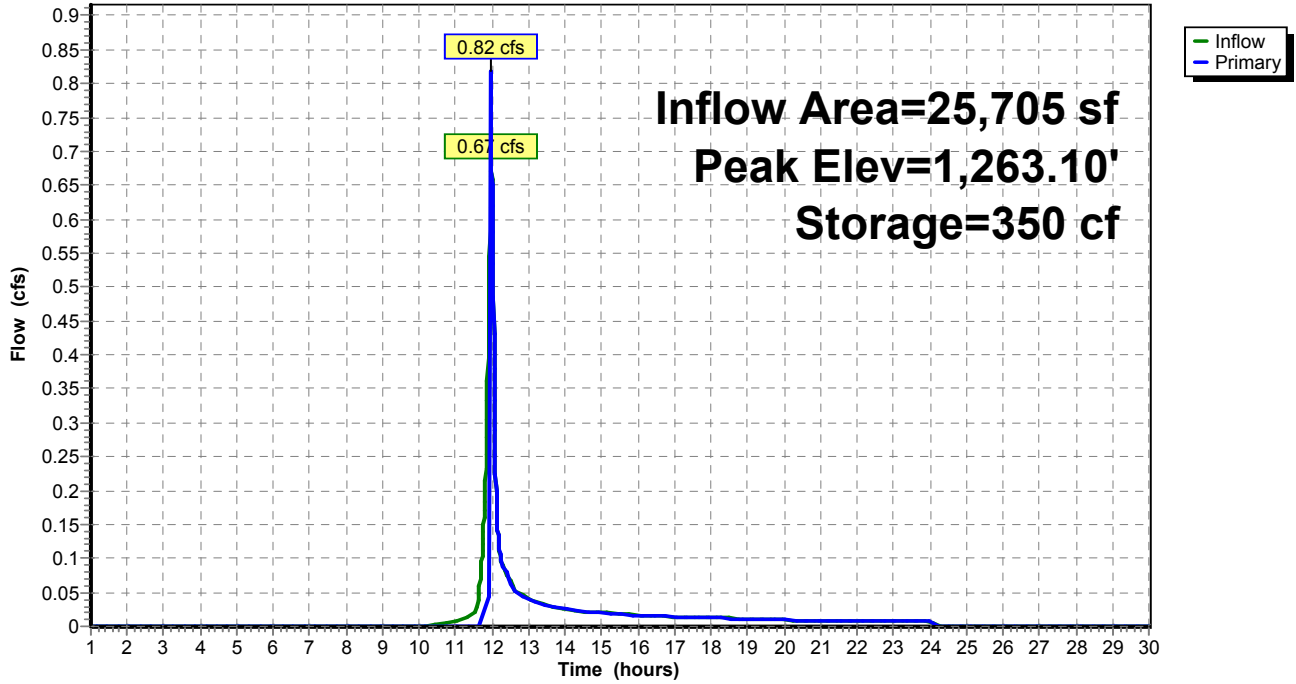
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.72 cfs @ 11.97 hrs HW=1,263.10' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.72 cfs @ 0.75 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 1.50" for 10-Year event
 Inflow = 0.41 cfs @ 12.32 hrs, Volume= 1,948 cf
 Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,270.93' @ 25.92 hrs Surf.Area= 2,243 sf Storage= 1,948 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,269.00	94	74.7	0	0	94
1,269.50	443	134.5	124	124	1,091
1,270.00	977	192.5	346	470	2,602
1,270.50	1,587	229.6	635	1,105	3,853
1,271.00	2,347	279.8	977	2,082	5,892
1,271.50	3,234	306.5	1,389	3,471	7,146

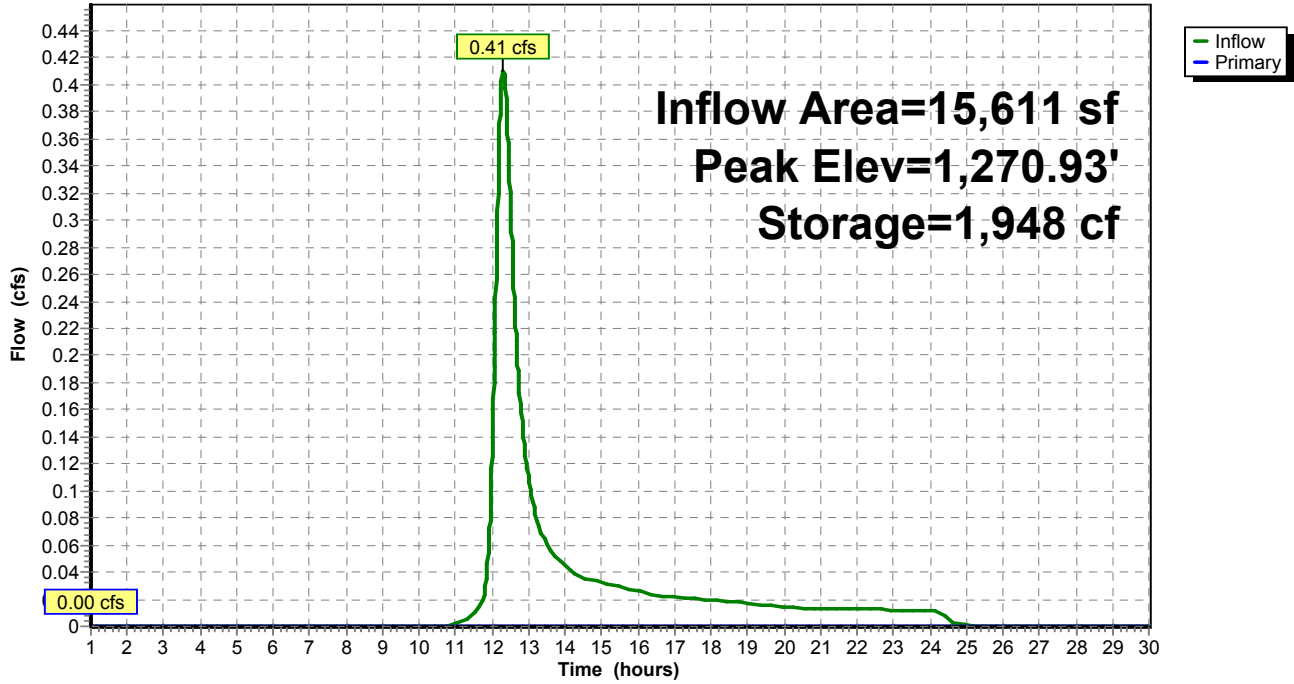
Device	Routing	Invert	Outlet Devices
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,269.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 2.25" for 10-Year event
 Inflow = 0.38 cfs @ 11.93 hrs, Volume= 675 cf
 Outflow = 0.38 cfs @ 11.93 hrs, Volume= 546 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.38 cfs @ 11.93 hrs, Volume= 546 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.07' @ 11.93 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 114.2 min calculated for 546 cf (81% of inflow)
 Center-of-Mass det. time= 33.2 min (853.9 - 820.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

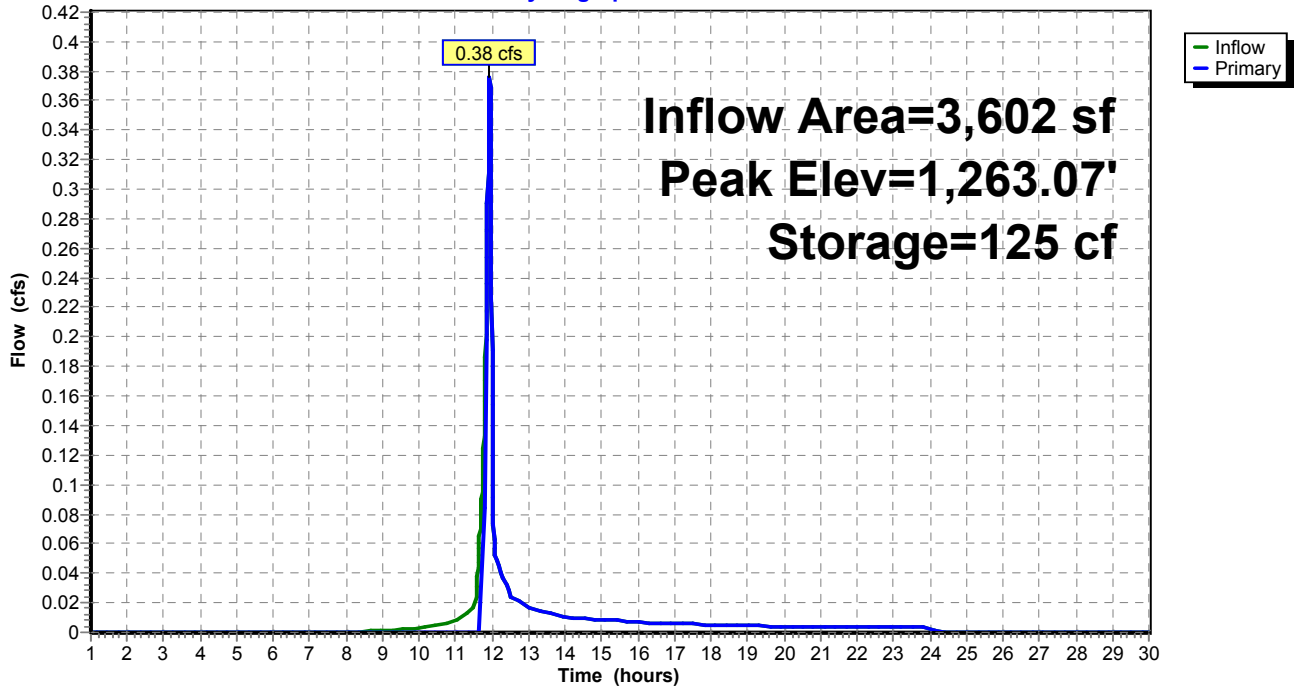
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.37 cfs @ 11.93 hrs HW=1,263.07' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.37 cfs @ 0.65 fps)

Pond 100P: VCI

Hydrograph



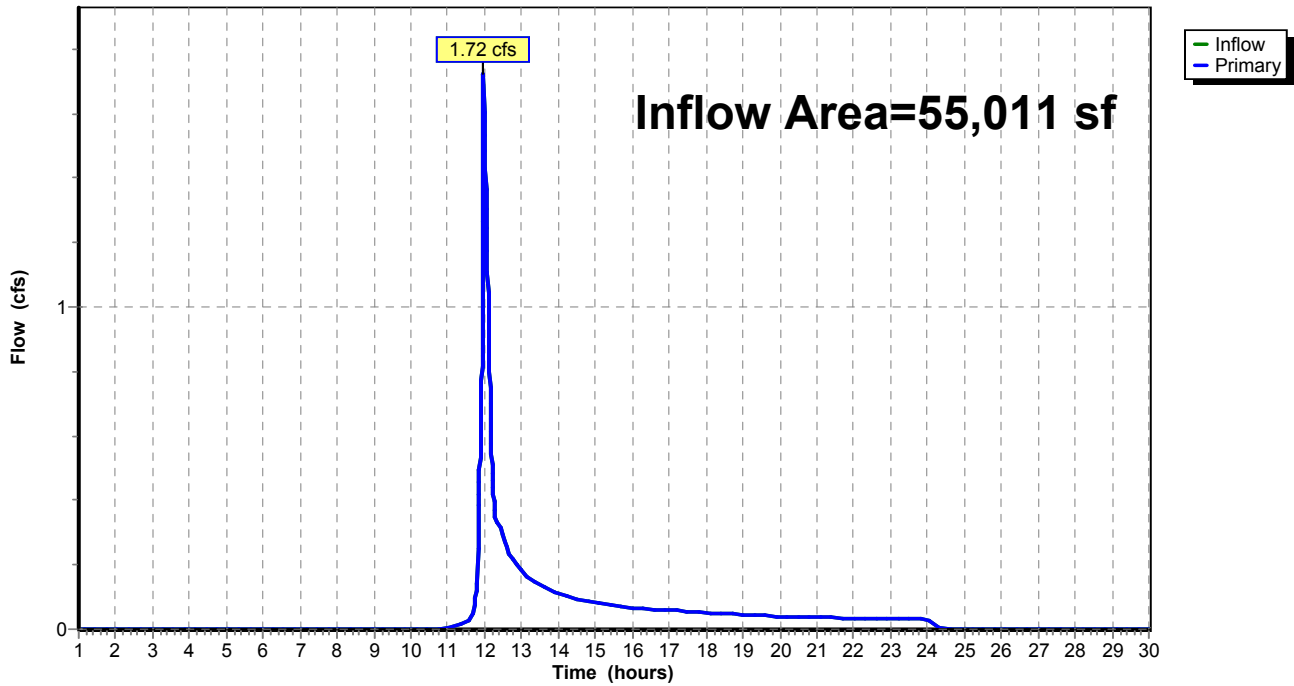
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 0.99" for 10-Year event
Inflow = 1.72 cfs @ 11.97 hrs, Volume= 4,543 cf
Primary = 1.72 cfs @ 11.97 hrs, Volume= 4,543 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD	Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=3.62" Flow Length=145' Tc=9.4 min CN=87 Runoff=1.12 cfs 2,689 cf
Subcatchment10S: DA TO VCI	Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=3.04" Flow Length=165' Tc=2.4 min CN=81 Runoff=0.50 cfs 912 cf
Subcatchment12S: OFFSITE DA	Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=2.16" Flow Length=287' Tc=12.1 min CN=71 Runoff=1.19 cfs 3,027 cf
Subcatchment14S: DA TO VCD	Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=2.33" Flow Length=358' Tc=6.3 min CN=73 Runoff=0.96 cfs 1,958 cf
Subcatchment15S: DA TO INFILTRATION	Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=2.16" Flow Length=147' Tc=33.7 min CN=71 Runoff=0.61 cfs 2,813 cf
Pond 6P: MLV PAD	Peak Elev=1,264.58' Storage=1,339 cf Inflow=1.12 cfs 2,689 cf Outflow=0.50 cfs 1,490 cf
Pond 9P: VCD	Peak Elev=1,263.12' Storage=350 cf Inflow=0.96 cfs 2,688 cf Outflow=0.96 cfs 2,337 cf
Pond 10P: INFILTRATIONBERM	Peak Elev=1,271.00' Storage=2,084 cf Inflow=0.61 cfs 2,813 cf Outflow=0.04 cfs 730 cf
Pond 100P: VCI	Peak Elev=1,263.09' Storage=125 cf Inflow=0.50 cfs 912 cf Outflow=0.50 cfs 792 cf
Link 2L: Proposed Conditions	Inflow=2.28 cfs 7,645 cf Primary=2.28 cfs 7,645 cf

Total Runoff Area = 55,011 sf Runoff Volume = 11,398 cf Average Runoff Depth = 2.49"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 1.12 cfs @ 12.01 hrs, Volume= 2,689 cf, Depth= 3.62"

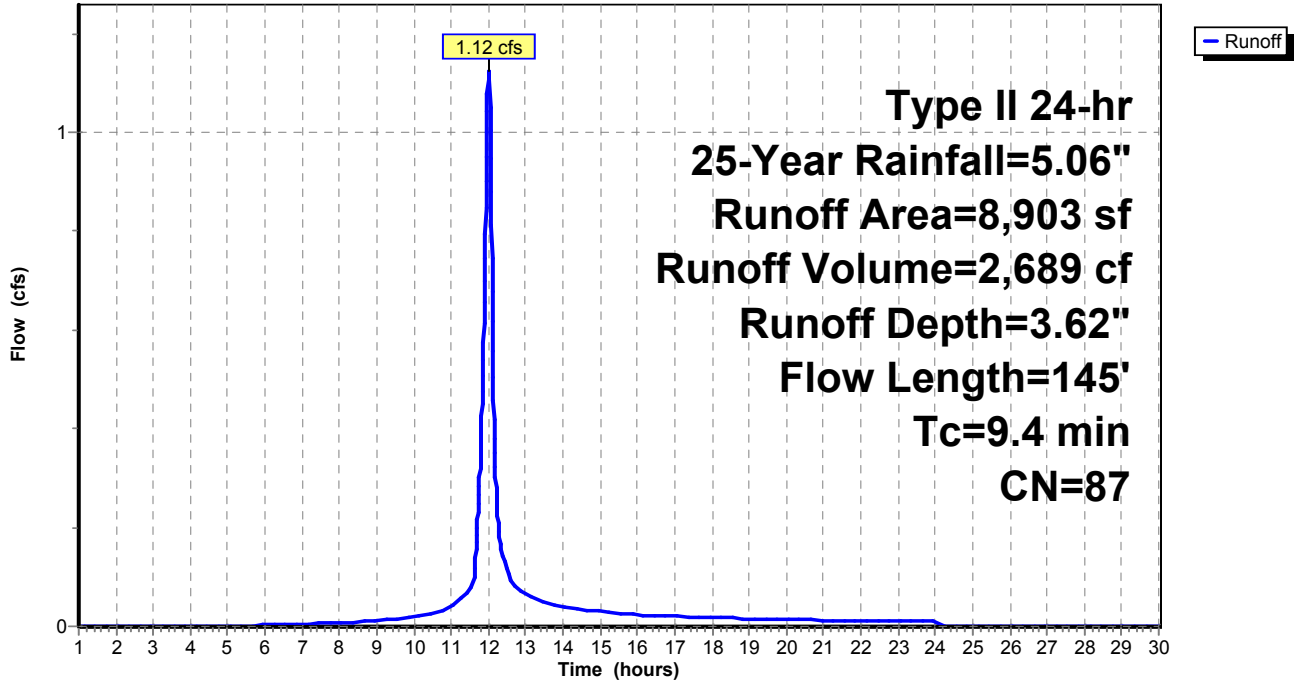
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.50 cfs @ 11.93 hrs, Volume= 912 cf, Depth= 3.04"

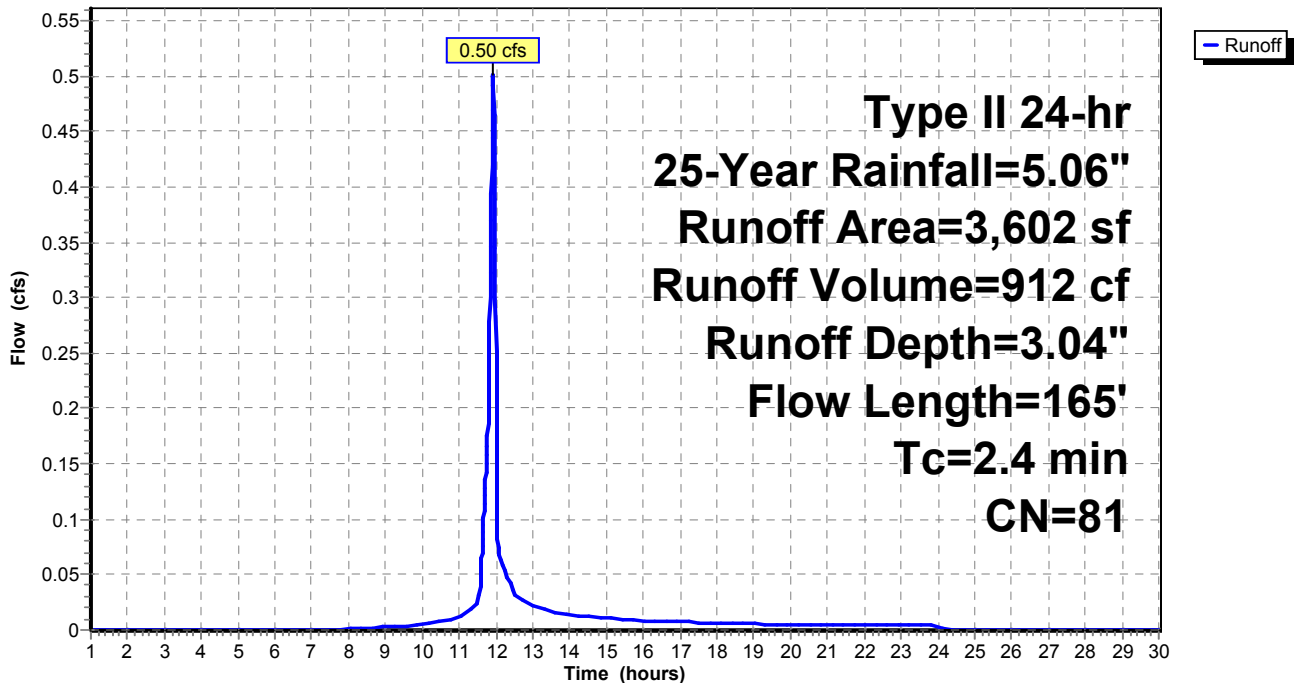
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 1.19 cfs @ 12.04 hrs, Volume= 3,027 cf, Depth= 2.16"

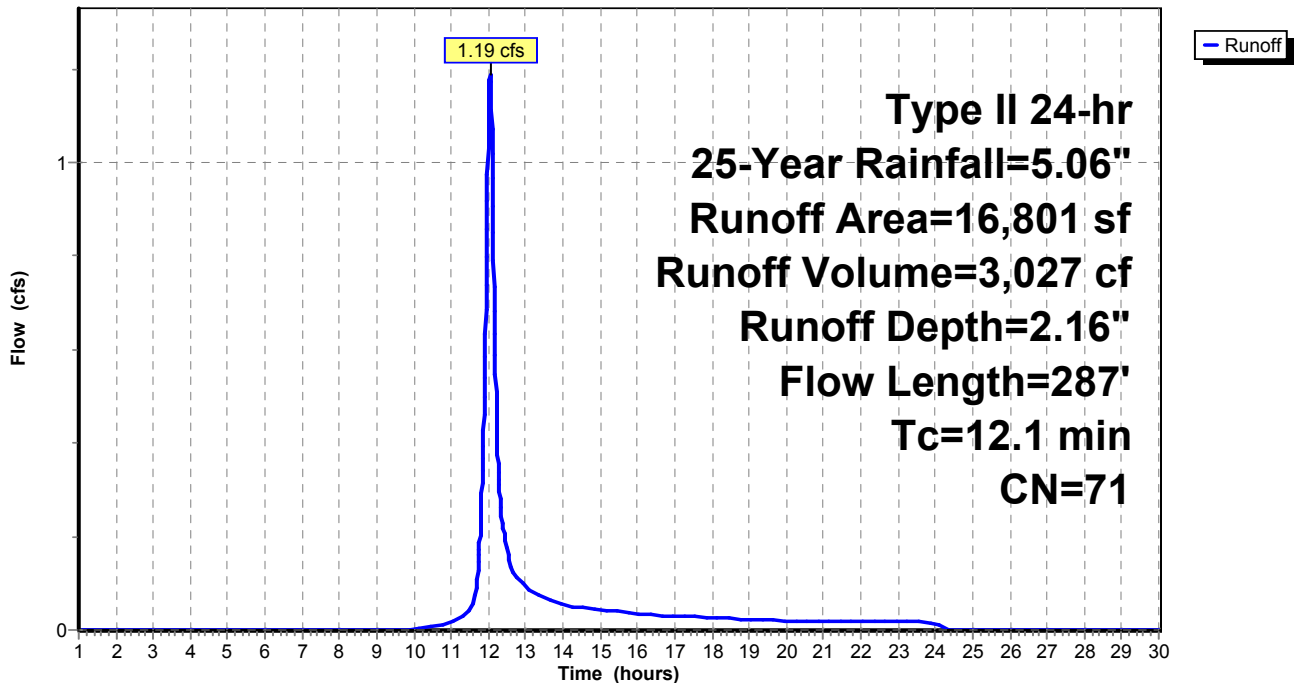
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 0.96 cfs @ 11.98 hrs, Volume= 1,958 cf, Depth= 2.33"

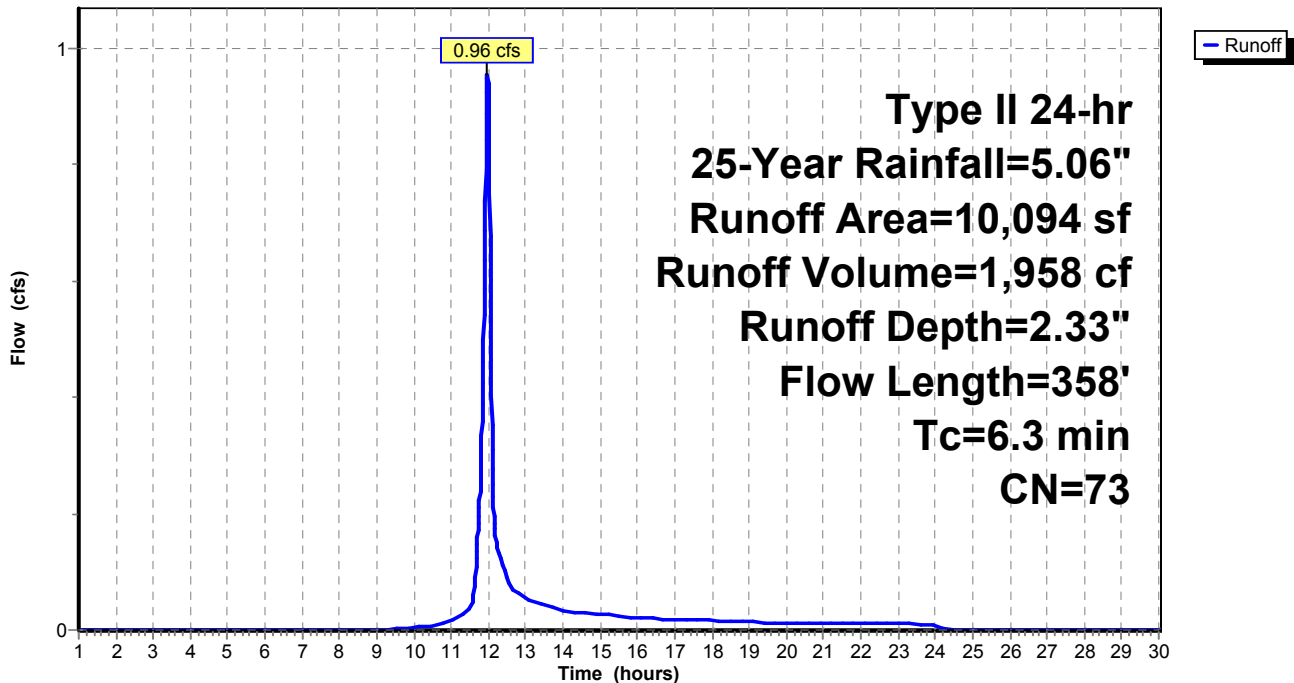
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.61 cfs @ 12.31 hrs, Volume= 2,813 cf, Depth= 2.16"

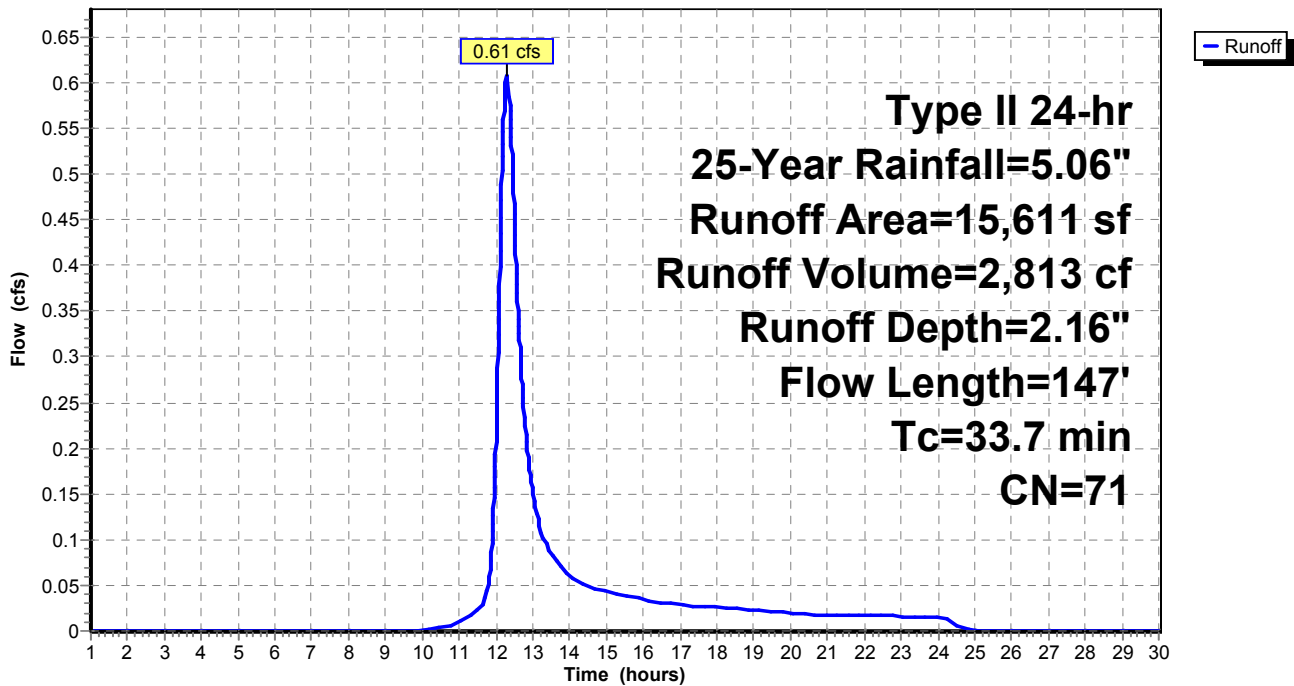
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 25-Year Rainfall=5.06"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 3.62" for 25-Year event
 Inflow = 1.12 cfs @ 12.01 hrs, Volume= 2,689 cf
 Outflow = 0.50 cfs @ 12.13 hrs, Volume= 1,490 cf, Atten= 55%, Lag= 7.5 min
 Primary = 0.50 cfs @ 12.13 hrs, Volume= 1,490 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.58' @ 12.13 hrs Surf.Area= 4,644 sf Storage= 1,339 cf

Plug-Flow detention time= 211.7 min calculated for 1,489 cf (55% of inflow)
 Center-of-Mass det. time= 102.5 min (903.3 - 800.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

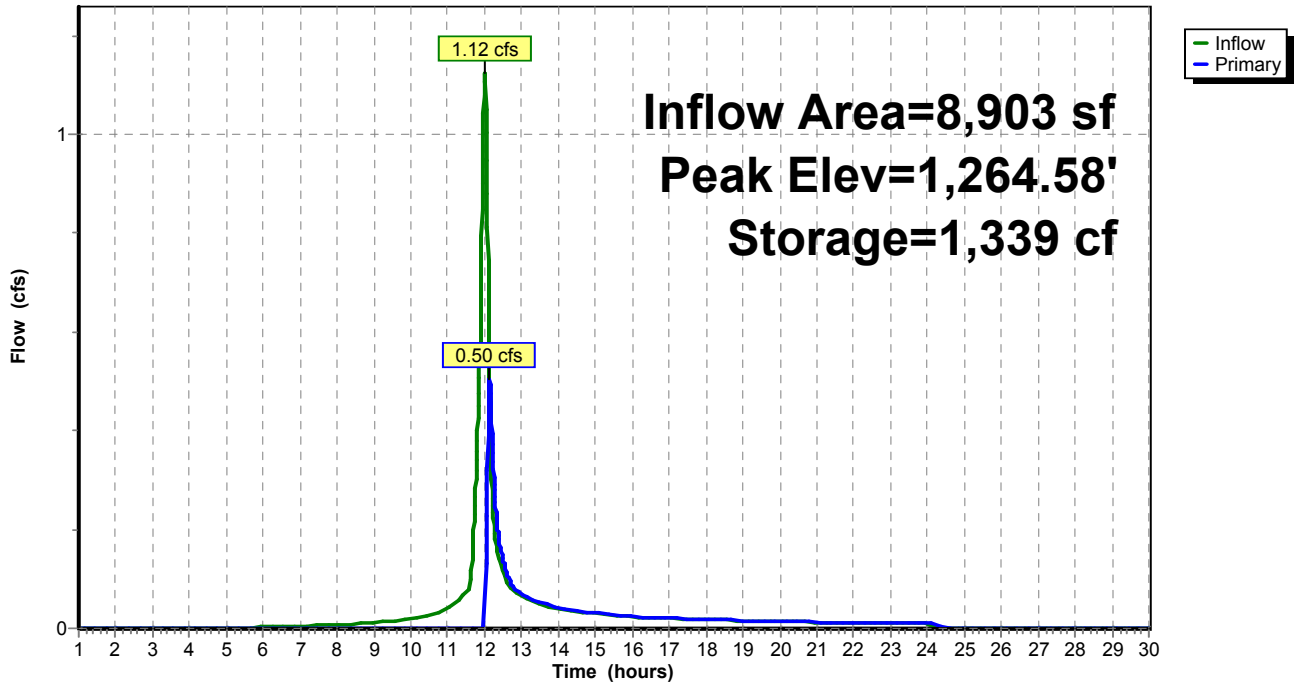
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.50 cfs @ 12.13 hrs HW=1,264.57' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.50 cfs @ 0.67 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 1.26" for 25-Year event
 Inflow = 0.96 cfs @ 11.98 hrs, Volume= 2,688 cf
 Outflow = 0.96 cfs @ 11.98 hrs, Volume= 2,337 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.96 cfs @ 11.98 hrs, Volume= 2,337 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.12' @ 11.98 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 98.8 min calculated for 2,337 cf (87% of inflow)
 Center-of-Mass det. time= 34.1 min (956.8 - 922.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

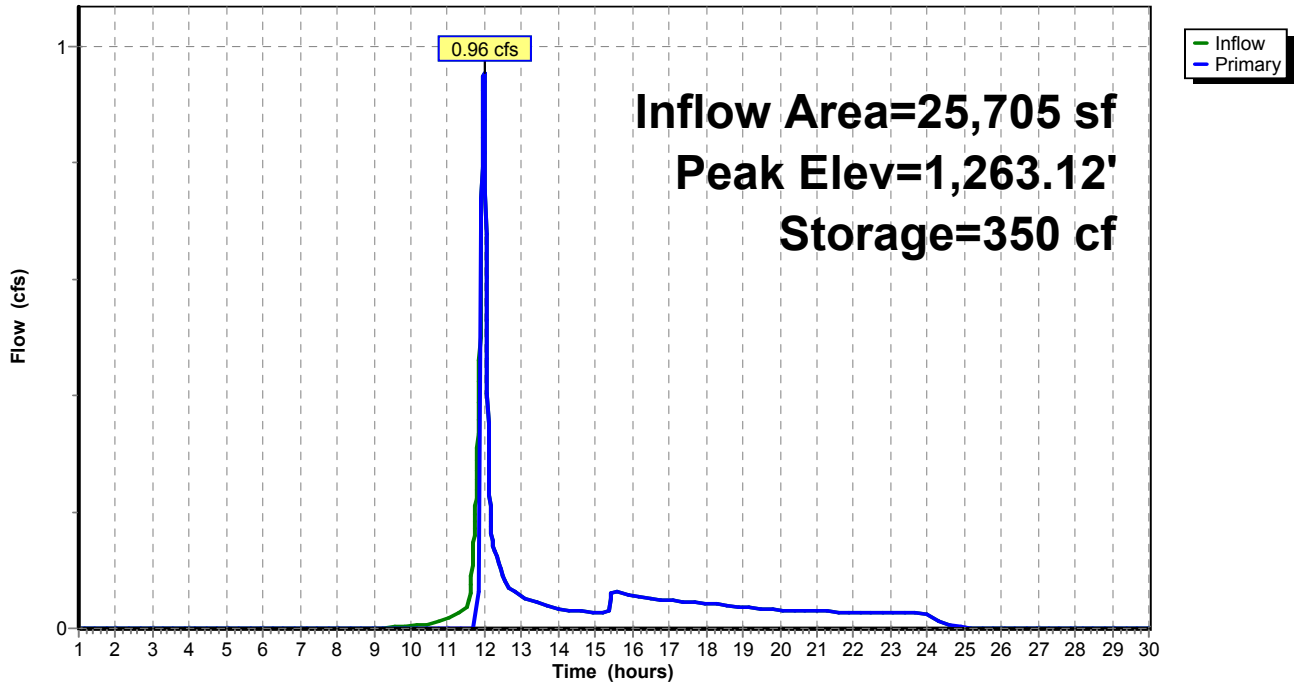
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.95 cfs @ 11.98 hrs HW=1,263.12' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.95 cfs @ 0.83 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 2.16" for 25-Year event
 Inflow = 0.61 cfs @ 12.31 hrs, Volume= 2,813 cf
 Outflow = 0.04 cfs @ 15.47 hrs, Volume= 730 cf, Atten= 94%, Lag= 189.9 min
 Primary = 0.04 cfs @ 15.47 hrs, Volume= 730 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,271.00' @ 15.47 hrs Surf.Area= 2,348 sf Storage= 2,084 cf

Plug-Flow detention time= 429.0 min calculated for 730 cf (26% of inflow)
 Center-of-Mass det. time= 286.8 min (1,153.7 - 866.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
1,269.00	94	74.7	0	0	94	
1,269.50	443	134.5	124	124	1,091	
1,270.00	977	192.5	346	470	2,602	
1,270.50	1,587	229.6	635	1,105	3,853	
1,271.00	2,347	279.8	977	2,082	5,892	
1,271.50	3,234	306.5	1,389	3,471	7,146	

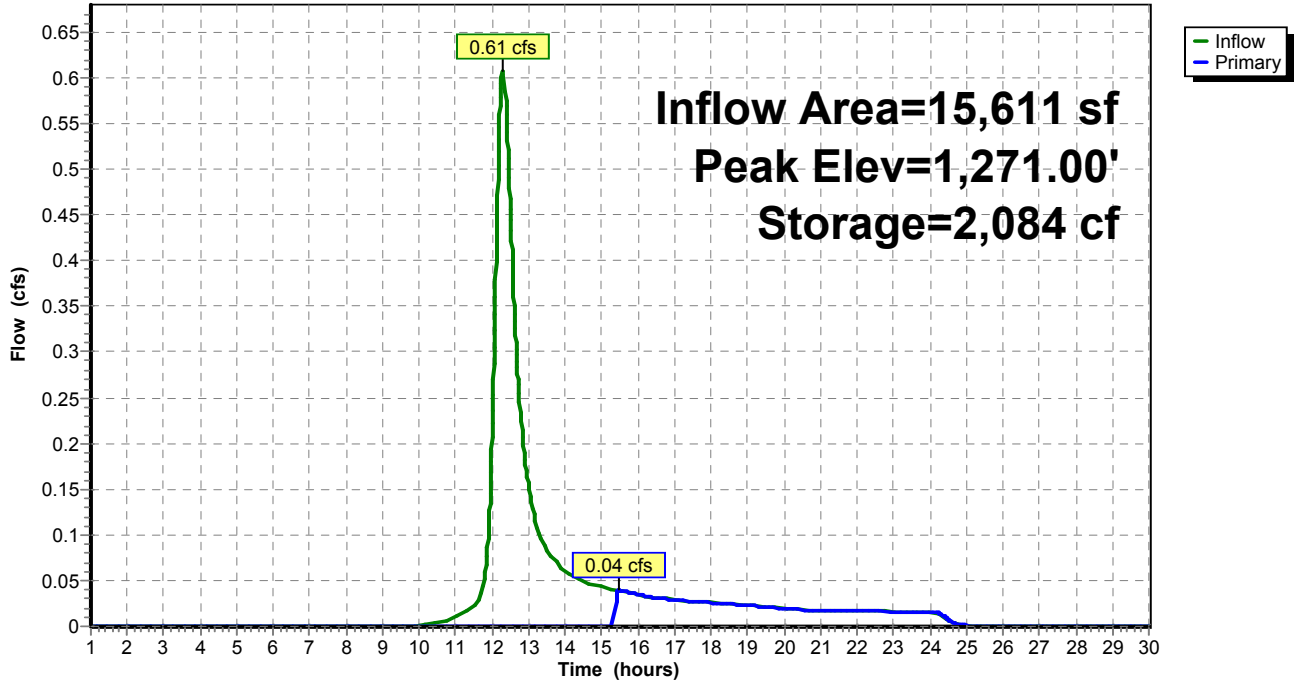
Device	Routing	Invert	Outlet Devices												
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir												
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00												
			2.50 3.00 3.50 4.00 4.50												
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68												
			2.72 2.81 2.92 2.97 3.07 3.32												

Primary OutFlow Max=0.01 cfs @ 15.47 hrs HW=1,271.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.01 cfs @ 0.07 fps)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 3.04" for 25-Year event
 Inflow = 0.50 cfs @ 11.93 hrs, Volume= 912 cf
 Outflow = 0.50 cfs @ 11.93 hrs, Volume= 792 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.50 cfs @ 11.93 hrs, Volume= 792 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.09' @ 11.93 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 87.4 min calculated for 791 cf (87% of inflow)
 Center-of-Mass det. time= 24.6 min (836.8 - 812.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

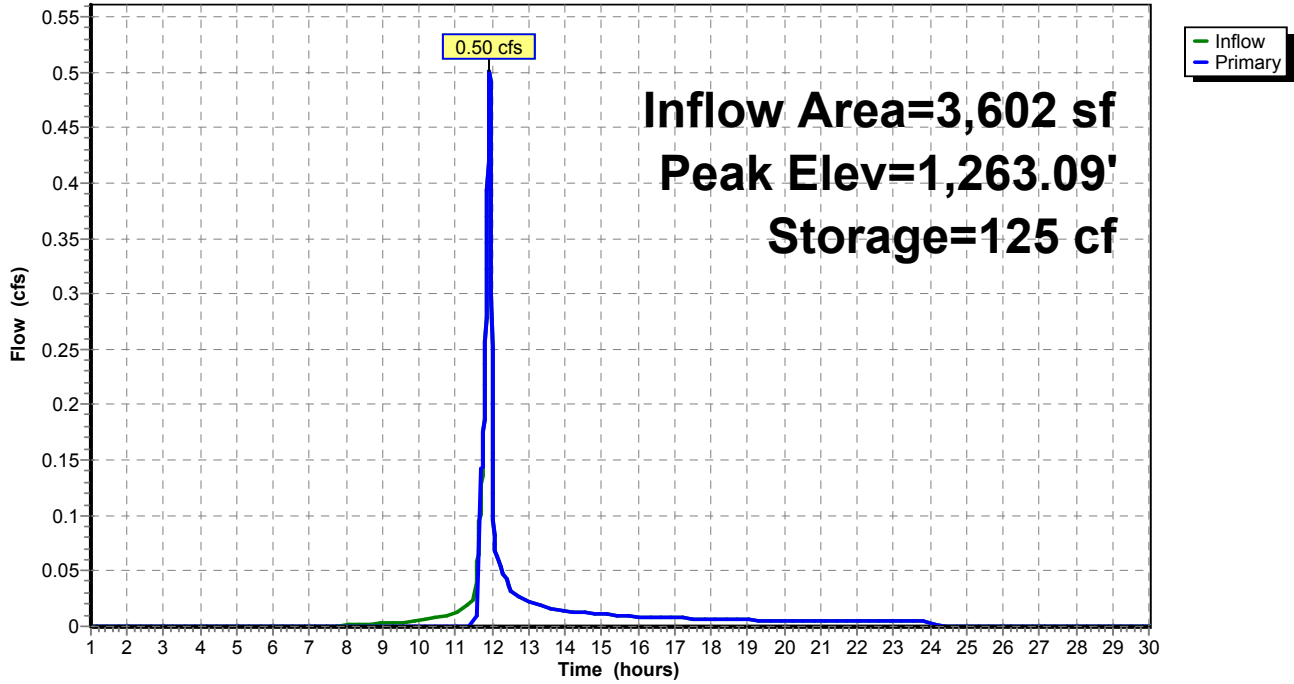
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.50 cfs @ 11.93 hrs HW=1,263.09' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.50 cfs @ 0.72 fps)

Pond 100P: VCI

Hydrograph



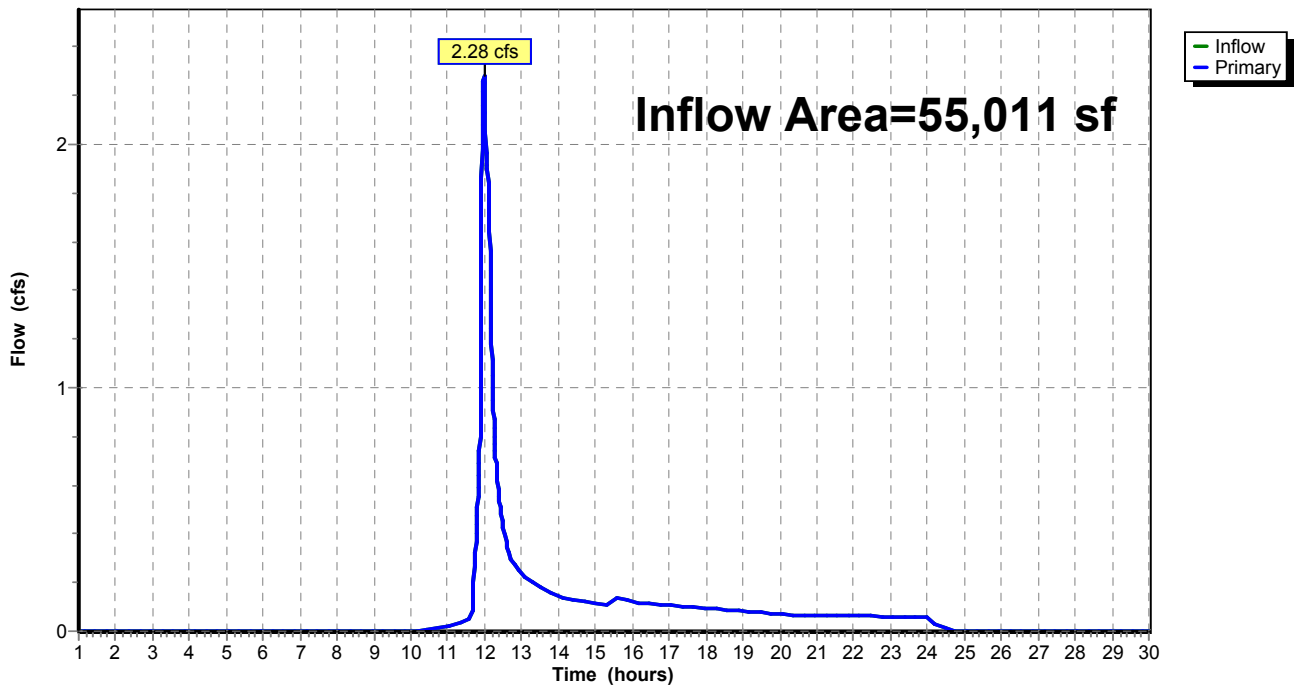
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 1.67" for 25-Year event
Inflow = 2.28 cfs @ 11.98 hrs, Volume= 7,645 cf
Primary = 2.28 cfs @ 11.98 hrs, Volume= 7,645 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=4.40"
 Flow Length=145' Tc=9.4 min CN=87 Runoff=1.35 cfs 3,266 cf

Subcatchment10S: DA TO VCI Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=3.77"
 Flow Length=165' Tc=2.4 min CN=81 Runoff=0.62 cfs 1,133 cf

Subcatchment12S: OFFSITE DA Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=2.80"
 Flow Length=287' Tc=12.1 min CN=71 Runoff=1.55 cfs 3,924 cf

Subcatchment14S: DA TO VCD Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=2.99"
 Flow Length=358' Tc=6.3 min CN=73 Runoff=1.22 cfs 2,515 cf

Subcatchment15S: DA TO INFILTRATION Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=2.80"
 Flow Length=147' Tc=33.7 min CN=71 Runoff=0.80 cfs 3,646 cf

Pond 6P: MLV PAD Peak Elev=1,264.62' Storage=1,420 cf Inflow=1.35 cfs 3,266 cf
 Outflow=1.00 cfs 2,067 cf

Pond 9P: VCD Peak Elev=1,263.14' Storage=350 cf Inflow=1.22 cfs 4,078 cf
 Outflow=1.22 cfs 3,730 cf

Pond 10P: INFILTRATIONBERM Peak Elev=1,271.00' Storage=2,091 cf Inflow=0.80 cfs 3,646 cf
 Outflow=0.16 cfs 1,564 cf

Pond 100P: VCI Peak Elev=1,263.10' Storage=125 cf Inflow=0.62 cfs 1,133 cf
 Outflow=0.62 cfs 1,008 cf

Link 2L: Proposed Conditions Inflow=3.36 cfs 10,728 cf
 Primary=3.36 cfs 10,728 cf

Total Runoff Area = 55,011 sf Runoff Volume = 14,483 cf Average Runoff Depth = 3.16"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 1.35 cfs @ 12.01 hrs, Volume= 3,266 cf, Depth= 4.40"

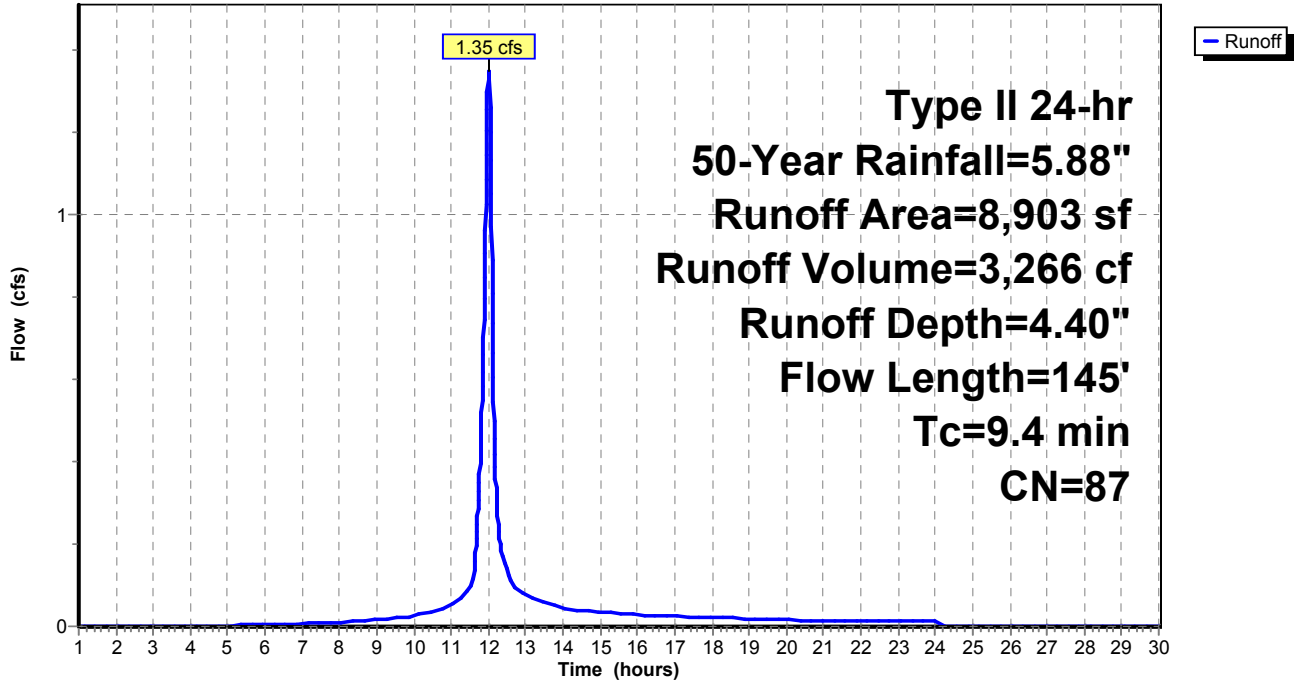
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.62 cfs @ 11.93 hrs, Volume= 1,133 cf, Depth= 3.77"

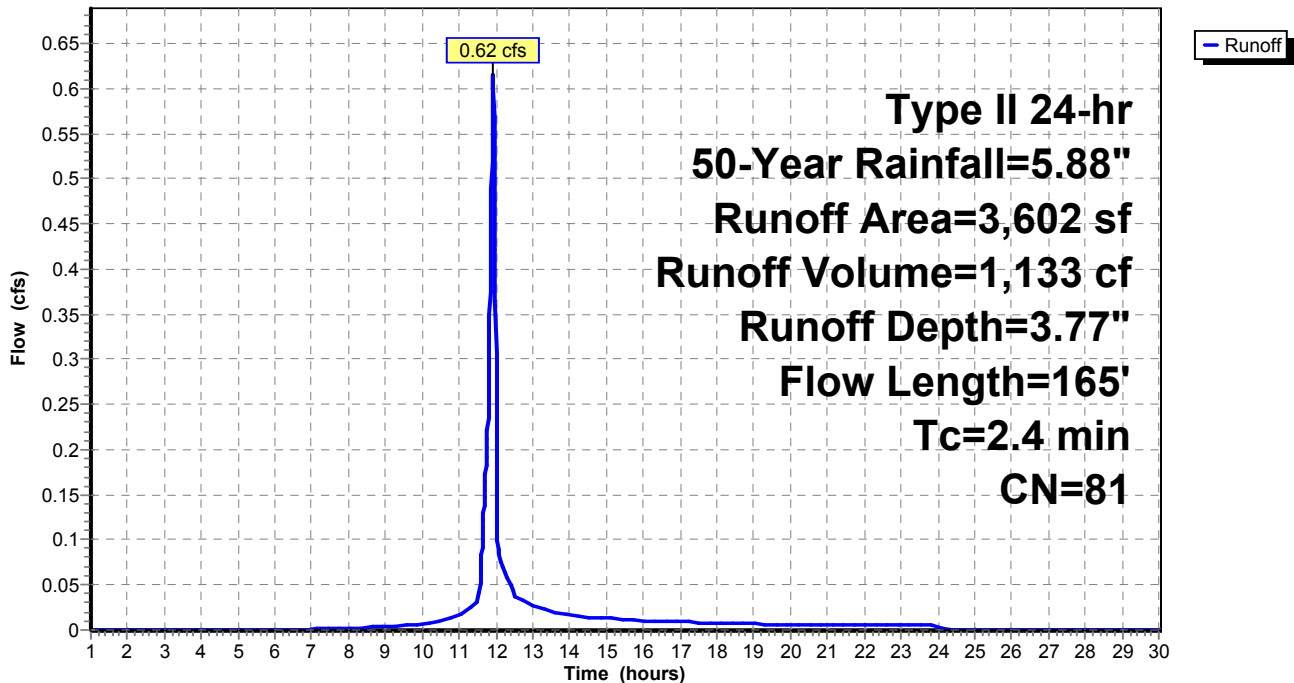
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 1.55 cfs @ 12.04 hrs, Volume= 3,924 cf, Depth= 2.80"

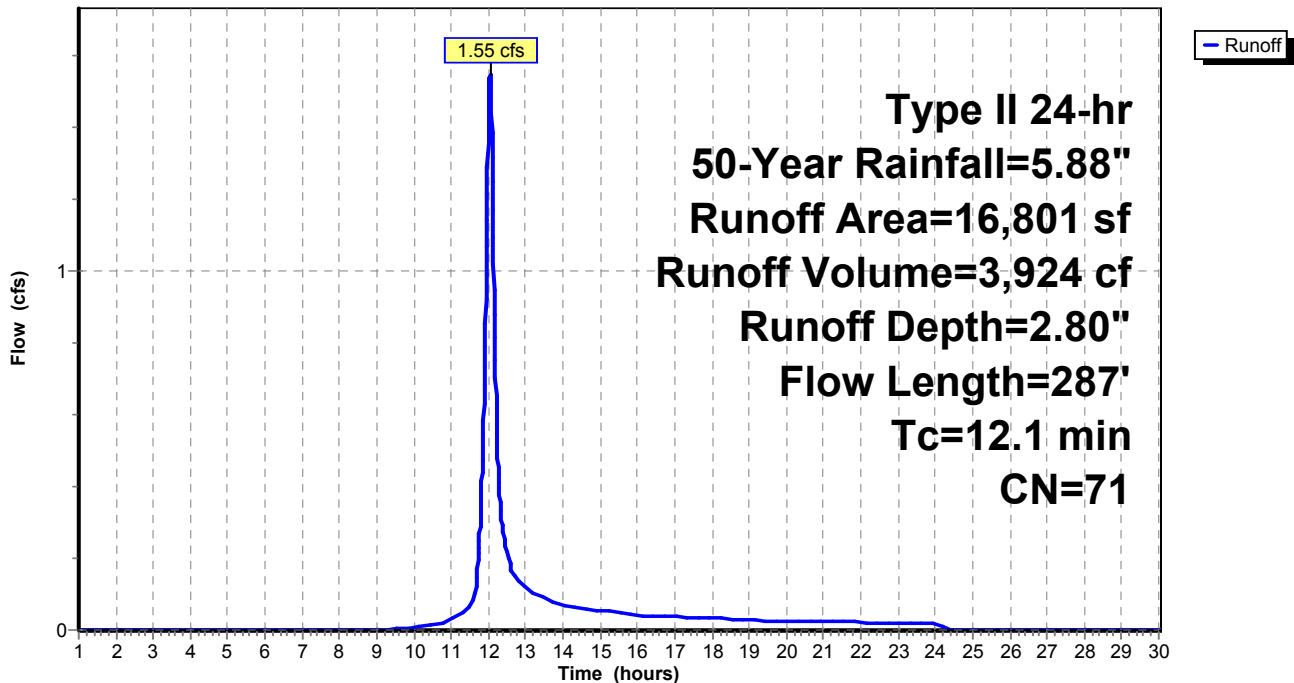
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 1.22 cfs @ 11.98 hrs, Volume= 2,515 cf, Depth= 2.99"

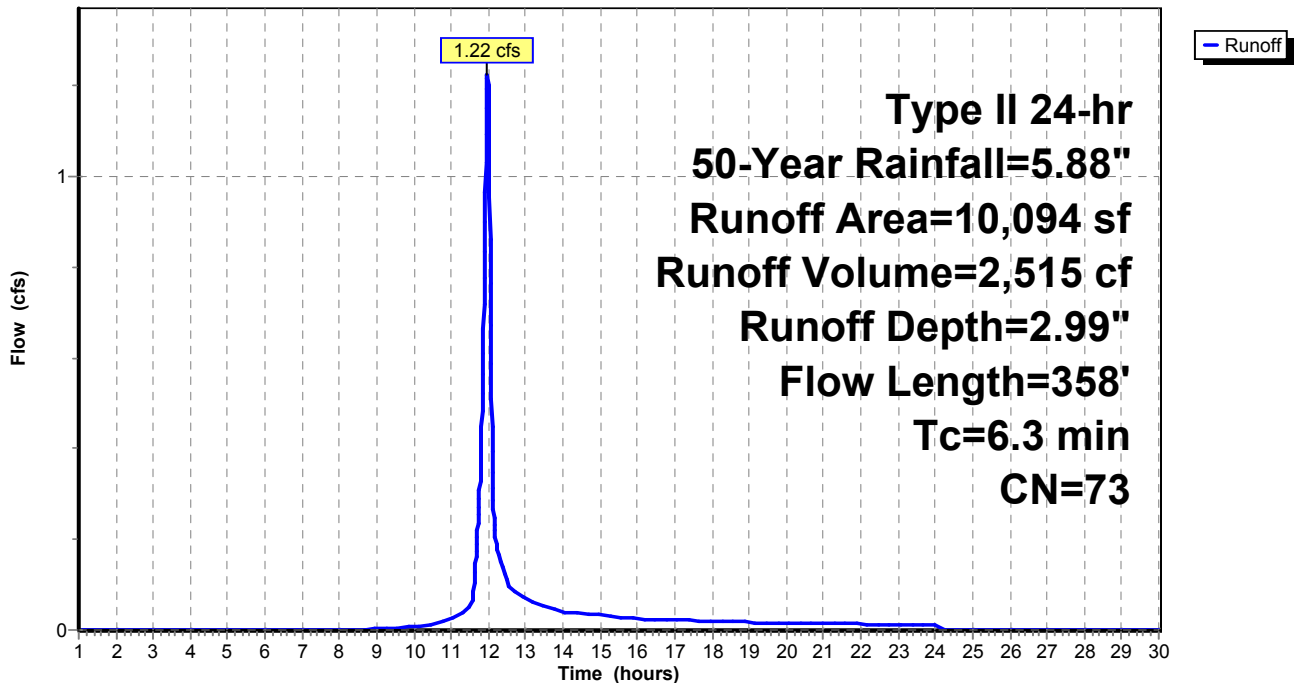
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 0.80 cfs @ 12.29 hrs, Volume= 3,646 cf, Depth= 2.80"

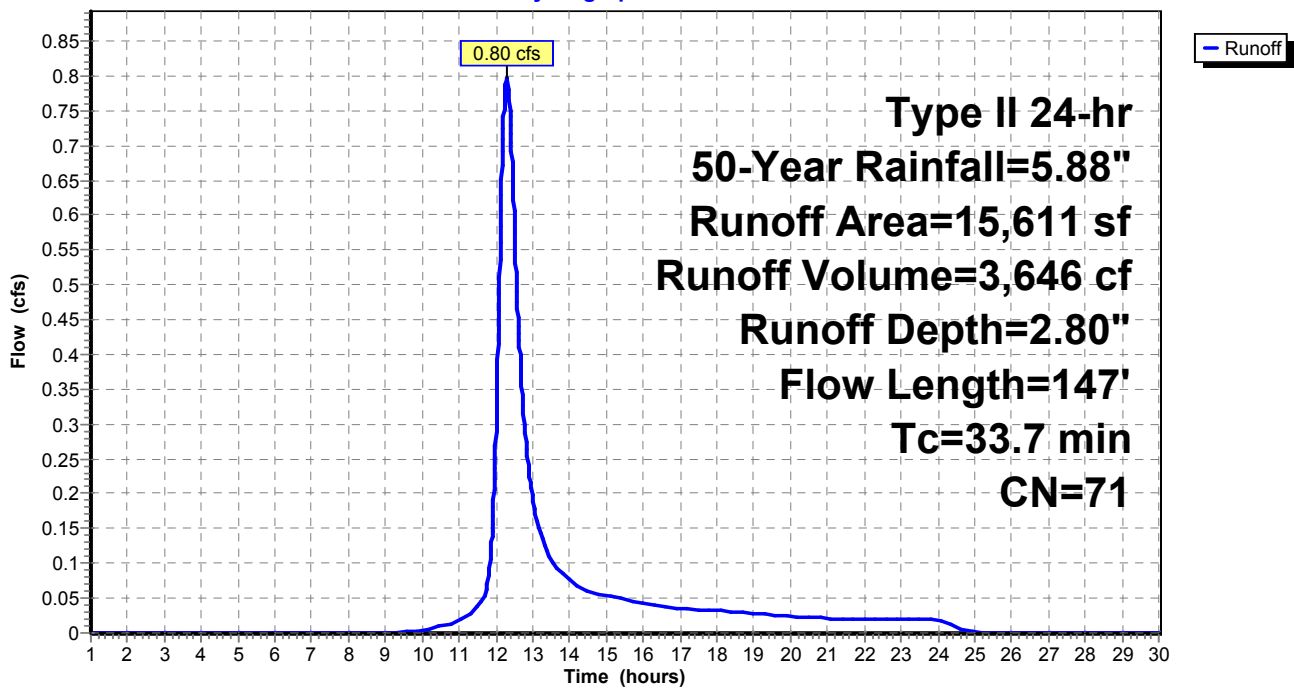
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 50-Year Rainfall=5.88"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 4.40" for 50-Year event
 Inflow = 1.35 cfs @ 12.01 hrs, Volume= 3,266 cf
 Outflow = 1.00 cfs @ 12.08 hrs, Volume= 2,067 cf, Atten= 26%, Lag= 4.3 min
 Primary = 1.00 cfs @ 12.08 hrs, Volume= 2,067 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.62' @ 12.08 hrs Surf.Area= 4,644 sf Storage= 1,420 cf

Plug-Flow detention time= 183.9 min calculated for 2,067 cf (63% of inflow)
 Center-of-Mass det. time= 81.0 min (876.4 - 795.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

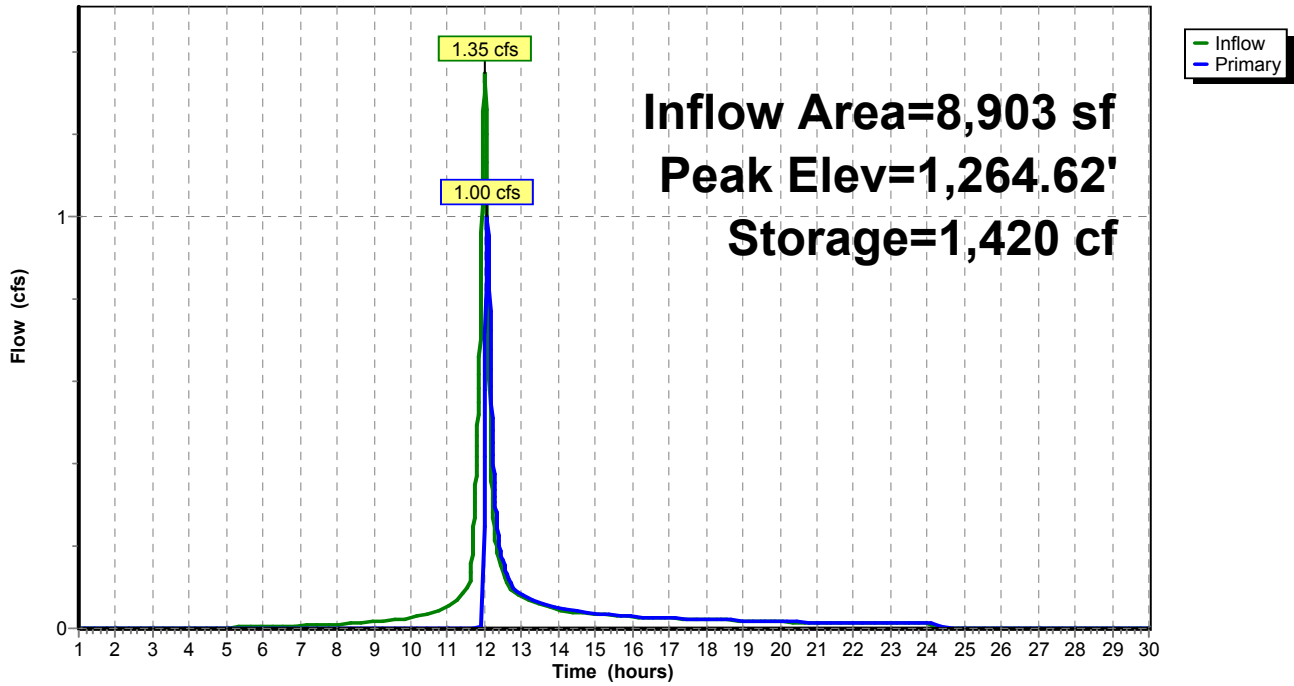
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.00 cfs @ 12.08 hrs HW=1,264.62' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 1.00 cfs @ 0.84 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 1.90" for 50-Year event
 Inflow = 1.22 cfs @ 11.98 hrs, Volume= 4,078 cf
 Outflow = 1.22 cfs @ 11.98 hrs, Volume= 3,730 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.22 cfs @ 11.98 hrs, Volume= 3,730 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.14' @ 11.98 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 64.5 min calculated for 3,729 cf (91% of inflow)
 Center-of-Mass det. time= 20.7 min (923.2 - 902.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

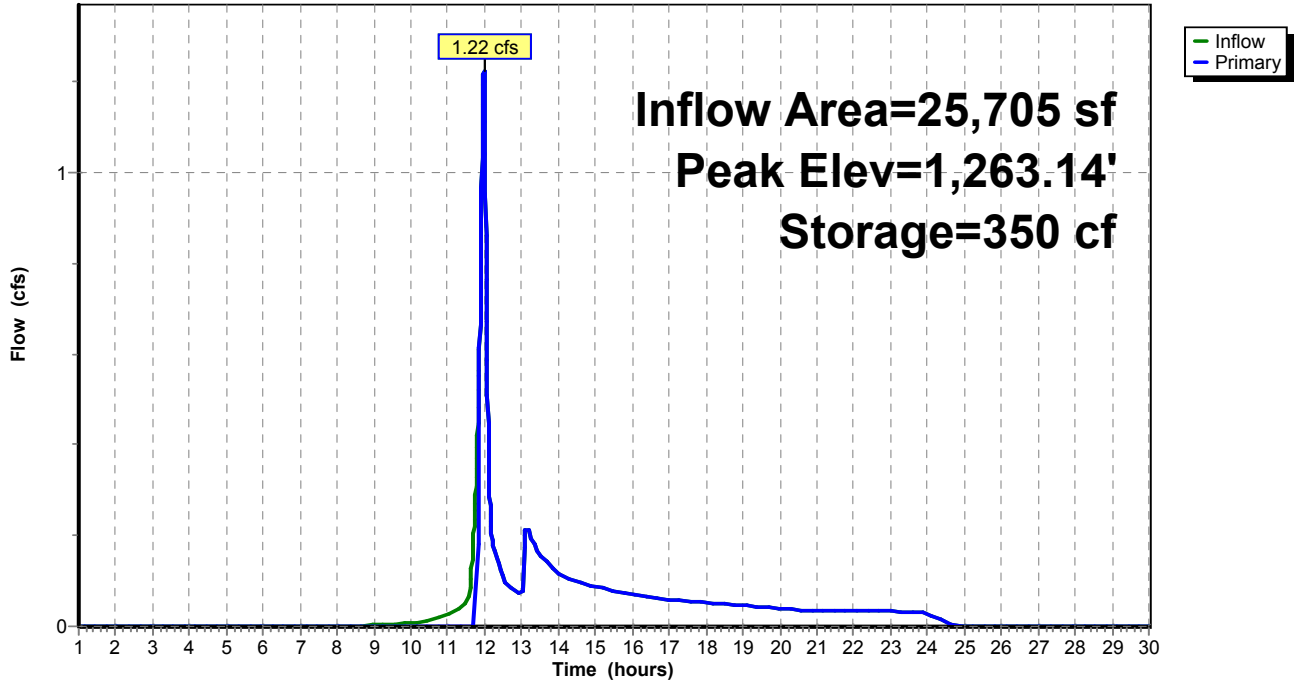
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.22 cfs @ 11.98 hrs HW=1,263.14' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 1.22 cfs @ 0.90 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 2.80" for 50-Year event
 Inflow = 0.80 cfs @ 12.29 hrs, Volume= 3,646 cf
 Outflow = 0.16 cfs @ 13.13 hrs, Volume= 1,564 cf, Atten= 80%, Lag= 50.0 min
 Primary = 0.16 cfs @ 13.13 hrs, Volume= 1,564 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,271.00' @ 13.13 hrs Surf.Area= 2,353 sf Storage= 2,091 cf

Plug-Flow detention time= 290.2 min calculated for 1,563 cf (43% of inflow)
 Center-of-Mass det. time= 161.1 min (1,020.4 - 859.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,269.00	94	74.7	0	0	94
1,269.50	443	134.5	124	124	1,091
1,270.00	977	192.5	346	470	2,602
1,270.50	1,587	229.6	635	1,105	3,853
1,271.00	2,347	279.8	977	2,082	5,892
1,271.50	3,234	306.5	1,389	3,471	7,146

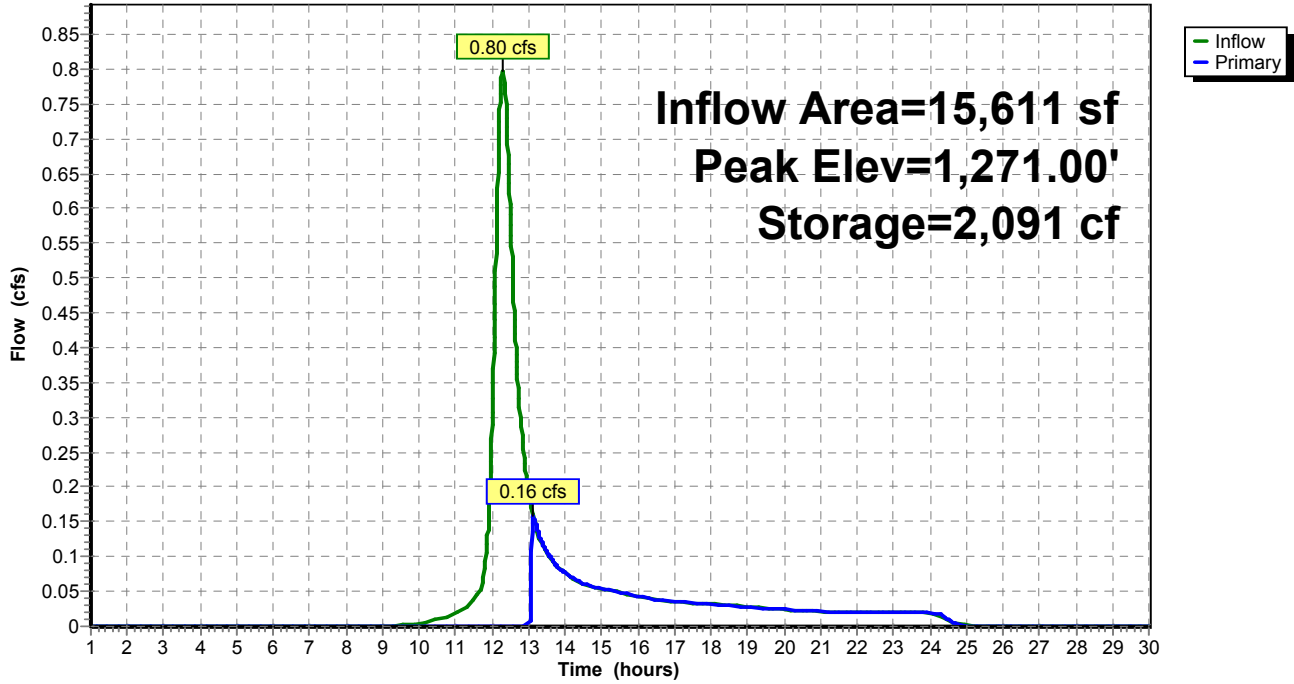
Device	Routing	Invert	Outlet Devices											
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir											
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00											
			2.50 3.00 3.50 4.00 4.50											
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68											
			2.72 2.81 2.92 2.97 3.07 3.32											

Primary OutFlow Max=0.06 cfs @ 13.13 hrs HW=1,271.00' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.06 cfs @ 0.14 fps)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 3.77" for 50-Year event
 Inflow = 0.62 cfs @ 11.93 hrs, Volume= 1,133 cf
 Outflow = 0.62 cfs @ 11.93 hrs, Volume= 1,008 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.62 cfs @ 11.93 hrs, Volume= 1,008 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.10' @ 11.93 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 77.8 min calculated for 1,008 cf (89% of inflow)
 Center-of-Mass det. time= 22.7 min (828.6 - 806.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

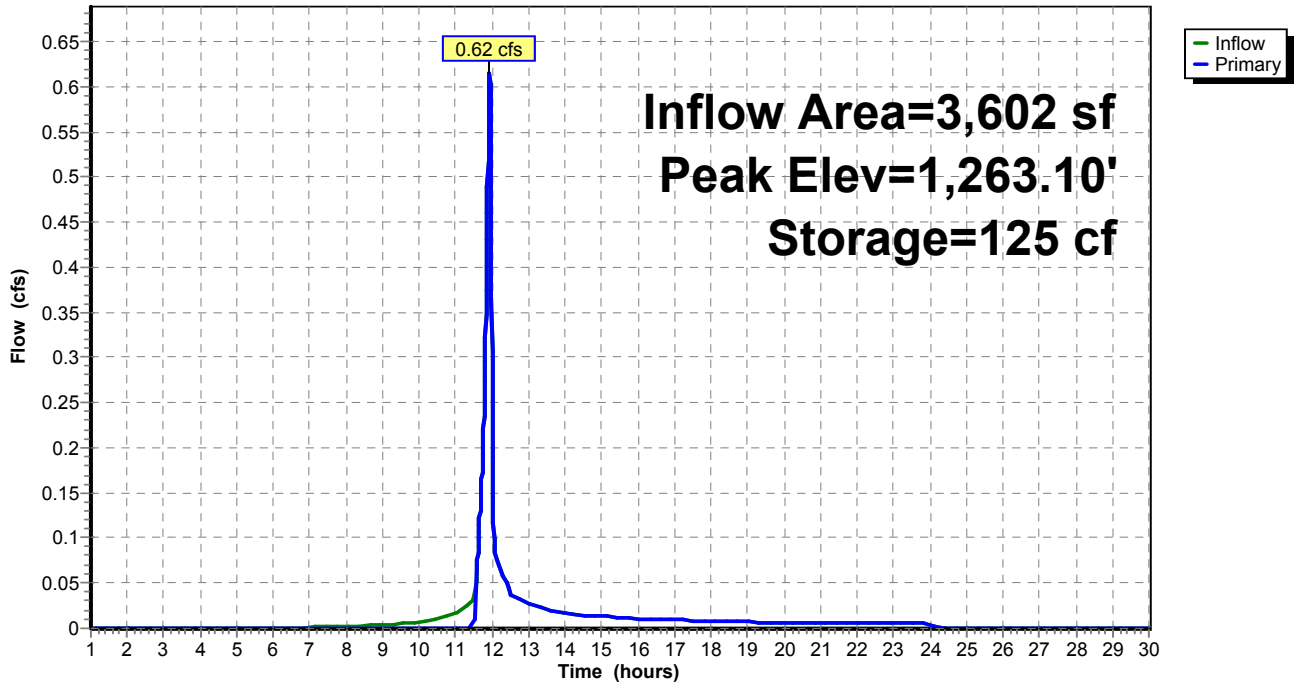
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.61 cfs @ 11.93 hrs HW=1,263.10' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.61 cfs @ 0.77 fps)

Pond 100P: VCI

Hydrograph



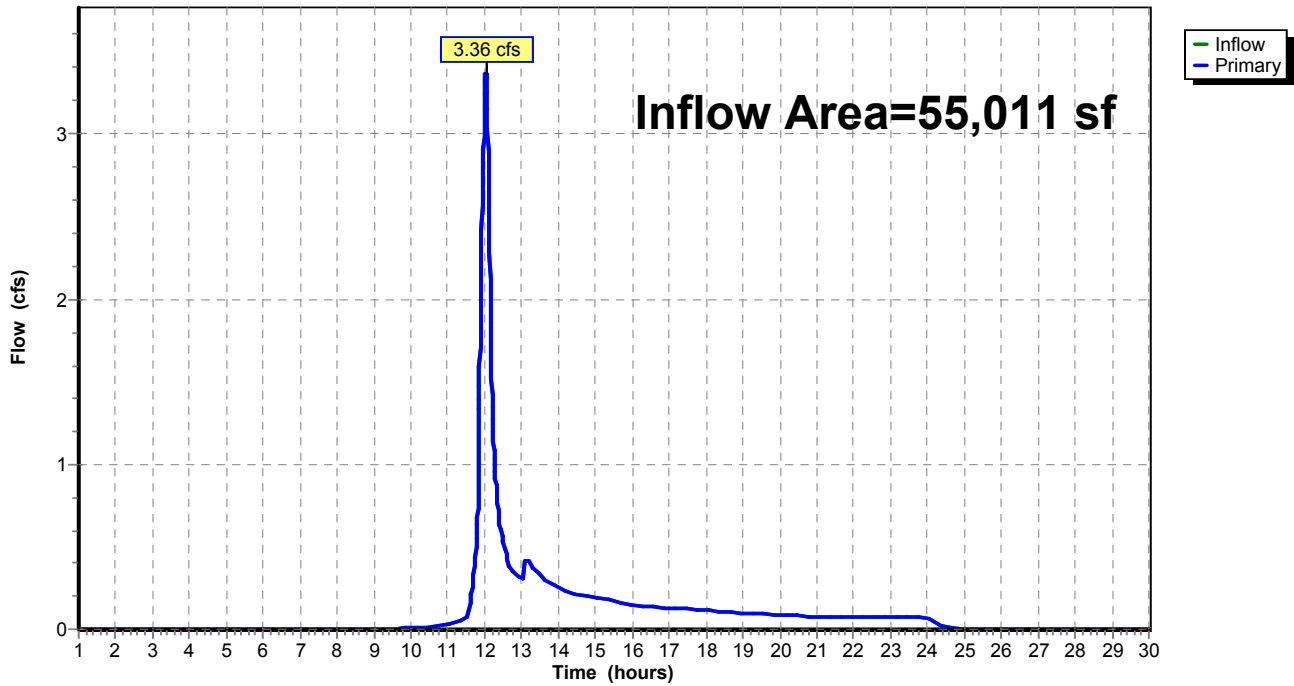
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 2.34" for 50-Year event
Inflow = 3.36 cfs @ 12.03 hrs, Volume= 10,728 cf
Primary = 3.36 cfs @ 12.03 hrs, Volume= 10,728 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



Time span=1.00-30.00 hrs, dt=0.01 hrs, 2901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment5S: DA TO MLV PAD Runoff Area=8,903 sf 57.90% Impervious Runoff Depth=5.32"
Flow Length=145' Tc=9.4 min CN=87 Runoff=1.62 cfs 3,951 cf

Subcatchment10S: DA TO VCI Runoff Area=3,602 sf 12.88% Impervious Runoff Depth=4.66"
Flow Length=165' Tc=2.4 min CN=81 Runoff=0.75 cfs 1,398 cf

Subcatchment12S: OFFSITE DA Runoff Area=16,801 sf 3.30% Impervious Runoff Depth=3.59"
Flow Length=287' Tc=12.1 min CN=71 Runoff=1.98 cfs 5,025 cf

Subcatchment14S: DA TO VCD Runoff Area=10,094 sf 6.41% Impervious Runoff Depth=3.80"
Flow Length=358' Tc=6.3 min CN=73 Runoff=1.54 cfs 3,195 cf

Subcatchment15S: DA TO INFILTRATION Runoff Area=15,611 sf 0.79% Impervious Runoff Depth=3.59"
Flow Length=147' Tc=33.7 min CN=71 Runoff=1.03 cfs 4,669 cf

Pond 6P: MLV PAD Peak Elev=1,264.65' Storage=1,481 cf Inflow=1.62 cfs 3,951 cf
Outflow=1.45 cfs 2,751 cf

Pond 9P: VCD Peak Elev=1,263.16' Storage=350 cf Inflow=1.54 cfs 5,782 cf
Outflow=1.54 cfs 5,436 cf

Pond 10P: INFILTRATIONBERM Peak Elev=1,271.01' Storage=2,114 cf Inflow=1.03 cfs 4,669 cf
Outflow=0.55 cfs 2,588 cf

Pond 100P: VCI Peak Elev=1,263.11' Storage=125 cf Inflow=0.75 cfs 1,398 cf
Outflow=0.75 cfs 1,273 cf

Link 2L: Proposed Conditions Inflow=4.87 cfs 14,486 cf
Primary=4.87 cfs 14,486 cf

Total Runoff Area = 55,011 sf Runoff Volume = 18,237 cf Average Runoff Depth = 3.98"
87.38% Pervious = 48,067 sf 12.62% Impervious = 6,944 sf

Summary for Subcatchment 5S: DA TO MLV PAD

Runoff = 1.62 cfs @ 12.00 hrs, Volume= 3,951 cf, Depth= 5.32"

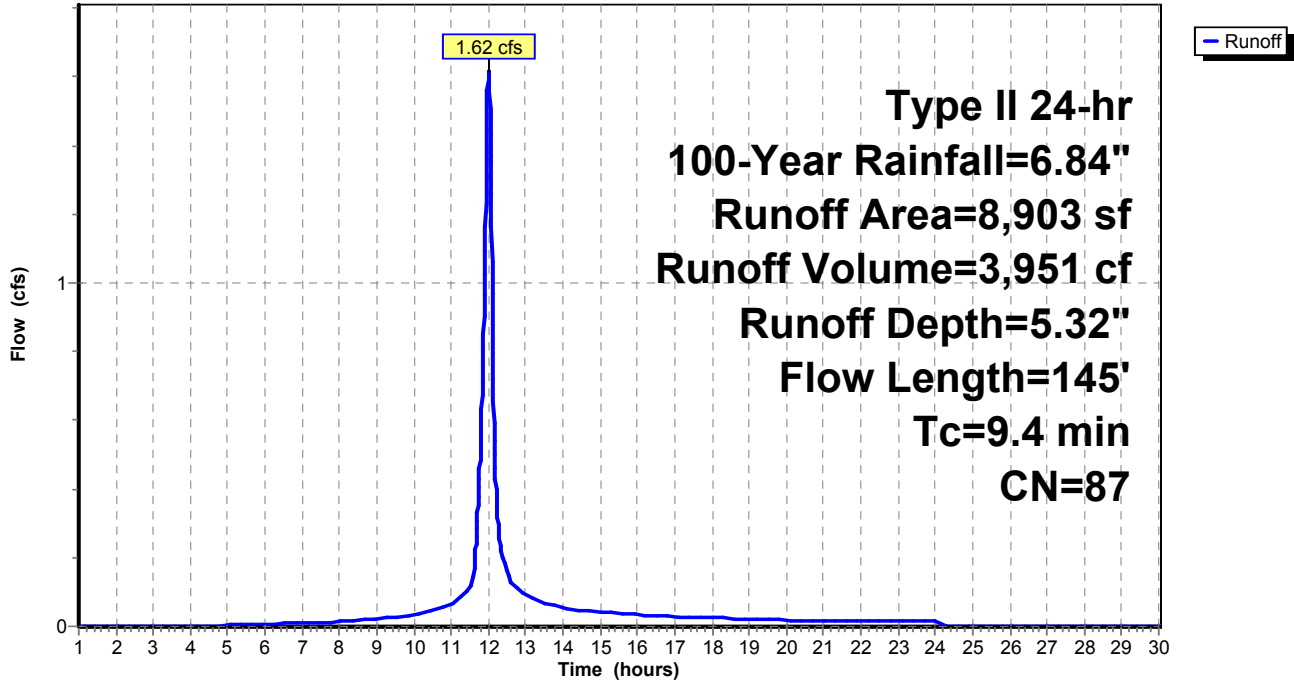
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
152	89	Gravel roads, HSG C
* 5,040	98	Crushed Stone Pad, HSG C
* 115	98	Paved roads , HSG C
* 3,596	71	Meadow Fair, HSG C
0	70	Woods, Good, HSG C
8,903	87	Weighted Average
3,748		42.10% Pervious Area
5,155		57.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0300	0.99		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
3.2	46	0.2000	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
5.3	43	0.0500	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.5	21	0.0100	0.70		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
0.2	24	0.0100	1.61		Shallow Concentrated Flow, SC2 Unpaved Kv= 16.1 fps
9.4	145	Total			

Subcatchment 5S: DA TO MLV PAD

Hydrograph



Summary for Subcatchment 10S: DA TO VCI

Runoff = 0.75 cfs @ 11.93 hrs, Volume= 1,398 cf, Depth= 4.66"

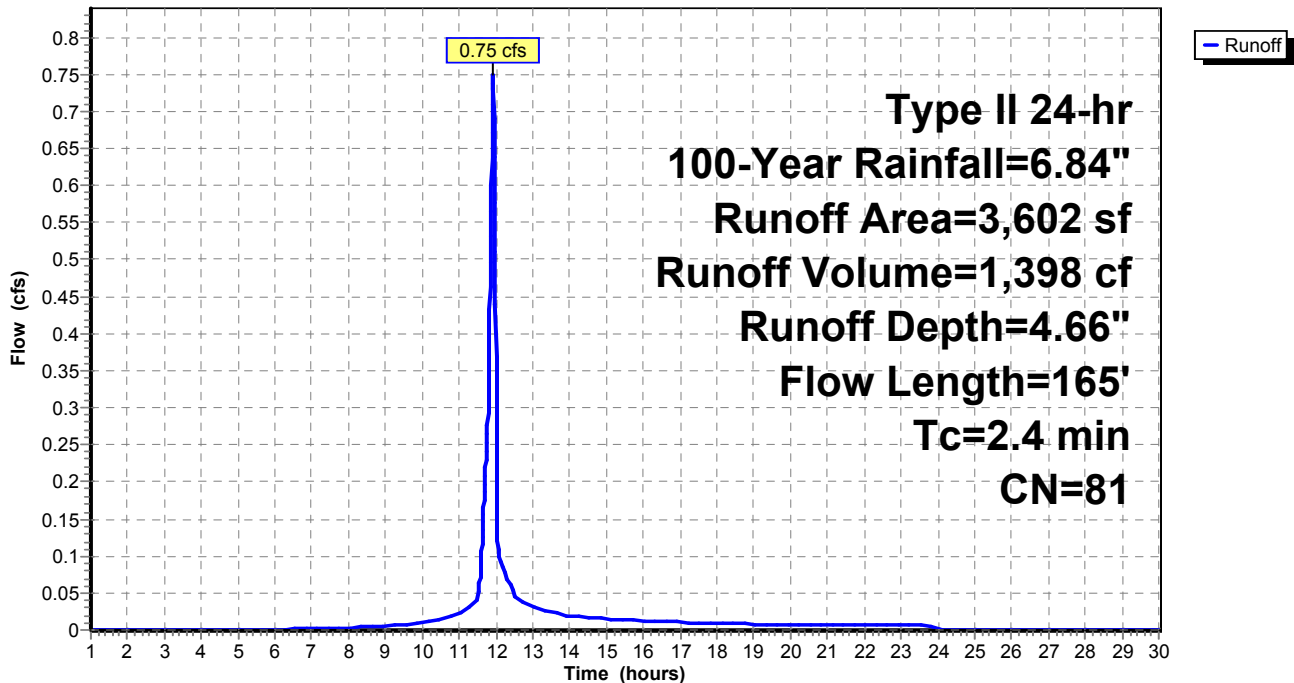
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
* 464	98	Paved road, HSG C
1,267	89	Gravel roads, HSG C
* 1,871	71	Meadow Fair, HSG C
3,602	81	Weighted Average
3,138		87.12% Pervious Area
464		12.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	63	0.0800	2.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
0.3	20	0.0400	1.26		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.92"
1.2	17	0.3300	0.24		Sheet Flow, Grass: Dense n= 0.240 P2= 2.92"
0.4	65	0.0400	3.00		Shallow Concentrated Flow, C1 Grassed Waterway Kv= 15.0 fps
2.4	165	Total			

Subcatchment 10S: DA TO VCI

Hydrograph



Summary for Subcatchment 12S: OFFSITE DA

Runoff = 1.98 cfs @ 12.04 hrs, Volume= 5,025 cf, Depth= 3.59"

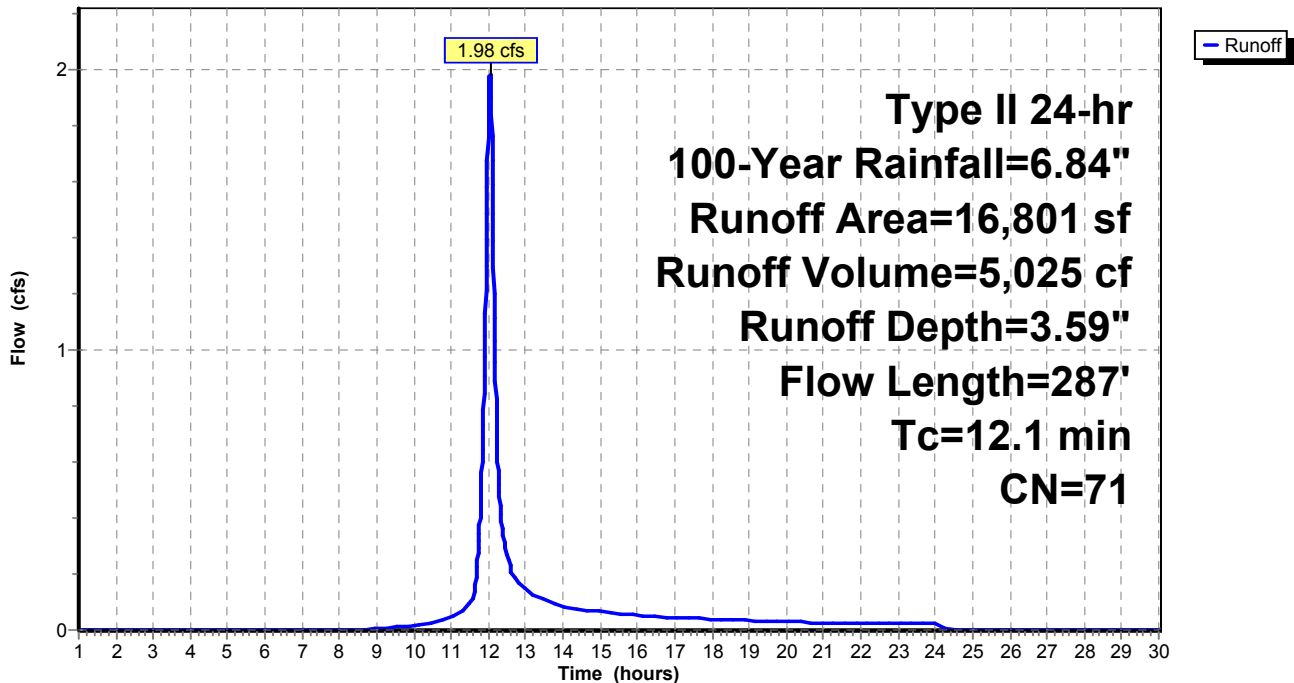
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
555	98	Paved parking, HSG C
11,291	70	Woods, Good, HSG C
4,955	71	Meadow, non-grazed, HSG C
16,801	71	Weighted Average
16,246		96.70% Pervious Area
555		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	61	0.0400	1.57		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
0.9	8	0.1300	0.14		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
7.3	31	0.1300	0.07		Sheet Flow, Sheet3 Woods: Dense underbrush n= 0.800 P2= 2.92"
3.3	187	0.0350	0.94		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
12.1	287	Total			

Subcatchment 12S: OFFSITE DA

Hydrograph



Summary for Subcatchment 14S: DA TO VCD

Runoff = 1.54 cfs @ 11.98 hrs, Volume= 3,195 cf, Depth= 3.80"

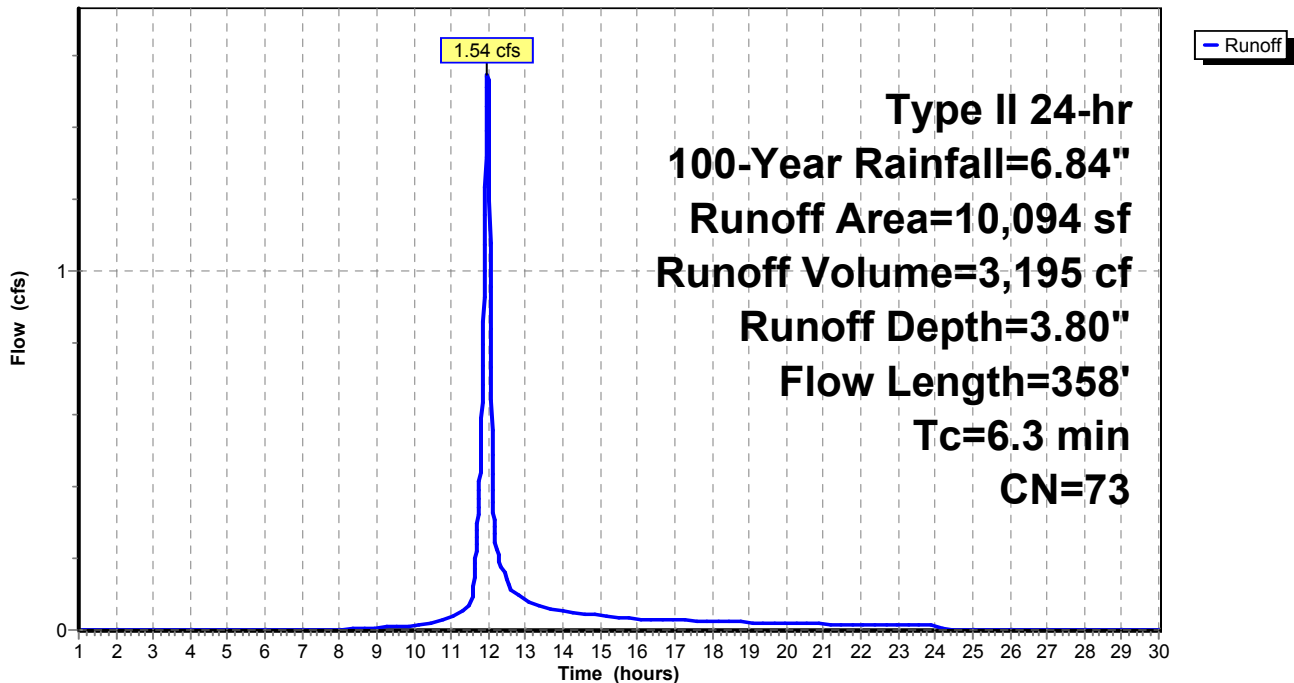
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
647	98	Paved parking, HSG C
650	70	Woods, Good, HSG C
8,797	71	Meadow, non-grazed, HSG C
10,094	73	Weighted Average
9,447		93.59% Pervious Area
647		6.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	70	0.0400	1.61		Sheet Flow, Sheet1 Smooth surfaces n= 0.011 P2= 2.92"
2.7	30	0.1300	0.19		Sheet Flow, Sheet2 Grass: Dense n= 0.240 P2= 2.92"
0.1	9	0.1300	2.52		Shallow Concentrated Flow, SC1 Short Grass Pasture Kv= 7.0 fps
2.8	249	0.0100	1.50		Shallow Concentrated Flow, SC2 Grassed Waterway Kv= 15.0 fps
6.3	358	Total			

Subcatchment 14S: DA TO VCD

Hydrograph



Summary for Subcatchment 15S: DA TO INFILTRATION BERM

Runoff = 1.03 cfs @ 12.29 hrs, Volume= 4,669 cf, Depth= 3.59"

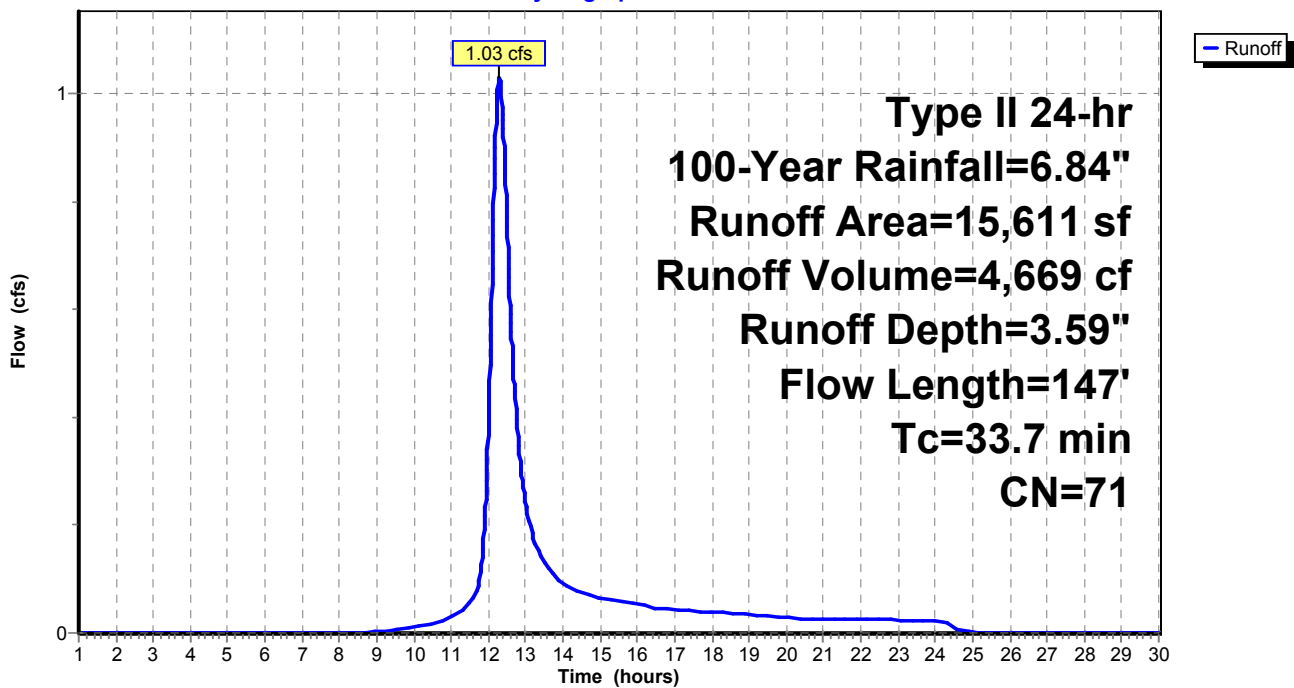
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs
 Type II 24-hr 100-Year Rainfall=6.84"

Area (sf)	CN	Description
123	98	Paved parking, HSG C
10,225	70	Woods, Good, HSG C
5,263	71	Meadow, non-grazed, HSG C
15,611	71	Weighted Average
15,488		99.21% Pervious Area
123		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.3	100	0.0300	0.05		Sheet Flow, Sheet1 Woods: Dense underbrush n= 0.800 P2= 2.92"
0.1	11	0.0700	1.32		Shallow Concentrated Flow, SC1 Woodland Kv= 5.0 fps
0.3	36	0.0800	1.98		Shallow Concentrated Flow, SC2 Short Grass Pasture Kv= 7.0 fps
33.7	147	Total			

Subcatchment 15S: DA TO INFILTRATION BERM

Hydrograph



Summary for Pond 6P: MLV PAD

Inflow Area = 8,903 sf, 57.90% Impervious, Inflow Depth = 5.32" for 100-Year event
 Inflow = 1.62 cfs @ 12.00 hrs, Volume= 3,951 cf
 Outflow = 1.45 cfs @ 12.05 hrs, Volume= 2,751 cf, Atten= 10%, Lag= 2.6 min
 Primary = 1.45 cfs @ 12.05 hrs, Volume= 2,751 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 1,264.65' @ 12.05 hrs Surf.Area= 4,644 sf Storage= 1,481 cf

Plug-Flow detention time= 164.4 min calculated for 2,751 cf (70% of inflow)
 Center-of-Mass det. time= 68.2 min (858.2 - 790.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,263.00'	2,128 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 5,320 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,263.00	0	0	0
1,263.50	813	203	203
1,264.00	2,861	919	1,122
1,264.50	4,644	1,876	2,998
1,265.00	4,645	2,322	5,320

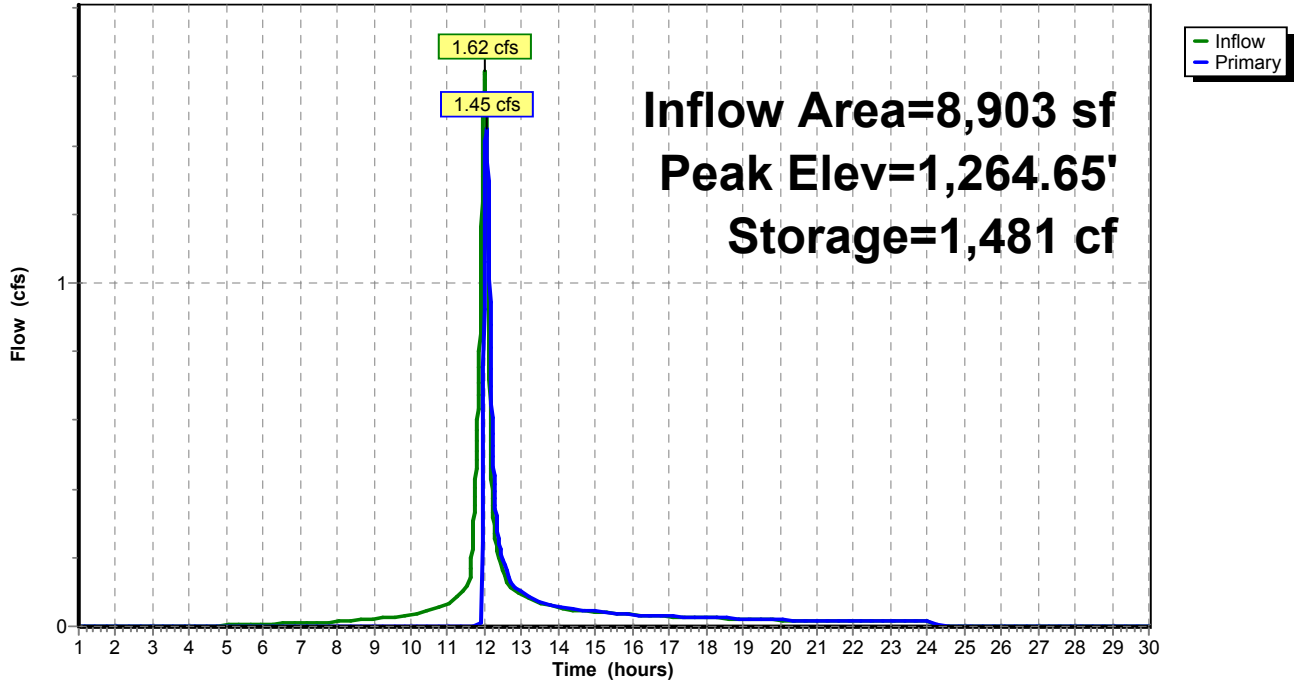
Device	Routing	Invert	Outlet Devices
#1	Primary	1,264.50'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.44 cfs @ 12.05 hrs HW=1,264.65' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 1.44 cfs @ 0.95 fps)

Pond 6P: MLV PAD

Hydrograph



Summary for Pond 9P: VCD

Inflow Area = 25,705 sf, 3.00% Impervious, Inflow Depth = 2.70" for 100-Year event
 Inflow = 1.54 cfs @ 11.98 hrs, Volume= 5,782 cf
 Outflow = 1.54 cfs @ 11.98 hrs, Volume= 5,436 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.54 cfs @ 11.98 hrs, Volume= 5,436 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 8
 Peak Elev= 1,263.16' @ 11.98 hrs Surf.Area= 0 sf Storage= 350 cf

Plug-Flow detention time= 46.4 min calculated for 5,436 cf (94% of inflow)
 Center-of-Mass det. time= 14.1 min (895.4 - 881.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	351 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	175
1,263.00	350
1,263.50	351

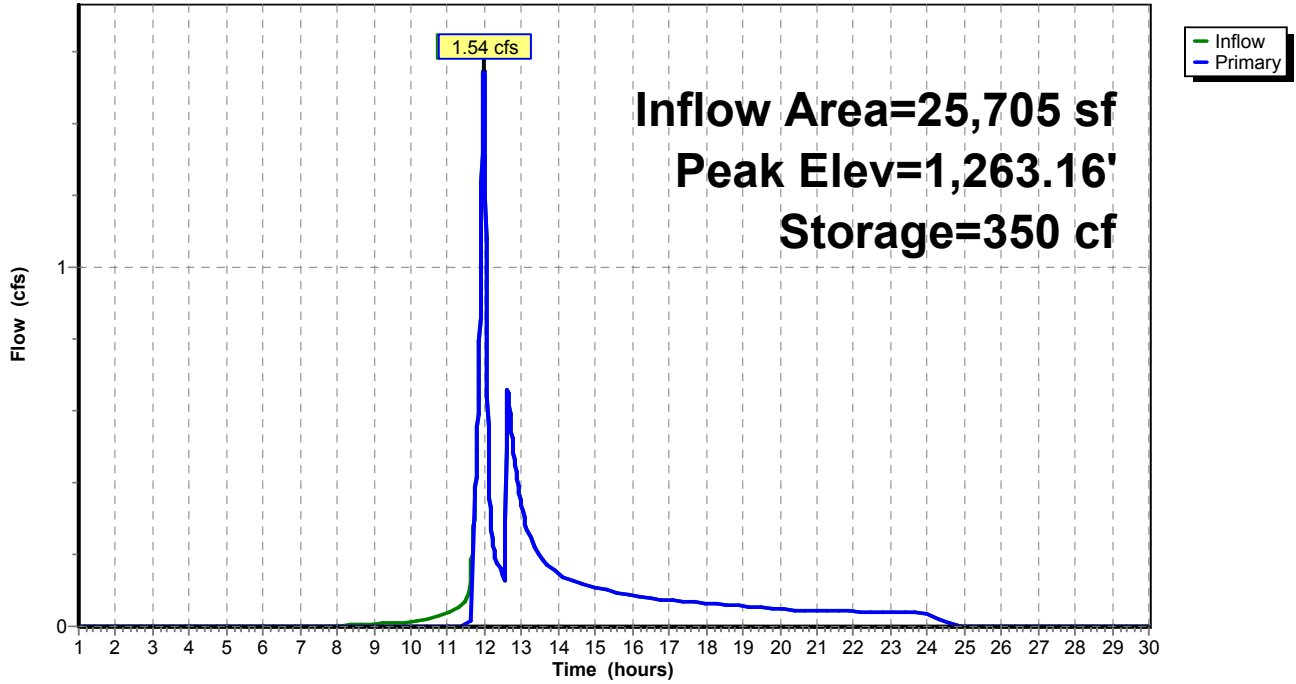
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	10.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.54 cfs @ 11.98 hrs HW=1,263.16' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 1.54 cfs @ 0.97 fps)

Pond 9P: VCD

Hydrograph



Summary for Pond 10P: INFILTRATION BERM

Inflow Area = 15,611 sf, 0.79% Impervious, Inflow Depth = 3.59" for 100-Year event
 Inflow = 1.03 cfs @ 12.29 hrs, Volume= 4,669 cf
 Outflow = 0.55 cfs @ 12.62 hrs, Volume= 2,588 cf, Atten= 47%, Lag= 19.9 min
 Primary = 0.55 cfs @ 12.62 hrs, Volume= 2,588 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,271.01' @ 12.62 hrs Surf.Area= 2,367 sf Storage= 2,114 cf

Plug-Flow detention time= 220.3 min calculated for 2,588 cf (55% of inflow)
 Center-of-Mass det. time= 101.9 min (954.1 - 852.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	1,269.00'	3,471 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
1,269.00	94	74.7	0	0	94	
1,269.50	443	134.5	124	124	1,091	
1,270.00	977	192.5	346	470	2,602	
1,270.50	1,587	229.6	635	1,105	3,853	
1,271.00	2,347	279.8	977	2,082	5,892	
1,271.50	3,234	306.5	1,389	3,471	7,146	

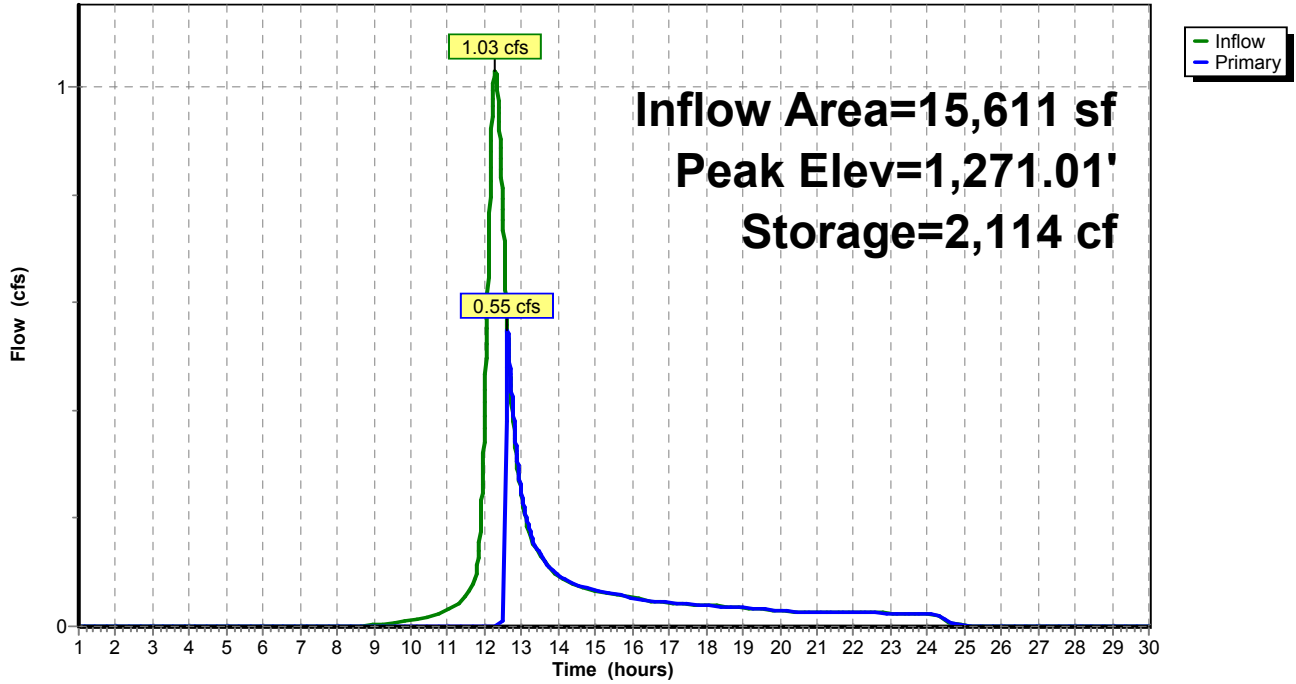
Device	Routing	Invert	Outlet Devices												
#1	Primary	1,271.00'	125.0' long x 3.0' breadth Broad-Crested Rectangular Weir												
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00												
			2.50 3.00 3.50 4.00 4.50												
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68												
			2.72 2.81 2.92 2.97 3.07 3.32												

Primary OutFlow Max=0.37 cfs @ 12.62 hrs HW=1,271.01' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.37 cfs @ 0.26 fps)

Pond 10P: INFILTRATION BERM

Hydrograph



Summary for Pond 100P: VCI

Inflow Area = 3,602 sf, 12.88% Impervious, Inflow Depth = 4.66" for 100-Year event
 Inflow = 0.75 cfs @ 11.93 hrs, Volume= 1,398 cf
 Outflow = 0.75 cfs @ 11.93 hrs, Volume= 1,273 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.75 cfs @ 11.93 hrs, Volume= 1,273 cf

Routing by Stor-Ind method, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs / 6
 Peak Elev= 1,263.11' @ 11.93 hrs Surf.Area= 0 sf Storage= 125 cf

Plug-Flow detention time= 67.5 min calculated for 1,273 cf (91% of inflow)
 Center-of-Mass det. time= 20.8 min (820.8 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	126 cf	Custom Stage Data Listed below

Elevation (feet)	Cum.Store (cubic-feet)
1,262.00	0
1,262.50	63
1,263.00	125
1,263.50	126

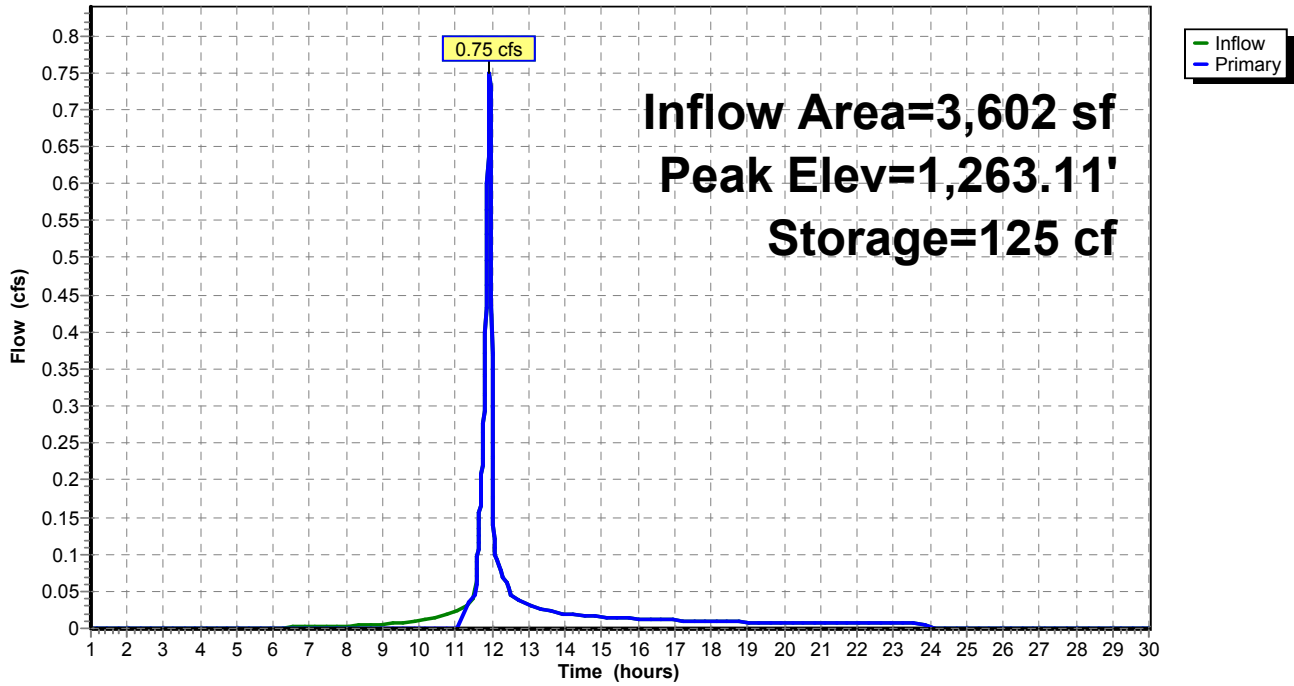
Device	Routing	Invert	Outlet Devices
#1	Primary	1,263.00'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.75 cfs @ 11.93 hrs HW=1,263.11' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir**(Weir Controls 0.75 cfs @ 0.82 fps)

Pond 100P: VCI

Hydrograph



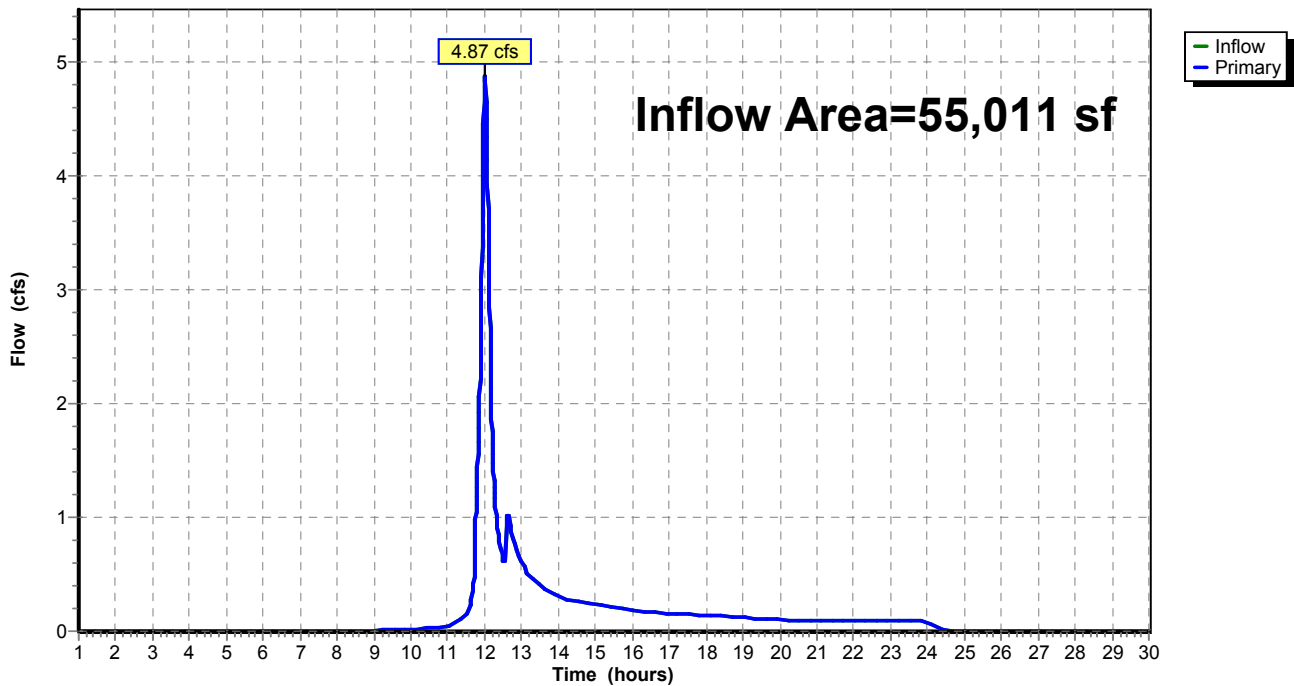
Summary for Link 2L: Proposed Conditions

Inflow Area = 55,011 sf, 12.62% Impervious, Inflow Depth = 3.16" for 100-Year event
Inflow = 4.87 cfs @ 12.01 hrs, Volume= 14,486 cf
Primary = 4.87 cfs @ 12.01 hrs, Volume= 14,486 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.01 hrs

Link 2L: Proposed Conditions

Hydrograph



G.5 Conveyance Calculations

- a. E&S Worksheet 11
- b. NAG Swale Lining Analysis
- c. Figure 9.3-Riprap Apron Design

E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Atlantic Sunrise _____

LOCATION: AR-LU-007.1 Vegetated Channel for Infiltration (VCI) _____

PREPARED BY: JMS **REVISED BY: JMS** DATE: 9/28/15 **REV 09/19/16**

CHECKED BY: BJP **CHECKED BY: SMK** DATE: 9/28/15 **REV 09/19/16**

CHANNEL OR CHANNEL SECTION	AR-LU-007.1 VCI	AR-LU-007.1 VCI
TEMPORARY OR PERMANENT? (T OR P)	P	P
DESIGN STORM (2, 5, OR 10 YR)	10	10
ACRES (AC)	0.08	0.08
MULTIPLIER ¹ (1.6, 2.25, or 2.75) ¹	N/A	N/A
Qr (REQUIRED CAPACITY) (CFS)	0.38	0.38
Q (CALCULATED AT FLOW DEPTH d) (CFS)	0.40	0.38
PROTECTIVE LINING ²	SC250	SC250 REINFORCED VEGETATION
n (MANNING'S COEFFICIENT) ²	0.04	0.25
Va (ALLOWABLE VELOCITY) (FPS)	N/A	N/A
V (CALCULATED AT FLOW DEPTH d) (FPS)	1.55	0.44
τa (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)	2.50	8.00
τd (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)	0.27	0.75
CHANNEL BOTTOM WIDTH (FT)	2	2
CHANNEL SIDE SLOPES (H:V)	3	3
D (TOTAL DEPTH) (FT)	1.5	1.5
CHANNEL TOP WIDTH @ D (FT)	11	11
d (CALCULATED FLOW DEPTH) (FT)	0.11	0.30
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	2.66	3.80
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	18.18	6.67
d50 STONE SIZE (IN)	N/A	N/A
A (CROSS-SECTIONAL AREA) (SQ. FT.)	0.26	0.87
R (HYDRAULIC RADIUS)	0.10	0.22
S (BED SLOPE) ³ (FT/FT)	0.04	0.04
Sc (CRITICAL SLOPE) (FT/FT)	0.052	1.539
.7Sc (FT/FT)	0.036	1.077
1.3Sc (FT/FT)	0.067	2.000
STABLE FLOW? (Y/N)	N	Y
FREEBOARD BASED ON UNSTABLE FLOW (FT)	0.01	0.0
FREEBOARD BASED ON STABLE FLOW (FT)	0.50	0.5
MINIMUM REQUIRED FREEBOARD ⁴ (FT)	0.50	0.5
DESIGN METHOD FOR PROTECTIVE LINING ⁵ PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	S	S

EQUIVALENT PIPE CALCULATION:

Q n s (ft/ft) D (ft.) D (in) Round up to:
0.40 0.013 0.04 0.338 4.059 **12" pipe**

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8}$$

Pipe Equivalence Calculation for Sizing Rip Rap Apron:

Use Manning's Equation

$$Q = (1.49/n)*A*(R^{2/3})*S^{1/2}$$

Q = Flow Rate from Worksheet 11 (cfs)

n = Manning's Constant for Smooth Plastic Pipe = 0.013 (unitless)

A = Area of Pipe (ft) = 0.25 * Pi * D²

D = Diameter of Pipe (ft)

R = Hydraulic Radius = A / P = (0.25 * Pi * D²) / (Pi * D) = 0.25 * D

P = Perimeter of Pipe (ft) = Pi * D

S = Slope of channel from Worksheet 11 (ft/ft)

Solve Manning's Equation for Diameter of Pipe:

$$Q = (1.49/n)*A*(R^{2/3})*S^{1/2}$$

$$Q = (1.49/n)*(0.25*Pi*D^2)*((0.25*D)^{2/3})*S^{1/2}$$

$$Q*n*/(1.49*S^{1/2}) = (0.25*Pi*D^2)*((0.25*D)^{2/3})$$

$$Q*n*/(1.49*S^{1/2})*0.25*(0.25^{2/3}) = (Pi*D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478) = (D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478) = (D^8/3)$$

$$(Q*n*/(S^{1/2}*Pi*0.1478))^{3/8} = D$$

Multiply by 12 to convert feet to inches:

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8} * 12$$

- Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
- Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
- Slopes may not be averaged.
- Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater
- Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Atlantic Sunrise

LOCATION: AR-LU-007.1 Vegetated Channel for Diversion Purposes (VCD)

PREPARED BY: JMS **REVISED BY: JMS**

DATE: 9/28/15 **REV 09/19/16**

CHECKED BY: BJP **CHECKED BY: SK**

DATE: 9/28/15 **REV 09/19/16**

CHANNEL OR CHANNEL SECTION	AR-LU-007.1 VCD	AR-LU-007.1 VCD
TEMPORARY OR PERMANENT? (T OR P)	P	P
DESIGN STORM (2, 5, OR 10 YR)	10	10
ACRES (AC)	0.23	0.23
MULTIPLIER ¹ (1.6, 2.25, or 2.75) ¹	N/A	N/A
Qr (REQUIRED CAPACITY) (CFS)	0.67	0.67
Q (CALCULATED AT FLOW DEPTH d) (CFS)	0.67	0.68
PROTECTIVE LINING ²	SC250	SC250 REINFORCED VEGETATION
n (MANNING'S COEFFICIENT) ²	0.04	0.25
Va (ALLOWABLE VELOCITY) (FPS)	N/A	N/A
V (CALCULATED AT FLOW DEPTH d) (FPS)	1.15	0.31
τa (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)	2.50	8.00
τd (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)	0.14	0.36
CHANNEL BOTTOM WIDTH (FT)	2	2
CHANNEL SIDE SLOPES (H:V)	3	3
D (TOTAL DEPTH) (FT)	1.5	1.5
CHANNEL TOP WIDTH @ D (FT)	11	11
d (CALCULATED FLOW DEPTH) (FT)	0.22	0.58
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	3.32	5.48
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	9.09	3.45
d50 STONE SIZE (IN)	N/A	N/A
A (CROSS-SECTIONAL AREA) (SQ. FT.)	0.59	2.17
R (HYDRAULIC RADIUS)	0.17	0.38
S (BED SLOPE) ³ (FT/FT)	0.01	0.01
Sc (CRITICAL SLOPE) (FT/FT)	0.043	1.296
.7Sc (FT/FT)	0.030	0.908
1.3Sc (FT/FT)	0.056	1.685
STABLE FLOW? (Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW (FT)	0.02	0.0
FREEBOARD BASED ON STABLE FLOW (FT)	0.50	0.5
MINIMUM REQUIRED FREEBOARD ⁴ (FT)	0.50	0.5
DESIGN METHOD FOR PROTECTIVE LINING ⁵ PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	S	S

EQUIVALENT PIPE CALCULATION:

Q n s (ft/ft) D (ft.) D (in) Round up to:
0.68 0.013 0.01 0.537 6.442 **12" pipe**

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8}$$

Pipe Equivalence Calculation for Sizing Rip Rap Apron:

Use Manning's Equation

$$Q = (1.49/n)*A*(R^{2/3})*(S^{1/2})$$

Q = Flow Rate from Worksheet 11 (cfs)

n = Manning's Constant for Smooth Plastic Pipe = 0.013 (unitless)

A = Area of Pipe (ft) = 0.25 * Pi * D²

D = Diameter of Pipe (ft)

R = Hydraulic Radius = A / P = (0.25 * Pi * D²) / (Pi * D) = 0.25 * D

P = Perimeter of Pipe (ft) = Pi * D

S = Slope of channel from Worksheet 11 (ft/ft)

Solve Manning's Equation for Diameter of Pipe:

$$Q = (1.49/n)*A*(R^{2/3})*(S^{1/2})$$

$$Q = (1.49/n)*(0.25*Pi*D^2)*((0.25*D)^{2/3})*(S^{1/2})$$

$$Q*n*/(1.49*S^{1/2}) = (0.25*Pi*D^2)*((0.25*D)^{2/3})$$

$$Q*n*/(1.49*S^{1/2})*0.25*(0.25^{2/3}) = (Pi*D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478) = (D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478) = (D^8/3)$$

$$(Q*n*/(S^{1/2}*Pi*0.1478))^{3/8} = D$$

Multiply by 12 to convert feet to inches:

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8} * 12$$

- Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
- Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
- Slopes may not be averaged.
- Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater
- Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.



Tensar International Corporation
 5401 St. Wendel-Cynthiana Road
 Poseyville, Indiana 47633
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 www.nagreen.com

**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: ASR Access Roads
 Project Number: 63544
 Channel Name: AR-LU-007.1 VCI**

Discharge	0.38
Peak Flow Period	24
Channel Slope	0.04
Channel Bottom Width	2
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Silt Loam

SC250 - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	0.38 cfs	1.53 ft/s	0.11 ft	0.04	2.5 lbs/ft ²	0.27 lbs/ft ²	9.33	STABLE	E
SC250 Reinforced Vegetation	Straight	0.38 cfs	0.44 ft/s	0.3 ft	0.25	8 lbs/ft ²	0.75 lbs/ft ²	10.69	STABLE	E
Underlying Substrate	Straight	0.38 cfs	0.44 ft/s	0.3 ft	--	0.8 lbs/ft ²	0.005 lbs/ft ²	167.26	STABLE	--



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 5401 St. Wendel-Cynthiana Road
 Poseyville, Indiana 47633
 Tel. 800.772.2040
 Fax 812.867.0247
 www.nagreen.com

**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: ASR Access Roads
 Project Number: 63544
 Channel Name: AR-LU-007.1 VCD**

Discharge	0.67
Peak Flow Period	24
Channel Slope	0.01
Channel Bottom Width	2
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Silt Loam

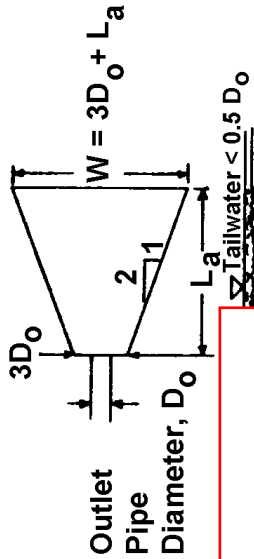
SC250 - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	0.67 cfs	1.15 ft/s	0.22 ft	0.04	2.5 lbs/ft ²	0.14 lbs/ft ²	18.26	STABLE	E
SC250 Reinforced Vegetation	Straight	0.67 cfs	0.31 ft/s	0.58 ft	0.25	8 lbs/ft ²	0.36 lbs/ft ²	22.25	STABLE	E
Underlying Substrate	Straight	0.67 cfs	0.31 ft/s	0.58 ft	--	0.8 lbs/ft ²	0.002 lbs/ft ²	375.35	STABLE	--

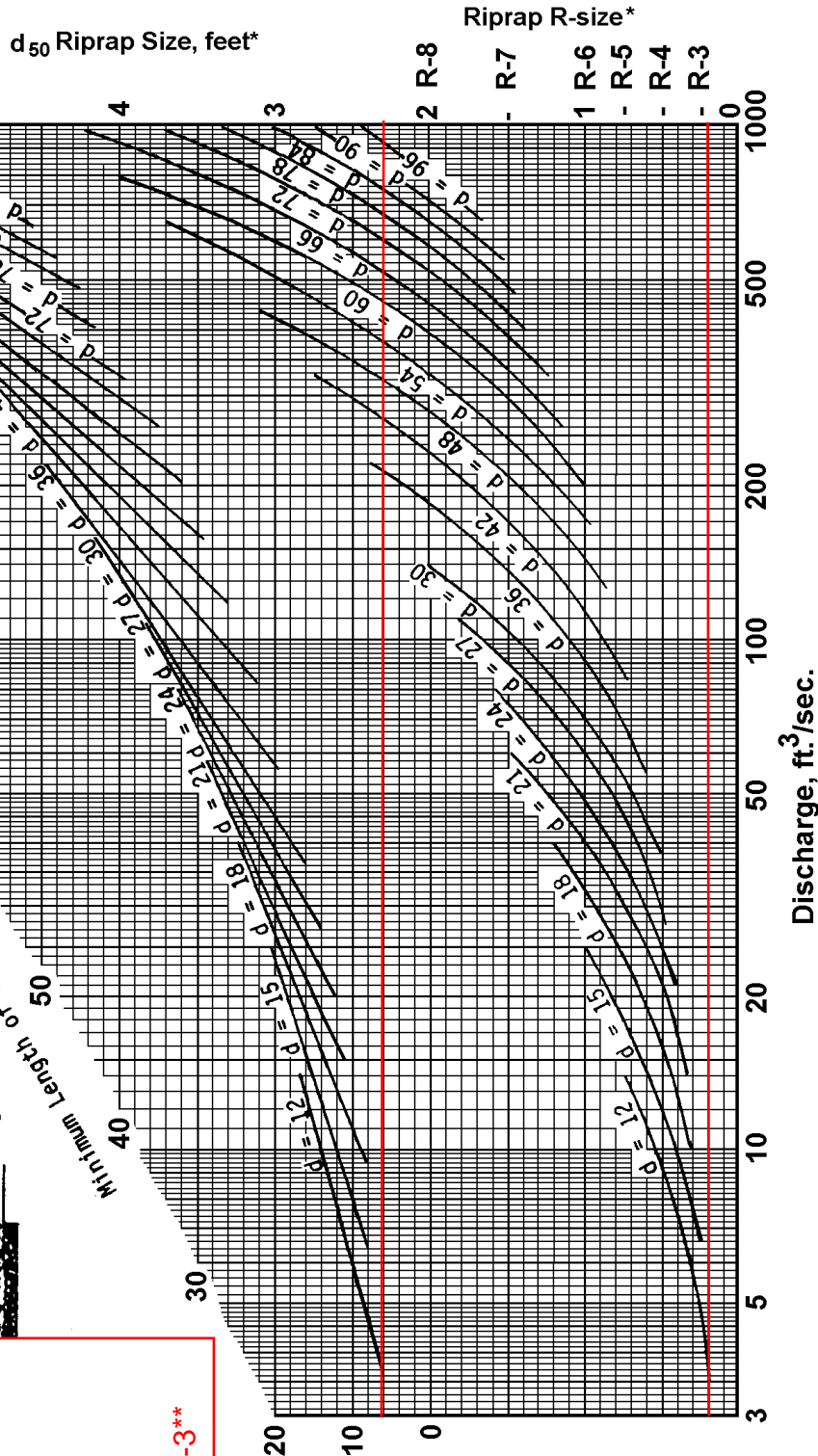
FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION ($T_w < 0.5$ DIAMETER)

Adapted from USDA - NRCS



Do=1'*
3Do=3'*
La=6' **
W=9'***
Rt=9"
Riprap R-Size=R-3**

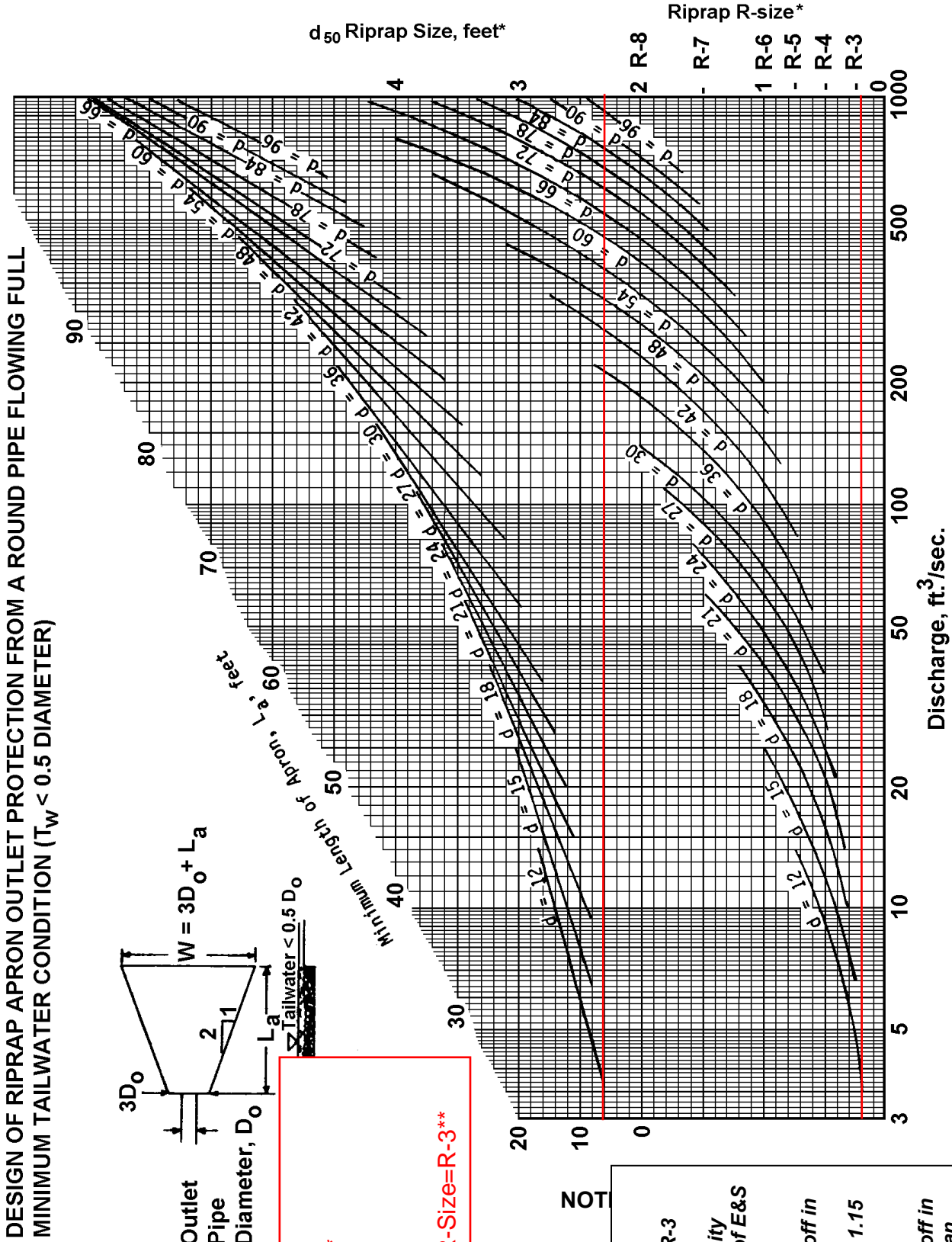


NOT
 for Box Cu

Check Velocity
Riprap R-Size: R-3
Maximum Velocity
from Table 6.6 of E&S
Manual: 6.5 ft/s
Velocity of Runoff in
Channel from
Worksheet #11: 1.55
ft/s
Velocity of Runoff in
Channel less than
Maximum? Yes

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.
 ** DIMENSIONS BASED ON MINIMUM SIZING CRITERIA FROM CHART

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



**$D_o=1'$ **
 $3D_o=3'$ **
 $L_a=6'$ **
 $W=9'$ **
 $Rt=9'$
 Riprap R-Size=R-3****

NOT
 Check Velocity
 Riprap R-Size: R-3
 Maximum Velocity
 from Table 6.6 of E&S
 Manual: 6.5 ft/s
 Velocity of Runoff in
 Channel from
 Worksheet #11: 1.15
 ft/s
 Velocity of Runoff in
 Channel less than
 Maximum? Yes

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.
 ** DIMENSIONS BASED ON MINIMUM SIZING CRITERIA FROM CHART

G.6 PCSM BMP Calculations

- a. Check Dam Volume Calculations

**ATLANTIC SUNRISE NATURAL GAS PIPELINE PROJECT
(ACCESS ROAD) VEGETATED CHANNEL CHECKDAM VOLUME
PAR LU-007.1-Vegetated Channel for Infiltration**

8/8/2016

TOTAL REACH VOLUME = 125 CF Width (W_B): 2 FT. Depth (H): 1 FT.

VEGETATED CHANNEL PAR-LU-007.1

ROAD STA 1+34 to 2+84

Input data

S = 0.040 ft/ft
H = 1 ft
 W_B = 2
 z_1 = 3
 z_2 = 3

Output data

L_{storage} = 25 ft
 W_T = 8 ft
 $W_T + W_B$ = 10 ft
V = 63 cf
 L_{spacing} = 30 ft
No. of Check Dams = 2
Subreach Volume = 125 CF

Infiltration(Q_i)

Infiltration Depth = 12 in
Field Q_i = 4.59 in/hr
Factor of Safety = 2.0
Reduced Q_i = 2.3 in/hr
Dewatering Time = 5.23 hr
Less than 72 hours? YES

**ATLANTIC SUNRISE NATURAL GAS PIPELINE PROJECT
(ACCESS ROAD) VEGETATED CHANNEL CHECKDAM VOLUME
PAR LU-007.1-Vegetated Channel for Diversion**

8/8/2016

TOTAL REACH VOLUME = 250 CF Width (W_B): 2 FT. Depth (H): 1 FT.

VEGETATED CHANNEL PAR-LU-007.1

ROAD STA 0+00 to 1+75

Input data

S = 0.010 ft/ft
H = 1 ft
 W_B = 2
 z_1 = 3
 z_2 = 3

Output data

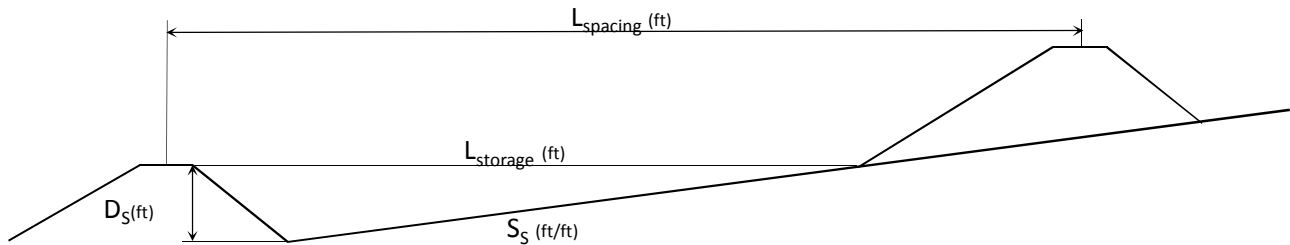
L_{storage} = 100 ft
 W_T = 8 ft
 $W_T + W_B$ = 10 ft
V = 250 cf
 L_{spacing} = 105 ft
No. of Check Dams = 1
Subreach Volume = 250 CF

Infiltration(Q_i)

Infiltration Depth = 12 in
Field Q_i = 4.59 in/hr
Factor of Safety = 2.0
Reduced Q_i = 2.30 in/hr
Dewatering Time = 5.23 hr
Less than 72 hours? YES

EARTHEN CHECK DAM INFILTRATION VOLUME AND SPACING

Per the Pennsylvania Stormwater BMP Manual (pg 94), the minimum spacing ($L_{spacing}$) of check dams is determined by the length of the storage volume ($L_{storage}$) and the length to the check dam center line. The length of the storage volume is calculated by dividing the height of the rock filter (D_S) by the slope of the channel (S_S):



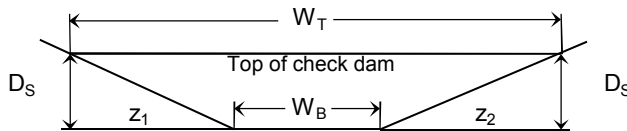
$$L_{storage} = D_S / S_S$$

Where: $L_{storage}$ = Storage Length
 S_S = Channel slope
 D_S = Height of the check dam

$$L_{spacing} = L_{storage} + [(D_S + 1) / (-S_S + 0.5)]$$

Where: $L_{spacing}$ = Check Dam Spacing
 $L_{storage}$ = Storage Length
 S_S = Channel slope
 D_S = Height of the check dam

The volume of runoff that will be stored upstream of a check dam is dependent on the height of the check dam, the slope of the upstream channel and the dimensions of the upstream channel. The storage volume (V_S) can be calculated with:



$$V_S = 0.25 \times L_{storage} \times D_S \times (W_T + W_B)$$

Where:
 $L_{storage}$ = Storage Length
 D_S = Height of check dam
 W_T = check dam top width
 W_B = check dam bottom width

The check dam top width (W_T) is given by:

$$W_T = W_B + z_1 + z_2$$

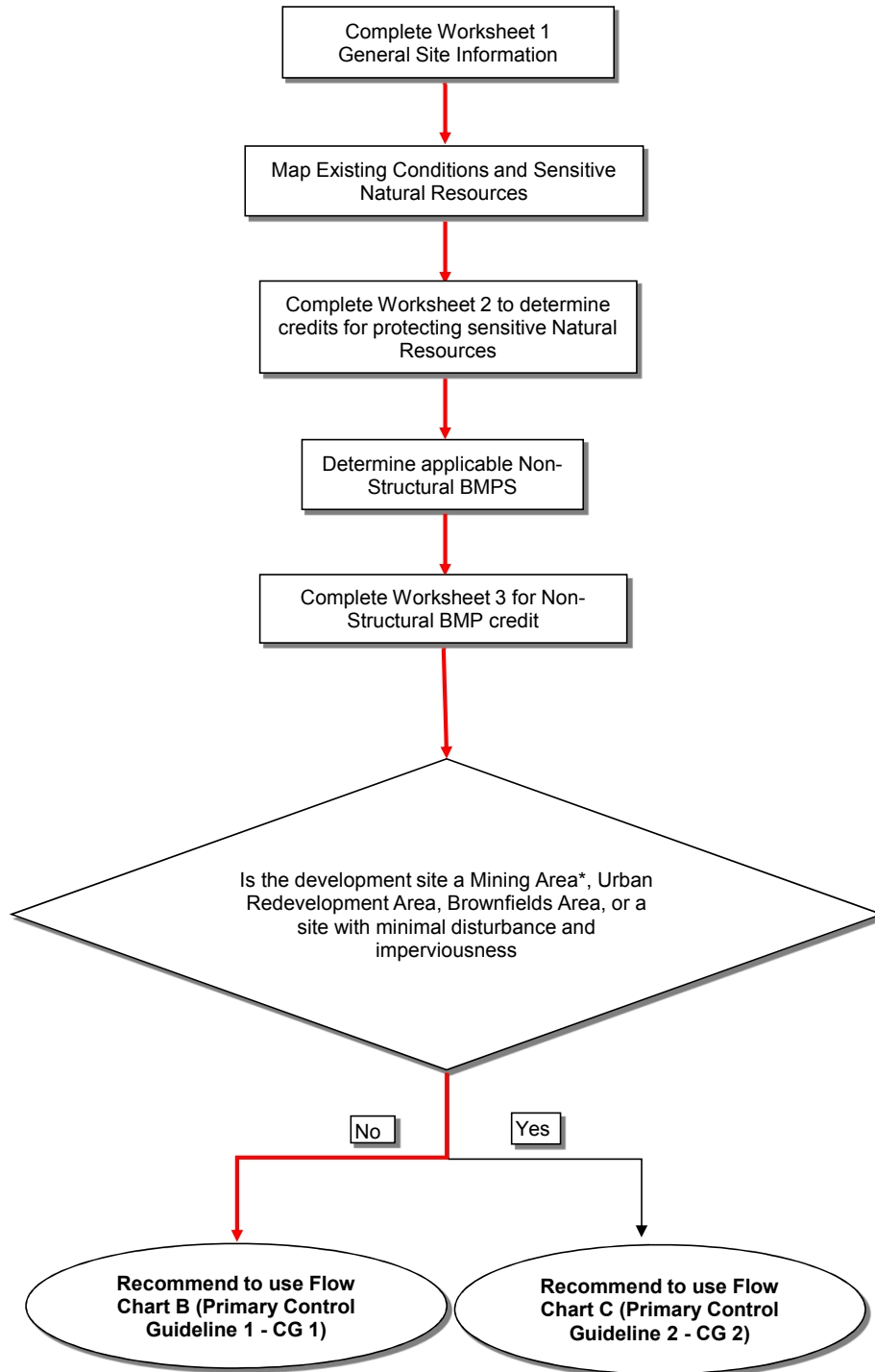
Where: W_B = check dam bottom width
 z_1 = side slope
 z_2 = side slope

G.7 Water Quality Worksheets

- a. Flow Chart A – Stormwater Calculation Process
- b. Worksheet 1. General Site Information
- c. Worksheet 2. Sensitive Natural Resources
- d. Worksheet 3. Nonstructural BMP Credits
- e. Flow Chart B – Control Guideline 1 Process
- f. Worksheet 4. Change in Runoff Volume for 2-Yr Storm Event
- g. Worksheet 5. Structural BMP Volume Credits
- h. Worksheet 10. Water Quality Compliance for Nitrate

FLOW CHART A

Stormwater Calculation Process



Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 28-Feb-16

Project Name: Atlantic Sunrise Pipeline AR-LU-007.1

Municipality: Fairmount Township

County: Luzerne

Total Area (acres): 0.75

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgmt/wc/default.htm#newtopics>

Watershed: Fishing Creek

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: UNT to Maple Run

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

Worksheet 2. Sensitive Natural Resources

INSTRUCTIONS:

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

*Note: Sensitive areas are shown on the Soil Erosion Control Plans.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	N/A		
Floodplains	N/A		
Riparian Areas	N/A		
Wetlands	N/A		
Woodlands		0.42	0.00
Natural Drainage Ways	N/A		
Steep Slopes, 15% - 25%	N/A		
Steep Slopes, over 25%	N/A		
Other:	N/A		
Other:	N/A		
TOTAL EXISTING:		0.42	0.00

Worksheet 3. Nonstructural BMP Credits

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2)	-	Ac.
1.2 Area of Riparian Forest Buffer Protection	-	Ac.
3.1 Area of Minimum Disturbance/Reduced Grading	-	Ac.
TOTAL	-	Ac.

Site Area	<i>minus</i>	Protected Area	=	Stormwater Management Area
0.75	-	0.00	=	0.75
		<small>This is the area that requires stormwater management</small>		

VOLUME CREDITS

3.1 Minimum Soil Compaction

Lawn	_____ ft ²	x 1/4"	x 1/12	=	_____ - ft ³
Meadow	_____ ft ²	x 1/3"	x 1/12	=	_____ - ft ³

3.3 Protect Existing Trees

For Trees within 100 feet of impervious area:

Tree Canopy	_____ ft ²	x 1/2"	x 1/12	=	_____ -
-------------	-----------------------	--------	--------	---	---------

For Trees within 20 feet of impervious area:

Tree Canopy	_____ ft ²	x 1"	x 1/12	=	_____ -
-------------	-----------------------	------	--------	---	---------

5.1 Disconnect Roof Leaders to Vegetated Areas

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area	_____ ft ²	x 1/3"	x 1/12	=	_____ -
-----------	-----------------------	--------	--------	---	---------

For all other disconnected roof areas

Roof Area	_____ ft ²	x 1/4"	x 1/12	=	_____ -
-----------	-----------------------	--------	--------	---	---------

5.2 Disconnect Non-Roof impervious to Vegetated Areas

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area	_____ ft ²	x 1/3"	x 1/12	=	_____ -
-----------------	-----------------------	--------	--------	---	---------

For all other disconnected non-roof areas

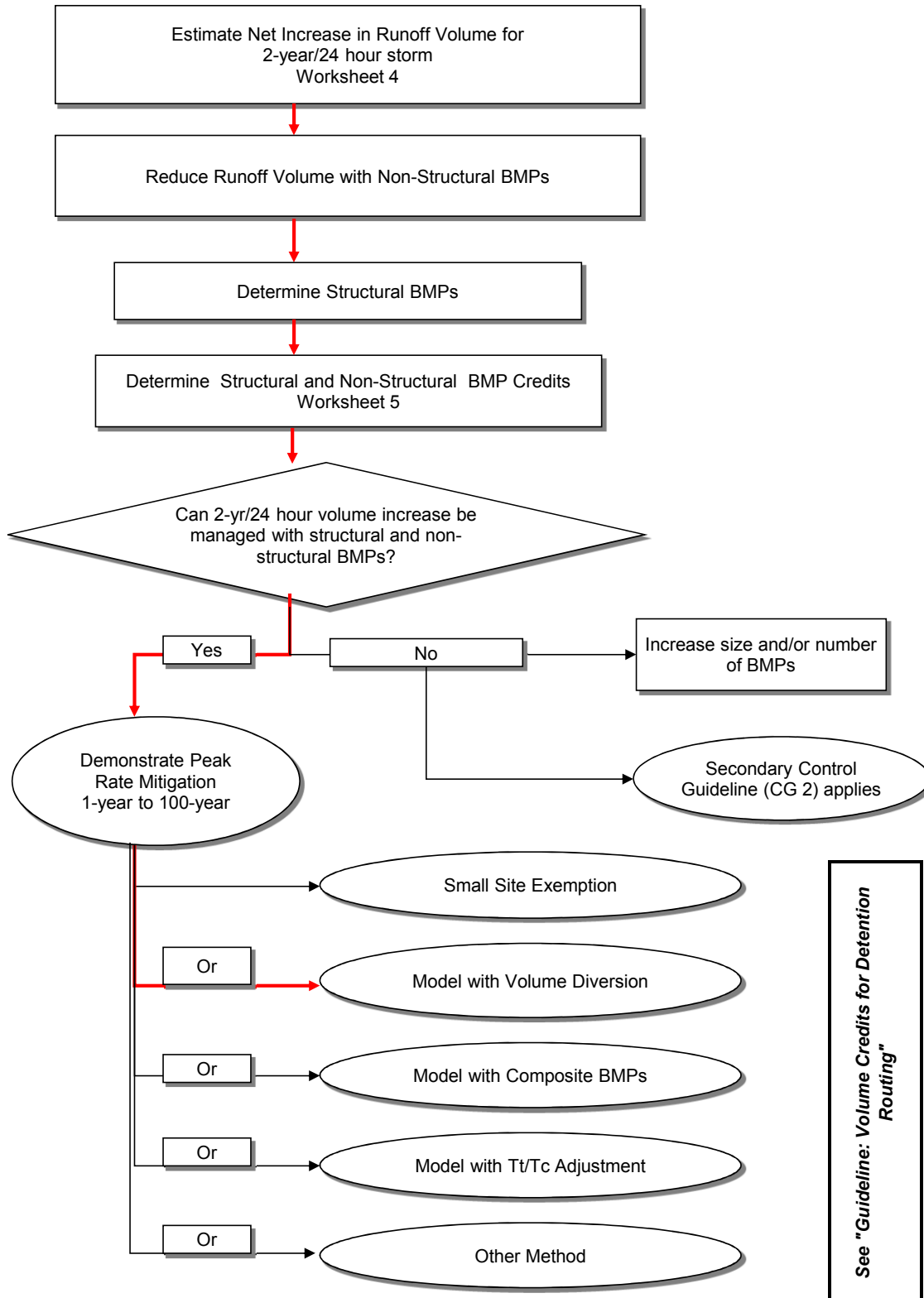
Impervious Area	_____ ft ²	x 1/4"	x 1/12	=	_____ -
-----------------	-----------------------	--------	--------	---	---------

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ - ft³

* For use on Worksheet 5

FLOW CHART B

Control Guideline 1 Process



WORKSHEET 4 . CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT: Atlantic Sunrise Pipeline AR-LU-007.1

2-Year Rainfall: 2.88 in

Total Site Area: 0.75 acres
Protected Site Area: 0 acres
Managed Area 0.75 acres

Existing Conditions:

Cover Type	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff ¹ (in)	Runoff Volume ² (ft ³)
Meadow	C	14,336	0.329	71	4.08	0.82	0.69	827
Woods	C	18,220	0.418	70	4.29	0.86	0.65	985
Impervious ³	C	0	0.000	98	0.20	0.04	2.65	-
"Meadow" ³	C	0	0.000	71	4.08	0.82	0.69	-
TOTAL:		32,556	0.747					1,812

Developed Conditions:

Cover Type	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff ¹ (in)	Runoff Volume ² (ft ³)
Meadow	C	26,097	0.599	71	4.08	0.82	0.69	1,506
Gravel Rd	C	1,419	0.033	89	1.24	0.25	1.79	212
Stone	C	5,040	0.116	98	0.20	0.04	2.65	1,112
Woods	C	0	0.000	70	4.29	0.86	0.65	-
Impervious	C	0	0.000	98	0.20	0.04	2.65	-
TOTAL:		32,556	0.747					2,830

2-Year Volume Increase (ft³) **1,018**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = (P - 0.2S)² / (P+ 0.8S) where
 P = 2-Year Rainfall (in)
 S = (1000/ CN)-10

2. Runoff Volume (CF) = Q x Area x 1/12
 Q = Runoff (in)
 Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI. The use of a weighted CN value for volume calculations is not acceptable.

3. Twenty (20) percent of existing impervious area, when present, shall be considered meadow (good condition) in the model for existing conditions for redevelopment per Volume Control Guideline 1. (For Existing Condition: Impervious Area + "Meadow" = Total Impervious Area)

WORKSHEET 5. STRUCTURAL BMP VOLUME CREDITS

PROJECT: Atlantic Sunrise Pipeline AR-LU-007.1
SUB-BASIN: Upper Central Susquehanna River

Required Control Volume (ft³) - from Worksheet 4: 1,018
 Non-structural Volume Credit (ft³) - from Worksheet 3: - 0
 Structural Volume Reqmt (ft³) 1,018
 (Required Control Volume minus Non-structural Credit)

Proposed BMP		Area (ft ²)	Volume Reduction Permanently Removed (ft ³)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well / Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm		
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond / Retention Basin		
6.6.3	Dry Extended Detention Basin		
6.6.4	Water Quality Filters		
6.7.1	Riparian Buffer Restoration		
6.7.2	Landscape Restoration / Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other	Check dams in Vegetated Channels		125
	Storage in 24" stone MLV pad		2,128

Total Structural Volume (ft³): 2,253
 Structural Volume Requirement (ft³): 1,018
DIFFERENCE 1,235

MLV Pad Infiltration Calculations Summary		
Average Measured Infiltration Rate for MLV Pad	4.59	in/hr
Factor of Safety	2.00	
Design Infiltration Rate	2.30	in/hr
Dewatering Time for top 6 inches of MLV Pad	2.61	hours
Depth of AASHTO #57 Section of MLV Pad	18	inches
Dewatering Time for AASHTO #57 Section of MLV Pad	7.84	hours
Total Dewatering Time for MLV Pad	10.46	hours

Check Dam Infiltration Calculations Summary		
Average Measured Infiltration Rate for Channel	4.59	in/hr
Factor of Safety	2.00	
Design Infiltration Rate	2.30	in/hr
Height of Check Dam	12	inches
Dewatering Time for Detained Water in Channel	5.23	hours

*A factor of safety of 2 is the minimal safety factor for design purposes per pager 19 of 21 of "Protocol 1, Site Evaluation and Soil Infiltration Testing, included as Appendix C of the Pennsylvania Stormwater BMP Manual.

WORKSHEET 10. WATER QUALITY COMPLIANCE FOR NITRATE

Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the

PRIMARY BMPs FOR NITRATE:

	YES	NO
NS BMP 5.4.2 - Protect / Conserve / Enhance Riparian Buffers	<input type="checkbox"/>	<input checked="" type="checkbox"/>
NS BMP 5.5.4 - Cluster Uses at Each Site	<input type="checkbox"/>	<input checked="" type="checkbox"/>
NS BMP 5.6.1 - Minimize Total Disturbed Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>
NS BMP 5.6.3 - Re-Vegetate / Re-Forest Disturbed Areas (Native	<input checked="" type="checkbox"/>	<input type="checkbox"/>
NS BMP 5.9.1 - Street Sweeping / Vacuuming	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Structural BMP 6.7.1 - Riparian Buffer Restoration	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Structural BMP 6.7.2 - Landscape Restoration	<input type="checkbox"/>	<input checked="" type="checkbox"/>

SECONDARY BMPs FOR NITRATE:

NS BMP 5.4.1 - Protect Sensitive / Special Value Features	<input type="checkbox"/>	<input type="checkbox"/>
NS BMP 5.4.3 - Protect / Utilize Natural Drainage Features	<input type="checkbox"/>	<input type="checkbox"/>
NS BMP 5.6.2 - Minimize Soil Compaction	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.4.5 - Rain Garden / Bioretention	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.4.8 - Vegetated Swale	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.4.9 - Vegetated Filter Strip	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.6.1 - Constructed Wetland	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.7.1 - Riparian Buffer Restoration	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.7.2 - Landscape Restoration	<input type="checkbox"/>	<input type="checkbox"/>
Structural BMP 6.7.3 - Soils Amendment/Restoration	<input type="checkbox"/>	<input type="checkbox"/>

G.8 Infiltration Information

- a. Field Observation Report



Field Observation Report

Project Number: 14C4909 - A
Project Name: Atlantic Sunrise Project – AR-LU-007.1
Date of Field Visit: October 16, 2015
Weather Conditions: Sunny and Cloudy Temperature: Approx 50-60°F
Prepared By: Krystal Bealing, APSS and Joseph Kempf

Copies of Report Have Been Sent To: Client Contractor Other

Client:
Transcontinental Gas Pipe Line
Company, LLC
2800 Post Oak Blvd
Houston, TX 77251

Contractor:
BL Companies
4242 Carlisle Pike, Suite 260
Camp Hill, PA 17011

Three soil pits were excavated by backhoe and described by an Associate Professional Soil Scientist (APSS) to varying depths utilizing the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) *Field Book for Describing and Sampling Soils, Version 3.0* and *Keys to Soil Taxonomy, Twelfth Edition, 2014*. According to the Web Soil Survey, soils within the area of the pits are described by the USDA-NRCS as Lackawanna very stony silt loam, 3-8% slopes.

Test Pit #1, located at N41° 17' 18.20", W76° 16' 57.18", was observed to have two horizons, with a fragipan observed at 30 inches.

Test Pit #2, located at N41° 17' 18.02", W76° 16' 57.94", was observed to have three horizons, with a restrictive soil horizon due to bedrock components observed at 53 inches.

Test Pit #3, located at N41° 17' 17.86", W76° 16' 57.46", was observed to have four horizons, with a fragipan observed at 35 inches.

Additionally, infiltration tests using the double ring infiltrometer method were conducted at each pit location, at depths ranging from 6 inches below surface to 29 inches below surface. The elevations of the proposed improvements and the existing ground are provided on the infiltration testing location map. If the difference between the existing and proposed elevations is greater

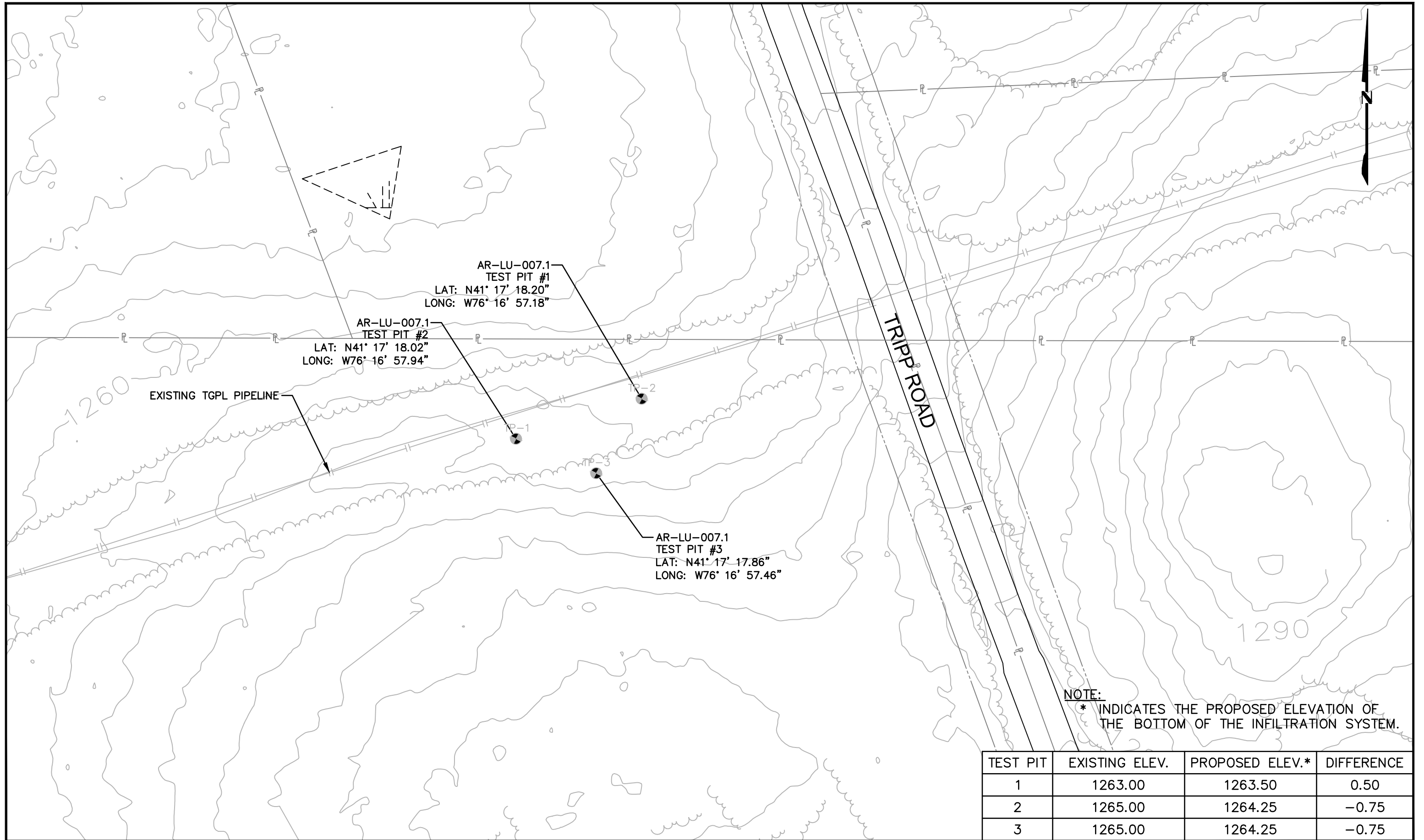
Field Observation Report

than zero, infiltration was performed at the existing elevation. If the difference between the existing and proposed elevation is between 0 and -5.00 feet, infiltration was conducted at the proposed elevation, or at two feet above the observed limiting layer, whichever was more shallow. If the difference between the existing and proposed elevations is greater than -5.00, infiltration was placed at 5 feet (60 inches) below the existing elevation to adhere to Occupational Safety and Health Administration (OSHA) standards for trenching and excavation safety.

Infiltration testing was conducted within a level testing area at all test pit locations using the double ring infiltrometer method. An infiltrometer containing a 12-inch outer ring and a 6-inch inner ring was driven into the soil a minimum of two inches. Both rings were filled with water to the rim at 30 minute intervals for one hour. If the drop in water level, measured within the center ring, during the last 30 minutes of the presoak is 2 inches or more, measurements are taken in 10-minute intervals. If the water level drop is less than 2 inches, measurements are taken in 30-minute intervals. After each measurement, the rings were refilled to the rim. Each measurement was taken at a fixed reference point. Measurements were taken until the rate of drop stabilized, or eight measurements were taken. A stabilized rate of drop is considered a difference of 0.25-inch or less between the highest and lowest measurements of four consecutive readings. An average of the stabilized rate (i.e., the last four measurements) or the average of eight total measurements if the rate of drop did not stabilize, expressed in inches per hour, represents the infiltration rate. Testing was completed at 6 inches below the surface at Test Pit #1, at 29 inches below the surface at Test Pit #2, and at 11 inches below the surface at Test Pit #3.

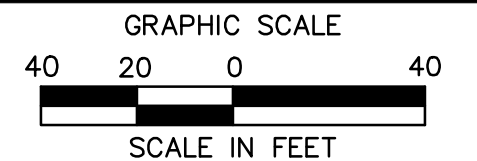
The infiltration rate at Test Pit #1 was observed to be 9.563 inches per hour.
The infiltration rate at Test Pit #2 was observed to be 4.500 inches per hour.
The infiltration rate at Test Pit #3 was observed to be 4.688 inches per hour.

The soil profile descriptions, infiltration worksheet, photographs, infiltration testing location map, and USDA-NRCS Soil Survey information are attached.



LANDOWNER: KARNS

AR-LU-007.1 INFILTRATION TESTING LOCATIONS



Soil Profile Log

Project 14C4909-A Atlantic Sunrise Project -AR-LU-007.1

Test Pit # 1

Name Joe Kempf and Krystal Bealing, APSS

Date October 16, 2015

Weather 50-60°F; Sunny and Cloudy

Equipment Mini Excavator

Elevation 1263 AMSL

Soil Type Lackawanna very stony silt loam, 3-8% slopes

Geology Catskill Formation

Landscape Position/Slope Sideslope 0-5%

Land Use Wooded

Additional Comments

Horizon	Upper Boundary (inches)	Lower Boundary (inches)	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Matrix Color	Color Patterns	Pores, Roots, Structure	Depth to Bedrock	Depth to Water	Comments
A	0	30	Sil	15-35% Channery	10YR 6/4	-	Roots present; Weak, Subangular Blocky	-	-	Very Friable
Bx	30	60+	Sil	35-60% Channery	10YR 6/3	5% 10YR 5/6	Massive	-	-	Friable Limiting Layer - Fragipan

Note: Unless stated otherwise, horizon strike and dip was not observed to have a significant impact on water flow within the profile.

Soil Profile Log

Project 14C4909-A Atlantic Sunrise Project -AR-LU-007.1

Test Pit # 2

Name Joe Kempf and Krystal Bealing, APSS

Date October 16, 2015

Weather 50-60°F; Sunny and Cloudy

Equipment Mini Excavator

Elevation 1265 AMSL

Soil Type Lackawanna very stony silt loam, 3-8% slopes

Geology Catskill Formation

Landscape Position/Slope Sideslope 0-5%

Land Use Wooded

Additional Comments

Horizon	Upper Boundary (inches)	Lower Boundary (inches)	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Matrix Color	Color Patterns	Pores, Roots, Structure	Depth to Bedrock	Depth to Water	Comments
A	0	11	Sil	15-35% Channery	10YR 3/3	-	Roots present; Weak, Subangular Blocky	-	-	Very Friable
Bw	11	53	Sil	35-60% Channery	7.5YR 2/2	-	Weak, Subangular Blocky	-	-	Very Friable
Cr	53	60+	Sil	60-90% Channery	10YR 6/3	-	Massive	-	-	Friable Limiting Layer - Restrictive Soil Horizon due to bedrock components

Note: Unless stated otherwise, horizon strike and dip was not observed to have a significant impact on water flow within the profile.

Soil Profile Log

Project 14C4909-A Atlantic Sunrise Project -AR-LU-007.1

Test Pit # 3

Name Joe Kempf and Krystal Bealing, APSS

Date October 16, 2015

Weather 50-60°F; Sunny and Cloudy

Equipment Mini Excavator

Elevation 1265 AMSL

Soil Type Lackawanna very stony silt loam, 3-8% slopes

Geology Catskill Formation

Landscape Position/Slope Sideslope 0-5%

Land Use Wooded

Additional Comments

Horizon	Upper Boundary (inches)	Lower Boundary (inches)	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Matrix Color	Color Patterns	Pores, Roots, Structure	Depth to Bedrock	Depth to Water	Comments
A	0	11	SIL	-	10YR 3/2	-	Roots present; Weak, Subangular Blocky	-	-	Very Friable
Bw1	11	23	SIL	-	10YR 5/6	-	Weak, Subangular Blocky	-	-	Very Friable
Bw2	23	35	SIL	15-35% Channery	10YR 5/6	-	Moderate, Subangular Blocky	-	-	Friable
Bx	35	60+	SIL	35-60% Channery	10YR 6/2	3% 10YR 4/6	Massive	-	-	Friable Limiting Layer - Fragipan

Note: Unless stated otherwise, horizon strike and dip was not observed to have a significant impact on water flow within the profile.

ATLANTIC SUNRISE PROJECT - AR-LU-007.1

SOIL INFILTRATION WORKSHEET - DOUBLE RING INFILTROMETER METHOD

Hole Number	Drop >2 inches after 30 minute presoak? ¹	Reading Interval (minutes)	Reading 1 (Inches of Drop)	Reading 2 (Inches of Drop)	Reading 3 (Inches of Drop)	Reading 4 (Inches of Drop)	Reading 5 (Inches of Drop)	Reading 6 (Inches of Drop)	Reading 7 (Inches of Drop)	Reading 8 (Inches of Drop)	Average Stabilized Reading ² (Inches of Drop)	Infiltration Rate ³ (in/hr)	Comments
1	Yes	10	2.250	2.375	1.500	1.500	1.750	1.625			1.594	9.563	55-60°F, sunny and cloudy. Test done at 6 inches below surface.
2	Yes	10	0.750	0.750	0.750	0.750					0.750	4.500	55-60°F, sunny and cloudy. Test done at 29 inches below surface.
3	Yes	10	0.625	0.750	0.875	0.875					0.781	4.688	55-60°F, sunny and cloudy. Test done at 11 inches below surface.

¹Inches of drop greater than 2 inches after the 30 minute presoak? Yes, use 10 minute interval; No, use 30 minute interval.

²Calculated as the average of the last four stabilized (less than 0.25-inch difference overall) readings, or an overall average in the case of eight total readings.

³Calculated as the average stabilized reading x 2 for 30 minute intervals; x 6 for 10 minute intervals.



View of Pit #1.



View of Pit #2.



View of Pit #3.

Luzerne County, Pennsylvania

LcB—Lackawanna very stony silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9ygp
Elevation: 1,100 to 1,800 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Lackawanna and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackawanna

Setting

Landform: Hillslopes, ridges
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountaintop, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish ablation till derived from sandstone and siltstone

Typical profile

A - 0 to 8 inches: channery silt loam
Bw - 8 to 25 inches: channery loam
Bx - 25 to 60 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 21 to 36 inches to fragipan
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat):
Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 21 to 35 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: C

Data Source Information

Soil Survey Area: Luzerne County, Pennsylvania
Survey Area Data: Version 6, Sep 19, 2014

G.9 Off-Site Discharge Analysis

a. Adequacy of Off-Site Discharge

ACCESS ROAD: AR-LU-007.1 - Adequacy of Off-Site Discharge

AR-LU-007.1 is a proposed permanent access road (PAR) located in Fairmount Township, Luzerne County, Pennsylvania. The intent of this PAR is to provide permanent maintenance and operational access to the proposed Main Line Valve 02 (CN-MLV-02) located on the proposed 30" Central Penn Line North Pipeline. The PAR is approximately 100 feet long over relatively hilly terrain. The PAR begins at Tripp Road and terminates at the MLV site at approximate milepost 6.7. The PAR will be entirely located within the pipeline permanent right of way.

The PAR will have a width of 14 feet and a cross slope of 2% that will direct runoff in a northerly direction to the vegetated channel for infiltration (VCI) with check dams. A vegetated channel for diversion purposes (VCD) with check dams will be constructed on the south side of the proposed road and MLV pad to capture and divert uphill runoff. A small portion of runoff from the disturbed site will be directed to the proposed MLV site. The MLV site will be constructed with a 6-inch thick layer of AASHTO #8 stone on top of nonwoven geotextile and an 18-inch thick layer of AASHTO #57 stone. These proposed improvements have been designed to have no anticipated impacts or changes to downhill properties as a result of constructing the MLV site.

The PAR and MLV site have been designed to match or reduce peak stormwater runoff from the design areas to an off-site discharge point. (See the enclosed Pre and Post Drainage Area Maps and calculations in Appendix G.3 and G.4 for details.) The reduced peak runoff for all storm events is summarized in the Pre-vs. Post- Construction Peak Rate of Flow Summary for The Study Point table below. The reduction was achieved by promoting infiltration through retention storage in the VCD, VCI, and MLV pad. Retaining and infiltrating runoff decreases the rate of stormwater runoff as well as recharging the groundwater.

Pre- vs. Post-Construction Peak Rate of Flow Summary for The Study Point			
Stormwater discharge rate for the design frequency storm (cfs)	Pre-construction	Post-construction	Net Change
1) 1-Year/24-Hour	0.70	0.20	(0.50)
2) 2-Year/24-Hour	1.20	0.45	(0.75)
3) 5-Year/24-Hour	2.01	1.00	(1.01)
4) 10-Year/24-Hour	2.79	1.72	(1.07)
5) 25-Year/24-Hour	4.07	2.28	(1.79)
6) 50-Year/24-Hour	5.29	3.36	(1.93)
7) 100-Year/24-Hour	6.76	4.87	(1.89)

The VCD is proposed to the South of the MLV site and PAR. This VCD is 4-feet wide, 1-foot deep, and conveys flows from the abutting existing woodlands around the back side of the MLV site. The VCD is equipped with multiple check dams to slow down flow and create small retention areas throughout the channel to promote infiltration. These

measures allow for stormwater to pond during storm events and infiltrate into the ground, which reduces flows.

The VCI is located on the North side of the MLV site and PAR. The VCI has a 2-foot wide bottom and varying depths throughout the channel. The VCI collects runoff from the PAR and the MLV site and conveys the flows to existing woodlands. The VCI is equipped with multiple check dams to slow down flow and creates small retention areas throughout the channel to promote infiltration. A riprap apron is proposed at the end of the channel dissipate energy.



The final measure used to ensure reduced peak stormwater runoff is the MLV pad itself. The pad is a gravel area constructed of a top layer of 6" of AASHTO #8 aggregate, on a non-woven geotextile fabric, and a bottom layer of 18" AASHTO #57 stone. This 18-inch-deep area will detain and infiltrate the foot print of the MLV pad, plus a small area around the pad to the East.

After being conveyed through one of these three stormwater PSCM BMP's above, the runoffs flows northwest, until they converge to the existing woodlands. At this point the runoff follows pre-construction conditions, ultimately outletting into Beaver Pond (WB-T02-15020), approximately 1290 feet west of the MLV Site. The picture to the left shows the existing ground cover at the discharge point.

The flow path from the MLV site crosses the following soil types:

- LcB – Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony.
- MsB – Morris channery silt loam, 0 to 8 percent slopes, extremely stony
- WmB – Wellsboro channery silt loam, 3 to 8 percent slopes, extremely stony.

The PADEP E&S Manual defines erosion resistant soils as soils having an erodibility "K" factor less than or equal to 0.37. The K factor for the soil types, according to the National Resources Conservation Service (NRCS) website <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>, crossed by the flow path are summarized below:

- LcB – No value specified by NRCS
- MsB – No value specified by NRCS
- WmB – No value specified by NRCS

All soils crossed by the flow path are considered erosion resistant soils.

In addition to the stormwater flow reduction and soil data above, the VCI, VCD and MLV pad has reduced the proposed stormwater velocity as it leaves the design points. The

velocities at these points are such that they are slower than 1 fps, as summarized in the Stormwater Velocity Rate Summary table below. Based on Table G.1 in the PADEP E&S Manual, “Allowable Velocities for Downslope covers for Channeled Flows” (shown below), the maximum allowable velocity for grass is 4 fps. The velocity of the runoff from the proposed improvements is less than the maximum allowable velocity.

Stormwater Velocity Rate Summary			
Design Frequency Storm	MLV Pad Velocity (fps)	VCI Velocity (fps)	VCD Velocity (fps)
1) 1-Year/24-Hour	0.00	0.22	0.14
2) 2-Year/24-Hour	0.10	0.55	0.22
3) 5-Year/24-Hour	0.20	0.60	0.57
4) 10-Year/24-Hour	0.37	0.65	0.75
5) 25-Year/24-Hour	0.67	0.72	0.83
6) 50-Year/24-Hour	0.84	0.77	0.90
7) 100-Year/24-Hour	0.95	0.82	0.97

Table G.1. Allowable Velocities for Downslope Covers for Channeled Flows

Ground Cover	Allowable Velocity
Grass*	4 fps
Gravel	5 fps
Mulch	1-2 fps

* See E&S Manual for more information on permissible velocities for grass and other cover types. Allowable velocities for grass can vary from 2.5 fps to as much as 8 fps. 4 fps has been selected as a conservative figure for design purposes.

(Table from the 2012 PADEP E&S Manual)

In conclusion, based on the designed measures discussed above, and the soil and velocity data provided for this MLV site and access road, there are no anticipated impacts or changes to downhill properties as a result of construction the MLV site.

Down Slope Property Owners:

- Carol J. Bonham (PA-LU-013.000)
- Michael D. Karns & Jennifer Karns (PA-LU-012.000)
- Unknown Property Owner (PA-LU-010.000)
- Unknown Property Owner (PA-LU-011.000)

G.10 Storage Volume Analysis
a. Storage Volume Analysis

ACCESS ROAD: LU-007.1 – Storage Volume Analysis

Stormwater detention is provided behind the check dams in the vegetated channel and in the void space between the AASHTO #57 stone layer at the MLV pad. The void space between the 6" AASHTO #8 stone at the surface of the pad is excluded from the detention, or storage volume, calculations. The required storage volume is calculated through an iterative process of increasing the storage volume in the HydroCAD model until the post-construction stormwater runoff rate is less than or equal to the pre-construction runoff rate.

Vegetated channel storage is created by installing check dams along the channel. The "Earthen Check Dam Infiltration Volume and Spacing" exhibit provided in Appendix G.6 describes how the storage volume behind each check dam is calculated. The number of check dams required is dependent on the channel cross-sectional dimensions, slope of channel, and required storage volume.

The void space between the AASHTO #57 stone provides the storage volume for the MLV pad. The void space between the 6" AASHTO #8 stone at the surface of the pad is excluded from the volume calculations.

The storage volume of the MLV pad is dependent on the slope of the MLV pad. If the pad were graded at 0% in all directions, the storage volume would simply be the area of the pad multiplied by the depth. However, due to site topography, a 0% grade would result in large quantities of earth movement, fill at the infiltration interface, or cut too close to the ground water table. Instead, the pad was designed to minimize these impacts by mimicking the existing grade. An actual storage volume was calculated based on the elevation of the low point of the pad (minus the 6" AASHTO #8 cover), since that is the highest runoff could be stored without overtopping the AASHTO #57 stone. Two scenarios apply to all of the main line valve pads on the project: low side pads and low corner pads. Since many of the volumes can only be obtained using calculus to determine the total storage the water surface elevation and base of the pad, AutoCAD Civil 3D was used to determine the storage volumes. To determine volumes in Civil 3D, surfaces representing the bottom of the pad and water surface elevation were built and combined into a volumetric surface; an earthwork analysis was run on the volumetric surface to determine the total volume between the two. The volume of low side pads can be checked using simple volumetric formulas for triangular (steeper grades, shallower pads) or trapezoidal (more gradual grades, deeper pads) prisms, with the cross sectional wetted area multiplied by the length of the low side of the pad. AR-LU-007.1 is a low-corner pad. Finally, the calculated storage volume was reduced by 60% to determine the available storage volume with 40% voids.

The detained stormwater will infiltrate the ground. The dewatering time for the stormwater detained behind the check dams is provided with the check dam volume calculations in Appendix G.6. The dewatering time for the stormwater detained in the void space of the MLV pad rock is provided at the bottom of Worksheet #5 included in Appendix G.7.

APPENDIX H

AR-LU-008 Specific Narrative and Calculations

H.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

H.2 Location Map

H.3 Sediment Barrier Table

- a. E&S Worksheet 1

H.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-008

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-008 is a proposed temporary access road (TAR) located in Fairmount Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The TAR **is a gravel road, which** begins at Tripp Road and follows Clustered Road, a private road, until it terminates at the pipeline right-of-way at approximate mile post 7.3. This TAR is approximately **3,550** feet long over an existing road.

A rock construction entrance and driveway apron **with compost filter sock** is proposed at the intersection with Tripp Road. Temporary widening and gravel surfacing is proposed along the **majority** of the road. **From Station 4+50 to 9+00, equipment mats will be installed rather than the typical road section to minimize the disturbance within or adjacent to the riparian buffer.** Temporary equipment mats will be placed at the low points in the road, as well.

Compost filter socks are proposed to filter runoff leaving the areas disturbed due to the temporary widening, graveling and subsequent restoration. Upon completion of the pipeline construction the existing road will be returned to the pre-construction width and surfacing, and disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-008 is an existing road that will be utilized as a temporary access road. Some temporary widening will be performed for construction traffic. All construction traffic will utilize the existing road path. Soil compaction impacts have been minimized by the use of the existing road path and minimizing the road width to 14 feet which is only 4-8 feet wider than the existing road. These areas will be restored with native topsoil to enhance the revegetation process.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-008 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-008 is approximately 3,550 linear feet; however, it follows an existing gravel road for its extent. Only minor widening improvements are necessary to use the existing gravel road. Utilizing the existing gravel road minimizes the potential thermal impact of this road.***
- ***During the construction phase of this project compost filter socks will be placed downgradient of the proposed access road. The compost filter socks will promote infiltration of runoff from the proposed temporary impervious surfaces. Infiltration of runoff prior to entering receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surface. Therefore, there are no permanent thermal impacts as a result of the use of this road for the of the pipeline.***

RIPARIAN BUFFER WAIVER:

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 3 of the ESCGP-2 NOI).

AR-LU-008 will require a Riparian Buffer Waiver - The existing road encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. Timber matting will be installed over the existing road to protect the existing road from construction traffic wear. The impacted riparian buffer area is 0.93 acres.

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-008 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
OxF	Oquaga and Lordstown extremely stony silt loams steep	4.8
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	5.1
At	Atherton silt loam, gray subsoil variant	6.7
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	5.1
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	5.1
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	4.8
ChB	Chenango gravelly loam, 3 to 8 percent slopes	6.0

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-008**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install rock construction entrance with wash rack and gravel driveway apron.**
- 9. Install construction mats adjacent to riparian buffer area.**
- 10. Remove brush to effectively install perimeter E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 11. Install perimeter E&SC BMPs as depicted on the E&SC Plan.**

- 12. Apply stabilization measures immediately to any disturbed areas due to the initial clearing and installation of E&SC BMPs.**
- 13. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 14. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 15. Proceed with major clearing and grubbing.**
- 16. Begin construction staking for layout of access road.**
- 17. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline limit of disturbance. Stockpiled soil shall not exceed 35 feet in height, have maximum side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.**
- 18. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 19. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, the disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**

- 20. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 21. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.**
- 22. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.**
- 23. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.**
- 24. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.**
- 25. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.**

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-008

Municipality: Fairmount Township

County: Luzerne

Total Area (acres): 3.8

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Fishing Creek

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: Kitchen Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

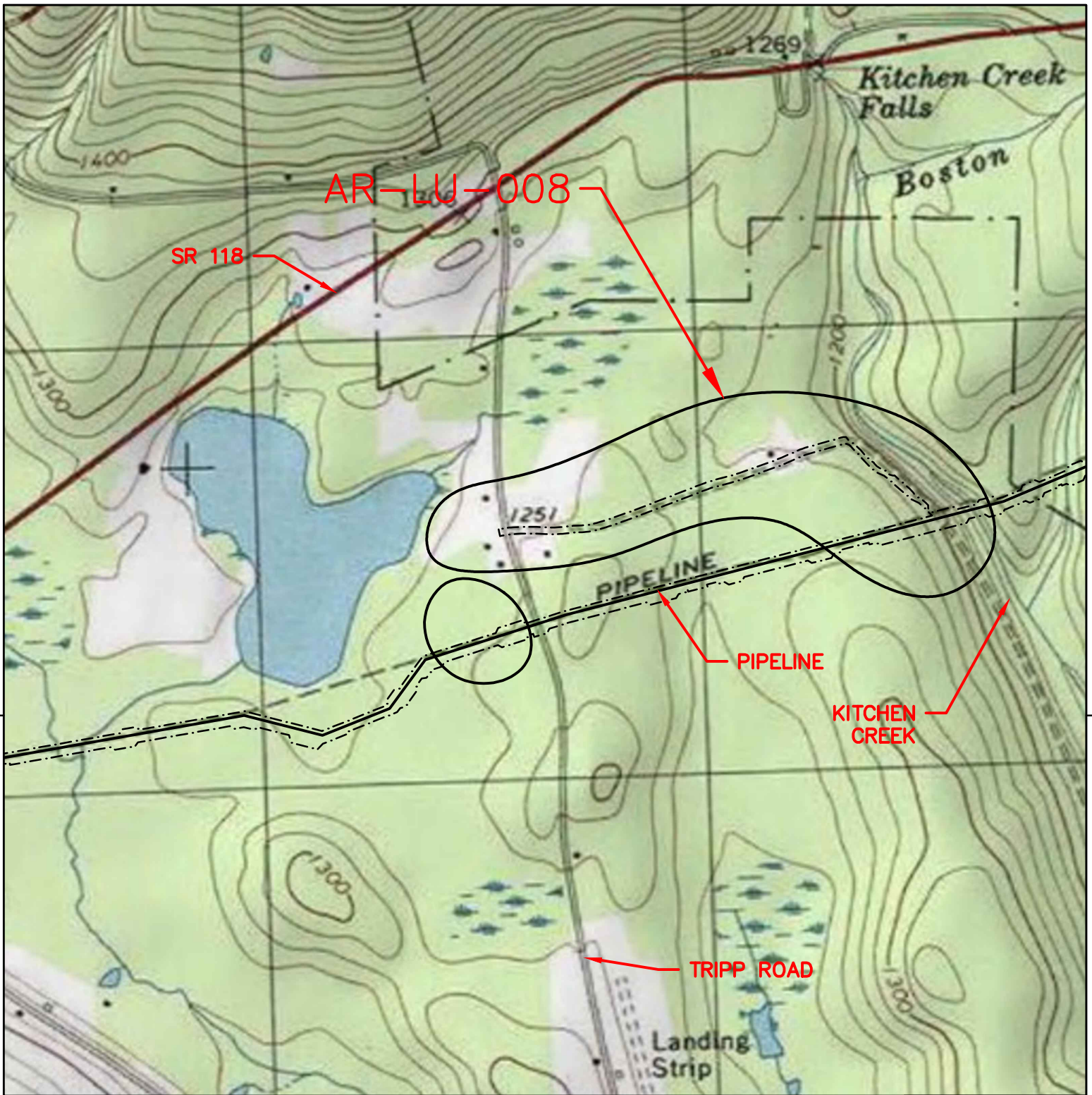
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

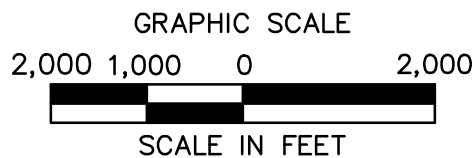
H.2 Location Map



RED
ROCK
QUADRANGLE

SWEET
VALLEY
QUAD

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING



ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-008
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-008	SHEET 1 OF 1
							WO: 1161481			

H.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX I

AR-LU-009 Specific Narrative and Calculations

I.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

I.2 Location Map

I.3 Sediment Barrier Table

- a. E&S Worksheet 1

I.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-009

WATERSHED: Phillips Creek

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-009 is a proposed temporary access road (TAR) located in Fairmount Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Goss Road and terminates at the pipeline right-of-way at approximate milepost M-0056 MP 0.7. This TAR is approximately **220** feet long. The first **90** feet of road follows an existing driveway, the remaining **130** feet is proposed over undisturbed ground. There are no proposed improvements over the first **90** feet of road, **therefore, there are no anticipated impacts or erosion and sedimentation control measures proposed for this portion of the road.** Temporary gravel surfacing is proposed for the portion of the road over the undisturbed ground. Compost filter socks are proposed to clean runoff leaving the area disturbed due to the temporary graveling and subsequent restoration. A temporary rock construction entrance and driveway apron **with compost filter sock** will be installed where the TAR meets the existing driveway. Upon completion of the pipeline construction, the disturbed areas will be restored to pre-construction conditions.

TMDL:

The watershed and sub-basin where this road is located as well as the nearest surface waters to receive runoff from this road, are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-009 is temporary access road that will utilize a portion of an existing driveway. All construction traffic will utilize the existing driveway path, as well as an additional 130 feet by 14 feet wide temporary gravel surface over undisturbed ground. Soil compaction impacts have been minimized by the use of the existing driveway and minimizing the road width to 14 feet. The temporary gravel surfacing will be restored to pre-construction conditions.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-009 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-009 is approximately 220 linear feet long. By utilizing an existing drive for the first 90 feet, the total length of necessary temporary construction has been minimized and, therefore, minimizing thermal impact of the road.***
- ***This road is proposed in a location that minimizes tree removal. The ability to use this road without the removal of additional trees acts to minimize the thermal impact of this road.***
- ***During the construction phase of this project compost filter socks will be placed downgradient of the proposed access road. The compost filter socks will promote infiltration of runoff from the proposed temporary impervious surfaces. Infiltration of runoff prior to entering the receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, thus minimizes the thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the at this section. Temporary gravel surface added for the TAR will be removed and the areas will be restored with vegetation. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-009 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
LaB	Lackawanna channery loam, 3 to 8 percent slopes	5.1
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	5.1

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-009**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install E&SC BMPs down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrance with wash rack.**
- 9. Remove brush to effectively install perimeter E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 10. Install perimeter E&SC BMPs.**
- 11. Apply stabilization measures immediately to any disturbed areas due to the initial clearing and installation of Compost Filter Socks.**

- 12. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter E&SC BMPs.**
- 13. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 14. Proceed with major clearing and grubbing.**
- 15. Begin construction staking for layout of access road.**
- 16. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline limit of disturbance. Stockpiled soil shall not exceed 35 feet in height, have maximum side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.**
- 17. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 18. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, or upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**

- 19. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the Site and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 20. Loosen and de-compact topsoil throughout the constructed TAR to be removed and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.**
- 21. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.**
- 22. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose/recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.**
- 23. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.**
- 24. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.**

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-009

Municipality: Fairmount Township

County: Luzerne

Total Area (acres): 0.25

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgmt/wc/default.htm#newtopics>

Watershed: Phillips Creek

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: Phillips Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

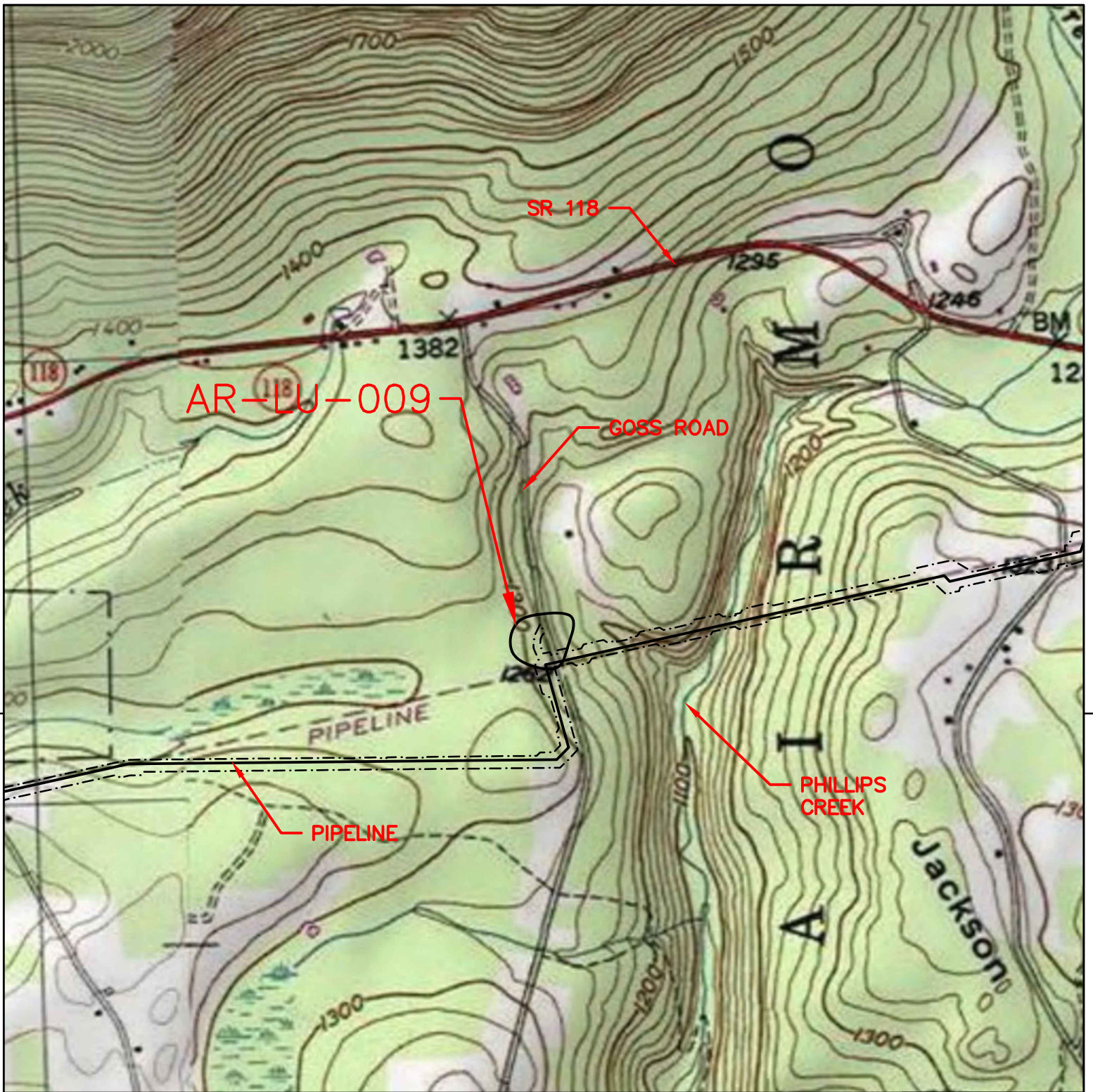
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

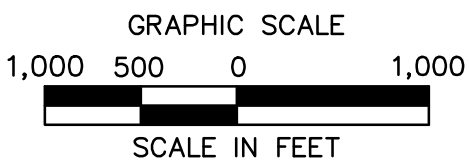
I.2 Location Map



RED
ROCK
QUADRANGLE

SWEET
VALLEY
QUAD

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING



ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-009
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-009	SHEET 1 OF 1
							WO: 1161481			

I.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX J

AR-LU-009.1 Specific Narrative and Calculations

J.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

J.2 Location Map

J.3 Sediment Barrier Table

- a. E&S Worksheet 1**

J.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-009.1

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-009.1 is a proposed permanent access road (PAR) located in Ross Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access and permanent maintenance and operations access to the proposed 30" Central Penn Line North Pipeline. The road begins at Route 118 and terminates at the pipeline right-of-way at approximate milepost 13.4. The road is approximately 490 feet long and follows an existing road named Creekside Lane. There are no proposed **earth disturbing** improvements to Creekside Lane; therefore, **no sediment barriers are proposed along the road**. A temporary construction entrance **with compost filter sock** will be installed at the pipeline right of way and removed upon completion of the construction activities.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-009.1 is an existing road that will be utilized as a permanent access road. All construction traffic will utilize the existing road, thus soil compaction impacts have been eliminated by the use of the existing road.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-009.1 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***The entire access road follows an existing road. The use of an existing road corridor eliminates the need for additional tree removal. The ability to use this road without the removal of additional trees acts to avoid additional thermal impact of this road.***
- ***Temporary construction phase improvements for this road are limited to a rock construction entrance. Runoff from these temporary improvements is***

directed to stabilized, well vegetated areas that will promote infiltration of the runoff. Infiltration of runoff prior to entering of receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.

- **The proposed RCE surfacing at the beginning of the road is temporary in nature and the disturbed areas outside of the existing road limits will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the minimal temporary gravel at the RCE area. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.**

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-009.1 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
LcB	Lackawanna channery silt loam, 3 to 8 percent slopes, extremely stony	5.1

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-009.1**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install E&SC BMPs down slope of these areas.**
- 7. Install the rock construction entrance with wash rack.**
- 8. Install perimeter E&SC BMPs as depicted on the E&SC Plan.**
- 9. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 10. Proceed with major clearing and grubbing.**
- 11. Begin construction staking for layout of limits of access road.**
- 12. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline ROW. Stockpiled soil shall not exceed 35 feet in height, have maximum**

side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.

- 13. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.***
- 14. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).***
- 15. Once the work within this area is complete, remove all gravel and geotextile fabric at the RCE from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. E&SC BMPs will remain in place and functional.***
- 16. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.***
- 17. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***

- 18. Upon local CCD and Transco approval of stabilization and re-vegetation, properly dispose/recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 19. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 20. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 28-Jan-15

Project Name: Atlantic Sunrise Pipeline AR-LU-009.1

Municipality: Ross Township

County: Luzerne

Total Area (acres): 0.57

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Huntington Creek

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: Huntington Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

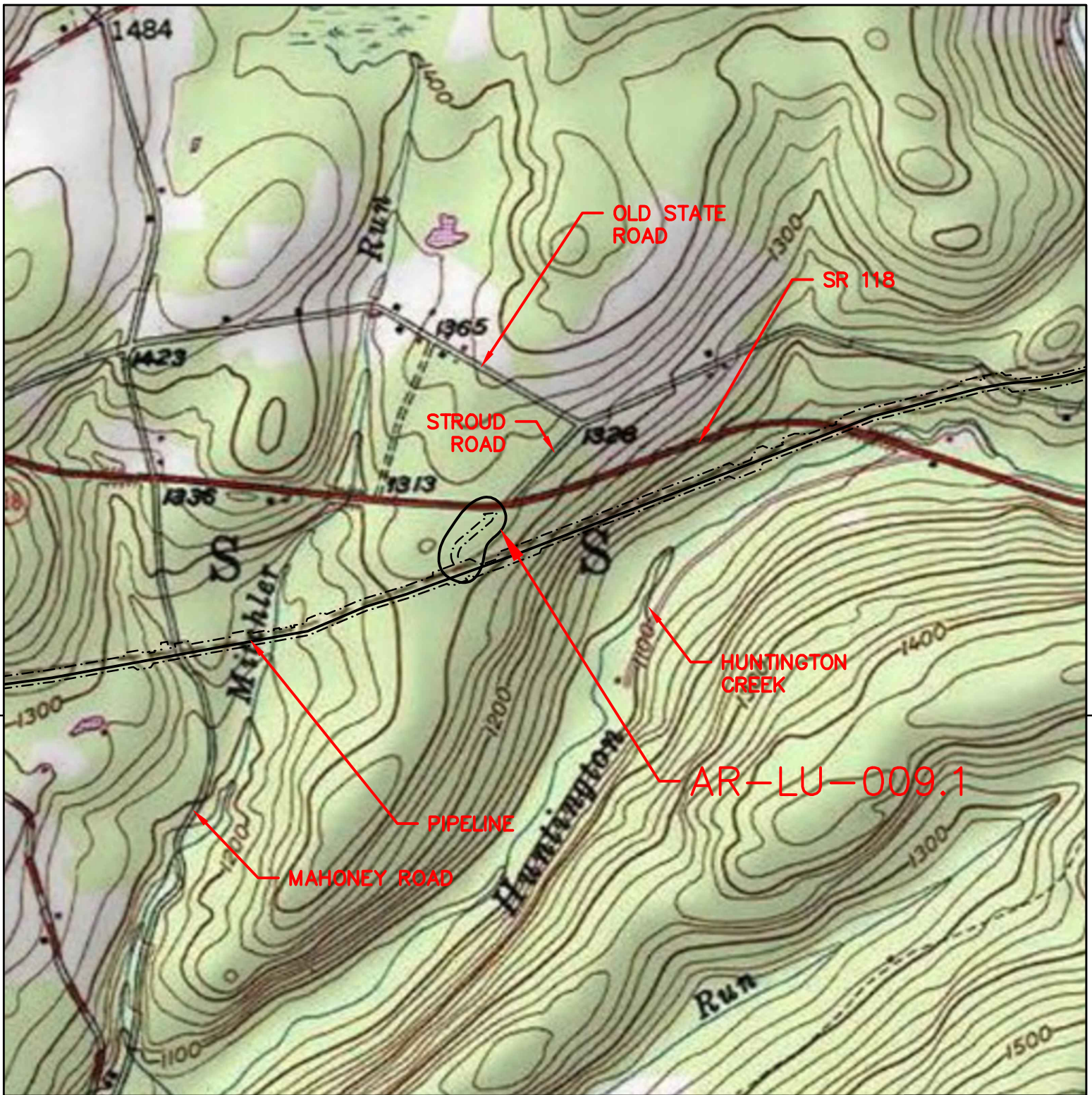
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes


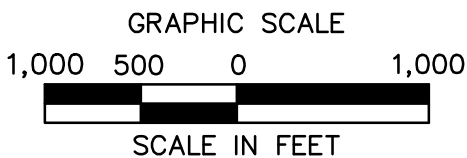
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

J.2 Location Map



SWEET VALLEY QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
PERMANENT AR-LU-009.1
ROSS TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-009.1	SHEET 1 OF 1
							WO: 1161481			

J.3 Sediment Barrier Table
a. E&S Worksheet 1

J.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX K

Intentionally Omitted by Applicant

APPENDIX L

AR-LU-011 Specific Narrative and Calculations

L.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

L.2 Location Map

L.3 Sediment Barrier Table

- a. E&S Worksheet 1**

L.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-011

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-011 is a proposed temporary access road (TAR) located in Lake Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Pine Tree Road and terminates at the pipeline right-of-way at approximate milepost 17.2. This TAR is approximately 600 feet long over an existing **gravel** road. Temporary widening and gravel surfacing is proposed from approximate station 0+50 to station 4+25. A temporary rock construction entrance and driveway apron **with compost filter sock** will be installed where the TAR meets Pine Tree Road. Equipment mats will be placed where the TAR crosses an existing TGPL pipeline. The road is located entirely within ASR pipeline limit of disturbance. **The proposed E&S measures are included in the Pipeline E&S Plan and shown in grey on the Access Road Plan for coordination purposes.** Upon completion of the pipeline construction the existing road will be returned to the pre-construction width and surfacing and disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-011 is a proposed temporary access road. The temporary access road is situated completely within the permanent right of way of the pipeline reducing the area of impact. Although some temporary widening is proposed, the TAR roadway width has been minimized to 14 feet. All temporary widening will be restored to pre-construction conditions.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-011 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-011 is approximately 600 linear feet; however, it follows an existing gravel road for its extent. Only sliver widening improvements are necessary to use the existing gravel road. Utilizing the existing gravel road minimizes the potential thermal impact of this road.***
- ***The entire access road follows an existing gravel road. The use of an existing road corridor eliminates the need for additional tree removal. The ability to use this road without the removal of additional trees acts to avoid additional thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surface which fell outside of the existing road footprint. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

RIPARIAN BUFFER WAIVER:

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 3 of the ESCGP-2 NOI).

AR-LU-011 will require a Riparian Buffer Waiver – The existing road encroaches the riparian buffer within the pipeline right of way. No earth disturbing improvements are proposed within the riparian buffer. A rock construction entrance with wash rack and driveway apron installed on top of geotextile are proposed to be installed within the riparian buffer. The impacted riparian buffer area is 0.08 acres.

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-011 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	4.8
OIC	Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes	4.8
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	4.8

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-011**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around woodlands and wetlands to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrances with wash rack and gravel driveway apron.**
- 9. Install construction mats over existing pipeline crossing.**
- 10. Remove brush to effectively install E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of E&SC BMPs on the Site as shown on the construction drawings.**
- 11. Install E&SC BMPs as depicted on the E&SC Plan.**

- 12. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 13. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 14. Proceed with major clearing and grubbing.**
- 15. Begin construction staking for layout of access road.**
- 16. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline limit of disturbance. Stockpiled soil shall not exceed 35 feet in height, have maximum side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.**
- 17. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 18. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the limit of disturbance. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**

- 19. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 20. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.**
- 21. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.**
- 22. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose/recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.**
- 23. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.**
- 24. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.**

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-011

Municipality: Lake Township

County: Luzerne

Total Area (acres): 0.83

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Paint Spring Run

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: UNT to Paint Spring Run

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterM](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm) No

[anagement/GeneralPermits/default.htm](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm)

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

Approved Act 167 Plan? Yes

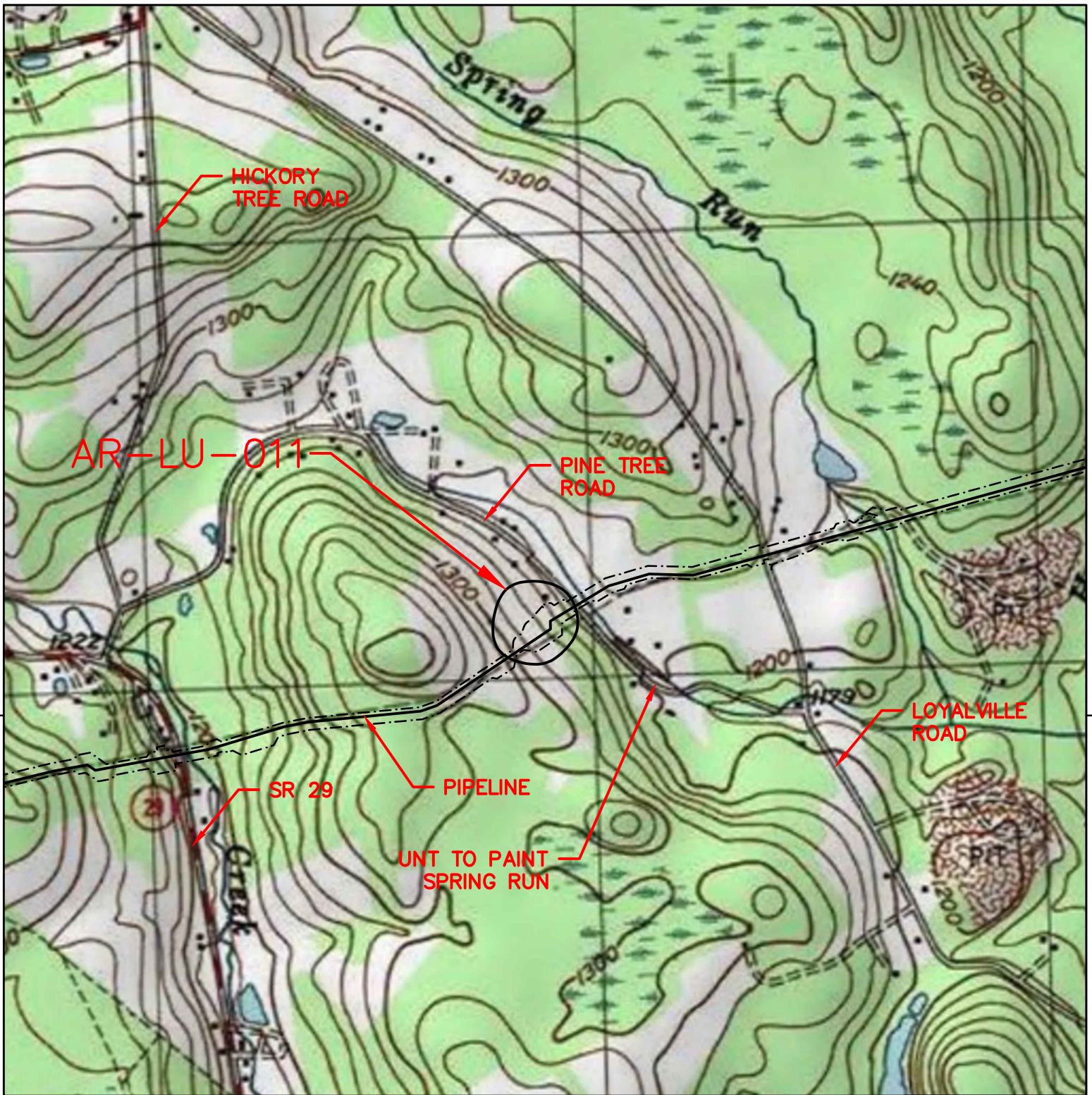
[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagem](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html) No

[ent/Approved_1.html](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html)

Existing River Conservation Plan? Yes


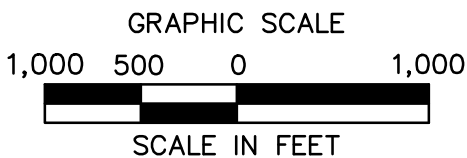
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

L.2 Location Map



HARVEYS LAKE QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-011
LAKE TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-011	SHEET 1 OF 1
							WO: 1161481			

L.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX M

AR-LU-012 Specific Narrative and Calculations

M.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

M.2 Location Map

M.3 Sediment Barrier Table

- a. E&S Worksheet 1

M.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-012

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-012 is a proposed temporary access road (TAR) located in Lake Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Loyalville Road, traverses through the pipeline right-of-way and terminates at approximate milepost 17.5. This TAR is approximately 1,070 feet long and follows an existing farm road. Temporary widening and gravel surfacing is proposed for the first 630 feet. Adjacent to the wetlands, from station 1+30 to station 4+80, equipment mats will be installed and the road will not be widened. Equipment mats will also be installed where the road crosses the existing TGPL pipeline. The road is located entirely within ASR pipeline limit of disturbance and will utilize pipeline E&S controls. A temporary rock construction entrance and driveway apron **with compost filter sock** will be installed where the TAR meets Loyalville Road. Upon completion of the pipeline construction the existing road will be restored to pre-construction width and surface and the disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-012 is an existing farm road that will be utilized as a temporary access road. Some temporary widening and gravel surfacing will be performed for construction traffic. Equipment matting will also be utilized on portions of the road to further reduce impacts. All construction traffic will utilize the existing road path which lies completely within the pipeline right of way. Soil compaction impacts have been minimized by the use of the existing road path, its location within the pipeline right of way, and minimizing the road width to 14 feet within the temporarily widened road sections. Widened areas of the road will be restored with native topsoil to enhance the revegetation process.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-012 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-012 is approximately 1,070 linear feet and follows an existing gravel road for its extent; however, minor widening is only required for approximately 630 linear feet. Utilizing the existing gravel road minimizes the potential thermal impact of this road.***
- ***During the construction phase of this project compost filter socks will be placed downgradient of the proposed access road. The compost filter socks will promote infiltration of runoff from the proposed temporary impervious surfaces. Infiltration of runoff prior to entering receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surface within the small sliver widening areas. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

RIPARIAN BUFFER WAIVER:

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 3 of the ESCGP-2 NOI).

AR-LU-012 will require a Riparian Buffer Waiver– The existing road encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. Timber matting will be installed over the existing road to protect the existing road from construction traffic wear. The impacted riparian buffer area is 0.12 acres.

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-012 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
LcD	Lackawanna channery silt loam, 8 to 25 percent slopes, extremely stony	5.1
WyD	Wyoming gravelly loam, 15 to 25 percent slopes	4.8
ChC	Chenango gravelly loam, 8 to 15 percent slopes	6.0
BrB	Braceville gravelly loam, 3 to 8 percent slopes	5.6
ChB	Chenango gravelly loam, 3 to 8 percent slopes	6.0

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-012**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including rock construction entrance with wash rack. Install E&SC BMPs down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrance with wash rack and gravel driveway apron.**
- 9. Install construction mats over existing pipeline crossing and over existing culvert, roadway, and wetland area as shown on plans.**
- 10. Remove brush to effectively install perimeter controls, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 11. Install perimeter E&SC BMPs as depicted on the E&SC Plan.**

- 12. Apply stabilization measures immediately to any disturbed areas due to the initial clearing and installation of E&SC BMPs.**
- 13. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 14. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 15. Proceed with major clearing and grubbing.**
- 16. Begin construction staking for layout of access road.**
- 17. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline limit of disturbance. Stockpiled soil shall not exceed 35 feet in height, have maximum side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.**
- 18. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 19. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**

- 20. Once the temporary access road is no longer necessary, remove all excess gravel and geotextile fabric from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 21. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.**
- 22. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.**
- 23. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.**
- 24. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.**
- 25. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.**

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date:

Project Name:

Municipality:

County:

Total Area (acres):

Major River Basin:

<http://www.dep.state.pa.us/dep/depupdate/watermgmt/wc/default.htm#newtopics>

Watershed:

Sub-Basin:

Nearest Surface Water(s) to Receive Runoff:

Chapter 93 - Designated Water Use:

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment:

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

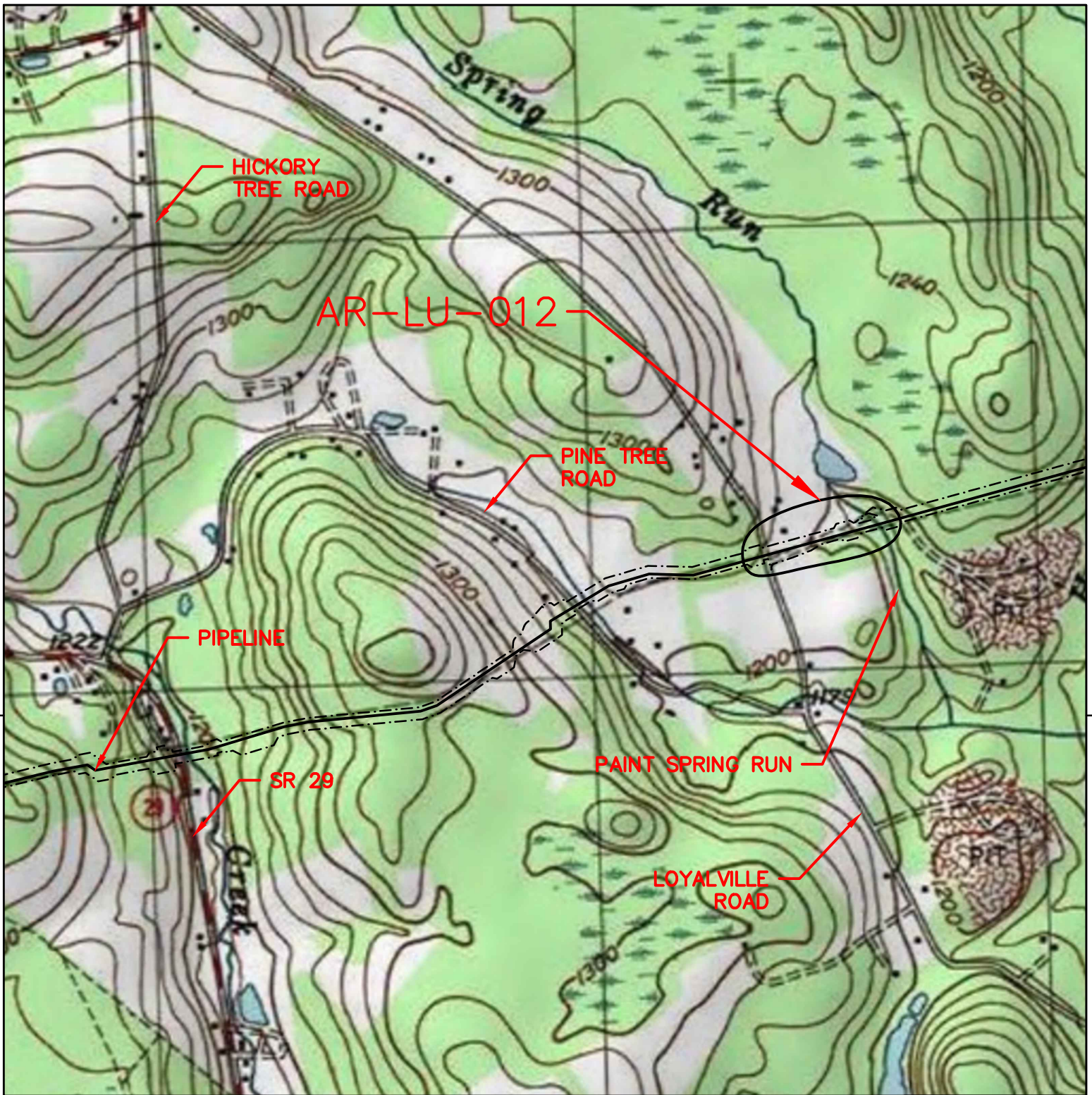
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes


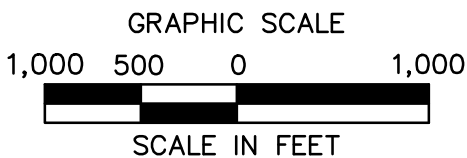
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

M.2 Location Map



HARVEYS LAKE QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-012
LAKE TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY:	CLM	DATE:	11/11/15	ISSUED FOR BID:	SCALE:	1"=1,000'
				1161481			CHECKED BY:		DATE:		ISSUED FOR CONSTRUCTION:		
							APPROVED BY:		DATE:		DRAWING NUMBER:	24-1601-70-28-A/ 1683_3-AR-LU-012	SHEET 1 OF 1
							WO:	1161481					

M.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX N

AR-LU-014 Specific Narrative and Calculations

N.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

N.2 Location Map

N.3 Sediment Barrier Table

- a. E&S Worksheet 1**

N.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-014

ACT 167 PLAN: Luzerne County Act 167, adopted June 2010

TMDL: None

NARRATIVE:

AR-LU-014 is a proposed temporary access road (TAR) located in Lehman Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Huntsville – Idletown Road, runs parallel with the pipeline right-of-way and terminates at approximate mile post 21.5. This TAR is approximately 1,000 feet long over an existing road. There are no proposed **earth disturbing** improvements; therefore, **no sediment barriers are proposed along the road**. A construction entrance and driveway apron **with compost filter sock** are proposed at the pipeline right-of-way. Equipment mats will be placed to protect existing culverts. **Within the pipeline right of way, the proposed temporary sediment barriers are included in the Pipeline E&S Plan and shown in grey on the Access Road Plan for coordination purposes**. Upon completion of the pipeline construction, the disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-014 is an existing road that will be utilized as a temporary access road. The earth disturbance due to this road is limited to a construction entrance and driveway apron. These areas will be restored with native topsoil to enhance the revegetation process.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-014 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- **The 1,000 linear feet of road follows an existing gravel road. No improvements are necessary to use the existing gravel road. The use of an existing road corridor eliminates the need for additional tree removal. The**

ability to use this road without the removal of additional trees acts to minimize the thermal impact of this road.

- **Temporary construction phase improvements for this road are limited to equipment mats over existing culverts, a driveway apron and rock construction entrance with wash rack. Runoff from these temporary improvements is directed to stabilized, well vegetated areas that will promote infiltration of the runoff. Infiltration of runoff prior to entering of receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.**
- **The proposed rock construction entrance with wash rack is temporary in nature, any disturbed areas as a result of the construction will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this existing gravel road. The proposed RCE with wash rack will be removed at the end of the construction and minor disturbed areas will be stabilized. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.**

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-014 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
RdA	Rexford loam, 0 to 3 percent slopes	5.7
OpD	Oquaga and Lordstown extremely stony silt loams, 8 to 25 percent slopes	4.8
WIC	Wellsboro channery silt loam, 8 to 15 percent slopes	5.3
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	5.1
WIB	Wellsboro channery silt loam, 3 to 8 percent slopes	5.3
LaB	Lackawanna channery loam, 3 to 8 percent slopes	5.1

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-014**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrance with wash rack and driveway apron on nonwoven geotextile and gravel surfacing where indicated in the E&SC Plans.**
- 9. Install construction mats over existing culverts.**
- 10. Remove brush to effectively install perimeter E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**

- 11. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter E&SC BMPs.**
- 12. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 13. Proceed with major clearing and grubbing.**
- 14. Begin construction staking for layout of limits of access road.**
- 15. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 16. Immediately stabilize the access road with geotextile and gravel surfacing where indicated in the E&SC Plans.**
- 17. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**
- 18. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 19. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match**

preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.

- 20. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***
- 21. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including perimeter sediment barrier. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 22. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 23. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-014

Municipality: Lake Township

County: Luzerne

Total Area (acres): 1.06

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Toby - Wapwallopen Creeks

Sub-Basin: Upper Central Susquehanna River

Nearest Surface Water(s) to Receive Runoff: UNT to Huntsville Creek

Chapter 93 - Designated Water Use: CWF, MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

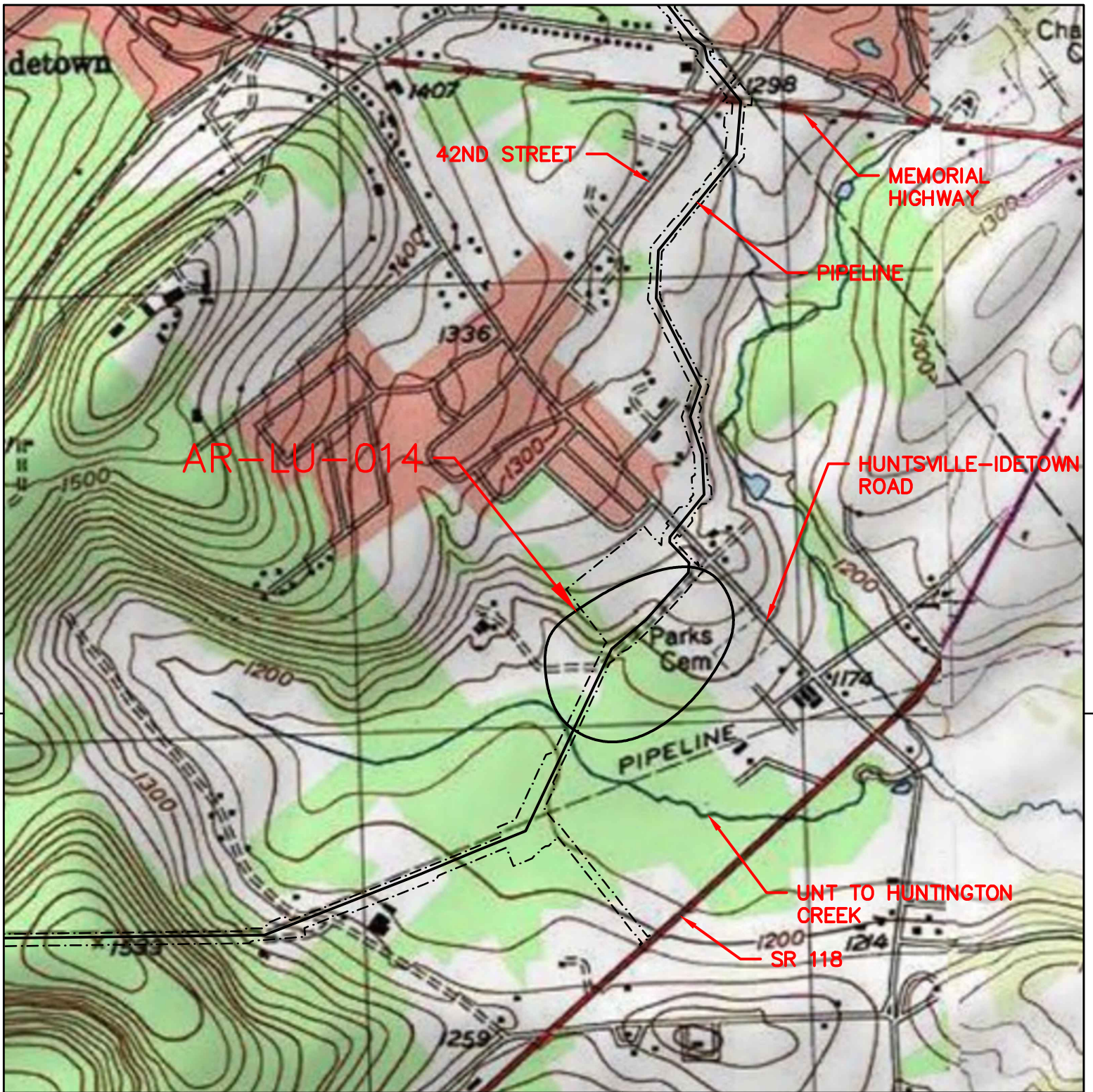
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

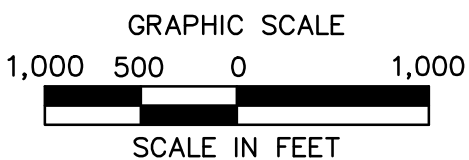
N.2 Location Map



HARVEYS LAKE
QUADRANGLE

KINGSTON
QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING



ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-014
LEHMAN TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-014	SHEET 1 OF 1
							WO: 1161481			

N.3 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX O

AR-LU-015 Specific Narrative and Calculations

O.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

O.2 Location Map

O.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion*
- c. *Minimized Soil Compaction*
- d. *Thermal Impact Analysis*
- e. *Acidic Soil Management Plan*
- f. *Road Specific Construction Sequence*
- g. *Worksheet 1. General Site Information*

ACCESS ROAD: AR-LU-015

ACT 167 PLAN: Bowman's Creek Watershed Act 167, adopted November 17, 2000

TMDL: None

NARRATIVE:

AR-LU-015 is a proposed temporary access road (TAR) located in Dallas Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Lake Street and terminates at the pipeline right-of-way at approximate mile post **M-0141 MP 0.1**. This TAR is approximately 50 feet long over an existing gravel road. Due to the relatively short length of this TAR, the proposed road will be constructed as a temporary rock construction entrance **with wash rack**. Upon completion of the pipeline construction, the existing **gravel** road will be returned to the pre-construction width and surfacing, and disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-015 will utilize an existing gravel road. All construction traffic will utilize the existing road, therefore, soil compaction impacts have been reduced with impacts minimized to just the temporary widened areas for installation of the construction entrance with wash rack. The temporary widened areas will be restored to pre-construction conditions with native top soil.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-015 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-015 is approximately 50 linear feet, minimizing the total length of necessary temporary construction and, therefore, minimizing thermal impact of the road.***

- ***This road is proposed in a location that minimizes tree removal. The ability to use this road to minimize the removal of additional trees acts to avoid additional thermal impact of this road.***
- ***Temporary construction phase improvements for this road are limited to a rock construction entrance with wash rack. Runoff from these temporary improvements is directed to stabilized, well vegetated areas that will promote infiltration of the runoff. Infiltration of runoff prior to entering receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***
- ***The proposed rock construction entrance with wash rack surfacing is temporary in nature outside of the limits of the existing road footprint and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surfaces outside the existing gravel road areas. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-015 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
MoB	Morris channery silt loam, 0 to 8 percent slopes	5.4

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-015**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrance with wash rack.**
- 9. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 10. Proceed with major clearing and grubbing.**
- 11. Begin construction staking for layout of limits of access road.**
- 12. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is**

thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.

- 13. Immediately stabilize the access road with geotextile and gravel surfacing where indicated in the E&SC Plans.***
- 14. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable E&SC BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).***
- 15. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. E&SC BMPs will remain in place and functional.***
- 16. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.***
- 17. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***
- 18. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose of or recycle***

E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.

19. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.

20. Upon completion of all earth disturbance activities, removal of all temporary E&SC BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date:

Project Name:

Municipality:

County:

Total Area (acres):

Major River Basin:

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed:

Sub-Basin:

Nearest Surface Water(s) to Receive Runoff:

Chapter 93 - Designated Water Use:

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment:

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterM](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm) No

[anagement/GeneralPermits/default.htm](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm)

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

Approved Act 167 Plan? Yes

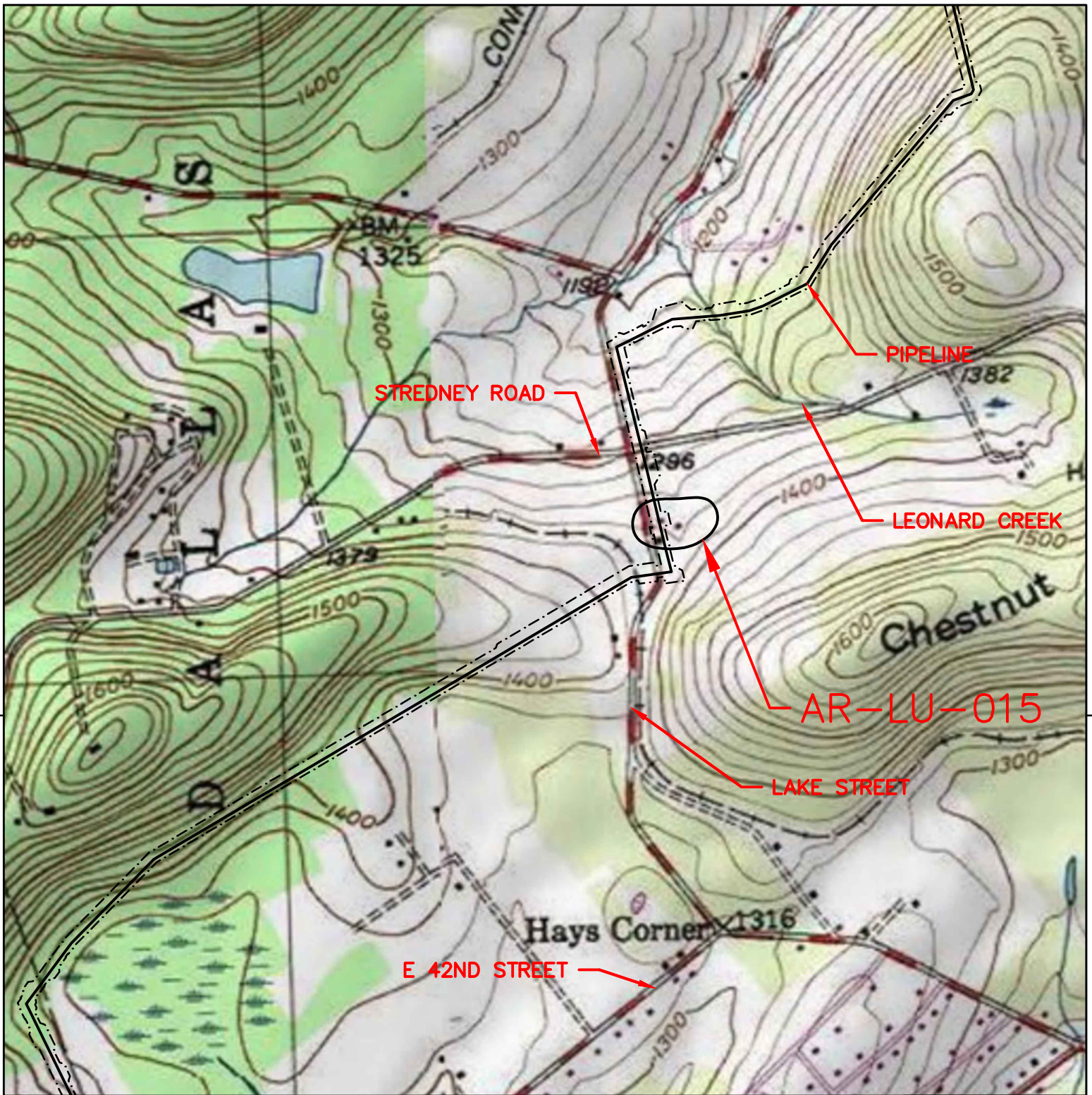
[http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagem](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html) No

[ent/Approved_1.html](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html)

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

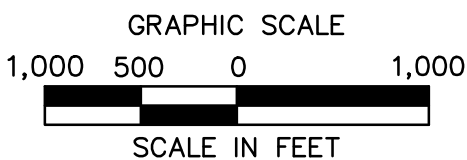
O.2 Location Map



HARVEYS LAKE
QUADRANGLE

KINGSTON
QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING



ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-015
DALLAS TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-015	SHEET 1 OF 1
							WO: 1161481			

APPENDIX P

Intentionally Omitted by Applicant

APPENDIX Q

AR-LU-019 Specific Narrative and Calculations

Q.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

Q.2 Location Map

Q.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion*
- c. *Minimized Soil Compaction*
- d. *Thermal Impact Analysis*
- e. *Acidic Soil Management Plan*
- f. *Road Specific Construction Sequence*
- g. *Worksheet 1. General Site Information*

ACCESS ROAD: AR-LU-019

ACT 167 PLAN: Bowman's Creek Watershed Act 167, adopted November 17, 2000

TMDL: None

NARRATIVE:

AR-LU-019 is a proposed temporary access road (TAR) located in Dallas Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Old Tunkhannock Highway, runs parallel to the pipeline right-of-way, and terminates at approximate milepost 25.4. This TAR is approximately **570** feet long over an existing road. Temporary widening and gravel surfacing is proposed along almost the entire length of road. A short 30 foot section of road will be installed over undisturbed land. **The road is located entirely within ASR pipeline limit of disturbance and will utilize pipeline E&S controls, additionally an ABACT rock filter will be installed in the existing roadside swale.** A temporary rock construction entrance **with wash rack** and driveway apron is proposed where the TAR meets Old Tunkhannock Highway. Upon completion of the pipeline construction the existing road will be returned to pre-construction width and surfacing and the disturbed areas will be restored to pre-construction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-019 will utilize an existing road with some temporary widening and a 30 foot extension over undisturbed ground. All construction traffic will utilize the existing road path. Soil compaction impacts have been minimized by the use of the existing road path and minimization of temporary widening to accommodate construction equipment turning movements. Post-construction the road will be restored to its original width and length with native topsoil to enhance the revegetation process.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-019 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***AR-LU-019 is approximately 570 linear feet; however, it follows an existing road for much of its extent, with the exception of 30 feet. Minor widening improvements are necessary to use the existing road. Utilizing the existing road minimizes the potential thermal impact of this road.***
- ***The majority of the access road follows an existing road. The use of an existing road corridor eliminates the need for additional tree removal. The ability to use this road without the removal of additional trees acts to avoid additional thermal impact of this road.***
- ***During the construction phase of this project compost filter socks will be placed downgradient of the proposed access road. The compost filter socks will promote infiltration of runoff from the proposed temporary impervious surfaces. Infiltration of runoff prior to entering receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surfaces. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-019 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
MoC	Morris channery silt loam, 8 to 15 percent slopes	5.4
WIC	Wellsboro channery silt loam, 8 to 15 percent slopes	5.3

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-019**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Install the rock construction entrance with wash rack and gravel driveway apron.**
- 8. Remove brush to effectively install E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 9. Install perimeter E&SC BMPs as depicted on the E&SC Plan.**
- 10. Apply stabilization measures immediately to any disturbed areas due to the initial clearing and installation of E&SC BMPs.**
- 11. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**

- 12. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 13. Proceed with major clearing and grubbing.**
- 14. Begin construction staking for layout of limits of access road.**
- 15. Strip topsoil and stockpile within the pipeline right of way per Details TS.1, TS.2, and TS.3 provided in the Best Management Practices and Quantities Plan under separate cover. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI). Excess material shall be removed from the Site immediately and hauled off-site to a suitable disposal or recycling site in compliance with local, state, and federal regulations.**
- 16. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 17. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**
- 18. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections and dispose of materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.**
- 19. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas**

at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.

- 20. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***
- 21. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 22. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 23. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-019

Municipality: Dallas Township

County: Luzerne

Total Area (acres): 0.60

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgmt/wc/default.htm#newtopics>

Watershed: Mehoopany - Bowman Creeks

Sub-Basin: Upper Susquehanna River

Nearest Surface Water(s) to Receive Runoff: UNT to Leonard Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

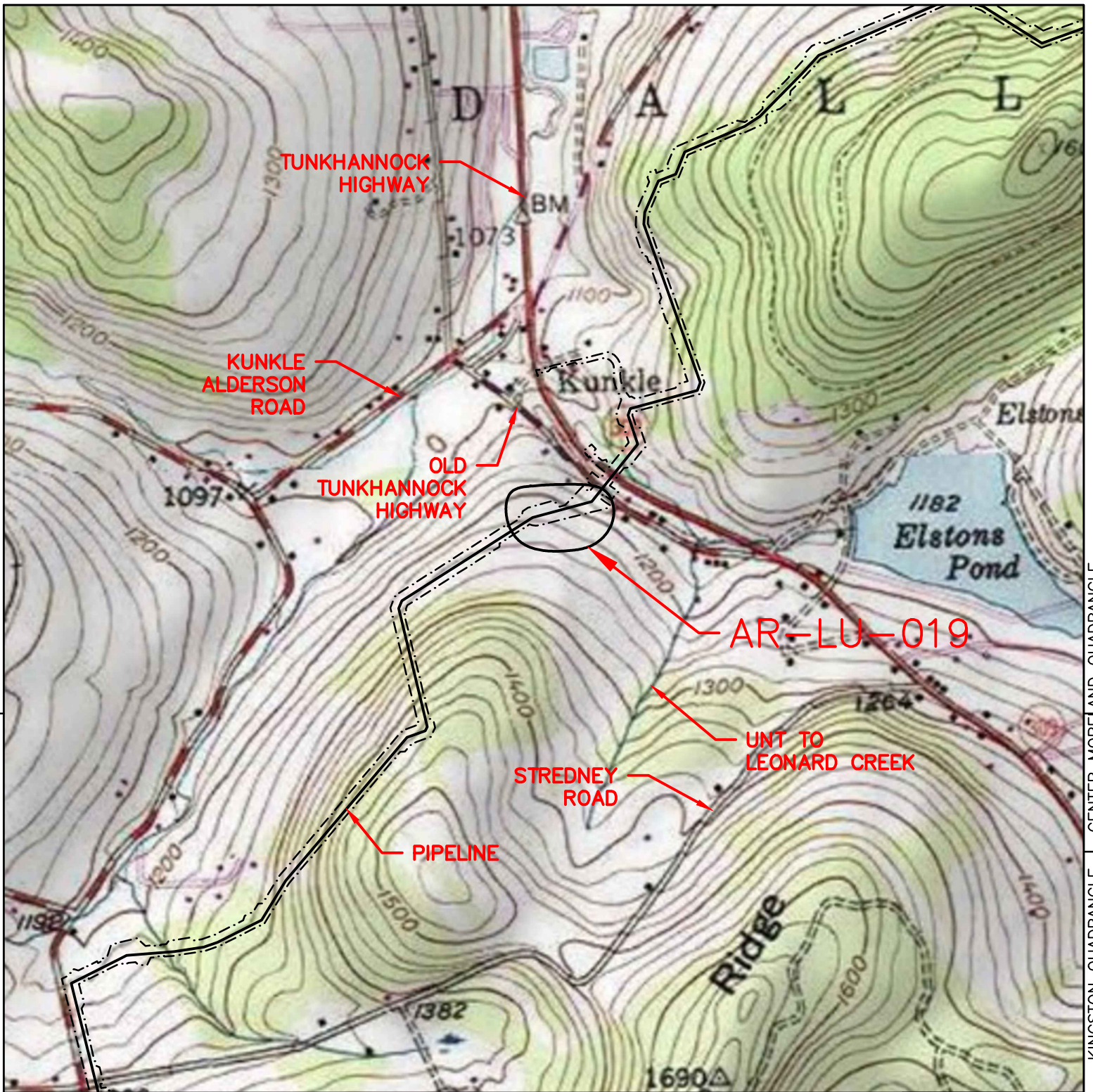
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No


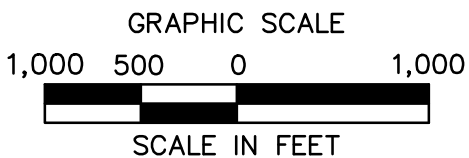
Q.2 Location Map



KINGSTON QUADRANGLE | CENTER MORELAND QUADRANGLE

KINGSTON QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-019
DALLAS TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-019	SHEET 1 OF 1
							WO: 1161481			

APPENDIX R

AR-LU-020 Specific Narrative and Calculations

R.1 Site Specific Narrative

- a. Narrative
- b. TMDL Discussion**
- c. Minimized Soil Compaction**
- d. Thermal Impact Analysis**
- e. Acidic Soil Management Plan**
- f. Road Specific Construction Sequence**
- g. Worksheet 1. General Site Information**

R.2 Location Map

R.3 Conveyance Calculations

- a. E&S Worksheet 11
- b. NAG Swale Lining Analysis
- c. Figure 9.3-Riprap Apron Design
- d. Temporary Swale Drainage Area Map

R.4 Sediment Barrier Table

- a. E&S Worksheet 1

R.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion*
- c. *Minimized Soil Compaction*
- d. *Thermal Impact Analysis*
- e. *Acidic Soil Management Plan*
- f. *Road Specific Construction Sequence*
- g. *Worksheet 1. General Site Information*

ACCESS ROAD: AR-LU-020

ACT 167 PLAN: Bowman's Creek Watershed Act 167, adopted November 17, 2000

TMDL: None

NARRATIVE:

AR-LU-020 is a proposed temporary access road (TAR) located in Dallas Township, Luzerne County, Pennsylvania. The intent of this road is to provide temporary construction access to the proposed 30" Central Penn Line North Pipeline. The road begins at Tunkhannock Highway and terminates at the pipeline right-of-way at approximate milepost M-0142 MP 0.0.

The TAR is approximately 920 feet long. For the first 544 feet the road follows an existing gravel drive, no improvements are proposed over this portion of the road. The remaining 380 feet of road is to be new temporary construction over undeveloped land. A temporary construction entrance with wash rack with compost filter sock will be installed at the beginning of the proposed edge of road and removed upon completion of the construction activities. A temporary filter sock diversion has been proposed to direct clean runoff away from the proposed disturbance necessary to construct the temporary access road. A temporary riprap apron is proposed at the termination of the filter sock diversion to reduce the energy of the diverted flows and spread the discharged water over a larger area; the stormwater will be conveyed across the access road through 12" deep AASHTO #1 rock matting. The discharged runoff will flow over meadow to the unnamed tributary to Leonard Creek (WW-T24-18001) located approximately 250 feet downhill of the access road.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads to the maximum extent practicable. AR-LU-020 is temporary access road that will utilize a portion of an existing gravel driveway. All construction traffic will utilize the existing 540-foot gravel driveway path, as well as, an additional 380 feet by 14 feet wide temporary access road over undisturbed ground. Soil compaction impacts have been minimized by the use of the existing gravel driveway and minimizing the temporary access road width to 14 feet. The portion of the temporary access road that is over undisturbed ground will be restored to

pre-construction conditions with native soils to enhance the revegetation process.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-020 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***This road is proposed in a location that minimizes tree removal. The ability to use this road for the first 540 feet without the removal of additional trees acts to minimize the thermal impact of this road.***
- ***During the construction phase of this project compost filter socks will be placed downgradient of the proposed access road. The compost filter socks will promote infiltration of runoff from the proposed temporary impervious surfaces. Infiltration of runoff prior to entering receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.***
- ***Filter sock diversions have been proposed to intercept runoff prior to contact with the proposed temporary gravel surface of the road. The use of the diversion swale will reduce the amount of runoff that will come in contact with the temporary gravel surface, minimizing the thermal impact of this road.***
- ***The proposed gravel surfacing is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the temporary gravel surface. Therefore, there are no permanent thermal impacts as a result of the use of this road for the construction of the pipeline.***

RIPARIAN BUFFER WAIVER:

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 3 of the ESCGP-2 NOI).

AR-LU-020 will require a Riparian Buffer Waiver– The existing road encroaches the riparian buffer. No improvements are proposed within the riparian buffer. The existing gravel road will be used. The impacted riparian buffer area is 0.14 acres.

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-020 Soil Acidity Table		
Soil Map Symbol	Soil Name	PH
OID	Oquaga and Lordstown channery silt loams, 15 to 25 percent slopes	4.8
OIC	Oquaga and Lordstown channery silt loams, 8 to 15 percent slopes	4.8
Ho	Holly silt loam	6.5

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-020**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Perform tree cutting where required. (Areas with tree cutting shall be restored to meadow in good condition.)**
- 8. Install the rock construction entrance with wash rack and gravel driveway apron.**
- 9. Remove brush to effectively install perimeter E&SC BMPs, level side cuts to grant access for vehicles and workers to safely perform the installation of sediment barriers on the Site as shown on the construction drawings.**
- 10. Install perimeter E&SC BMPs as depicted on the E&SC Plan.**
- 11. Apply stabilization measures immediately to any disturbed areas due to the initial clearing and installation of E&SC BMPs.**

- 12. The Compliance Manager shall provide PADEP at least three days' notice prior to bulk earth disturbance and upon completed installation of perimeter erosion controls.**
- 13. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 14. Proceed with major clearing and grubbing.**
- 15. Begin construction staking for layout of limits of access road.**
- 16. Begin grading and strip and stockpile topsoil; install E&SC BMPs around stockpiles. Soil stockpile areas to support the access roads shall be located within the area of minimum disturbance/reduced grading for the same access road that the topsoil was stripped, or within the pipeline limit of disturbance. Stockpiled soil shall not exceed 35 feet in height, have maximum side slopes of 2:1, and be surrounded by 12" compost filter sock or silt fence. All existing excavated material that is not to be reused in the work is to be immediately removed from the site and properly disposed of at an approved facility or permitted waste area.**
- 17. Grade the access road as shown on the E&SC Plans (Section 2 of the ESCGP-2 NOI), including any broad based dips. Add AASHTO #57 stone to the portion of the existing road to remain in areas where existing gravel is thinning or bare to create a uniform travel surface. Continue adding AASHTO #57 stone to rutted or thinning areas as necessary during active use of the access road.**
- 18. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable E&SC BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).**
- 19. Once the temporary access road is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections of the access road and dispose of the materials at a suitable disposal or recycling site in**

compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. E&SC BMPs will remain in place and functional.

- 20. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed areas to match preconstruction conditions. Immediately fertilize, seed and stabilize areas at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.***
- 21. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***
- 22. Upon local CCD and Transco approval of stabilization and re-vegetation, remove temporary E&SC BMPs and stabilize areas disturbed by removal including the perimeter sediment barrier and temporary compost diversions. Properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 23. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 24. Upon completion of all earth disturbance activities, removal of all temporary E&SC BMPs and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 23-Mar-15

Project Name: Atlantic Sunrise Pipeline AR-LU-020

Municipality: Dallas Township

County: Luzerne

Total Area (acres): 0.4

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Mehoopany - Bowman Creeks

Sub-Basin: Upper Susquehanna River

Nearest Surface Water(s) to Receive Runoff: UNT to Leonard Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

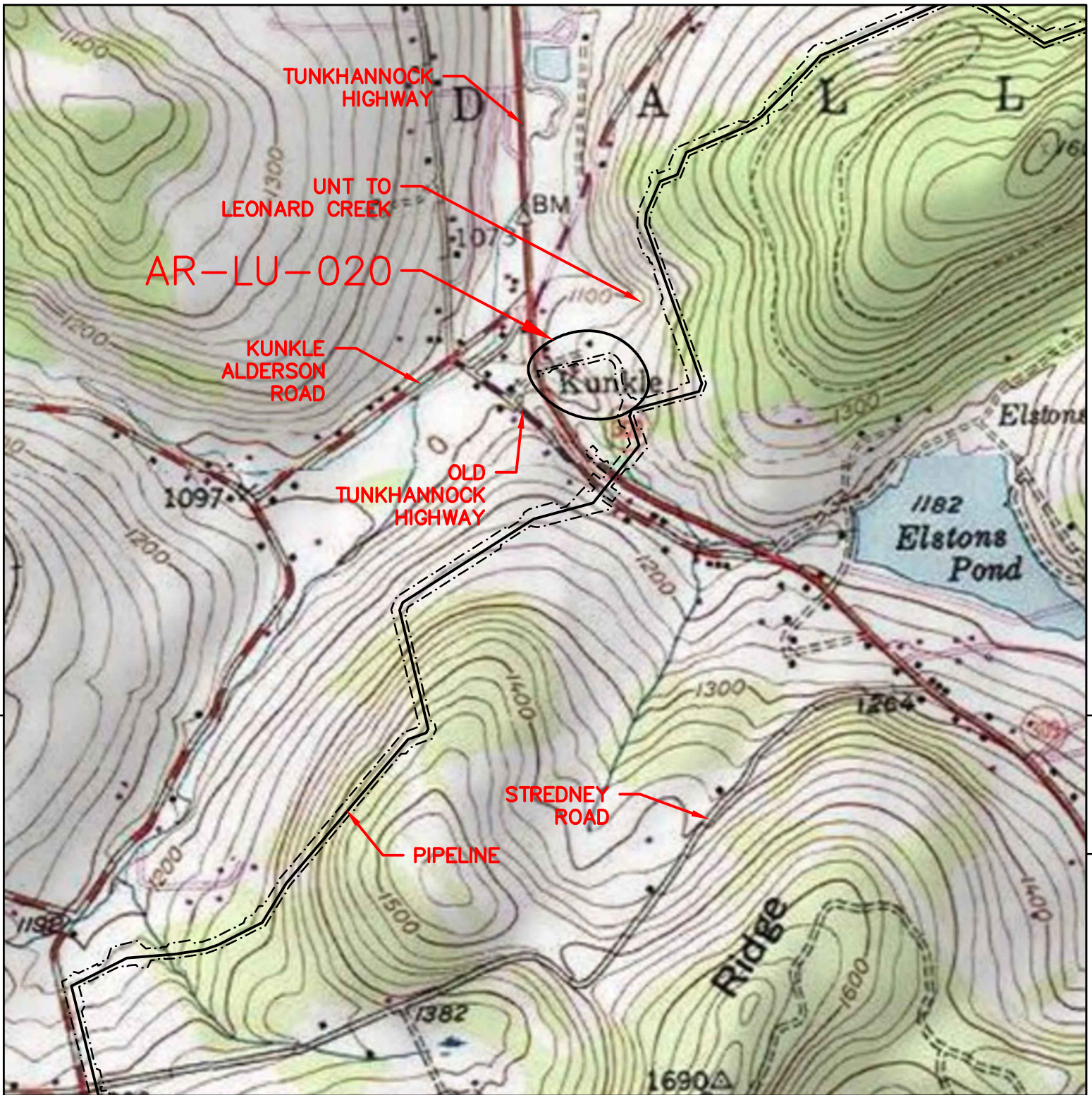
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

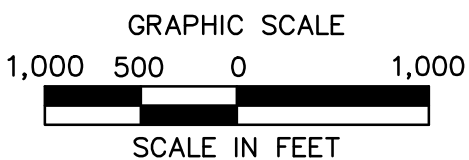
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No

R.2 Location Map




KINGSTON QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-020
DALLAS TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-020	SHEET 1 OF 1
							WO: 1161481			

R.3 Conveyance Calculations

- a. E&S Worksheet 11
- b. NAG Swale Lining Analysis
- c. Figure 9.3-Riprap Apron Design
- d. Temporary Swale Drainage Area Map

E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Atlantic Sunrise
 LOCATION: AR-LU-020-FSD-1
 PREPARED BY: EAW DATE: 6/17/16
 CHECKED BY: SMK DATE: 6/24/16

CHANNEL OR CHANNEL SECTION	Grass LINING (MIN)
TEMPORARY OR PERMANENT? (T OR P)	T
DESIGN STORM (2, 5, OR 10 YR)	2
ACRES (AC)	0.87
MULTIPLIER ¹ (1.6, 2.25, or 2.75) ¹	2.25
Q _r (REQUIRED CAPACITY) (CFS)	1.96
Q (CALCULATED AT FLOW DEPTH d) (CFS)	2.16
PROTECTIVE LINING ²	GRASS
n (MANNING'S COEFFICIENT) ²	0.05
V _a (ALLOWABLE VELOCITY) (FPS)	N/A
V (CALCULATED AT FLOW DEPTH d) (FPS)	2.37
τ _a (MAX ALLOWABLE SHEAR STRESS) (LB/FT ²)	4.20
τ _d (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT ²)	1.27
CHANNEL BOTTOM WIDTH (FT)	0
CHANNEL SIDE SLOPES (H:V)	7 1
D (TOTAL DEPTH) (FT)	2.0
CHANNEL TOP WIDTH @ D (FT)	14
d (CALCULATED FLOW DEPTH) (FT)	0.51
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	3.57
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	0.00
d50 STONE SIZE (IN)	N/A
A (CROSS-SECTIONAL AREA) (SQ. FT.)	0.91
R (HYDRAULIC RADIUS)	0.25
S (BED SLOPE) ³ (FT/FT)	0.04
Sc (CRITICAL SLOPE) (FT/FT)	0.058
.7Sc (FT/FT)	0.041
1.3Sc (FT/FT)	0.076
STABLE FLOW? (Y/N)	Y
FREEBOARD BASED ON UNSTABLE FLOW (FT)	0.09
FREEBOARD BASED ON STABLE FLOW (FT)	0.50
MINIMUM REQUIRED FREEBOARD ⁴ (FT)	0.50
DESIGN METHOD FOR PROTECTIVE LINING ⁵ PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	S

EQUIVALENT PIPE CALCULATION:

Q	n	s (ft/ft)	D (ft.)	D (in)	Round up to:
2.16	0.013	0.04	0.639	7.665	12" pipe

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8}$$

Pipe Equivalence Calculation for Sizing Rip Rap Apron:

Use Manning's Equation

$$Q = (1.49/n)*A*(R^{2/3})*(S^{1/2})$$

Q = Flow Rate from Worksheet 11 (cfs)

n = Manning's Constant for Smooth Plastic Pipe = 0.013 (unitless)

A = Area of Pipe (ft) = 0.25 * Pi * D²

D = Diameter of Pipe (ft)

R = Hydraulic Radius = A / P = (0.25 * Pi * D²) / (Pi * D) = 0.25 * D

P = Perimeter of Pipe (ft) = Pi * D

S = Slope of channel from Worksheet 11 (ft/ft)

Solve Manning's Equation for Diameter of Pipe:

$$Q = (1.49/n)*A*(R^{2/3})*(S^{1/2})$$

$$Q = (1.49/n)*(0.25*Pi*D^2)*((0.25*D)^{2/3})*(S^{1/2})$$

$$Q*n*/(1.49*S^{1/2})=(0.25*Pi*D^2)*((0.25*D)^{2/3})$$

$$Q*n*/(1.49*S^{1/2})*0.25*(0.25^{2/3})=(Pi*D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478)=(D^2)*(D^{2/3})$$

$$Q*n*/(S^{1/2}*Pi*0.1478)=(D^8/3)$$

$$(Q*n*/(S^{1/2}*Pi*0.1478))^{3/8}=D$$

Multiply by 12 to convert feet to inches:

$$D = ((Q*n)/(S^{1/2}*Pi*0.1478))^{3/8} * 12$$

- Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
- Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
- Slopes may not be averaged.
- Minimum Freeboard is 0.5 ft. or 1/4 Total Channel Depth, whichever is greater
- Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.



Tensar International Corporation
 5401 St. Wendel-Cynthiana Road
 Poseyville, Indiana 47633
 Tel. 800.772.2040
 Fax 812.867.0247
 www.nagreen.com

**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: ASR Access Roads
 Project Number: 63544
 Channel Name: AR-LU-020**

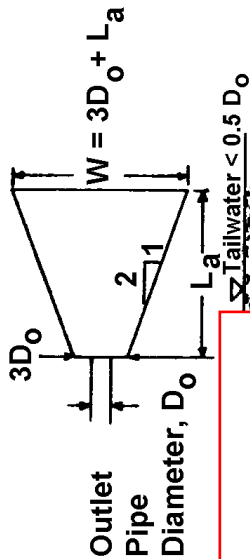
Discharge	1.96
Peak Flow Period	24
Channel Slope	0.04
Channel Bottom Width	0
Left Side Slope	7
Right Side Slope	0
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Silt Loam

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

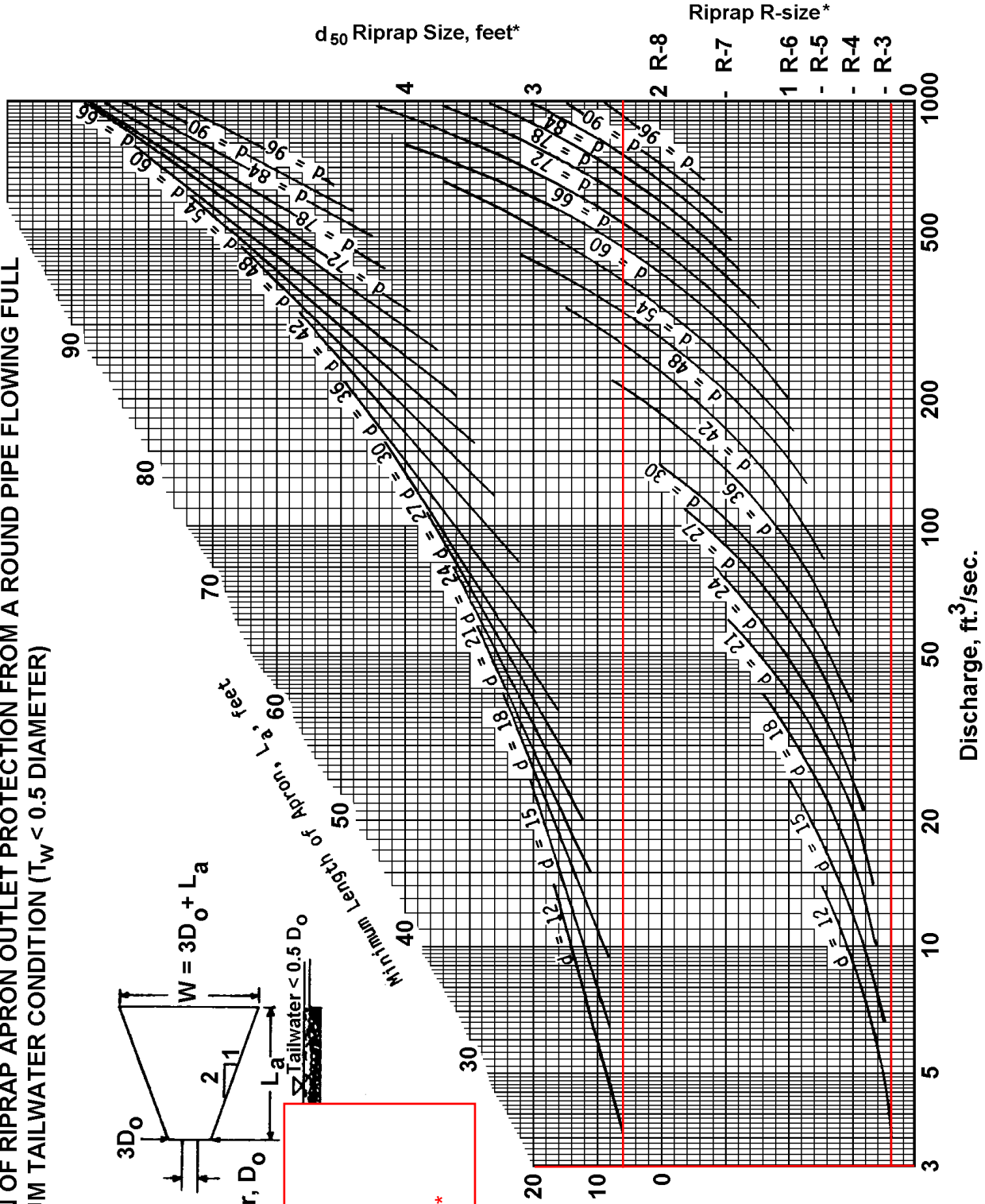
Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	2.16 cfs	2.37 ft/s	0.51 ft	0.05	4.2 lbs/ft ²	1.27 lbs/ft ²	3.31	STABLE	--
Underlying Substrate	Straight	2.16 cfs	2.37 ft/s	0.51 ft	--	0.04 lbs/ft ²	0.031 lbs/ft ²	1.13	STABLE	--

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

DESIGN OF RIPRAP APRON OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION ($T_w < 0.5$ DIAMETER)



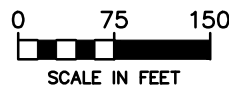
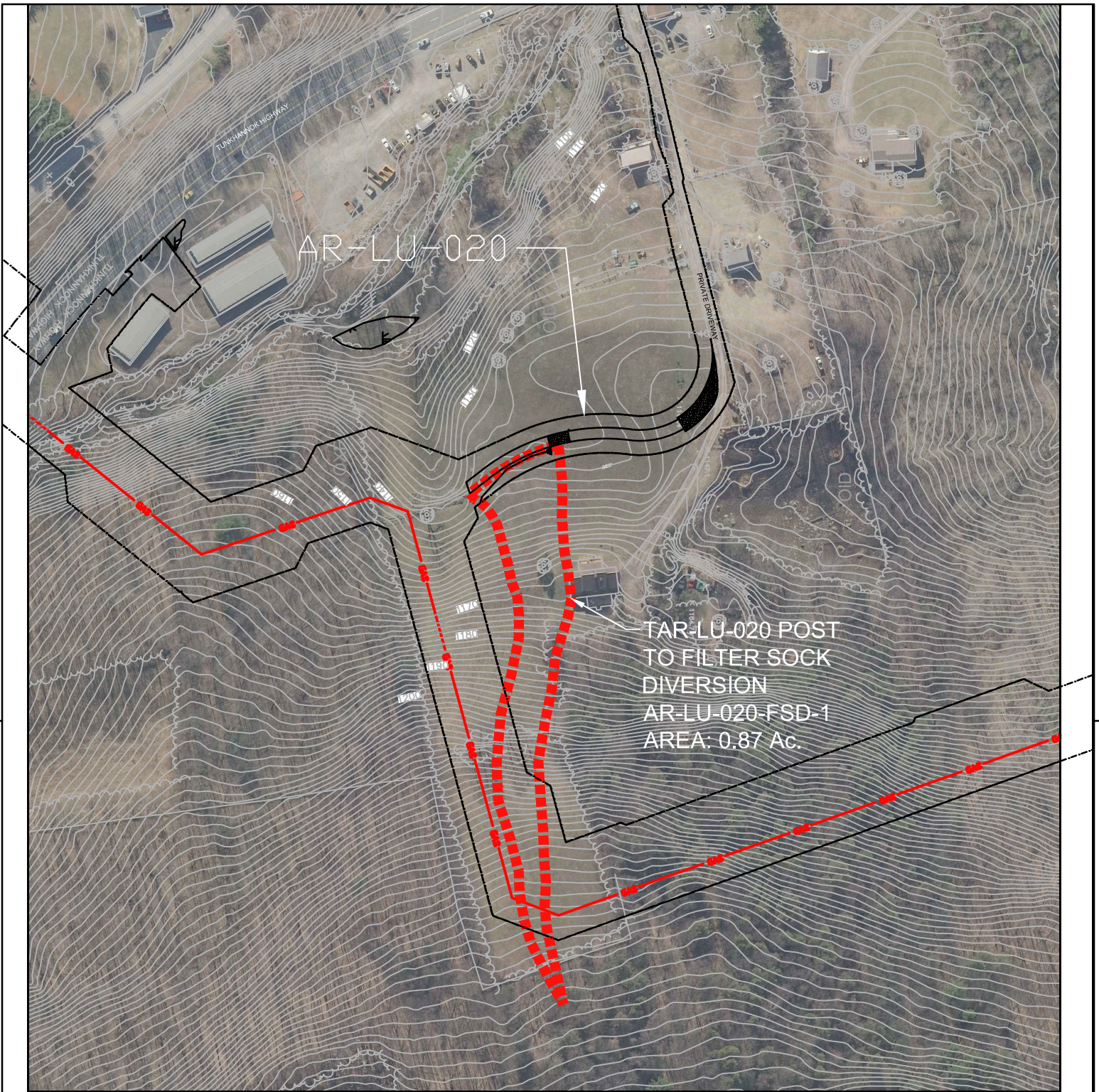
$D_o = 1'^{***}$
 $3D_o = 3'^{***}$
 $L_a = 6'^{***}$
 $W = 9'^{***}$
 $R_t = 9'^{***}$
Riprap Size: R-3**



Adapted from USDA - NRCS

Check Velocity
 Riprap R-Size: R-3
 Maximum Velocity from Table 6.6 of E&S Manual: 6.5 ft/s
 Velocity of Runoff in Swale from Worksheet #11: 2.37 ft/s
 Velocity of Runoff in Swale less than Maximum? Yes

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.
 ** DIMENSIONS BASED ON MINIMUM SIZING CRITERIA FROM CHART



ISSUED FOR PERMITTING

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

LEGEND

- TIME OF CONCENTRATION-SHEET FLOW
- TIME OF CONCENTRATION-SHALLOW CONCENTRATED FLOW
- DRAINAGE AREA
- PROPOSED GAS PIPELINE

ATLANTIC SUNRISE PROJECT -
CENTRAL PENN LINE NORTH
PROPOSED 30" NATURAL GAS PIPELINE
ACCESS ROAD DRAINAGE AREA MAP
AR-LU-020
FAIRMOUNT TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: OLC	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1" = 150'
							CHECKED BY: BJP	DATE: 11/11/15	ISSUED FOR CONSTRUCTION:	
							APPROVED BY: BJP	DATE: 11/11/15	DRAWING NUMBER:	AR-LU-020
							WO:			

E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Atlantic Sunrise

LOCATION: AR-LU-020-Rock Matting

PREPARED BY: OLC

DATE: 9/7/16

CHECKED BY: SMK

DATE: 9/17/16

CHANNEL OR CHANNEL SECTION		AR-LU-020 AASHTO #1	
TEMPORARY OR PERMANENT?	(T OR P)	T	
DESIGN STORM	(2, 5, OR 10 YR)	2	
ACRES	(AC)	0.87	(Drainage area to FSD)
MULTIPLIER ¹	(1.6, 2.25, or 2.75) ¹	2.25	
Q _r (REQUIRED CAPACITY)	(CFS)	1.96	(From FSD WS #11)
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.06	
PROTECTIVE LINING ²		AASHTO #1	
n (MANNING'S COEFFICIENT) ²		0.049	(Equation (p.138) used for rock w/ 40% depth)
V _a (ALLOWABLE VELOCITY)	(FPS)	N/A	
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.52	
τ _a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT ²)	N/A	
τ _d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT ²)	0.83	(Channel Bottom Width - 5' required perpendicular to the contours. For ease of installation, actual width of matting is perpendicular to the access road.)
CHANNEL BOTTOM WIDTH	(FT)	5	
CHANNEL SIDE SLOPES	(H:V)	0.1	
D (TOTAL DEPTH)	(FT)	1.00	(12" AASHTO #1 over Geotextile)
CHANNEL TOP WIDTH @ D	(FT)	5.20	
d (CALCULATED FLOW DEPTH)	(FT)	0.67	(2/3 of Rock Layer)
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.13	
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	7.50	
d ₅₀ STONE SIZE	(IN)	2.5	
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.35	(Area multiplied by 0.4 to calculate void space)
R (HYDRAULIC RADIUS)		0.21	
S (BED SLOPE) ³	(FT/FT)	0.02	
S _c (CRITICAL SLOPE)	(FT/FT)	0.073	
.7S _c	(FT/FT)	0.051	
1.3S _c	(FT/FT)	0.095	
STABLE FLOW?	(Y/N)	Y	
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.08	
FREEBOARD BASED ON STABLE FLOW	(FT)	0.50	
MINIMUM REQUIRED FREEBOARD ⁴	(FT)	0.50	
DESIGN METHOD FOR PROTECTIVE LINING ⁵ PERMISSIBLE VELOCITY (V) OR SHEAR STRESS	(S)	S	

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

R.4 Sediment Barrier Table

a. E&S Worksheet 1

APPENDIX S

AR-LU-020.1 Specific Narrative and Calculations

S.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

S.2 Location Map

S.1 Site Specific Narrative

- a. Narrative
- b. *TMDL Discussion***
- c. *Minimized Soil Compaction***
- d. *Thermal Impact Analysis***
- e. *Acidic Soil Management Plan***
- f. *Road Specific Construction Sequence***
- g. *Worksheet 1. General Site Information***

ACCESS ROAD: AR-LU-020.1

ACT 167 PLAN: Bowman's Creek Watershed Act 167, adopted November 17, 2000

TMDL: None

NARRATIVE:

AR-LU-020.1 is an existing temporary access road (TAR) located in Dallas Township, Luzerne County, Pennsylvania. The intent of this road/**lot area** is to provide a construction vehicle turnaround area for the proposed 30" Central Penn Line North Pipeline **at approximate mile post 25.5**. The lot area is an existing gravel lot; no improvements are proposed to the TAR aside from a rock construction entrance **with wash rack** to provide occasional access to the pipeline. Upon completion of pipeline construction, the disturbed areas will be restored to pre-constriction conditions.

TMDL DISCUSSION:

The nearest surface waters to receive runoff from this road are not subject to any TMDL restrictions.

MINIMIZED SOIL COMPACTION:

The Project seeks to minimize soils compaction impacts associated with access roads. AR-LU-020.1 is an existing temporary access road. All construction traffic will utilize the existing road, therefore, soil compaction impacts have been eliminated for this access road with exception of the rock construction entrance with wash rack. Any disturbed areas will be restored to pre-construction conditions with native soils.

THERMAL IMPACT ANALYSIS:

Thermal impacts associated with AR-LU-020.1 will be avoided to the maximum extent practicable. The following measures have been implemented to minimize thermal impacts:

- ***This road is proposed in a location that minimizes tree removal. The ability to use this road/lot area without the removal of additional trees acts to avoid additional thermal impact of this road.***
- ***Temporary construction phase improvements for this road are limited to a rock construction entrance with wash rack. Runoff from these temporary improvements is directed to stabilized, well vegetated areas that will promote infiltration of the runoff. Infiltration of runoff prior to entering***

receiving waters allows for runoff to assimilate to ground water temperatures which are minimally influenced by seasonal temperature changes, minimizing the thermal impact of this road.

- **The proposed additional gravel surfacing at the rock construction entrance with wash rack is temporary in nature and the disturbed areas will be returned to pre-construction conditions upon completion of the construction of the pipeline. There are no new permanent impervious surfaces as a result of the use of this road due to the removal of the additional gravel for the RCE. Therefore, there are no permanent thermal impacts as a result of the use of this road/lot area for the construction of the pipeline.**

RIPARIAN BUFFER WAIVER:

A comprehensive Riparian Buffer narrative is provided in the “Erosion and Sediment Control Plan Narrative” for the portion of the CPL North pipeline located in Luzerne County (Section 3 of the ESCGP-2 NOI).

AR-LU-020.1 will require a Riparian Buffer Waiver– The existing parking area encroaches the riparian buffer. No earth disturbing improvements are proposed within the riparian buffer. A rock construction entrance with wash rack installed on top of geotextile is proposed to be installed within the riparian buffer. The impacted riparian buffer area is 0.30 acres.

ACIDIC SOIL MANAGEMENT PLAN:

AR-LU-021.1		
Soil Map Symbol	Soil Name	PH
WIC	Wellsboro Channery Silt Loam, 3 to 8 Percent Slopes	5.3

An Acid Producing Soils Control Plan is included as part of this application. The plan identifies the measures to be used to control pollution associated with construction of access roads that contain acid-producing soils. The plan requires that these measures be applied only for soils with a pH less than 4.0 as recommended by the Natural Resources Conservation Service (NRCS). The table above depicts the soil types present on this road as well as the acidity of the soils. The pH of the soils on this road are outside the threshold established by the Acid Producing Soils Control Plan. Therefore, the measures prescribed in the plan do not need to be implemented for this road.

**ROAD SPECIFIC CONSTRUCTION SEQUENCE:
ACCESS ROAD: AR-LU-020.1**

- 1. At least 7 days prior to starting any earth disturbance activities, including clearing and grubbing, the owner and/or operator shall invite all contractors, Environmental Inspectors, the landowner, appropriate municipal officials, the E&S plan preparer, the PCSM plan preparer, the licensed professional responsible for oversight of critical stages of implementation of the PCSM plan, and a representative from the local conservation district to an on-site preconstruction meeting.**
- 2. At least 3 days prior to starting any earth disturbance activities, or expanding into an area previously unmarked, the Pennsylvania One Call System Inc. shall be notified at 1-800-242-1776 for the location of existing underground utilities.**
- 3. Hold pre-construction conference with the Environmental Inspectors, local County Conservation District (CCD), PADEP and Design Engineer.**
- 4. Survey crews locate and stake all special areas of concern (e.g., wetlands, streams, culverts, other utilities, etc.), edge of proposed access road, and field locate the limit of disturbance.**
- 5. Install orange construction fence around areas to be preserved.**
- 6. Locate staging areas and access points including the rock construction entrance with wash rack. Install sediment barriers (compost filter sock) down slope of these areas.**
- 7. Install the rock construction entrance with wash rack.**
- 8. If applicable, install security fence. The necessity of a security fence will be at the discretion of the Contractor.**
- 9. Immediately stabilize the access road with geotextile and gravel surfacing where indicated in the E&SC Plans.**
- 10. Upon temporary cessation of an earth disturbance activity or any stage of an activity where the cessation of earth disturbance activities will exceed four days, disturbed areas shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or any stage of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following: a minimum uniform**

coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation, or an acceptable BMP, which temporarily minimizes accelerated erosion and sedimentation. Temporary stabilization will not occur on active vehicular travel ways within the right of way. The on-site environmental inspector will log daily activity within the limits of disturbance and notify the Contractor of areas requiring temporary stabilization (i.e., areas where work has ceased for at least four days).

- 11. Once the temporary RCE is no longer necessary, remove all gravel and geotextile fabric from the temporarily improved sections of the access road and dispose of the materials at a suitable disposal or recycling site in compliance with local, state, and federal regulations. Restore pre-construction grades. Immediately seed and stabilize disturbed areas, including areas used to stockpile topsoil. BMPs will remain in place and functional.***
- 12. Loosen and de-compact topsoil throughout the temporarily improved sections of the access road and grade the disturbed area to match preconstruction conditions. Immediately fertilize, seed and stabilize areas outside of existing gravel road/lot at finished grade. Maintain E&SC BMPs until Site work is complete and uniform 70% perennial vegetative cover is established.***
- 13. Upon completion of all earth disturbance activities and permanent stabilization of all disturbed areas, the Owner shall contact the local CCD for an inspection prior to the removal of the E&SC BMPs. Vegetated areas must achieve a minimum uniform 70% perennial cover over the entire disturbed area to be considered stabilized. Roadways and parking areas should have at least a clean subbase in place to be considered stabilized.***
- 14. Upon local CCD and Transco approval of stabilization and re-vegetation, properly dispose of or recycle E&SC BMPs. Remove orange construction fencing and, if necessary, security fencing.***
- 15. Complete access road limit of disturbance stabilization, including seed application and mulching in areas disturbed by E&SC BMP removal.***
- 16. Upon completion of all earth disturbance activities, removal of all temporary BMPs and permanent stabilization of all disturbed areas, the Owner and/or Operators shall contact the local CCD for a final inspection.***

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 20-Oct-15

Project Name: Atlantic Sunrise Pipeline AR-LU-020.1

Municipality: Dallas Township

County: Luzerne

Total Area (acres): 0.3

Major River Basin: Susquehanna River

<http://www.dep.state.pa.us/dep/depupdate/watermgt/wc/default.htm#newtopics>

Watershed: Mehoopany-Bowman Creek

Sub-Basin: Upper Susquehanna

Nearest Surface Water(s) to Receive Runoff: UNT to Leonard Creek

Chapter 93 - Designated Water Use: HQ-CWF,MF

<http://www.pacode.com/secure/data/025/chapter93/chap93toc.html>

Impaired according to Chapter 303(d) List? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303d-Report.htm> No

List Causes of Impairment: _____

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes

<http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/GeneralPermits/default.htm> No

Existing or planned drinking water supply? Yes

No

If yes, distance from proposed discharge (miles): _____

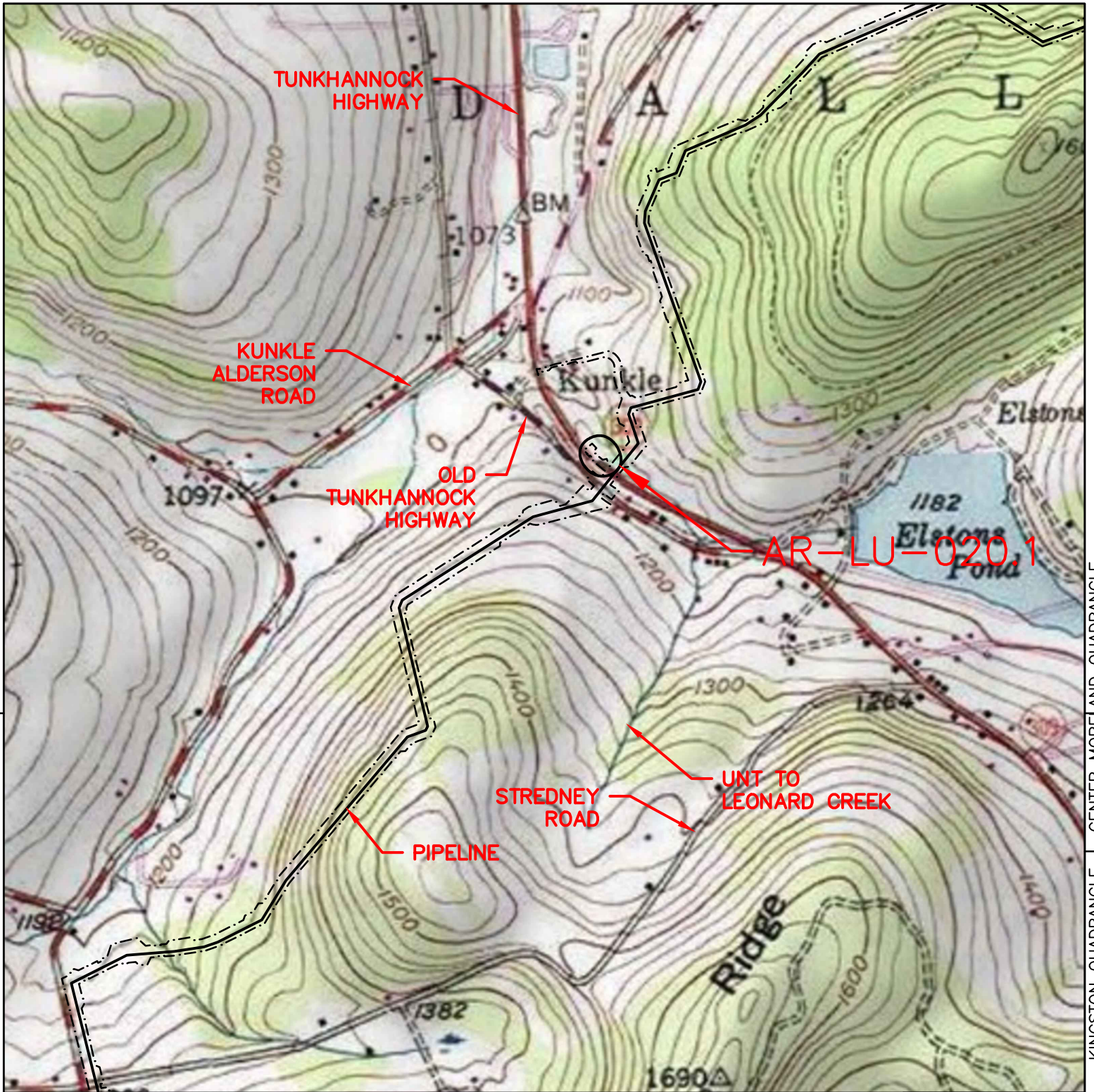
Approved Act 167 Plan? Yes

http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/StormwaterManagement/Approved_1.html No

Existing River Conservation Plan? Yes

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/planningprojects/> No


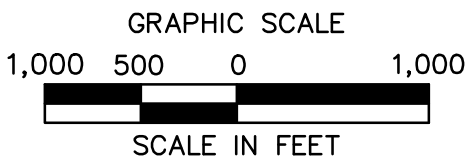
S.2 Location Map



KINGSTON QUADRANGLE | CENTER MORELAND QUADRANGLE

KINGSTON QUADRANGLE

ARCHITECTURE
ENGINEERING
ENVIRONMENTAL
LAND SURVEYING

ATLANTIC SUNRISE
PROPOSED 30" NATURAL GAS PIPELINE

USGS LOCATION MAP
TEMPORARY AR-LU-020.1
DALLAS TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA



NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: CLM	DATE: 11/11/15	ISSUED FOR BID:	SCALE: 1"=1,000'
				1161481			CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
							APPROVED BY:	DATE:	DRAWING NUMBER: 24-1601-70-28-A/ 1683_3-AR-LU-020.1	SHEET 1 OF 1
							WO: 1161481			

