



EROSION, SEDIMENT AND STORMWATER CONTROL PLAN FOR OIL AND GAS OPERATIONS

1. GENERAL INFORMATION	
Project Name: _____ Municipality: _____ County: _____	
Operator: _____	
Address: _____ City: _____ State: __ Zip Code: _____	
Latitude: ____ degrees ____ minutes ____ seconds Longitude: ____ degrees ____ minutes ____ seconds	
Reference Datum: <input type="checkbox"/> North American Datum 1983 <input type="checkbox"/> North American Datum 1927 <input type="checkbox"/> World Geodetic System 1984	
Contour Collection Method: <input type="checkbox"/> GPS <input type="checkbox"/> Interpolated from U.S.G.S. topo map <input type="checkbox"/> DEP's eMAP	
Total Project Area (Acres): _____ Total Disturbed Area (Acres): _____	
Project Type (Check All that Apply)	
<input type="checkbox"/> Oil/Gas Well <input type="checkbox"/> Pipeline/Transmission/Compressor Facility <input type="checkbox"/> Processing Facility <input type="checkbox"/> Treatment Facility <input type="checkbox"/> Other	
A. PROJECT DESCRIPTION	
Will the earth disturbance activity encounter any coal seams? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, have you contacted the local DEP District Mining Office for further assistance? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Provide a narrative description of the project. (Add additional sheets as necessary) _____	

B. RECEIVING WATERS	
All streams in Pennsylvania are classified based upon their designated and existing uses and water quality criteria. Designated uses for waters of this Commonwealth are found in 25 Pa. Code §93.9a-z at http://www.pacode.com/secure/data/025/chapter93/chap93toc.html . Existing uses of waters of this Commonwealth are found at the DEP Web site www.depweb.state.pa.us . Type the phrase "existing use" in the DEP Keyword box. The county conservation district office can also supply this information. List the bodies of water likely to receive direct runoff within or from the oil and gas earth disturbance activity.	
<u>Stream Name/Watershed</u>	<u>Designated/Existing Use</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
C. RESPONSIBLE PARTIES	
Person(s) responsible for construction and maintenance of erosion and sediment control BMPs during earth disturbance activities. (NOTE: If duties are assigned to more than one party, list all others under Section 9 of this plan.)	
Name: _____ Phone: _____	
Address: _____ City: _____ State: __ Zip Code: _____	
Erosion and Sediment Control Plan prepared by:	
Name: _____ Phone: _____	
Address: _____ City: _____ State: __ Zip Code: _____	

2. MAPS

A. LOCATION MAP

The map must include the location of the project with respect to roadways, streams, wetlands, lakes, ponds, floodplains, type and extent of vegetation and other identifiable landmarks. A United States Geologic Service (USGS) 7.5 min. quadrangle map may be used to show the existing topographical features of the project site and the immediate surrounding area.

B. SOIL MAP

A soils map is attached showing the proposed site including access roads, drill pads, impoundments, and pipelines. (Soils information is available from the Natural Resource Conservation Service (NRCS) website <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> . Soils information should be addressed when determining roadway layout, pad configurations, and appropriate stabilization methods. List all soils that will be encountered and check off all limitations that apply. See Appendix B for LIMITATIONS OF PENNSYLVANIA soils pertaining to earthmoving projects and complete worksheet 1

C. PLAN MAP

Attach a site specific map with the site location, site boundaries, topographic features, existing land uses, north arrow and legend. The map must include the location of all earth disturbance activities (roads, drill pads, impoundments, pipelines and other associated activities). The scale and north arrow must be plainly marked. The map scale must be large enough to clearly depict the topographical features of the project. A complete legend of all symbols used on the map must also be included. The following should be clearly shown on the plan maps. In the case where significant cut and fill operations are to occur, the slope should be depicted with contour lines and/or cross-sections.

•Topographic features	Wetland Crossings
•North Arrow	• Stream Crossings
•Drill Pads	• Access Roads
	Existing Roads
	• Proposed Erosion Control BMPs
	• Receiving surface waters

D. STREAM AND WETLAND CROSSING MAP

A legible photocopy of a USGS 7.5 min. quadrangle map showing the location of the project boundaries and all surface water crossings will be attached to the plan map. Each crossing location as well as any earth disturbance that is to occur within 50 ft of a stream channel must include the type of water obstruction and encroachment permit that is to be secured. At all stream crossing locations, runoff must be directed to a sediment removal area, i.e., filter strip, straw bale, silt fence, sump, a trap for treatment. Waterbars and/or broad based dips should be installed and maintained as required on the approaches to the stream crossing.

Has application been made for required stream crossing permits? Yes No Not Applicable

3. SCHEDULE AND SEQUENCE OF OPERATIONS

A. PRE CONSTRUCTION

Starting Date: _____ Completion Date: _____

Disturbed Acreage Calculation

	Total Length (ft)	Average Width (ft)	=	Area (sq ft)			
Access Roads	_____	_____	=	_____			
Pipelines/Compressors	_____	_____	=	_____			
Drill Pads	_____	_____	=	_____			
Other	_____	_____	=	_____			
		Total Area (sq. ft.)	=	_____	÷ 43,560 sq ft/A	=	_____

B. SITE CONSTRUCTION/ WELL DRILLING/PRODUCTION CHECKLIST

- 1. Prior to commencement of any earth disturbance activity including clearing and grubbing, the registrant shall clearly delineate sensitive areas, riparian forest buffer boundaries, areas proposed for infiltration practices, the limits of clearing, and trees that are to be conserved within the project site, and shall install appropriate barriers where equipment may not be parked, staged, operated or located for any purpose.
- 2. Site access – This is the first land-disturbance activity to take place at the site and should provide BMPs to minimize accelerated erosion and sedimentation from the following areas: entrance to the site, construction routes, and areas designated for equipment or other use at the site including parking, stockpiles.
- 3. Sediment Barriers – Install perimeter BMPs after the construction site is accessed, keeping associated clearing and grubbing limited to only that amount required for installing perimeter BMPs.
- 4. Upslope Diversion Channels – including outlet protection are constructed to divert upslope clean water runoff around the disturbed area (when necessary).
- 5. Sediment Basins and Traps – including outlet protection shall be constructed prior to the remaining clearing/grubbing and other earth disturbance activities.
- 6. Sediment Laden Water Channels or other Conveyance– used to divert stormwater runoff water to the appropriate BMPs such as traps and ponds should be installed prior to the remaining clearing/grubbing and other earth disturbance activities.
- 7. Land Clearing and Grading – Implement clearing and grading only after all downslope E&S BMPs have been constructed and stabilized.
- 8. Surface Stabilization – Apply temporary or permanent stabilization measures immediately to any disturbed areas where work has reached final grade, has been delayed or otherwise temporarily suspended.
- 9. Construction of Buildings, Utilities, and Paving – During construction, install and maintain any additional erosion and sediment control BMPs, and implement any structural post construction stormwater BMPs that may be required.
- 10. Final Stabilization, Topsoiling, Trees and Shrubs, After construction is completed, install stabilization BMPs including: permanent seeding, mulching and riprap, and complete implementation of stormwater BMPs in this last construction phase. Stabilize all open areas, including borrow and spoil areas, and remove all temporary BMPs and stabilize any disturbances associated with the removal of the BMP.

Minor modifications to the E & S Plan and Site Restoration Plan shall be noted on the plan that is available at the site and initialed by the appropriate Department staff. Minor changes to the plan may include adjustments to BMPs and locations within the permitted boundary to improve environmental performance, prevent potential pollution, change in ownership or address, typographical errors and on-site field adjustments such as the addition or deletion of BMPs, or alteration of earth disturbance activities to address unforeseen circumstances.

Major modifications to the approved E & S Plan involving new or additional earth disturbance activity other than those described as minor modifications above, and/or the addition of a discharge will require prior approval by the reviewing entity and may require the submittal of a new plan.

C. EROSION CONTROL & STORMWATER BEST MANAGEMENT PRACTICES (BMPs)

The Best Management Practices listed in this plan shall be installed and maintained in accordance with the **Erosion and Sediment Pollution Control Manual**, No. 363-2134-008, as amended and updated and the **Oil and Gas Operator's Manual No. 550-0300-001** as amended and updated. The BMPs contained in this plan shall be installed as shown (or indicated) prior to earth disturbance (including clearing and grubbing) within the drainage area of the BMP in question. Appropriate BMPs shall be provided for each stage of activity (including, but not necessarily limited to, access road construction and maintenance, drilling pad, frac ponds, & pipelines). Each BMP shall be kept functional until all earth disturbances within the drainage area are completed and a minimum vegetative cover (uniform 70% coverage of perennial vegetation over the entire disturbed area) has been achieved or other suitable permanent erosion protection has been installed.

If no, please explain: _____

Will all erosion control and stormwater BMPs be installed and maintained as specified in this plan? Yes No

Will all unnecessary disturbed areas be limed, fertilized, seeded and mulched as specified in this plan? Yes No

Will all unnecessary culverts and waterbars be removed as specified in this plan? Yes No

Will all permanent waterbars be installed as specified in this plan? Yes No

Will all unnecessary disturbed areas be regraded, smoothed, limed, fertilized, seeded and mulch as specified in this plan? Yes No

4. DESCRIPTION OF EROSION AND SEDIMENT/STORMWATER CONTROL BEST MANAGEMENT PRACTICES

The following standard BMPs have been provided to fulfill the requirements of this plan. Additional BMPs are listed in the Erosion and Sediment Pollution Control Manual as well as the Oil and Gas Operator's Manual and *the Underground Utility Line Construction BMP Manual*. BMP construction details are shown in Appendix A. If you plan to use any of these recommended BMPs, please check the appropriate boxes. If you plan to use alternative BMPs, you must provide drawings showing the details, specifications and spacing.

A. CROSS-DRAIN CULVERT

Culverts will be installed before the ground freezes. Culverts shall be placed with a slope of 2 to 4 percent and cross the road at a 30-degree downslope angle. Culverts will be 12" pipe or larger.

Will this BMP be used? Yes No Will recommended spacing be used? Yes No. If no, please explain:

B. WATERBARS

Waterbars will be placed on pipelines and **retired** roadways according to the spacing indicated below.

Will this BMP be used? Yes No Will recommended spacing be used? Yes No

C. BROAD-BASED DIPS

Broad-based dips will be installed and worked before the ground freezes. Broad-based dips on the road system are planned to be spaced as indicated in Appendix A.

Will this BMP be used? Yes No Will recommended spacing be used? Yes No. If no, please explain:

D. FILTER STRIPS

Filter strip widths vary by slope on land between roads and perennial streams.

The width of the filter strip depends on the slope between the road and the stream.

Will this BMP be used? Yes No Will recommended spacing be used? Yes No. If no, please explain:

E. FILTER FABRIC FENCE

Filter fabric fence must be installed on contour at the edge of disturbed areas. Both ends of each fence section must be extended upslope at 45 degrees to the main fence alignment. They should not be installed in streams, ditches or other areas of concentrated flow. Install filter fabric fence before the ground freezes.

Will this BMP be used? Yes No

F. TURNOUTS

Channels that drain water away from roads into well-vegetated areas are known as turnouts. Turnouts (see Appendix A) are typically located along crowned roadways where runoff cannot sheet flow off the roadway. Like ditch relief culverts, the purpose of turnouts is to minimize the volume of water in a roadside ditch. Turnouts should be located so as to take advantage of natural drainageways or buffer areas wherever possible. Where a suitable vegetative filter strip is not available, a compost filter sock, rock filter or other sediment removal BMP should be installed at the outlet of the turnout.

Will this BMP be used? Yes No

G. ROADSIDE DITCH		
<p>In most cases, the ditches paralleling temporary access roads and haul roads need not be lined if sufficient ditch relief culverts are provided, erosion resistant soils are present, and flow velocities are less than 2 fps. However, protective liners are required for roadside ditches discharging to special protection waters, where they discharge directly to surface waters, or where necessary to prevent the erosion of the channel itself. A typical cross-section for a roadside ditch is shown in Appendix A.</p>		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No		
H. CROWNED/INSLOPED ROADWAY		
<p>Crowned roadways are typically installed where the topography allows for sheet flow to infiltrate into the surrounding vegetation. In situations where crowned roadways will not function properly an insloped roadway will be constructed.</p>		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No Crowned <input type="checkbox"/> Yes <input type="checkbox"/> No Insloped <input type="checkbox"/> Yes <input type="checkbox"/> No		
I. STABILIZED ROAD ENTRANCE		
<p>The purpose is to remove mud from tires and keep it off the public road. The construction entrance shall be constantly maintained.</p>		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No		
J. COMPOST FILTER SOCK		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No		
K. CHANNELS		
<p>Channels are used for several purposes. Collector channels are used to collect runoff from disturbed areas and convey it to a sediment removal facility (e.g. sediment trap) prior to discharge into receiving surface waters. Diversion channels are used to divert runoff from undisturbed upslope areas and convey it around areas of earth disturbance (i.e. drill pads, impoundments, etc.). Conveyance channels are used to convey discharges from sediment traps & cross drains to receiving surface waters.</p>		
<p>Channels should be sized to convey the calculated peak flows as calculated in the table located in Appendix A. Otherwise supporting calculations must be attached to show sufficient capacity. They should also be provided with a suitable protective liner to prevent erosion within the channel. Wherever grass is used as a protective liner, a temporary erosion control mat (e.g. rolled fiber blanket) should be firmly anchored to the bottom and sides of the channel to hold soil in place until the vegetation becomes established.</p>		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No Check all that apply:		
Temporary <input type="checkbox"/> Yes <input type="checkbox"/> No	Rip-rap <input type="checkbox"/> Yes <input type="checkbox"/> No	
Permanent <input type="checkbox"/> Yes <input type="checkbox"/> No	Diversion <input type="checkbox"/> Yes <input type="checkbox"/> No	
Vegetative <input type="checkbox"/> Yes <input type="checkbox"/> No	Collector <input type="checkbox"/> Yes <input type="checkbox"/> No	
L. SEDIMENT TRAPS		
<p>Sediment traps may be used to control runoff from drainage areas up to 5.0 acres (disturbed and undisturbed). They must be sized to provide 2,000 cubic feet of total storage capacity for each acre tributary to the trap. The sediment storage zone is considered to be 700 cubic feet per acre. Outlets should be located as far from the inflow as possible. At a minimum, spillway widths should be equal to 6 feet for each acre tributary to the trap.</p>		
Will this BMP be used? <input type="checkbox"/> Yes <input type="checkbox"/> No		
M. ALTERNATIVE BMPs		
Will alternative BMPs be used? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, attach drawings showing the details, specifications and spacing.		
N. POST CONSTRUCTION STORMWATER/SITE RESTORATION		
<p>Disturbed areas will be seeded and mulched as indicated below. Recommended Seed mixes may be found in Appendix A. Mulch will be applied at a rate of 3-4 tons/acre. The Department recommends that a soil test be done to determine proper soil amendment application rates for the proposed seed mixtures. Prior to seeding, soil amendments will be applied as follows:</p>		
<u>Soil Amendment</u>	<u>Type</u>	<u>Rate of Application</u>
Fertilizer	_____	_____
Lime	_____	_____

N. POST CONSTRUCTION STORMWATER/SITE RESTORATION (continued)

<u>Area of Disturbance</u>	<u>Seed Mixture</u>	<u>Rate of Application (lb/acre)</u>
Well Pads	_____	_____
Access Roads	_____	_____
Pipelines	_____	_____
Impoundments	_____	_____
Compressor Locations	_____	_____
Other	_____	_____

1. *Non-Structural BMPs* which promote the treatment, infiltration, evaporation, and transpiration of stormwater runoff shall be used. Yes No
2. *Low Impact, Conservation, and Green Infrastructure Designs* shall be used to minimize the generation of runoff by preserving open space, preserving natural areas, reducing the amount of impervious surface, and other green infrastructure design principles that utilize or mimic infiltration or evapotranspiration. Yes No
3. *Infiltration practices* shall include either engineered structures or landscape features designed to capture and infiltrate runoff that mimic pre-construction conditions. Yes No
4. *Runoff practices* shall be designed and constructed to convey runoff, increase evaporation, and manage rate. Such practices are to also promote infiltration, filtration, and biological uptake of pollutants. Yes No
5. *Filtration practices* shall be used to treat runoff through filter media that are designed to capture pollutants through the processes of physical filtration of solids or cation exchange of dissolved pollutants. Yes No

List the Stormwater/Site Restoration BMPs that will be used:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

O. EROSION CONTROL BLANKETS

Erosion control blanketing (either rolled or sprayed) shall be installed or applied for all slopes 3H:1V or steeper within 50 feet of a surface water or where soil conditions indicate blanketing is needed to achieve the required vegetative cover.

Will this BMP be used? Yes No

P. OTHER

Please explain: _____

5. SPECIAL PROTECTION WATERSHEDS

Projects that are located in special protection watersheds that have a designated or existing use of high quality (HQ) or exceptional value (EV), Wild Trout Streams or non-special protection watersheds impaired for sediment or stormwater must demonstrate that all construction and post construction discharges will not degrade the physical, chemical or biological characteristics of the surface waters. Plan preparers should utilize "non-discharge" BMPs in their E&S and PCSM Plans to the greatest extent possible. These BMPs may be found in the Post Construction Stormwater Manual and the Oil and Gas Operator's Manual. Calculations are not necessary if non-discharge BMPs are used, the approximate original contours and the preservation of the preconstruction drainage pattern and features are maintained or replicated and the disturbed areas will be revegetated or stabilized with pervious material (crushed rock and gravel surface are considered pervious material). In addition, if stormwater BMPs will be employed that use natural measures, do not require extensive construction and maintenance, promote pollutant reduction and are capable of controlling the stormwater runoff from a 2-year/ 24-hour storm event and the net increase of stormwater is infiltrated or dissipated away from the waters of the Commonwealth, calculations are not necessary.

5. SPECIAL PROTECTION WATERSHEDS (continued)

a. Is the project located in a Special Protection Watershed? Yes No. If yes, provide a detailed description of how the post-construction stormwater runoff will be managed.

b. Will there be a net increase in accelerated erosion and sedimentation from the construction runoff? Yes No

c. Does the post construction runoff volume equal pre-construction runoff volume for the 2-year/24-hour storm? Yes No

d. Does the rate of post-construction stormwater equal pre-construction runoff rate for the 2, 5, 10, 25, 50 and 100 year storm events? Yes No NA

If NA please explain:

List the Post Construction Stormwater BMPs that will be used

<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

6. MAINTENANCE

BMPs will be inspected on a weekly basis and after each measurable rainfall event during the active construction/drilling phase of the project. Yes No

Culverts will be cleaned out, repaired or replaced as necessary. Yes No

Filter strips will be maintained. Yes No

Earth Disturbance areas will be repaired where signs of accelerated erosion are detected. Yes No

Seeding and mulching will be repeated in those areas that appear to be failing or have failed. Yes No

Other (describe)

7. SITE CLEANUP

Describe procedures which ensure the proper handling, storage, control, disposal and recycling of well drilling waste, including but not limited to fuels, oil, lubricants and other materials brought to the site or used in the process of drilling.

Garbage, fuels or any substance harmful to human, aquatic or fish life, will be prevented from entering springs, streams, ponds, lakes, wetlands or any water course or water body.

Oils, fuels, lubricants and coolants will be placed in suitable containers and disposed properly.

All trash and garbage will be collected and disposed properly.

Other (describe).

8. ADDITIONAL EXPLANATION/COMMENTS (if needed)

9. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control Plan and Site Restoration/ Stormwater Management Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name:	Signature:	
Company:		
Address:		
Phone:		

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist, The plans shall both contain the following certification:

I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

10. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____	_____
Print Name and Title of Applicant	Print Name and Title of Co-Applicant (if applicable)
_____	_____
Signature of Applicant	Signature of Co-Applicant
_____	_____
Date Application Signed	Date Application Signed

Notarization

Sworn to and subscribed to before me this _____ day of _____, 20_____	Commonwealth of Pennsylvania County of _____
_____	My Commission expires _____
Notary Public	

**NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED
IF ADDITIONAL INFORMATION IS REQUIRED**

Name:	
Address:	Phone:

APPENDIX A

BMP CONSTRUCTION DETAILS

A. Cross Drain Culverts

Sizing and Spacing* of Cross Drain Culverts for Temporary Access Roads

Road Grade (%)	Culvert Spacing* (ft)	Length of Upslope Drainage (ft)				
		< 300	300 – 400	400 – 500	500 – 600	>600
		Minimum Culvert Size (in)				
2	300	12	15	15	15	18
3	235	12	15	15	15	18
4	200	12	15	15	15	18
5	180	12	12	15	15	15
6	165	12	12	12	15	15
7	155	12	12	12	12	15
8	150	12	12	12	12	15
9	145	12	12	12	12	15
10	140	12	12	12	12	15
12	135	12	12	12	12	15

Maximum Spacing* of Cross Drain Culverts (18" dia. CMP) For Permanent Access Roads

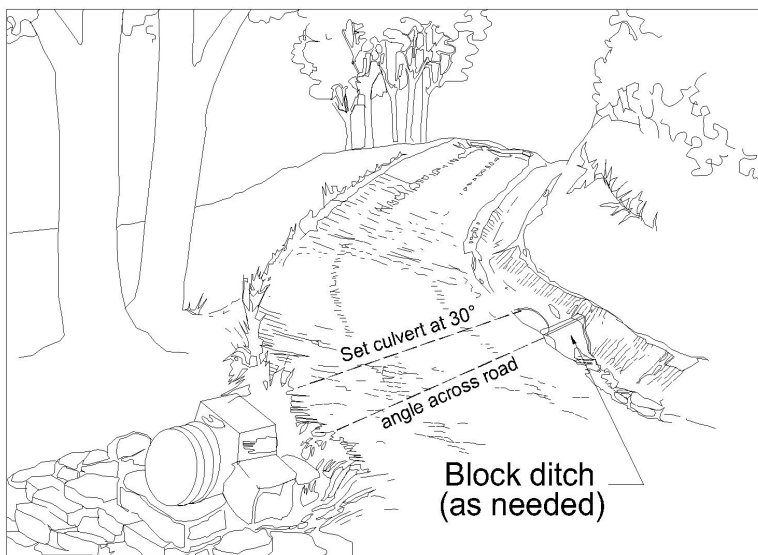
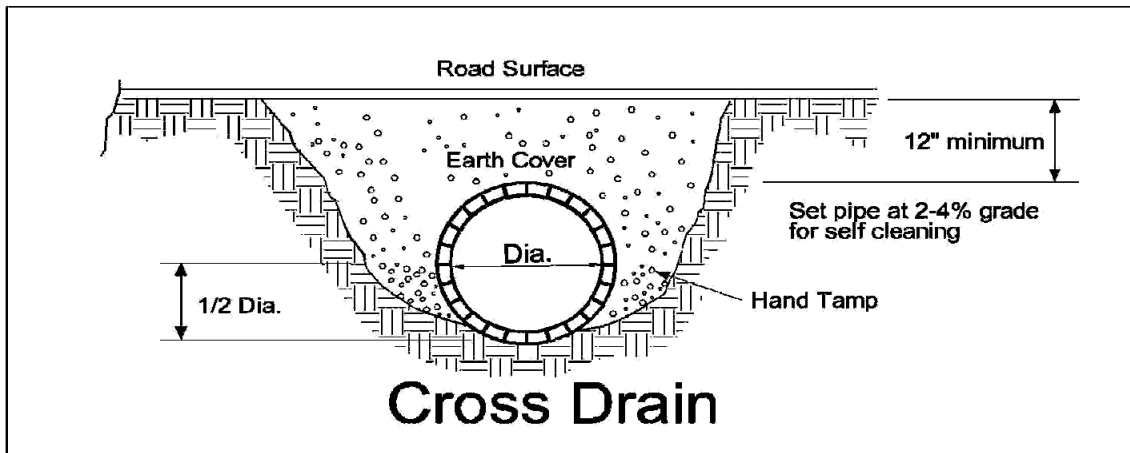
Road Grade Percent	Soil Type in Ditch				
	Gravels, Sandy Gravels, Aggregate Surfacing	Silty Gravels, Clayey Gravels	Plastic and Nonplastic Inorganic Clays	Inorganic Silts, Silty or Clayey Sands	Sands, Silty Sands, and Gravelly Sands
	Feet				
2	390	315	245	170	95
4	335	275	210	145	85
6	285	230	180	125	75
8	240	195	150	105	65
10	200	160	125	90	55
12	160	130	105	75	45
14	135	110	85	60	35

*Spacing may be adjusted slightly to take advantage of natural drainage-ways.

R-4 (Min.) Riprap protection will be provided at all outfalls.

At all stream crossing locations, runoff must be directed to a sediment removal area, i.e., filter strip, straw bale, silt fence, sump, or trap for treatment. Waterbars and/or broad based dips should be installed and maintained as required on the approaches to the stream crossing.

TYPICAL CROSS DRAIN CULVERT

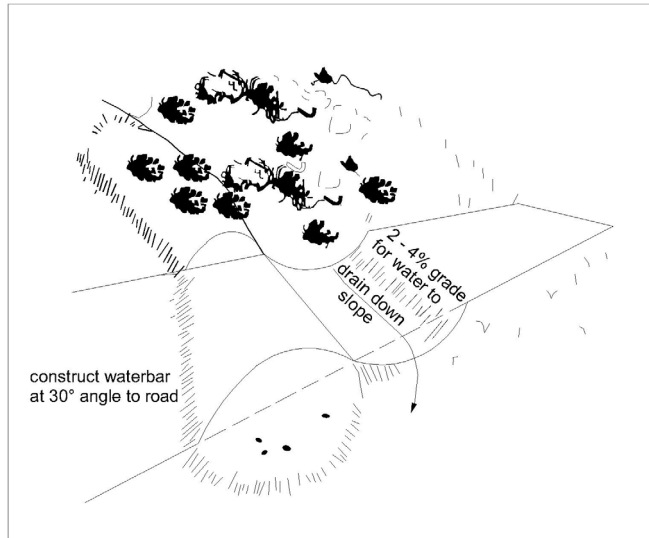


B. WATERBARS - Waterbars are typically used to control stormwater runoff on retired access roads as well as pipeline right-of-ways. They are not recommended for active access roads due to the difficulty of moving equipment over them as well as the need for continual maintenance due to damage from traffic. Waterbars will be installed before the ground freezes and will be spaced as indicated below

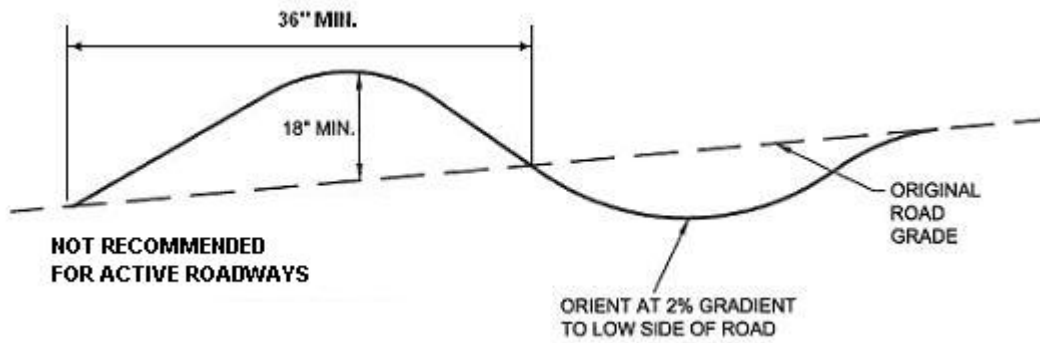
Waterbar Spacing: Circle all that apply

<u>Road Grade (%)</u>	<u>Spacing (FT)</u>
2	250
5	135
10	80
15	60
20	45
25	40
30	35
40	30

TYPICAL WATERBAR



STANDARD CONSTRUCTION DETAIL #3-5 WATERBAR

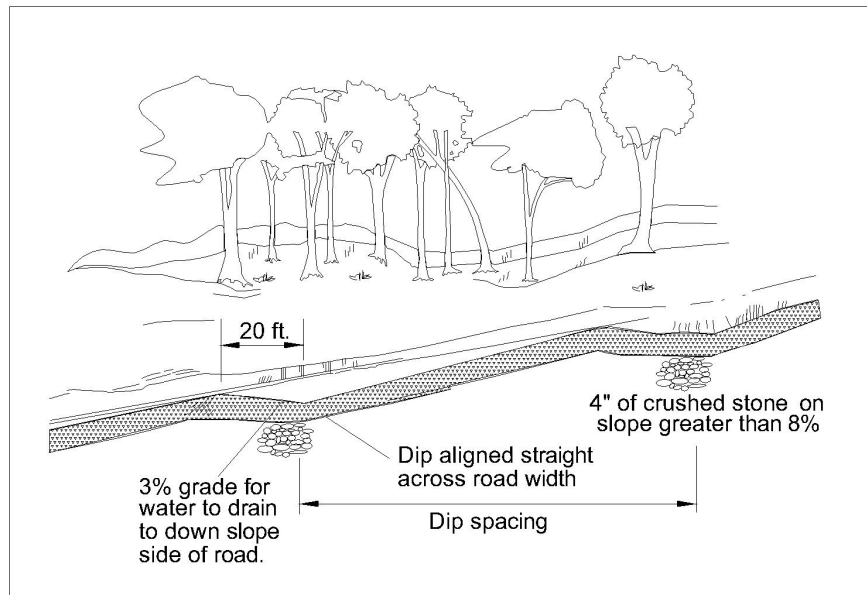


C. BROAD-BASED DIPS - Broad-based dips may be used to direct runoff from active access roads to well-vegetated areas or sediment removal BMPs (e.g. sediment traps). Broad-based dips, unlike waterbars, are easily traversed by construction equipment and typically require less maintenance to ensure their integrity. Due to the nature of broad-based dips, they should not be constructed on roads with grades exceeding 10%. Where access roads must exceed 10% gradients, insloping should be used to control runoff.

RECOMMENDED BROAD-BASED DIP SPACING

Road Grade (% Slope)	Recommended Spacing (feet)	Alternative Spacing* (feet)
2	300	_____
3	250	_____
4	200	_____
5	180	_____
6	170	_____
7	160	_____
8	150	_____
9-10	140	_____

TYPICAL BROAD-BASED DIP

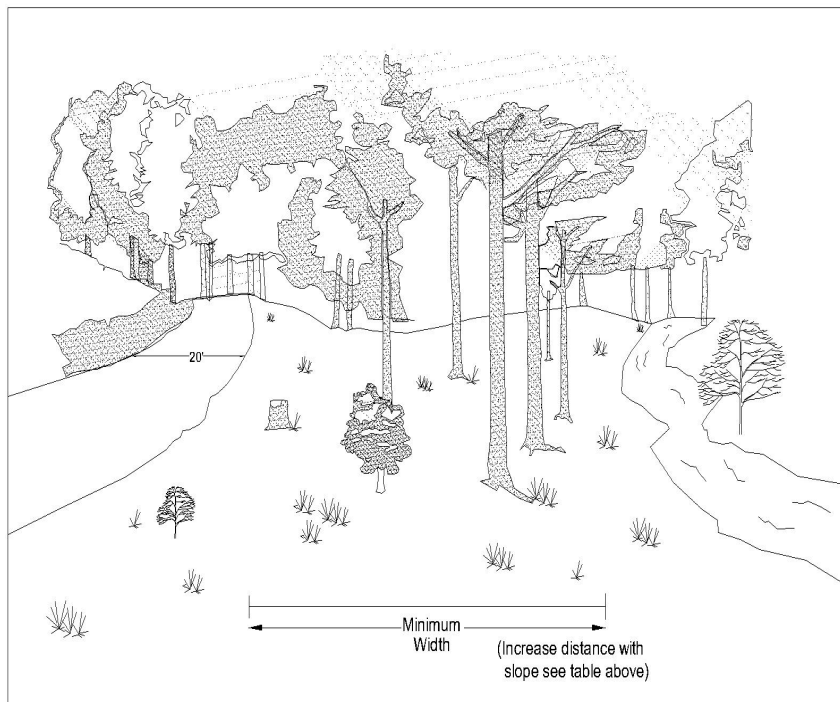


D. FILTER STRIPS

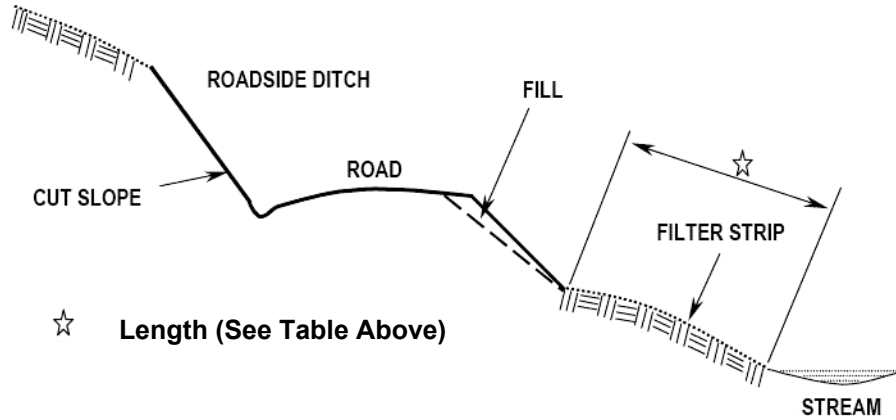
<u>Slope of Land Between Road and Stream (%)</u>	<u>Minimum Length of Filter Strip (feet) +</u>
0	25++
10	45++
20	65
30	85
40	105
50	125
60	145
70	165

- + Lengths should be doubled when the earth disturbance activity is located where receiving waters have a designated use/existing use of High Quality or Exceptional Value or within a municipal water supply, source water area.
- ++ Earth disturbance 50 feet or less from the top of the stream bank (absent evidence to the contrary) requires a water obstruction and encroachment permit from the appropriate DEP Oil and Gas Management Program or Conservation District.

TYPICAL VEGETATIVE FILTER STRIP



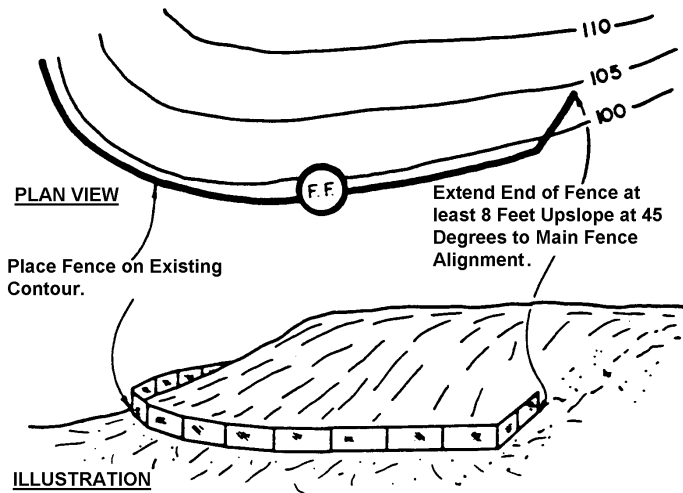
VEGETATIVE FILTER STRIP LENGTH



- E. SILT FENCE** - Silt fence may be used to control runoff from small disturbed areas when it is in the form of sheet flow, and the discharge is to a stable area. Only those fabric types specified for such use by the manufacturer should be used. Standard Filter Fabric width shall be 30" min.; Reinforced and Super Filter Fabric width shall be 42" min. Do not use silt fence in areas of concentrated flows (e.g. channels, swales, erosion gullies, across pipe outfalls, etc). Silt fence should not be used in areas where rock or rocky soils prevent the full and uniform anchoring of the fence. Forested areas are not recommended unless tree roots can be severed during excavation of the anchor trench.

Silt fence must be installed on existing level grade. Maximum slope length above silt fence may not exceed those shown in the table below.

SILT FENCE ALIGNMENT

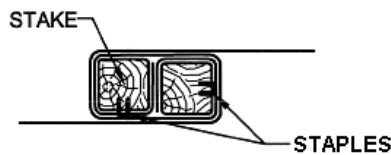


Maximum Slope Lengths for Silt Fence

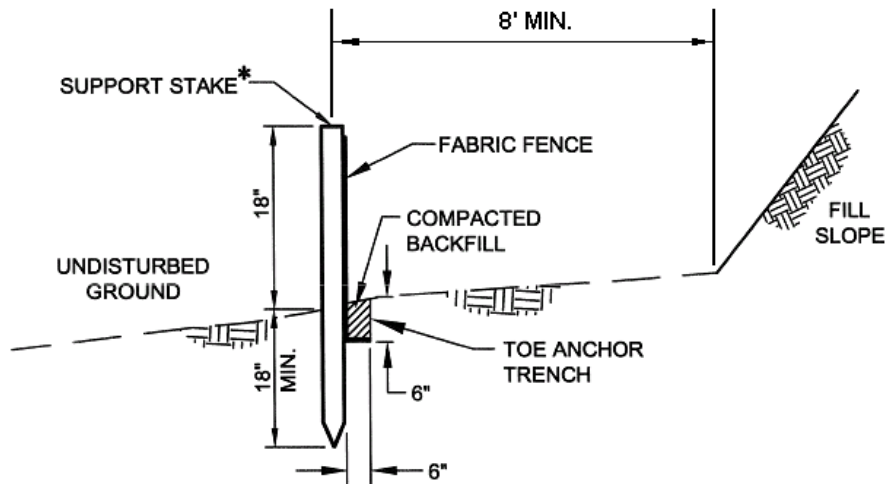
Slope - Percent	Maximum Slope Length (ft) Above Fence		
	Standard (18" High) Silt Fence	Reinforced (30" High) Silt Fence	Super Silt Fence
2 (or less)	150	500	1000
5	100	250	550
10	50	150	325
15	35	100	215
20	25	70	175
25	20	55	135
30	15	45	100
35	15	40	85
40	15	35	75
45	10	30	60
50	10	25	50

STANDARD SILT FENCE (18" HIGH)

*STAKES SPACED @ 8' MAX.
 USE 2" x 2" (± 3/8") WOOD
 OR EQUIVALENT STEEL
 (U OR T) STAKES

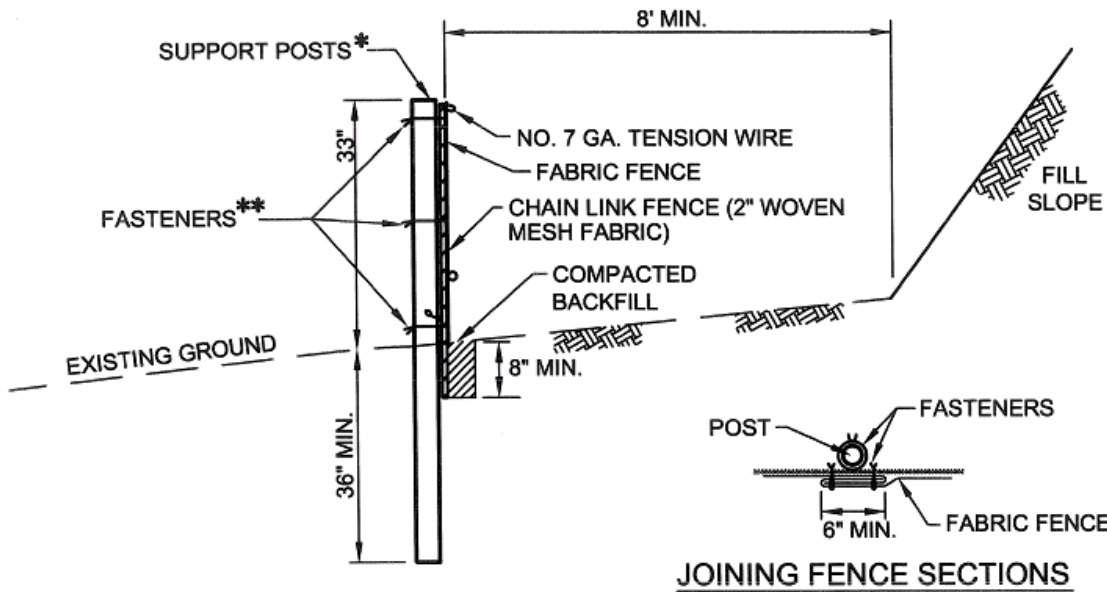
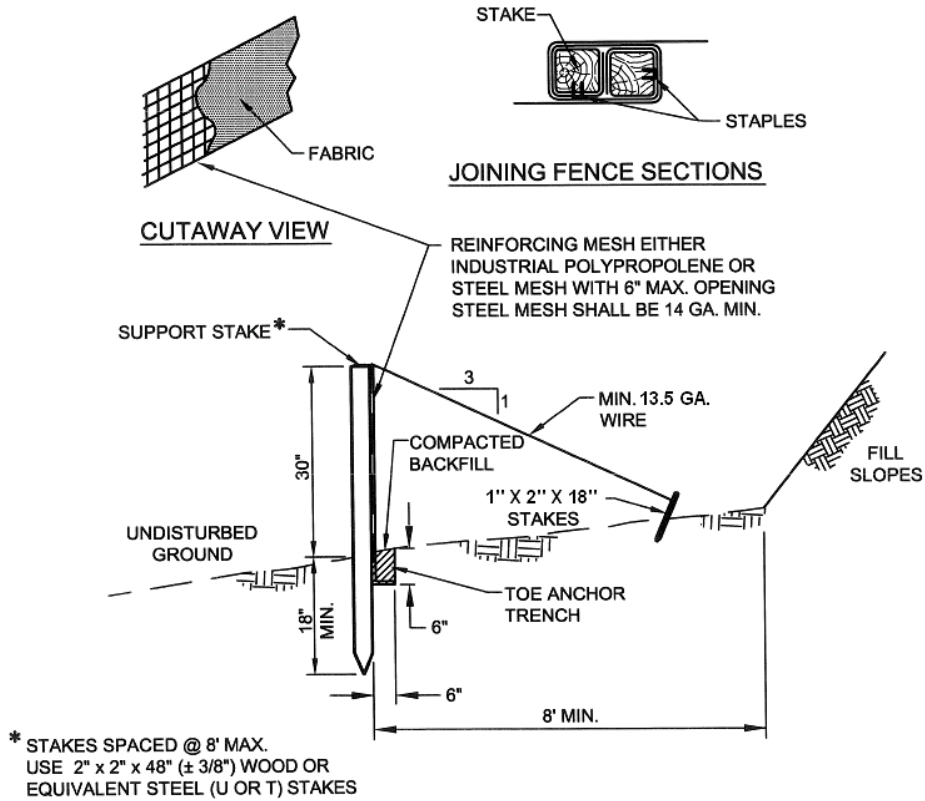


JOINING FENCE SECTIONS



ELEVATION VIEW

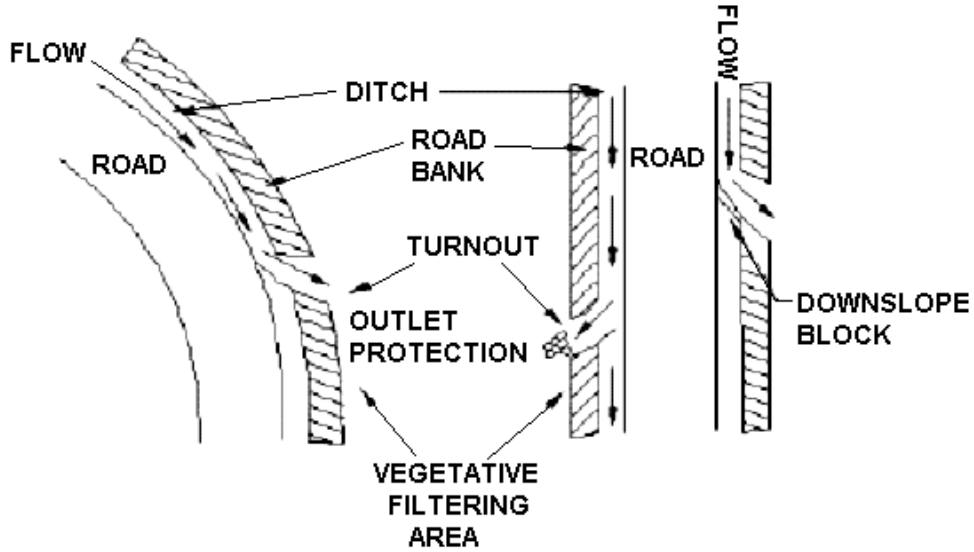
REINFORCED SILT FENCE (30" HIGH)



* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. HEAVY DUTY GALVANIZED OR ALUMINUM POSTS.

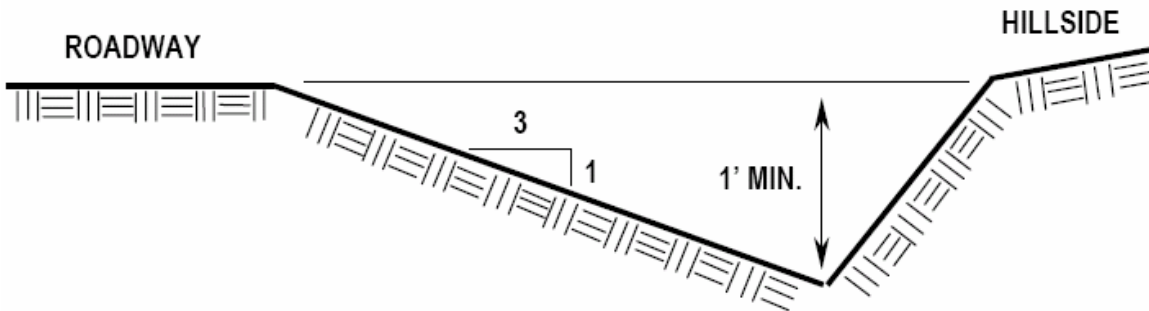
** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 9 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 13.5 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX C. TO C.

- F. TURNOUT** Turnouts are typically located along crowned roadways where runoff cannot sheet flow off the roadway. Like ditch relief culverts, the purpose of turnouts is to minimize the volume of water in a roadside ditch. Turnouts should be located so as to take advantage of natural drainageways or buffer areas wherever possible. Where a suitable vegetative filter strip is not available, a compost filter sock, rock filter or other sediment removal BMP should be installed at the outlet of the turnout.

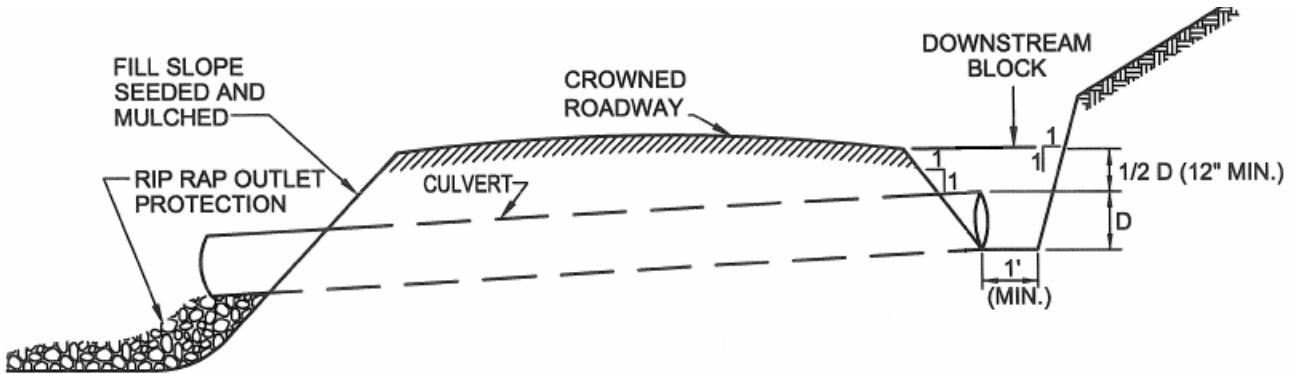


- G. ROADSIDE DITCH** - In most cases, the ditches paralleling temporary access roads and haul roads need not be lined if sufficient ditch relief culverts are provided, erosion resistant soils are present, and flow velocities are less than 2 fps. However, protective liners are required for roadside ditches discharging to special protection waters, where the discharging directly to surface waters, or where necessary to prevent the erosion of the channel itself.

Typical Roadside Ditch Section

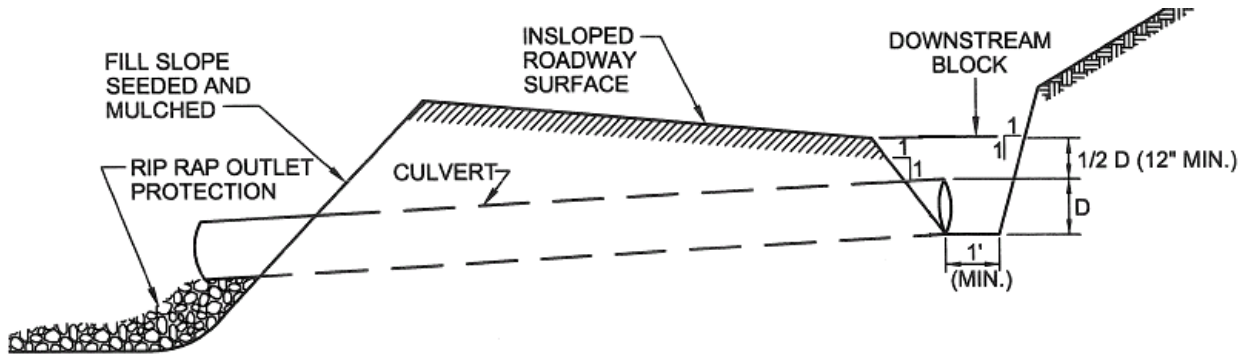


H. CROWNED / INSLOPED ROADWAY

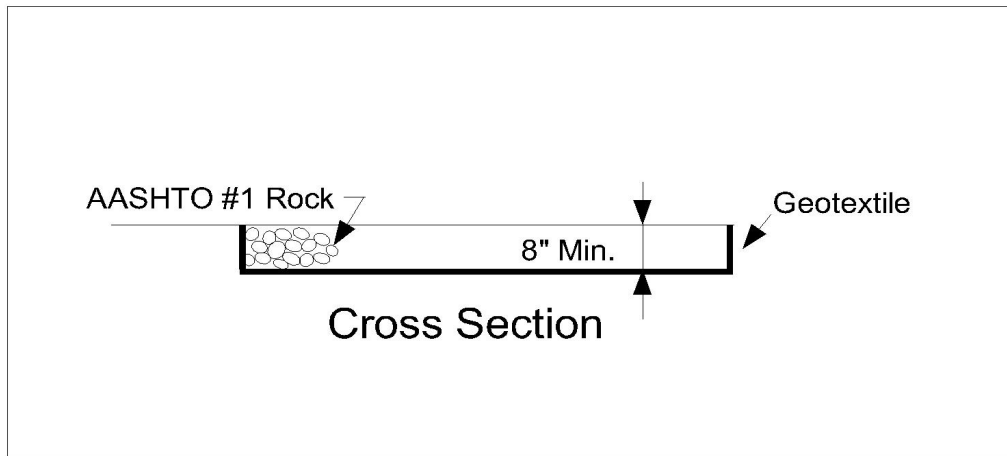
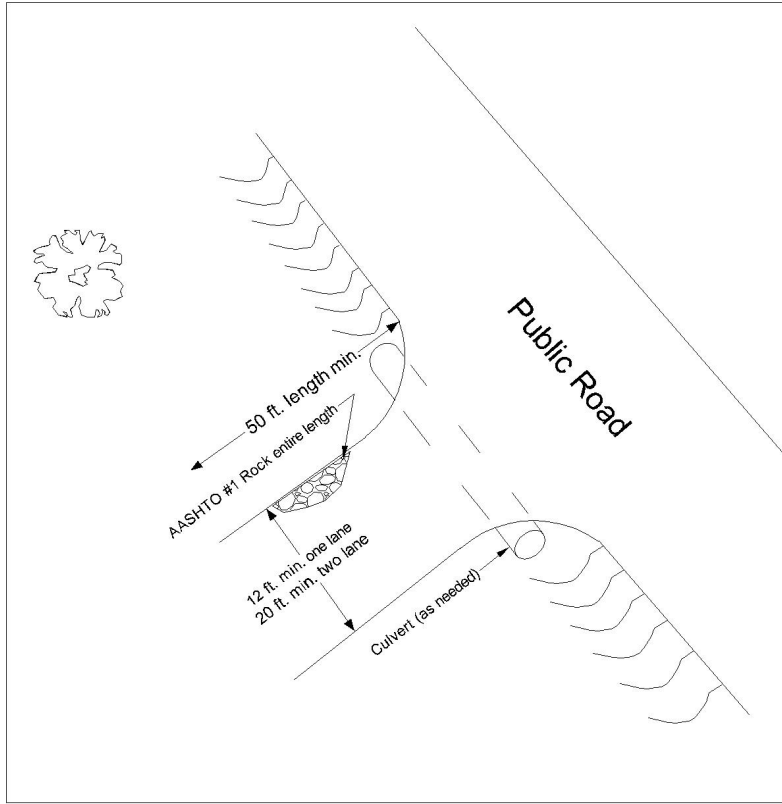


Cut and fill slopes shall be stabilized immediately upon completion of roadway grading. These areas shall be blanketed wherever they are located within 50 feet of a surface water or within 100 feet of a surface water where a suitable vegetative filter strip does not exist. A durable top dressing shall be provided for soils having low strength.

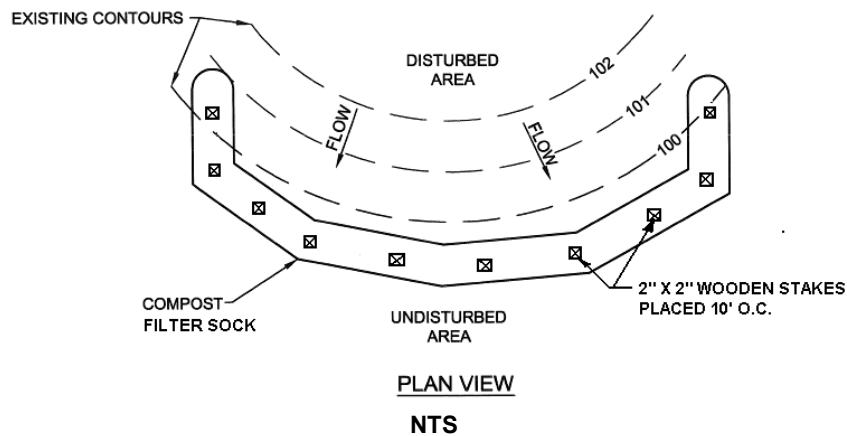
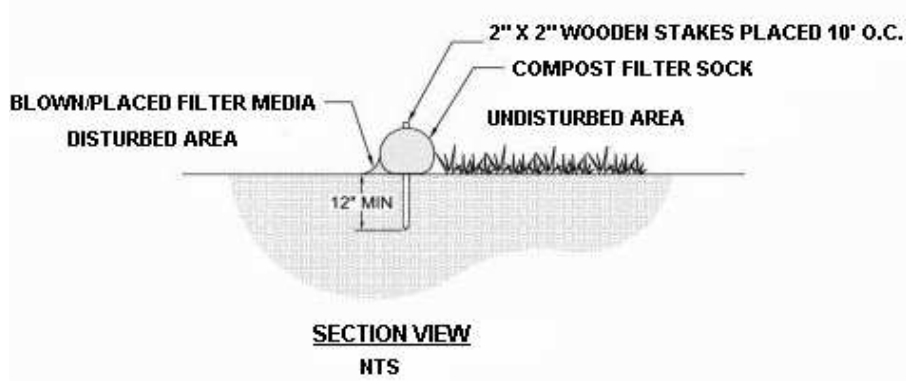
Roadside ditches shall be provided with adequate protective lining. Adequately sized culverts or other suitable cross drains shall be provided at all seeps, springs, and drainageways. Ditch relief culverts shall be provided at the intervals indicated on the Tables below. Roadway shall be inspected weekly and after each runoff event. Damaged roadways, ditches, or cross drains shall be repaired immediately.



- I. **STABILIZED ROAD ENTRANCE** - A rock construction entrance should be installed wherever it is anticipated that construction traffic will exit the project site onto any roadway, public or private. Access to the site should be limited to the stabilized construction entrance(s).



J. COMPOST FILTER SOCK



Compost shall meet the following standards:

Organic Matter Content	80% - 100% (dry weight basis)
Organic Portion	Fibrous and elongated
pH	5.5 – 8.0
Moisture Content	35% – 55%
Particle Size	98% pass through 1” screen
Soluble Salt Concentration	5.0 dS Maximum

Compost Filter Sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up slope at 45 degrees to the main sock alignment. Maximum slope length above any 18” diameter sock shall not exceed that shown on above table for reinforced silt fence. Maximum slope length for a 24” diameter sock shall not exceed that for super silt fence.

Traffic shall not be permitted to cross filter socks.

Accumulated Sediment shall be removed when it reaches ½ the above ground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer’s specifications or replaced within 24 hours of inspection.

Biodegradable filter sock shall be replaced after 6 months; photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer’s recommendations.

Upon stabilization of the area tributary to the sock, 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.

K. CHANNELS

TEMPORARY VEGETATED TRAPEZOIDAL CHANNEL SIZING CHART (2H:1V SIDE SLOPES)										
Tributary Acres	1	2	3	4	5	6	7	8	9	10
Minimum Channel Depth (ft)	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
Channel Bed Slope (FT/FT)	Minimum Channel Bottom Width (FT)									
≤ 0.04	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
0.05	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0
0.06	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0
0.07	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
0.08	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	6.0	6.0
0.09	2.0	2.0	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0

TEMPORARY VEGETATED TRAPEZOIDAL CHANNEL SIZING CHART (2H:1V SIDE SLOPES) SPECIAL PROTECTION WATERSHED										
Tributary Acres	1	2	3	4	5	6	7	8	9	10
Minimum Channel Depth (ft)	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
Channel Bed Slope (FT/FT)	Minimum Channel Bottom Width (FT)									
≤ 0.04	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0
0.05	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0
0.06	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	6.0	6.0 TRM
0.07	2.0	2.0	2.0	2.0	2.0	4.0	4.0	6.0	6.0 TRM	6.0 TRM
0.08	2.0	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0 TRM	6.0 TRM
0.09	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0 TRM	6.0 TRM	6.0 TRM

TRM = Turf reinforcement matting

Supporting calculations are attached to show sufficient channel capacity and adequate protective liner. Yes No

VEGETATED CHANNEL

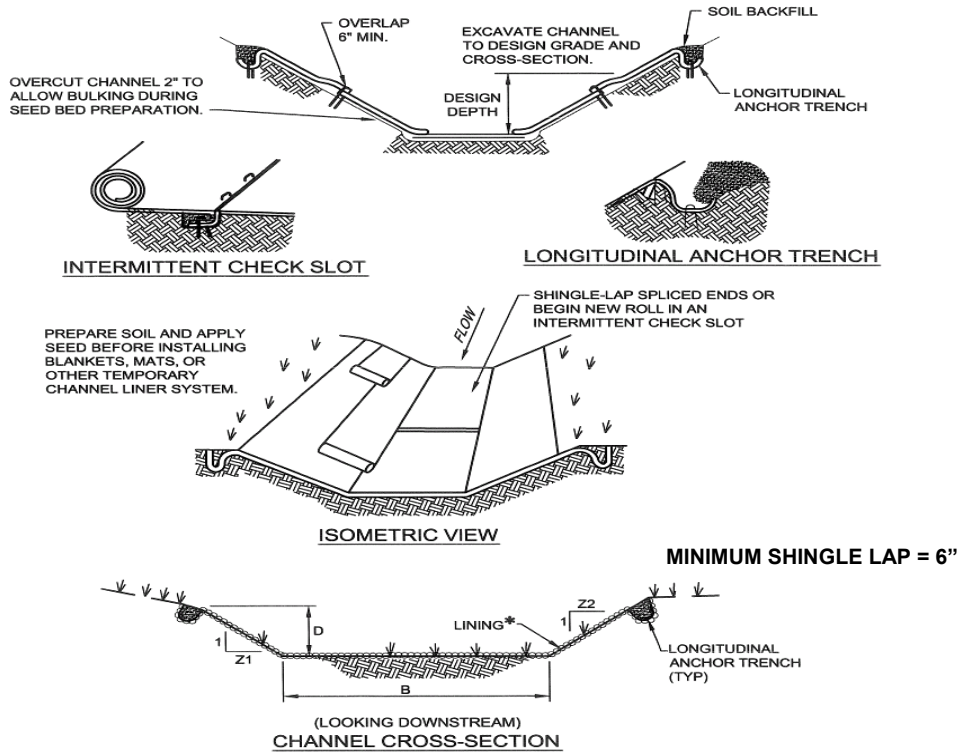
CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	TOP WIDTH W (FT)	Left Side Slope Z1 (FT)	Right Side Slope Z2 (FT)	LINING*

Anchor trenches shall be installed at beginning and end of channel in the same manner as longitudinal anchor trenches.

Channel dimensions shall be constantly maintained. Sediment deposits shall be removed within 24 hours of discovery.

Damaged lining shall be repaired or replaced within 48 hours of discovery.

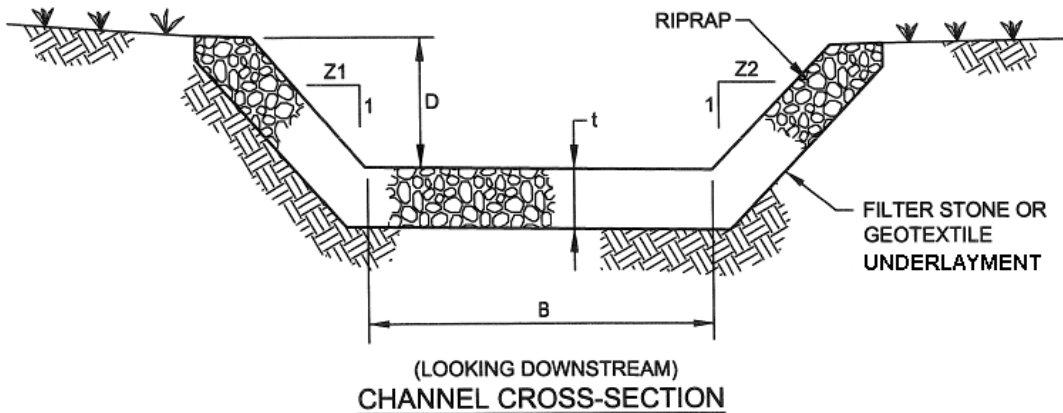
VEGETATED CHANNEL



* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATIVE STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION.

RIP-RAP CHANNEL

Channel	Stations	B	D	Z1	Z2	Riprap Gradation	t	Underlayment	Underlayment Thickness



STANDARD DESIGN FOR PERMANENT RIPRAP CHANNELS WITH 2:1 SIDE SLOPES & 2 FOOT TOTAL DEPTH																				
ACRES	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10
Bottom Width (Ft)	2	4	2	4	2	4	2	4	2	4	2	4	4	6	4	6	4	6	4	6`
Bed Slope (Ft/Ft)	RIPRAP R-SIZE																			
0.10	R-3	R-3	R-4	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-6	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.11	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.12	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.13	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.14	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.15	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.16	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.17	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.18	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.19	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.20	R-3	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5

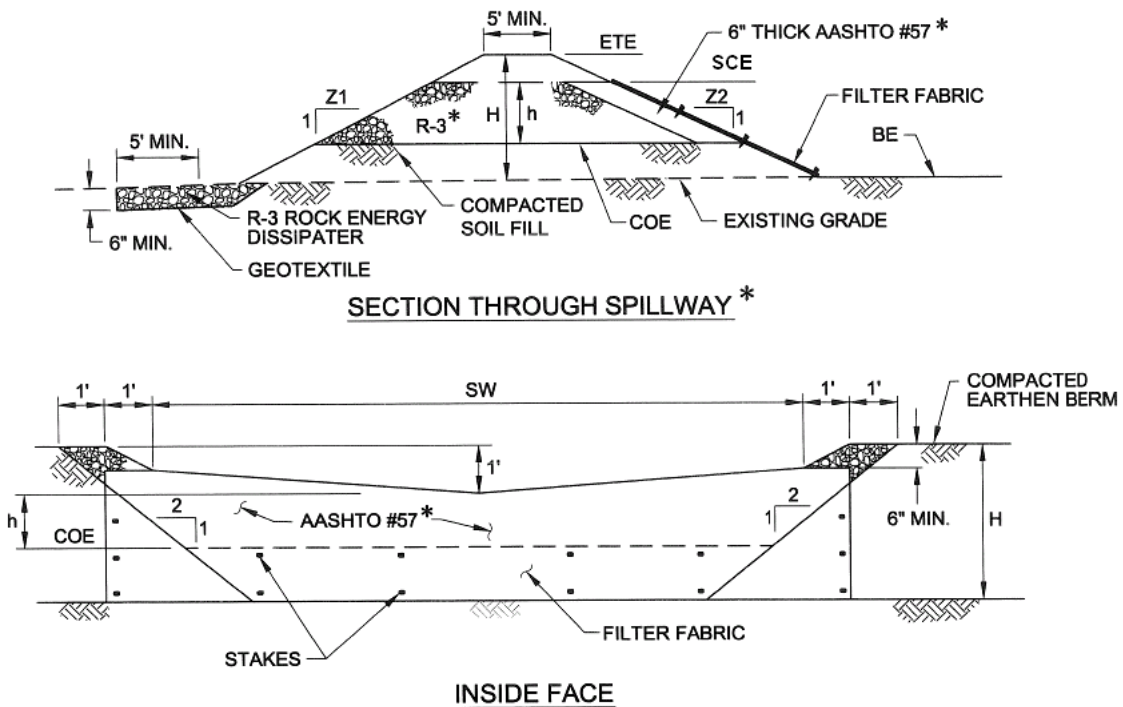
STANDARD DESIGN DIMENSIONS AND LINING FOR A PERMANENT GRASS CHANNEL WITH 2H:1V SIDE SLOPES AND 2 FOOT TOTAL DEPTH																				
ACRES	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10
Channel Bottom Width (Ft)	2	4	2	4	2	4	2	4	2	4	4	6	4	6	4	6	4	6	4	6`
Bed Slope	CHANNEL LINER = GRASS PLUS																			
0.01	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB
0.02	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM
0.03	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	TRM	ECB	TRM	ECB	TRM	TRM	TRM	TRM
0.04	ECB	ECB	ECB	ECB	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.05	ECB	ECB	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.06	ECB	ECB	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.07	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.08	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.09	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM

ECB = Erosion Control Blanket; TRM = Turf reinforcement Matting

L. SEDIMENT TRAPS

Sediment traps may be used to control runoff from drainage areas up to 5.0 acres (disturbed and undisturbed). They must be sized to provide 2,000 cubic feet of total storage capacity for each acre tributary to the trap. The sediment storage zone is considered to be 700 cubic feet per acre. Outlets should be located as far from the inflow as possible. At a minimum, spillway widths should be equal to 6 feet for each acre tributary to the trap

Trap No.	Total Tributary Acres	Required Storage Capacity 2000 X Acres (CF)	Length (FT)	Width (FT)	Depth (FT)	Storage Capacity Provided (CF)



M. SITE STABILIZATION

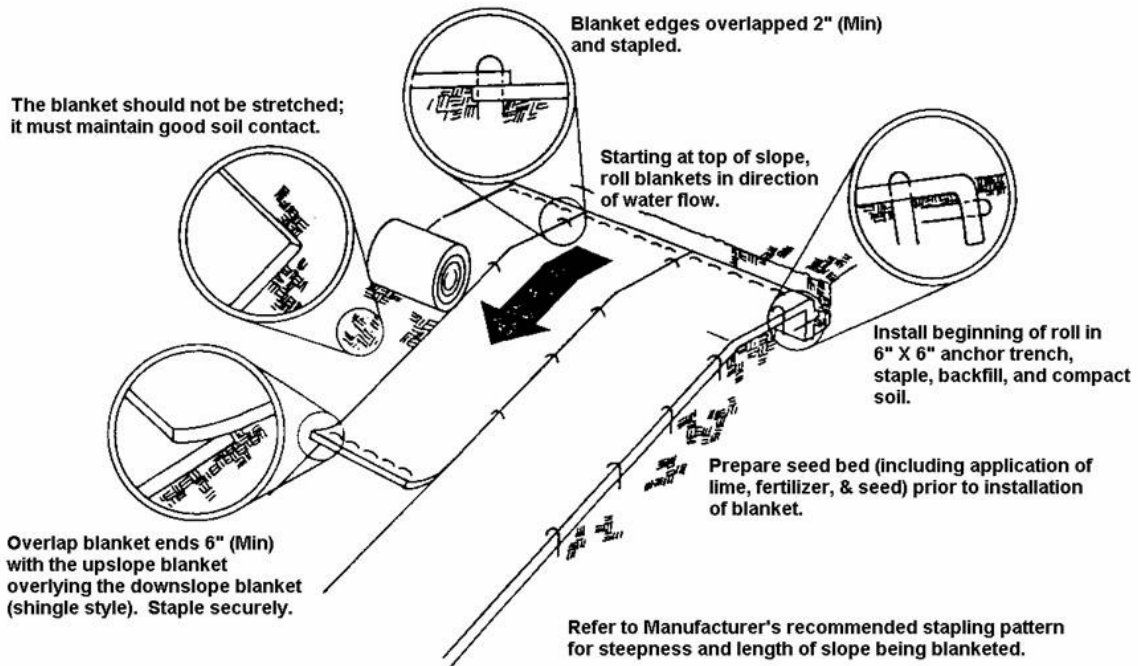
Recommended Permanent Seed Mixtures Cool and Warm Season Grass

Mixture Number	Season	Species	Seeding Rate lb./ac.
1	Cool	Tall fescue*, or	79
		Fine fescue, plus	46
		Redtop, or	4
		Perennial ryegrass,	19
		plus Birdsfoot trefoil	8
2	Cool	Birdsfoot trefoil,	8
		plus Tall fescue*	40
3	Cool	Orchardgrass, or	26
		Smooth	33
		bromegrass, plus	8
		Birdsfoot trefoil	
4	Warm	Flatpea, plus	27
		Tall fescue*, or	26
		Perennial ryegrass	25
5	Warm	Deertongue, plus	21
		Birdsfoot trefoil	8
6	Warm	Switchgrass, or	15
		Big Bluestem, plus	15
		Birdsfoot trefoil	8

Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	Seed Mixture (Select One Mixture)
Cut Slopes and Fills (not mowed) Well-drained Variable drainage	2, 4, or 6 2
Cut Slopes and Fills (mowed)	1
Cut Slopes and Fills (grazed/hay)	1, 2, or 3
Gullies and Eroded Areas	2 or 6
Erosion Control BMPs Channels, Drainage ditches, Trap embankments, etc. For hay or silage	1 or 2 2 or 3
Right-of-way Well-drained Variable drainage Well-drained areas for grazing/hay	4 or 6 2 2 or 3
Strip Mined Areas Spoils, waste areas, fly ash, slag, etc. (lime to soil test) For grazing/hay	2, 4, or 5 2, 3, or 6

N. EROSION CONTROL BLANKETS



Spray-on erosion control blankets (e.g. bonded fiber matrix or flexible growth medium) may be used in lieu of roll-on blankets if manufacturers' recommendations are followed.

APPENDIX B

LIMITATIONS OF PENNSYLVANIA SOILS PERTAINING TO EARTHMOVING PROJECTS
(Absence of an X does not mean "No Potential Limitation")

NOTE: THIS IS NOT NECESSARILY AN ALL-INCLUSIVE LIST.

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET\ STEEL *	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Abbottstown	X	C/S		X		X	X	X	X	X	X	X				X
Aeric Epiaquents	X	C/S	X			X	X				X	X				X
Albrights	X	C/S	X	X		X	X	X	X	X	X	X				X
Alden	X	C/S				X	X	X	X	X	X	X	X		X	X
Aldino	X	C/S				X	X	X	X	X		X				
Allegheny	X	C		X			X	X	X	X	X	X				
Allenwood	X	C/S					X	X	X	X	X	X				
Allis	X	X	X			X	X	X	X	X	X	X	X			
Alluvial Land	X	C/S			X	X	X		X	X	X	X		X		X
Alton	X	C	X						X		X	X				
Alvira	X	C/S	X	X		X	X	X	X	X	X	X				X
Amwell	X	C/S		X		X	X	X	X	X		X				
Andover	X	C/S	X	X		X	X	X	X	X	X	X				X
Aquepts	X	C/S				X	X	X	X	X	X	X			X	X
Aquults	X	C/S		X		X		X	X	X	X	X	X			X
Arents							X									
Arendtsville	X	C	X			X			X	X	X	X				X
Armagh	X	C/S				X	X	X	X	X	X	X	X			X
Arnot	X	C	X	X				X	X		X	X				
Ashton	X				X			X	X	X						
Atherton	X	S				X	X	X	X	X	X	X			X	X
Athol	X	C					X		X	X	X	X				
Atkins	X	C/S			X	X	X	X	X	X	X	X				X
Bagtown	X	C				X	X		X		X	X				X
Baile	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Barbour	X	C	X		X	X	X				X	X				X
Basher	X	C/S			X	X	X	X	X	X	X	X				X
Bath	X	C/S				X	X		X		X	X				

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET/STEEL*	DROUGHTY	EASILY ERODED ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Beach & Riverwash	X	C/S				X	X	X		X		X				
Beach Sand	X	C/S			X	X	X		X		X					
Bedington	X	C	X	X			X		X		X	X				
Belmont				X									X			
Beltsville	X	C/S		X		X	X	X	X	X		X				
Benson	X	C	X					X	X	X	X	X				
Berks	X	C	X	X			X		X	X	X					
Bermudian	X	C		X	X	X	X	X		X	X	X				X
Berrien	X	S		X		X	X		X	X		X			X	
Bethesda	X	C/S	X			X	X	X	X		X	X				X
Birdsall	X	C/S				X	X	X	X	X	X	X	X		X	X
Birdsboro	X	C/S		X		X	X		X	X	X	X				X
Blairton	X	C/S		X		X	X	X	X	X	X	X				X
Bowmansville	X	C/S			X	X	X	X	X	X	X	X				X
Braceville	X	C/S	X	X		X	X	X	X	X	X	X				X
Brandywine	X	C	X	X				X	X		X					
Brecknock	X	C	X						X	X	X	X				
Brinkerton	X	C/S	X	X		X	X	X	X	X	X	X	X			X
Brooke	X	S						X	X		X	X	X			
Brownsburg	X	C		X			X	X	X	X	X	X				
Buchanan	X	C/S	X	X		X	X	X	X	X	X	X				X
Buckingham	X	C/S		X		X	X	X	X	X	X	X				X
Bucks	X	C						X	X	X	X	X	X			
Burgin						X		X	X			X	X			
Butlertown	X	C/S		X		X	X	X	X	X		X				
Califon	X	C/S				X		X	X			X				X
Calvert	X	C/S		X		X	X	X	X	X	X	X	X			X
Calvin	X	C	X	X			X			X		X				
Cambridge	X	C/S		X		X	X	X	X	X		X			X	X
Canadice	X	S		X		X	X	X	X		X	X	X		X	X
Canaseraga	X	C/S		X		X		X	X	X		X				X
Caneadea	X	C/S		X		X	X	X	X		X	X	X			X
Canfield	X	C/S		X		X	X	X	X	X		X				X
Carbo	X	S	X	X				X	X		X		X	X		
Catden	X	S				X		X	X			X			X	X
Carlisle	X	S				X	X		X			X			X	X
Catoctin	X	C/S	X								X					
Cattaraugus	X	C	X			X			X		X	X				
Cavode	X	C/S		X		X	X	X	X	X		X	X			X

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET/ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Cedarcreek	X	C/S	X			X	X	X			X					
Ceres	X	C						X	X		X	X				
Chagrin	X	C		X	X	X	X	X	X	X		X	X		X	X
Chalfont	X	C/S		X		X	X	X	X	X	X	X				X
Chavies		C		X	X			X		X		X				
Chenango	X	C	X		X	X	X		X	X	X	X				
Chester	X	C		X				X	X	X	X	X				
Chewacla	X	C/S			X	X	X	X	X	X		X				X
Chili	X	C					X	X	X		X	X				
Chippewa	X	C/S	X	X		X	X	X	X	X		X	X		X	
Chrome	X	C/S	X					X	X		X	X	X			
Clarksburg	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Clearbrook	X	C/S	X				X	X	X	X	X	X	X			
Clymer	X	C	X	X			X	X	X	X	X	X				X
Codorus	X	C/S			X	X	X	X	X	X		X				X
Cokesbury	X					X			X	X		X				
Collamer	X	C/S		X		X	X	X	X	X		X				X
Colonie	X	C	X					X	X		X					
Comly	X	C/S	X	X		X	X			X	X	X				
Comus	X	C		X	X		X	X	X	X		X				
Conestoga	X	C/S						X	X	X		X		X		
Congaree	X	C		X	X		X	X	X	X		X				
Conotton	X	C/S	X	X		X	X	X	X	X	X	X				
Conowingo	X	C/S		X		X		X	X	X		X	X			X
Cookport	X	C/S	X	X		X	X	X	X	X	X	X				X
Covegap	X	C/S							X		X	X		X		
Craigsville	X	C	X		X		X	X			X	X				
Croton	X	C/S		X		X	X	X	X	X	X	X			X	X
Culleoka	X	C		X				X	X	X	X	X				
Culvers	X	C/S	X			X		X	X	X		X				X
Dalton	X	C/S		X		X	X		X	X	X	X			X	
Darien	X	C/S				X		X	X	X	X	X	X			X
Dekalb	X	C	X					X	X	X	X	X				
Delaware	X	C			X		X		X			X				
Deposit	X	C/S	X		X	X	X		X		X					X
Dormont	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Downsville	X	C							X		X	X		X		
Doylestown	X	C/S	X	X		X	X	X	X	X	X	X				X
Drifton	X	C/S		X		X	X	X	X		X	X				

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Dryrun	X	C/S		X		X	X		X		X	X				
Duffield	X	C/S		X			X	X	X	X	X	X	X	X		X
Duncannon	X	C		X				X	X	X		X				
Dunning	X	C/S		X	X	X	X	X	X		X		X	X	X	X
Dystrochrepts	X	C/S	X	X	X	X	X	X	X	X	X	X				
Edgemere	X	C/S				X	X	X	X	X	X	X			X	X
Edgemont	X	C	X				X		X		X	X				
Edom	X	S	X	X				X	X	X	X	X	X	X	X	
Elk	X	C/S		X			X	X	X	X						
Elkins	X	c/s			X	X	X	X	X	X	X	X	X			
Elko	X	C/S	X			X		X	X			X	X			X
Ellery	X	C/S	X			X	X	X	X	X	X	X			X	X
Elliber	X	C	X						X		X	X		X		
Elnora	X	C	X			X			X		X					X
Empyville	X	C	X			X	X		X		X	X				
Erie	X	S	X	X		X	X	X	X	X	X	X			X	X
Ernest	X	C/S		X		X	X	X	X	X	X	X	X			X
Evendale	X	C/S				X	X	X	X	X	X	X	X	X		X
Fairplay	X	S		X	X	X	X	X	X	X	X	X			X	
Fairpoint	X	C/S	X				X	X	X		X	X	X	X		
Fitchville	X	C/S				X	X	X	X	X	X	X	X			X
Fountainville	X	C/S		X		X		X	X	X		X				
Fleetwood	X	C	X					X			X					X
Fluents	X	C/S	X	X	X	X	X			X		X				
Fluvequents	X	C/S	X	X	X	X	X	X		X		X				
Fredon	X	C/S	X	X		X	X	X	X		X	X				X
Freetown	X	C/S				X	X	X				X			X	
Frenchtown	X	C/S		X		X	X	X	X	X	X	X			X	X
Freshwater Marsh	X	S				X	X	X	X		X	X			X	
Funkstown	X	S		X	X	X		X	X	X		X				X
Gageville	X	C/S		X		X		X	X	X	X	X	X			X
Gaila	X	C/S						X	X		X	X				
Gibraltar	X	C/S		X	X	X	X	X	X	X		X				
Gilpin	X	C	X	X			X	X	X	X	X	X				
Ginat	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Gladstone	X	C		X			X		X			X	X			
Glenelg	X	C		X			X	X	X	X	X	X				X
Gleneyre	X	C/S			X	X	X	X	X	X	X	X			X	X
Glenford	X	C/S				X	X	X	X	X		X	X			

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Glenville	X	C/S				X	X	X	X	X	X	X				X
Gresham		X		X			X	X	X	X		X				X
Guernsey	X	C/S		X		X	X	X	X		X	X	X	X		X
Guthrie							X									
Hagerstown	X	S		X		X	X	X	X	X	X	X	X	X		
Halsey	X	C/S		X	X	X	X	X	X	X	X	X				X
Hanover	X	C/S				X	X	X	X	X		X	X			
Harbor	X	C/S				X		X	X			X	X			
Haplaquents							X									
Hartleton	X	C	X					X	X	X	X	X				
Hatboro	X	C/S			X	X	X	X	X	X	X	X				X
Haven	X	C	X					X	X			X				
Hazleton	X	C	X	X			X	X	X	X	X	X				
Henrietta	X					X		X	X		X	X			X	
Highfield	X	C	X				X		X		X	X				
Hollinger	X	C						X	X	X		X		X		
Holly	X	C/S			X	X	X	X	X	X	X	X			X	X
Hornell	X	C/S	X	X		X		X	X		X	X	X			X
Howard	X		X	X			X		X		X	X				
Howell	X	C/S		X		X		X		X		X	X			
Hublersburg	X	C/S						X	X	X	X	X	X			
Huntington	X	C			X	X	X	X				X		X		
Hustontown	X	C/S	X			X	X		X	X		X				
Itmann	X	C/S	X					X	X		X	X				
Ivory	X	C/S		X		X	X	X	X	X	X	X	X			
Jimtown	X	C/S				X	X	X			X	X				X
Joanna	X	C					X	X	X	X		X				
Jugtown	X	S			X	X	X	X	X	X		X		X		
Kedron	X	C/S				X	X	X	X	X	X	X				X
Kanona							X									
Kimbles	X	C/S				X	X	X	X		X	X				X
Kingsville	X	C/S	X			X	X		X		X	X			X	X
Kinzua	X	C						X	X		X	X				
Klinesville	X	C/S	X	X			X		X		X	X				
Knauers	X	C/S	X		X	X	X	X	X		X	X			X	X
Kreamer	X	C/S		X		X	X	X	X	X		X		X		
Lackawanna	X	C	X			X	X	X			X	X				X
Laidig	X	C/S	X	X		X	X	X	X	X	X	X				
Lakin	X	C	X						X							

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Lamington	X	C/S		X		X	X		X	X	X	X			X	X
Langford	X	S	X	X		X	X	X	X		X	X			X	X
Lansdale	X	C	X					X	X		X	X				
Lantz	X	C/S		X	X	X	X	X	X	X	X	X	X			X
Lawrenceville	X	C/S		X		X	X	X	X	X		X				X
Leck Kill	X	C						X	X	X	X	X				X
Leetonia	X	C	X	X			X				X					
Legore	X	C/S	X					X	X	X	X	X	X			
Lehew	X	C	X						X		X					
Lehigh	X	C/S				X	X		X	X	X	X				X
Lewisberry		C								X	X	X				
Library	X	C/S		X		X	X	X	X		X	X	X	X		X
Lickdale	X	C/S		X		X	X	X	X		X	X	X			
Linden	X	C			X	X	X	X	X	X		X				
Lindside	X	S			X	X	X	X	X	X		X		X		X
Lobdell	X	C/S		X	X	X	X	X	X	X		X	X			X
Lordstown	X	C	X	X				X	X	X		X				
Loudonville	X	C/S						X	X	X		X	X			
Lowell	X	C/S						X	X	X	X	X	X	X		
Luray		X		X		X		X	X	X	X	X	X		X	X
Macove	X	C/S						X	X		X	X				
Mahoning	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Manlius	X	C	X				X		X		X	X				
Manor	X	C		X				X	X	X	X	X				
Mardin	X	S	X	X		X	X	X	X	X		X				X
Markes	X	C/S	X			X		X	X		X	X				X
Matapeake	X	C/S		X			X	X	X			X				
Matewan	X	C	X						X		X					
Mattapex	X	C/S		X		X	X	X	X	X		X				
Maurertown	X	C/S		X	X	X	X	X	X	X	X	X	X		X	
Meckesville	X	C/S				X		X	X	X	X	X				X
Medihemists	X	S				X	X	X				X			X	X
Medifibrists	X	S				X	X					X			X	X
Medisaprists		S				X	X	X				X			X	X
Melvin	X	S		X	X	X	X	X	X	X	X	X	X	X	X	X
Mertz	X	C/S								X		X				
Middlebury	X	S			X	X	X		X	X		X	X			
Mill	X	C/S				X	X	X	X	X	X	X	X		X	X
Millheim		C/S		X				X	X	X	X	X	X			

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Miner	X	C/S				X	X	X	X		X	X	X		X	X
Monongahela	X	C/S		X		X	X	X	X	X		X	X			X
Montalto	X	C/S					X	X	X		X	X	X			
Montevallo		C/S	X				X	X			X	X				
Morris	X	C/S	X	X		X	X	X	X		X	X				X
Morrison	X	C		X				X	X			X		X		
Mt. Airy	X	C	X				X				X	X				
Mt. Lucas	X	C/S				X	X	X	X	X	X	X				X
Mt. Zion	X	C/S		X		X	X	X	X	X	X	X	X			
Muck		X			X	X	X			X					X	X
Muck and Peat	X	S				X	X	X	X		X	X	X		X	X
Murrill	X	C/S					X	X	X	X	X	X		X		
Myersville	X	C/S						X	X	X	X	X				
Nanticoke	X	C			X	X	X	X	X	X	X				X	X
Natalie							X									
Neshaminy	X	C/S				X	X	X	X	X	X	X				
Newark	X	S		X	X	X	X	X	X	X	X	X		X		
Nockamixon	X	C/S		X		X	X	X	X	X		X				X
Nolin	X	C			X	X	X	X	X	X				X		
Nollville	X	C/S						X	X		X	X	X	X		
Nolo	X	C/S	X			X	X	X	X	X	X	X				X
Norwich	X	C/S	X	X		X	X	X	X		X	X			X	X
Ochrepts	X	C	X						X		X	X				
Onoville	X	C/S	X			X		X	X	X	X	X	X			X
Opequon	X	S	X	X				X	X		X	X	X	X		
Oquaga	X	C	X	X			X		X			X				
Orrville	X	C/S			X	X	X	X	X	X		X				X
Otego	X	S		X	X	X		X	X	X		X				X
Othello	X	C/S				X	X	X	X	X	X	X				X
Ottawa	X	C	X						X			X				
Painesville	X	C/S				X	X		X	X	X	X				X
Palms	X	C/S				X	X	X	X		X	X			X	X
Papakating	X	C/S			X	X	X	X	X	X	X	X			X	X
Parker	X	C	X						X		X	X				
Paupack	X	S				X	X		X			X			X	X
Pecktonville	X	C/S		X		X		X	X		X	X	X	X		
Pekin					X		X			X		X				
Penlaw	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Penn	X	C	X				X	X		X	X	X				

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Penn Val	X	C/S							X		X	X				
Pequea	X			X						X	X	X				
Phelps	X	S		X		X	X		X	X	X	X				X
Philo	X	C/S		X	X	X	X	X	X	X	X	X				X
Platea	X	C/S		X		X	X	X	X	X		X				X
Pocono	X	C	X						X		X					
Pope	X	C/S		X	X		X	X	X	X	X	X				
Portville	X	C/S				X	X		X	X	X	X	X			
Potomac	X	C	X		X						X					
Psammets	X	C	X		X	X			X		X					
Purdy	X	C/S		X		X	X	X	X	X	X	X	X			X
Rainsboro	X	X		X		X	X	X	X			X				
Ramsey		C	X						X		X					
Raritan	X	C/S				X	X		X	X	X	X				X
Ravenna		C/S		X		X			X	X	X	X				X
Ravenrock	X	C/S				X			X		X	X				
Rayne	X	C		X				X	X	X	X	X				
Readington	X	C/S		X		X	X	X	X	X	X	X				X
Reaville	X	C/S	X	X		X	X		X	X	X	X				X
Red Hook	X	C/S		X	X	X	X		X	X	X	X				
Rexford	X	C/S	X		X	X	X	X	X	X	X	X				X
Rimer	X	C/S	X	X		X	X		X	X	X	X	X			X
Riverhead	X	C	X					X	X		X	X				X
Riverwash							X									
Rohrersville	X	C/S		X		X	X	X	X	X		X	X			X
Rowland	X	C/S		X	X	X	X	X	X	X	X	X				X
Rubble Land											X					
Rushtown	X	C	X						X							
Ryder	X	C/S						X	X	X		X		X		
Sassafras	X	C						X	X			X				
Scio	X	C/S		X		X	X	X	X	X		X				X
Sciotoville	X	C/S		X		X	X	X	X	X		X	X			X
Sebring	X	C/S				X	X	X	X	X	X	X	X		X	X
Sequatchie		X		X						X						
Sheffield	X	C/S				X	X	X	X	X		X			X	
Shelmadine	X	C/S	X			X	X	X	X	X	X	X				
Shelocta	X	C						X	X		X	X				
Shohola	X	C/S	X			X	X	X	X	X	X	X				X
Shongo	X	C/S				X	X	X	X	X	X	X	X			X

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Sideling	X	C/S				X			X	X	X	X	X			
Skidmore	X	C	X		X	X	X		X		X					
Sloan	X	S		X	X	X	X	X	X	X	X	X	X			X
Solon	X	C	X					X			X	X				
Stanhope	X	C/S		X	X	X	X	X	X	X	X	X	X			X
Steff					X	X	X	X				X				
Steinsburg	X	C	X						X		X					
Stoney Land											X					
Swanpond	X	S		X		X		X	X		X	X	X			X
Suncook	X	C	X		X		X		X		X					
Swartwood	X	C	X	X		X		X	X	X	X					
Thorndale	X	C/S				X	X	X	X	X	X	X	X	X		X
Thurmont	X	C/S				X		X	X		X	X				
Tilsit	X	C/S		X		X	X	X	X	X						X
Tioga	X	C		X	X	X	X		X							
Timberville	X	C			X			X	X	X	X	X	X			
Titusville	X	C/S		X		X	X	X	X	X	X	X	X			X
Towhee	X			X		X	X	X	X	X	X	X	X			
Trego	X	C/S		X		X		X	X		X	X	X			
Trumbull	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Tunkhannock	X	C	X				X		X		X					
Tygart	X	C/S		X		X	X	X	X	X	X	X	X			X
Tyler	X	C/S		X		X	X	X	X	X	X	X	X			X
Udifluents	X	C/S			X	X	X		X	X		X				
Udorthents	X	C/S	X	X				X	X		X	X				
Unadilla	X	C		X			X	X	X	X		X				
Ungers	X	C		X				X	X			X				
Upshur	X	C/S	X	X				X	X		X	X	X			
Urbana						X						X				
Valois	X	C					X	X	X		X	X				
Vandergrift	X	C/S		X			X	X	X		X	X	X			X
Vanderlip	X	C	X						X							
Venango	X	C/S		X		X	X	X	X	X	X	X				X
Volusia	X	C/S	X	X		X	X	X	X	X	X	X				
Wallington	X	C/S		X		X	X	X	X	X	X	X				X
Warners		S		X	X	X	X	X	X		X	X		X	X	X
Washington	X	S				X	X	X	X	X	X	X	X	X		
Watchung	X	C/S		X		X	X	X	X	X	X	X	X			X
Watson	X	C/S	X			X	X	X	X	X		X	X			

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET/ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Wauseon	X	C/S				X	X	X	X	X	X	X			X	X
Wayland	X	S		X	X	X	X	X	X	X	X	X			X	X
Wehadkee	X	C/S			X	X		X	X	X		X				X
Weikert	X	C/S	X				X	X	X	X	X	X				
Weinbach	X	C/S		X		X	X	X	X	X	X	X	X			X
Wellsboro	X	C/S	X	X		X	X	X	X	X		X				X
Westmoreland	X	C		X				X	X	X		X				
Weverton	X	C/S	X					X	X		X	X				
Wharton	X	C/S		X		X	X	X	X	X	X	X	X			X
Wheeling	X	C						X	X	X		X				
Whiteford																
Whitwell																
Wick	X	C/S		X	X	X	X	X	X	X	X	X				X
Wickham																
Williamson	X	C/S		X		X	X	X	X	X		X				X
Wiltshire					X					X						
Woodglen																
Woodstown	X	C/S				X		X	X	X	X	X				X
Wooster	X	C		X		X		X	X	X	X	X				
Worsham	X	C/S		X		X	X	X	X	X	X	X	X			
Worth	X	C	X	X		X	X		X	X	X	X				
Wurno	X		X					X	X		X	X		X		
Wurstboro	X	C/S				X	X		X		X	X				
Wyalusing	X	C/S			X	X	X	X	X		X	X				X
Wyoming	X	C	X				X		X		X					
Zipp		X				X	X	X		X	X	X	X			
Zoar	X	C/S				X	X	X	X	X		X	X			

WORKSHEET 1

List the soils that will be encountered by earthmoving required to construct the drill pad(s), access road(s), pits, impoundments, collector & feeder lines, or other activities associated with the proposed well site(s).

Limiting Soil Characteristics									
Map Symbol	Soil Name	Erodible	Cut Banks Cave	Corrosive to Concrete or Steel	High Water Table	Low Strength	Piping	Poor Topsoil	Potentially Hydric