TO MAIN TOC

Appendices

A - Model Soil Erosion and Sediment Control Regulations for Land Development

B - The Erosion and Sediment Control Act (Sections 22a-329) Public Act 83-388

C - Definitions and Abbreviations

D - Bibliography and Suggested Reading

E - Directory of Related Agencies (Including Useful Internet Web Pages)

F - Matrix of Laws Which May Require Erosion and Sediment Control Implementation

G - Construction Network Scheduling

H - Soil Classification Systems

I - RUSLE

J - Risk Assessment Adapted from CT DOT Drainage Manual

K - Conversion Factors for Select English/Metric Measurements

L - CT Guidelines for Soil Erosion and Sediment Control Measures Wall Chart

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Appendix A

Model Soil Erosion and Sediment Control Regulations for Land Development

Introduction

These are the same model regulations that were first prepared in 1985 by the Soil Erosion and Sediment Control Task Force's Model Regulations Subcommittee under the direction of the Connecticut Council on Soil and Water Conservation, to help municipalities comply with Public Act 83-388 entitled "An Act Concerning Soil Erosion and Sediment Control" now codified in sections 22a- 315 of the Connecticut General Statutes. This act amended sections 8-2, 8-13d and 8-25 of the Connecticut General Statutes. Connecticut towns were required to be in compliance with these amendments on or before July 1, 1985.

Although all towns have implemented changes to their regulations under the Act, these model regulations continue to be incorporated into these Guidelines to meet the requirements of the Act. Following the model regulations are the original notes provided with the model regulations to provide historical information as to the advice given at the time of enactment.

Model Soil Erosion and Sediment Control Regulations for Land Development

Section 1. Definitions

1.1. "Certification" means a signed, written approval by the _____Commission (its designated agent or the _____County Soil and Water Conservation District) that a soil erosion and sediment control plan complies with the applicable requirements of these regulations.

1.2. "Commission" means the _____Commission of the Town (or City) of .

1.3. "County Soil and Water Conservation District" means the _____County Soil and Water Conservation District established under subsection (a) of section 22a-315 of the General Statutes.

1.4. "Development" means any construction or grading activities to improved or unimproved real estate.

1.5. "Disturbed area" means an area where the ground cover is destroyed or removed leaving the land subject to accelerated erosion.

1.6. "Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

1.7. "Grading" means any excavating, grubbing, filling (including hydraulic fill) or stockpiling of earth materials or any combination thereof, including the land in its excavated or filled condition.

1.8. "Inspection" means the periodic review of sediment and erosion control measures shown on the certified plan.

1.9. "Sediment" means solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion.

1.10. "Soil" means any unconsolidated mineral or organic material of any origin.

1.11. "Soil Erosion and Sediment Control Plan" means a scheme that minimizes soil erosion and sedimentation resulting from development and includes, but is not limited to, a map and narrative.

Section 2. Activities Requiring a Certified Erosion and Sediment Control Plan

A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre.

Section 3. Exemptions

A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

Section 4. Erosion and Sediment Control Plan

4.1. To be eligible for certification, a soil erosion and sediment control plan shall contain proper provisions to adequately control accelerated erosion and sedimentation and reduce the danger from storm water runoff on the proposed site based on the best available technology. Such principles, methods and practices necessary for certification are found in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985) as amended. Alternative principles, methods and practices may be used with prior approval of the Commission.

4.2. Said plan shall contain, but not be limited to:

A. A narrative describing:

1. the development;
2. the schedule for grading and construction activities including:
   a. start and completion dates;
   b. sequence of grading and construction activities;
   c. sequence for installation and/or application of soil erosion and sediment control measures;

d. sequence for final stabilization of the project site;

3. the design criteria for proposed soil erosion and sediment control measures and storm water management facilities;
4. the construction details for proposed soil erosion and sediment control measures and storm water management facilities;
5. the installation and/or application procedures for proposed soil erosion and sediment control measures and storm water management facilities;
6. the operation and maintenance program for proposed soil erosion and sediment control measures and storm water management facilities.

B. A site plan map at a sufficient scale to show:
1. the location of the proposed development and adjacent properties;
2. the existing and proposed topography including soil types, wetlands, watercourses and water bodies;
3. the existing structures on the project site, if any;
4. the proposed area alterations including cleared, excavated, filled or graded areas and proposed structures, utilities, roads and, if applicable, new property lines;
5. the location of and design details for all proposed soil erosion and sediment control measures and storm water management facilities;
6. the sequence of grading and construction activities;
7. the sequence for installation and/or application of soil erosion and sediment control measures;
8. the sequence for final stabilization of the development site.

C. Any other information deemed necessary and appropriate by the applicant or requested by the Commission or its designated agent.

Section 5. Minimum Acceptable Standards

5.1. Plans for soil erosion and sediment control shall be developed in accordance with these regulations using the principles as outlined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

5.2. The minimum standards for individual measures are those in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. The Commission (or the County Soil and Water Conservation District) may grant exceptions when requested by the applicant if technically sound reasons are presented.

5.3. The appropriate method from Chapter 9 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended, shall be used in determining peak flow rates and volumes of runoff unless an alternative method is approved by the Commission.

Section 6. Issuance or Denial of Certification

6.1. The _____ Commission (or the _____ County Soil and Water Conservation District) shall either certify that the soil erosion and sediment control plan, as filed, complies with the requirements and objectives of this regulation or deny certification when the development proposal does not comply with these regulations.

6.2. Nothing in these regulations shall be construed as extending the time limits for the approval of any application under Chapters 124, 124A or 126 of the General Statutes.

6.3. Prior to certification, any plan submitted to the municipality may be reviewed by the County Soil and Water Conservation District which may make recommendations concerning such plan, provided such review shall be completed within thirty days of the receipt of such plan.

6.4. The Commission may forward a copy of the development proposal to the conservation commission or other review agency or consultant for review and comment.

Section 7. Conditions Relating to Soil Erosion and Sediment Control

7.1. [1]The estimated costs of measures required to control soil erosion and sedimentation, as specified in the certified plan, may be covered in a performance bond or other assurance acceptable to the Commission in accordance with the provisions specified under Section _____of the regulations.

or

[2]The estimated costs of measures required to control soil erosion and sedimentation, as specified in the certified plan, that are a condition of certification of any modified site plan may be required to be covered in a performance bond or other assurance acceptable to the Commission in accordance with the provisions specified under Section ____ of the regulations.

7.2. Site development shall not begin unless the soil erosion and sediment control plan is certified and those control measures and facilities in the plan scheduled for installation prior to site development are installed and functional.

7.3. Planned soil erosion and sediment control measures and facilities shall be installed as scheduled according to the

certified plan.

7.4. All control measures and facilities shall be maintained in effective condition to ensure the compliance of the certified plan.

Section 8. Inspection

Inspections shall be made by the Commission or its designated agent during development to ensure compliance with the certified plan and that control measures and facilities are properly performed or installed and maintained. The Commission may require the permittee to verify through progress reports that soil erosion and sediment control measures and facilities have been performed or installed according to the certified plan and are being operated and maintained.

Original Notes on Model Regulations

The purpose of these notes is to provide municipalities with further insight, explanation and guidance on the Model Regulations. The notes emphasize administrative procedures which can be helpful in implementing these regulations. These notes also focus on other important issues concerning management of erosion and sedimentation not specifically referred to within the state law. It may be prudent to discuss these issues with your town attorney prior to promulgation of the regulations by the town to ensure that the regulations conform with the Law. The notes first address the Model Regulations specifically by sections and then on a general basis.

Section 1. Definitions

Other definitions may be deemed appropriate to add to this section dependent on local circumstances.

If erosion and sediment control provisions are to be incorporated directly into the existing regulations (as compared to adoption of the "stand alone" document), then the definitions section in the existing regulations will require a revision to add the model's definitions. Remember to retain proper alphabetical order.

Also check for conflicting or inconsistent definitions in the existing and in the model regulations. Revise as needed.

Section 2. Activities Requiring a Certified Erosion and Sediment Control Plan and Section 3. Exemptions

Municipalities that already have existing erosion and sediment control regulations should review those regulations for conformity with the new law with special attention given to the requirements contained in Sections 2 and 3 of the Model Regulations.

It is suggested that the contents of these sections be included in any use and/or zone tables and in any descriptions of the permitted uses and/or various zones which may appear within the existing regulations.

Based upon the legislative history of PA 83-388, agricultural activities are deemed exempt from erosion and sediment control regulations.

The Law exempts the development of an individual residential building lot for residential purposes from the erosion and sediment control regulations. However, it is not the intent of the Law to allow a fragmented parcel- by-parcel development of a subdivision without the required erosion and sediment control provisions. Therefore, subdivision approvals should provide for erosion and sediment control during development.

Section 4. Erosion and Sediment Control Plan

4.1. (Basis for Plan)

The applicant has the responsibility to develop his control plan based on the best available technology. The Connecticut Guidelines for Soil Erosion and Sediment Control publication is specifically referenced as the current state-of-the-art source and readily available from the Department of Environmental Protection's Natural Resources Center. However, there are other acceptable publications which contain the principles, methods and practices for certified plans.

The phrase, "reduce the danger from storm water runoff" relates to erosion only, for example, downstream streambank conditions. Towns have always had the authority to require storm water management provisions. Some towns already do this and it may be the timely thing to do along with erosion and sediment control. However, PA 83-388 does not mandate storm water management. Agencies which can assist towns in developing storm water management regulations are the Department of Environmental Protection, county soil and water conservation districts, USDA Soil Conservation Service, University of Connecticut Cooperative Extension Service and regional planning agencies.

4.2.A (Narrative)

The narrative is extremely useful to the certifier, inspector, enforcer, developer and developer's contractor. Erosion and sediment control is a procedure often calling for written descriptions to explain the basis for any proposed plan, detailed control measures, and interactions such as timing of earth moving or stabilization.

The narrative is an appropriate place to include provisions for contingency plans if unforeseen erosion or sedimentation problems arise. Contingency plans may be handled by requiring statements within the narratives that identify the permittee's (and the contractor's) responsibilities to deal with unforeseen erosion and sedimentation problems as they arise. It is the developer's responsibility to anticipate unforeseen erosion or sedimentation problems and to have the capability to deal effectively with such problems.

Other components of a good narrative would include self-monitoring and active maintenance procedures. A good erosion and sediment control plan will identify someone (engineer, contractor, etc.)

responsible for monitoring control measures with whom an inspector representing the town would be able to communicate routinely. On-site operational and maintenance procedures for erosion and sediment control measures should be required on a daily basis.

Having the narrative printed on the site plan map as noted is beneficial so long as it does not clutter the map. Specific components of the narrative are needed for the contractor to properly review, install and apply measures. Such components appear on the site plan map requirements so they do not become detached from one another.

4.2.B (Map)

An appropriate map scale for soil erosion and sediment control measures is site specific. Normally, a linear scale of 1 inch = 40 feet and contour intervals of 2 feet provide enough site plan detail for most projects. Circumstances may warrant more or less detail. Flexibility is highly desirable to meet site-specific needs and to not unnecessarily burden the applicants.

All of the site plan map requirements are important for soil erosion and sediment control. Such information is important in evaluating a proposed erosion and sediment control plan and in predicting the plan's effectiveness. The information is needed by the contractor in explicit detail so control measures can be properly located and installed or applied. The information is needed by inspectors to check if installation, operation and maintenance are as planned. The information becomes more crucial when the development site is large and/or an environmentally sensitive area.

As stated earlier, the site plan map requirements also contain components of the narrative, namely B(6), (7) and (8). The components are needed by the contractor during construction to tell him when and how to implement the control plan. These components will appear in the narrative, as required by law, but by having them also appear on field construction plans is advantageous. The construction workers would then only need the plan to work from and have before them only relevant narrative details, thus reducing the chances of the narrative being "forgotten about" during construction.

All of the site plan map requirements should be integrated with mapping requirements in the existing regulations, not repeated.

4.2.C (Other Information)

This section provides a "catch all" for those development sites requiring additional or special control measures or facilities not covered in Section 4.2(A) and (B). This section also allows for special controls or plan features to meet site specific situations that either the applicant or the commission wish to address.

Section 5. Minimum Acceptable Standards

Subsections 1 through 3 again reference the Connecticut Guidelines for Soil Erosion and Sediment Control as a source for establishing the "what to do" and "how to do it" in devising a control plan. Otherwise, a more lengthy section specifically covering the seemingly unlimited standards would evolve. Referencing these Guidelines provides the flexibility needed for site-specific development.

Performance standards are the desired goal for control of soil erosion and sediment, and the source from which control measures were designed are secondary. The Guidelines are meant to be a readily-available source to attain these desired performance standards.

Section 6. Issuance and Denial of Certification

6.1 (Commission Shall Certify or Deny)

It is suggested that the certifier keep public records defining the basis for all decisions. It is important that good public records be kept.

6.2 (Time Limits)

With the new Law, an application before the planning and/or zoning commission is automatically "incomplete" unless there is a control plan. Once a "complete" application is received, the timetable a commission must adhere to in their actions is established by statute. Proper provisions for soil erosion and sediment control must be done within that established timetable. THEREFORE, IT IS IMPERATIVE that commissions act promptly to review plans for certification, including prompt submittal of plans to others if their review is deemed necessary.

6.3 (Review by County Soil and Water Conservation Districts)

If the County Soil and Water Conservation District is to be designated as the certifying authority, then delete this subsection.

6.4 (Other Review)

Communication and coordination usually need to be improved upon among all parties interested in environmental safeguards. The municipal wetlands agency has a role in erosion and sediment control as part of its statutory charge for protecting wetlands and watercourses.

Section 7. Conditions Relating to Soil Erosion and Sediment Control

An additional component to consider in Section 7 would be titled "Compliance with Plan Requirements." It would state, "Any person engaged in development activities who fails to file a soil erosion and sediment control plan in accordance with these regulations, or who conducts a development activity except in accordance with provisions of a certified plan

shall be deemed in violation of these regulations."

7.1 (Bonding Options)

When the "stand alone" document approach is taken, the user should cross-reference the applicable bonding provisions similar to how they appear in the Model Regulations. THERE ARE TWO WAYS for such bonding requirement provisions to be stated in the regulations. The one used depends upon the regulations being amended. The first, 7.1, is only legal for subdivision or planned unit development regulations. The second, 7.1, is only legal for zoning's site plan review regulations and is also conditional to that portion of the modified site plan.

Bonding should be effected according to the normal bonding procedures established by each municipality, but may not have to be implemented at the time of soil erosion and sediment control plan certification. Bonding at the time building permits are requested may be preferable.

Establishing who (i.e., town engineer) is to recommend "the estimated costs required to control soil erosion and sedimentation" may be stated in the regulations.

Section 8. Inspection

Although the inspection section is brief, it is very important. Inspection is mandated by state law and should be seriously accomplished to protect the town's liability.

The second sentence of 8.1, beginning with "The Commission may require ...", can be considered an "as-built" requirement that can be used on large, complex or sensitive developments. Progress reports are not necessary for all control plans, but in special instances can be used to guarantee compliance by the applicant. Normally, the applicant would be expected to pass this responsibility on to the consultant who prepared the control plan.

Inspection records or reports should be kept in the event of possible enforcement action. Types of information for such inspection records include: inspection dates, weather conditions, people spoken to on-site, what was looked at, discussed, and agreed upon. Additionally, inspection reports may include drawings, sketches, or photographs of relevant features or problem areas.

Check the existing regulations for inspection and investigation provisions which grant access to the development site. Consider such provisions here if they do not exist in the regulations.

Other Notes

Delegation of the certifying authority responsibilities may be possible for a municipality, especially where existing erosion and sediment control mechanisms are already in place. It is recommended to consolidate past mechanisms with new requirements, especially the certification and inspection responsibilities.

Any **Preapplication** process for development that may be ongoing between the town and the potential applicant should consider including the county soil and water conservation district as a source of resource information concerning soil erosion and sediment control.

Amendments to an existing certified soil erosion and sediment control plan may be sought at a later date. Adherence to the plan amendment provisions already appearing in existing regulations will need to be enforced. The Act does not contain provision for amendment to certified plans. It is recognized that municipalities already deal with minor technical changes to approved plans in a variety of ways. Each municipality should consider including in their regulations a formal erosion and sediment control amendment provision for substantive changes. However, experience will bear out that unforeseen circumstances during construction will necessitate technical changes and contingency measures.

Enforcement proceedings by a municipality can be kept to a minimum if the municipality insists that carefully prepared and well-thought-out soil erosion and sediment control plans be submitted, properly reviewed for certification and implemented. Substandard plans must be rejected or denied, and certified plans, when implemented, must be inspected periodically by the town enforcement agent. For significant development applications, bonding and the requirement for as-built soil erosion and sediment control measures have been shown to increase compliance with environmental laws.

Inland wetlands authorities can independently exercise enforcement action when soil erosion and sedimentation impacts upon their regulated areas. The State of Connecticut, Department of Environmental Protection can ultimately enforce situations that pollute the waters of the state.

Original Model Regulation Subcommittee

Tom Mocko, Chairman (Connecticut Council on Soil and Water Conservation)
Robert Fried, attorney (Connecticut Association of Soil and Water Conservation Districts) Geoffrey Colegrove (Connecticut Association of Regional Planning Agencies)
Douglas Cooper (Dept. of Environmental Protection, Water Resources Unit)
Carmine DiBattista (Dept. of Env. Protection, Local Assistance and Program Coordination Unit)
Christopher Bogucki (Connecticut Waterworks Association)
Samuel Chambliss, attorney (Fairfield County Soil and Water Conservation District)
James Gibbons (University of Connecticut, Cooperative Extension Service)
Katie Feidelson (Connecticut Conference of Municipalities)
David Russell (Council of Small Towns)

Appendix B

The Erosion and Sediment Control Act (Sections 22a-325 through 22a-329) Public Act 83-388

Summary

The Act establishes a public policy that recognizes soil erosion resulting from the development of land as a serious problem, and the sediment generated by this erosion as polluting the land, water and air. The policy requires improved and broadened erosion and sediment control activities that will consist of a coordinated control program to reduce the danger from storm runoff, minimize nonpoint sediment pollution, and conserve and protect land, water, air, and other environmental resources. (C.G.S section 22a-326.)

Definitions are provided for the terms Council, disturbed area, erosion, inspection, soil erosion and sediment control plan, regulations, sediment and soil. (C.G.S section 22a-327.)

The Council on Soil and Water Conservation is given the responsibility to develop and maintain guidelines that will outline methods and technology for controlling erosion and sedimentation. These guidelines are to be made available to the public by the Department of Environmental Protection and the Soil and Water Conservation Districts. (C.G.S section 22a-328.)

All municipalities are required to develop regulations that require erosion and sediment control plans for development projects which will disturb an area larger than one-half acre. Erosion and sediment control plans are not required for land disturbances of one-half acre or less, or for the construction of a single-family house that is not part of a subdivision. The regulations must provide for certification of the plans for adequacy and for inspection of the measures being installed. (C.G.S section 22a-329.)

Section 8-2 (Zoning), subsection (b) of section 8-13d (Planned Unit Development) and subsection (a) of section 8-25 (Municipal Planning Commission) of the General Statutes are revised by this act to make erosion and sediment control mandatory rather than optional. Municipalities are given an implementation dated of July 1, 1985. (C.G.S section 22a-329 .)

For further information see other statutes.

Connecticut General Statutes, Revised to 1997

Sec. 22a-325. Short title: Soil Erosion and Sediment Control Act. Sections 22a-325 to 22a-329, inclusive, shall be known and may be cited as the "Soil Erosion and Sediment Control Act".

(P.A. 83-388, S. 1.)

Sec. 22a-326. Legislative finding; policy of the state. The General Assembly finds that soil erosion on land being developed is a serious problem in Connecticut, that sediment is a source of pollution, that rapid changes in land use from agricultural and rural to nonagricultural and urban and the construction of residential, industrial and commercial development and land-disturbing activities associated with development have accelerated soil erosion and sediment deposition resulting in water pollution and damage to residential, agricultural, industrial and recreational land uses, to fish and wildlife and to other resources. It is, therefore, declared to be the policy of the state to strengthen and extend its erosion and sediment control activities and programs and to establish and implement, through the Council on Soil and Water Conservation, soil and water conservation districts, the municipalities and the Commissioner of Environmental Protection, a state-wide coordinated erosion and sediment control program which shall reduce the danger from storm water runoff, minimize nonpoint sediment pollution from land being developed and conserve and protect the land, water, air and other environmental resources of the state.

(P.A. 83-388, S. 2.)

Sec. 22a-327. Definitions. As used in sections 22a-325 to 22a-329, inclusive: (1) "Council" means the Council on Soil and Water Conservation established under subsection (c) of section 22a-315; (2) "Disturbed area" means an area where the cover is destroyed or removed leaving the land subject to accelerated erosion; (3) "Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice and gravity; (4) "Inspection" means the periodic review of sediment and erosion control measures shown on the certified plan; (5) "Soil erosion and sediment control plan" means a scheme that minimizes soil erosion and sedimentation and includes, but is not limited to, a map and narrative. The map shall show topography, cleared and graded areas, proposed area alterations and the location of and detailed information concerning erosion and sediment measures and facilities. The narrative shall describe the project, the schedule of major activities on the land, the application of conservation practices, design criteria, construction details and the maintenance program for any erosion and sediment control facilities that are installed; (6) "Regulations" mean any regulations adopted by a municipality pursuant to sections 8-2 and 8-25; (7) "Sediment" means solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion; (8) "Soil" means any unconsolidated mineral and organic material of any origin.

(P.A. 83-388, S. 3; P.A. 85-409, S. 4, 8.)
History: P.A. 85-409 removed reference to Sec. 8-13d in Subdiv. (6), that section having been repealed by the same act.
Sec. 22a-328. Guidelines for soil erosion and sediment control. The council shall develop guidelines for soil erosion and sediment control on land being developed. The guidelines shall outline methods and techniques for minimizing erosion and sedimentation based on the best currently available technology. Such guidelines shall include, but not be limited to, model regulations that may be used by municipalities to comply with the provisions of sections 22a-325 to 22a-329, inclusive. The Commissioner of Environmental Protection and the soil and water conservation districts shall make the guidelines available to the public.

(P.A. 83-388, S. 4.)

Sec. 22a-329. Municipal land use. Regulations. (a) The regulations adopted by a municipality pursuant to sections 8-2 and 8-25, on and after July 1, 1985, shall require that: (1) Proper provision be made for soil erosion and sediment control; (2) a soil erosion and sediment control plan be submitted with any application for development when the disturbed area of such development is more than one-half acre; and (3) the municipality or the soil and water conservation district shall certify that the plan complies with regulations adopted pursuant to said sections. Prior to certification, any plan submitted to a municipality may be reviewed by the soil and water conservation districts which may make recommendations concerning such plan, provided such review shall be completed within thirty days of the receipt of such plan. The regulations shall include, but not be limited to, provisions for certification of a plan and inspection of measures being installed pursuant to such plan. A single-family dwelling that is not a part of a subdivision of land shall be exempt from such regulations. The soil and water conservation districts shall assist municipalities which so request in developing regulations to comply with this section. Nothing in this section shall be construed as extending the time limits for the approval of any application under chapter 124 or 126. (b) Notwithstanding the provisions of subsection (a) of this section, the council may grant an extension of time for the adoption of the regulations on soil and sediment control required under sections 8-2 and 8-25, but not beyond June 30, 1986, to any municipality which makes application to the council before July 1, 1985.

(P.A. 83-388, S. 5, 9; P.A. 85-91, S. 1, 5; 85-409, S. 5, 8.)

History: P.A. 83-388, S. 5, effective July 1, 1985; P.A. 85-91 added Subsec. (b) re time extension for adoption of regulations and made a corresponding technical change to prior provisions, designated as Subsec. (a); P.A. 85-409 removed reference to Sec. 8-13d and chapter 124a which were repealed by the same act.

Cited. 19 CA 334, 337.

Secs. 22a-330 to 22a-335. Reserved for future use.

Appendix C
Definitions and Abbreviations

Abbreviation / Term	Definition
2:1	Expression of slope gradient of run to rise where for every 2 units of horizontal distance there is a 1 unit vertical rise, referred to as two to one.
abutment	Support for a bridge, taking the horizontal thrust from the bridge in addition to its weight.
a.c.	Acre or acres (also abreviated as Ac.).
access road	A vehicular travelway constructed to provide ingress and egress to an area.
ACOE	See USACOE
acre-foot	A term used to denote a volume of water that will cover one acre to the depth of one foot. One acre-foot contains 325,851 gallons of water. Sometimes referred to as "Ac. ft."
aggregate	Granular material such as sand, gravel, crushed gravel or crushed stone. Aggregate is classified by size and gradation. See DOT Standard Specification Section M.01.01 for gradation of aggregate.
ANSI	American National Standards Institute.
anti-seep collars	Collars around pipe conduits to inhibit seepage and piping of soils along the conduit.
aquifer	A porous water-bearing formation of permeable rock, sand or gravel capable of yielding economically significant quantities of groundwater.
apron	A lining extending downstream from a hydraulic structure to prevent erosion and scour.
artesian	A ground water condition where a confined aquifer transfers static water pressures over some distance and can be under pressure.
ASTM	American Standards of Testing and Materials.
auxiliary spillway	See emergency spillway.
balled & burlapped	Nursery plant stock dug for transplanting in which soil around the roots is undisturbed; the ball of earth is then bound in burlap or similar mesh fabric.
bare-root	Nursery plant dug for transplanting from which the soil is removed from the roots.
barrel	A length of pipe, conduit or culvert laid horizontally through a roadway or dam embankment.
base flow	The portion of stream flow that is not due to storm runoff but is the result of ground water discharge or discharge from lakes or similar permanent impoundments of water.
bed load	Sand, silt, gravel, or soil and rock detritus carried by a stream, river or other similar flowing waterbody on or immediately above its bed. The bed load is part of the sediment load composed of relatively coarse material. The movement of bed load is executed by rolling, sliding along the bed, or saltation (bouncing along the bed or moving by the impact of bouncing particles) of bed particles.
bedding	Material used under and around a structure (e.g. a culvert) to form a stable base for the structure.
berm	A man-made deposit of material that is raised above the natural surface of the land and used to contain, divert or store water, sometimes referred to as a bench.
borrow area	An area from which soil or rock is taken to build an embankment, earth dam or other construction.
BMP	Best Management Practice.
break grade	To change grade, as in a tile line, ditch or channel.

CFR	Code of Federal Regulations.
cfs	Cubic feet per second, the rate of fluid flow at which 1 cubic foot of fluid passes a measuring point in one second.
CGS	Connecticut General Statutes.
channel	A drainageway that possesses a definite bed and banks which confine flowing water.
channel capacity	Capacity of a channel, constructed or natural, when flowing full or at design flow. Usually defined in terms of "*Q*" usually expressed as cfs.
channel grade stabilization structure	A permanent open structure used to control the grade and head cutting in natural or artificial channels.
channel stabilization	Erosion prevention and stabilization of velocity distribution in a channel using jetties, drops, revetments, vegetation or other measures.
chute	An open conduit for the purpose of transporting water down a slope or across obstructions. Same as flume.
clay	A mineral soil consisting of particles less than 0.005 to 0.002 millimeters in equivalent diameter, depending on the soil classification system (see Appendix H).
closed drain	That portion of a subsurface drain that rises to the surface to receive surface water.
cofferdam	A temporary wall constructed to exclude water from an excavation, formed by sheet piling, earth, sandbags, or other similar materials that are structurally capable of withstanding the water pressure without failure.
colloid	In soil, organic or inorganic matter having a particle sizes ranging from 0.0001 to 0.000001 millimeter.
concrete	A mixture of coarse aggregate, fine aggregate, water and Portland-pozzolan cement, also referred to as Portland cement concrete.
construction entrance	A stone stabilized pad sometimes associated with a mud rack, automotive spray, or other measures located at points of vehicular ingress and egress on a construction site used to reduce the tracking of sediment off site onto paved surfaces.
Continuity Equation	In hydrology, an axiom stating that the rate of flow past one section of a water conveyance system is equal to the rate of flow past another section of the same water conveyance system plus or minus any additions or subtractions between the two sections.
contour	An imaginary line on the surface of the earth connecting points of the same elevation or a line drawn on a map connecting points of the same elevation.
control section	A constriction or obstruction used in the design of hydraulics structures, such as spillways or grade stabilization structures, at which depths upstream are subcritical and downstream are supercritical.
core trench	Excavation for a core wall in the construction of an earth embankment.
cover	Vegetation or other material providing soil protection.
creep	The very slow, generally continuous downslope movement of soil and debris under the influence of gravity. 2. The movement of sand grains along the land surface.
crest	The top of a dam, dike, spillway or weir, frequently restricted to the overflow portion.
critical depth	The depth of water flowing in an open channel or conduit under conditions of critical flow.
critical flow	The flow condition at which the discharge is a maximum for a given specific energy, or at which the specific energy is a minimum for a given discharge.
cross section	A view of a vertical plane as cut through the ground surface (sometime subsurface) for determining contours, quantities of earthwork, channel capacity, etc.
cross-sectional area	The area of a cross section or a section of the stream at right angle to the main (average) direction of flow of a stream and bounded by the stream's wetted perimeter and free surface.
csm	Cubic feet per second per square mile.
CT	Connecticut.

cu. yds. or c.y.	Cubic yards; a term expressing volume, especially of earth fill.
cut	Portion of land surface or area from which earth or rock has been removed or will be removed by excavation; the depth below original ground surface to excavated surface.
dam	A barrier to confine or raise water for storage or diversion, to create a hydraulic head, or for retention of soil, rock or other debris.
DEP	Connecticut Department of Environmental Protection.
deposition	Transported material deposited because of decreased transport capacity of water or wind.
detention basin	An impoundment made by constructing a dam or an embankment (embankment detention basin), or by excavating a pit or dugout (excavated detention basin) for the purpose of temporarily detaining stormwater runoff to control its rate of flow. Basins resulting from both excavation and embankment construction are classified as embankment detention basins where the depth of water impounded against the embankment at emergency spillway elevation is three feet or more.
detention facility	A surface water runoff storage facility that is normally dry but designed to hold surface water temporarily during and immediately after runoff event to reduce downstream discharges.
dewatering	The removal of water by pumping, infiltration, open air drying or other methods; drainage of the soil profile.
dewatering of earth materials	A procedure that uses a perimeter earthen berm and/or excavation to create a containment area where excessively wet soil is placed to allow for the draining of water or evaporation of excessive moisture.
dike	An embankment to confine or control water.
discharge	1. Rate of flow, specifically fluid flow. 2. A volume of fluid passing a point per unit time, commonly expressed as cubic feet per second, million gallons per day, gallons per minute, or cubic meters per second (commonly referred to in hydraulic equations as *Q*).
disturbed area	Area where vegetation, topsoil or overburden is removed or where topsoil, spoil and other material is placed.
diversion	A channel and/or supporting ridge, or other man-made structure constructed to change the direction of water from one area to another.
DOT	Connecticut Department of Transportation.
DOT #3 stone	A gradation of aggregate found in DOT Standard Specifications Section M.01.01.
DOT Drainage Manual	Connecticut Department of Transportation Hydraulics and Drainage Manual, dated October 2000.
DOT Standard Specifications	Document entitled "State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction", as revised.
downstream	In a direction toward which a watercourse or drainageway is flowing.
drainage area	The land which drains water to a given point. Synonymous with watershed, drainage basin or catchment area, typically measured in acres, hectares, or square miles.
drainage basin	See drainage area.
drainage coefficient	A term expressing the rate at which water runs off from a drainage area.
drainage pattern	Arrangement of a system of surface or subsurface drains or overland flow paths.
drainageway	A man-made or natural channel or course along which water moves in draining an area.
drop inlet	An L-shaped conduit placed in an earth-filled dam, used to drop water from one level to another for gradient control and channel stabilization.
drop inlet spillway	Overfall hydraulic structure in which water flows down into a vertical riser conduit.
drop spillway	A spillway, usually less than 20 feet (6 meters) high having a vertical downstream face, and water drops over the face without touching the face.
dust control	The control of dust on construction sites, construction roads and other areas where dust is generated to prevent the movement of dust from exposed soil surfaces.

E&S	Erosion and sediment control.
E&S measure	A defined procedure intended for controlling the detachment of soil, the movement of water and/or the deposition of sediment; erosion and sediment control measure.
embankment	A man-made deposit of material that is raised above the natural surface of the land and used to contain, divert or store water; support roads or for other similar purposes.
emergency spillway	Auxiliary outlet to a water empoundment which transmits floodwater exceeding the capacity of the principal spillway.
erosion	The wearing away of land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.
erosion and sediment control	The device placed, constructed on or applied to the landscape that prevent or curbs the detachment of soil, its movement and/or deposition.
eutrophication	The process by which waters become over-enriched by nutrients, primarily nitrogen and phosphorus, to a point where excessive algal growth occurs.
FHWA	Federal Highway Administration.
filter	A layer or combination of layers of pervious materials designed and installed in such a manner as to provide drainage, yet prevents the movement of soil particles due to flowing water.
filter cloth	Synthetic fabrics used as a filter, usually beneath riprap or between materials with significant differences in grain size, to prevent the movement of fine material through course material but at the same time allowing the passage of water.
filter strip	A strip or area of vegetation for removing sediment, organic material, nutrients, and chemicals from runoff or wastewater.
flash board	A plank generally held horizontally in vertical slots on the crest of a dam or check structure to control the upstream water level.
floodplain	Any land area susceptible to being inundated by water, usually adjacent to a stream, river or waterbody and usually associated with a particular design flooding frequency (e.g., 100-year floodplain).
flume	An open conduit for the purpose of transporting water down a slope or across obstructions. Same as chute.
fps	Feet per second.
freeboard	Vertical distance between the maximum water surface elevation anticipated in the design and the top of a water control structure provided to prevent overtopping of the structure because of unforseen conditions.
ft/s	Feet per second.
ft.	Feet.
fugitive dust	Solid airborne particulate matter emitted from any source other than through a stack (see Regulations of Connecticut State Agencies section 22a-174-1(31).
gabions	Flexible wire mesh baskets composed of rectangular cells filled with riprap or other hard, durable rock.
geotextile	Fabric or synthetic material placed (1) between the soil and a pipe, gabion, stone, or retaining wall to enhance water movement and /or retard soil movement, (2) as a blanket or mat to add reinforcement and/or separation (3) to provide an above ground sediment barrier.
geotextile silt fence	A temporary sediment barrier consisting of a geotextile fabric pulled taut and attached to supporting posts and entrenched used to intercept and retain sediment from disturbed areas.
grade	1. The slope of a road, channel or natural ground. 2. Any surface prepared for the support of construction such as that for paving or laying conduit. 3. Ground surface elevation.
gradient	Change of elevation, velocity or other characteristic per unit of length; slope.
grading	Act of altering the ground surface to a desired grade or contour by cutting, filling, leveling and/or smoothing.
gravel filter	Graded sand and gravel aggregate placed around a drain to prevent the move-

	ment of fine materials into the structure.
groundwater	Water occurring in the zone of saturation in an aquifer or soil.
grub	The clearing of stumps, roots, trees, bushes, and undergrowth.
gully erosion	The erosion process whereby water accumulates in narrow channels, and removes the soil from this narrow area to depths ranging from 1 foot to as much as 97 feet in a relatively short period of time.
hardpan	A hardened soil layer in the lower A or B soil horizon (the lower topsoil area or just below) caused by cementation of soil particles.
hardy	Capable of living over winter without artificial protection.
hay bale barrier	A temporary sediment filter consisting of a row of entrenched and anchored bales of hay or straw used to intercept and detain small amounts of sediment from small disturbed areas.
head	The height of water above any plane of reference.
head cutting	An erosive process where the stream bottom is eroded in the direction of the head of the stream.
HEC 1	Computer program with associated manual entitled "Flood Hydrograph Package" developed by the US Army Corps of Engineers, Hydrologic Engineering Center, dated May 1991, Version 4.0.
HEC 2	Computer program with associated manual entitled "Water Surface Profiles" developed by the US Army Corps of Engineers, Hydrologic Engineering Center, dated May 1991, Version 4.6.2.
HEC 15	Hydraulic Engineering Circular No. 15 by the Federal Highway Administration entitled Design of Roadside Channels with Flexible Linings, dated April 1988.
hydraulic gradient	The slope of the hydraulic grade line; the slope of the free surface of water flowing in an open channel.
hydroseeding	A method of broadcasting seed and sometimes lime, fertilizer, and mulch together in a mixture of water.
impoundment	Generally, an artificial collector or storage of water, as a reservoir, pit, dugout, or sump.
infiltration rate	A soil characteristic determining or describing the maximum rate at which water can enter the soil under specified conditions.
inland wetland	A wetland as that term is defined in section 22a-38 of the Connecticut General Statutes.
internal drainage	Drainage of the soil profile; may be either natural or augmented by man.
invert elevation	The vertical bottom inside elevation of a pipe, sewer or other conduit or orifice in a pond or similar waterbody which defines the water level.
land grading	Reshaping of the ground surface by excavation or filling or both, to obtain planned grades to control surface runoff and reduce erosion potential.
landscape mulch	Application of a mulch that protects the soil surface on a long term basis and promotes the growth of landscape plantings.
landscape planting	Planting trees, shrubs, or ground covers for stabilization of disturbed areas.
lbs.	Pounds.
level spreader	An outlet for berms, diversions and other water conveyances consisting of an excavated depression with a broad stable point of discharge constructed at zero grade across a slope.
liming	The application of lime to reduce soil acidity and to supply calcium for plant growth.
m	Meters.
major storm	A storm predicted by the National Office of Atmospheric Administration (NOAA) Weather Service with warnings of flooding, severe thunderstorms or similarly severe weather conditions or effects.
Manning's formula	A formula used to predict the velocity and/or elevation of water in an open channel (see permanent lined waterway, vegetated waterway and subsurface drain measures).

meanders	A series of sinuous curves or loops in the course of a mature stream, produces as the stream swings from side to side in flowing across its floodplain.
min.	Minutes.
mm	Millimeter.
mulch for seed	Application of a mulch that will protect the soil surface on a temporary basis and promote the establishment of temporary or permanent seedings.
natural rate of erosion	The rate at which erosion takes place as a result of the combined effects of natural climatic occurrences and not because of the activities of man.
NAVDOCS-7.1	Naval Facilities Design Manual 7.1 Soil Mechanics.
NPDES	National Pollution Discharge Elimination System.
NRCS	USDA Natural Resources Conservation Service (formerly known as the USDA Soil Conservation Service or SCS).
orifice	A opening with a closed perimeter through which water flows.
outfall or outlet	Point where confined water flows from a conduit into an open channel or body of water or where one body of water drops away into another body of water.
outlet channel	A conveyance system constructed or altered primarily to carry water from man-made structures such as terraces, conduits and diversions.
outlet protection	Structurally lined aprons or other acceptable energy dissipating devices placed between the outlets of pipes or paved channel sections and a stable downstream channel.
owner of record	The person or party having a fee interest in the land and who may bear liability for the environmental conditions on the property.
P.A.	Public Act (state).
P.L.	Public Law (federal).
peak discharge	The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.
perennial stream	A stream that flows year round.
permanent diversion	A channel constructed across a slope with a supporting earthen ridge on the lower side.
permanent lined waterway	A permanent waterway, including chutes and flumes, with an erosion resistant lining composed of concrete, stone, or other appropriate durable material.
permanent seeding	Establishment of permanent stand of grass and/or legumes by seeding and mulching exposed soils with a seed mixture appropriate for long term stabilization.
permanent turf reinforcement mats	A manufactured mat composed of polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix used where design flows exceed the stability of the soils and/or proposed vegetation.
permanent pool	An area of a detention basin or flood control project that has a fixed water surface elevation due to a manipulation of the outlet structure.
permanent slope drain	A permanent open or enclosed structure or series of structures consisting of pipe(s), culvert(s) and/or manhole(s) used to convey water from a higher elevation to a lower elevation.
permeability	A generic term for the property that describes the rate at which gases and liquids can flow through the soil and porous media (e.g., a geotextile).
permissible velocity	The highest velocity at which water is conveyed in a channel or other conduit and not cause scour or erosion.
pH	A measure of the hydrogen ion concentration in a solution, expressed as the logarithm (base ten) of the reciprocal of the hydrogen ion concentration in gram moles per liter. On the pH scale (0 - 14), a value of 7 represents neutral conditions; decreasing values, below 7, indicate increasing hydrogen ion concentration (acidity); increasing values, above 7, indicate decreasing hydrogen ion concentration (alkalinity).
phase	A distinct and complete set of activities that have a specific functional goal wherein the work to be completed in the phase is not dependent upon the execution of work in a later phase in order to make it functional.
phreatic line	The line marking the upper surface of the zone of water saturation in the soil.

piping	Removal of soil material through subsurface flow channels or "pipes" developed by seepage water.
planting stock	Young plants or cuttings, either nursery grown or naturally occurring.
portable sediment tank	A tank or container into which sediment laden water is pumped in order to trap and retain the sediment before discharging the water or to transport the sediment laden water to an approved location for further treatment.
postconstruction stormwater management	Controlling and providing treatment for water that drains off a site during and after a period of rainfall or snow for the purpose of improving water quality and controlling water quantity.
ppm	Parts per million.
precast concrete	A plain or reinforced concrete element cast in other than its final position.
preconstruction meeting	A meeting that is held prior to the initiation of construction between concerned parties for the purpose of reviewing the contract with the contractor(s) and to identify special concerns, regulatory permit requirements and restrictions.
principal spillway	An earthen or concrete or pipe structure whose elevation determines the water level in an impoundment.
psi	Pounds per square inch.
pump intake and outlet protection	Structures or other protective devices into which or on which intake and discharge hoses are placed during pumping operations; used to reduce the amount of sediments taken up by a pump during dewatering operations and to prevent soil erosion due to scouring and the resuspension of detained sediments at the point of pump discharge.
pumping settling basin	An enclosed sediment barrier or excavated pit constructed with a stable inlet and outlet such that sediment laden water from pumping operations is de-energized and temporarily stored, allowing sediments to be settled and/or filtered out before being released from the construction site.
pure live seed	The product of the percentage of germination plus the hard seed and percentage of pure seed divided by 100.
Q	Engineering term used to define capacity, usually given as a volume over time (i.e., cubic feet per second, gallons per day, etc.).
raindrop erosion	The detachment and airborne of small soil particles caused by the impact of raindrops on soil.
rainfall amount	The amount of specified rainfall, such as daily, annual or for a storm, usually expressed by depth of the rain water which accumulates on a horizontal surface without infiltration and evaporation.
rainfall frequency	The frequency, usually expressed in years, at which a given rainfall intensity and duration can be expected to be equaled or exceeded.
rainfall intensity	The rate of rainfall of any given time interval, usually expressed in units of depth per time.
RCP	Reinforced concrete pipe.
reinforced concrete	Concrete containing reinforcement, including prestressed steel, and designed on the assumption that the two materials act together in resisting forces.
retaining wall	A wall that provides stability to a slope, constructed of mortared block or stone, cast-in-place concrete, timber, reinforced earth, gabions, precast concrete modular units or similar structures.
retention facility	A surface water storage facility that retains stormwater and runoff and promotes ground water infiltration.
revetment	A facing of stone, bags, blocks, pavement, etc., used to protect or armor a bank against erosion.
rill	A small channel eroded into soil surface by runoff which can be filled easily and removed by normal tillage.
rill erosion	An erosion process in which numerous small channels from several inches up to 1 foot in depth are formed.
riparian land	Land situated along the bank of a stream or other body of water.
riprap	A permanent, erosion-resistant ground cover of large, loose, angular stone.

riser A vertical pipe extending from the bottom of a pond that is used to control the discharge rate for a specified design storm.

root ball The intact ball of earth or growing medium containing the roots of a nursery plant.

root zone Depth of soil that plant roots readily penetrate and in which the predominant root activity occurs.

roughness coefficient A factor in velocity and discharge formulas representing the effect of channel roughness on energy losses in flowing water.

runoff That portion of the precipitation (excess rainfall, snow melt or irrigation) on a drainage area that is discharged from the area in the form of flow across the surface of the ground.

RUSLE Revised Universal Soil Loss Equation.

Saint Anthony Falls outlet A type of outlet protection for pipes and spillways that was tested at the Saint Anthony Falls testing facility in Minnesota.

sand A mineral soil generally consisting of soil particles ranging from 5.0 to 0.5 millimeters in diameter. See Appendix H for various soil classification systems.

scale The ratio of a distance on a photograph or map to its corresponding distance on the ground (e.g., 1:24,000 or 1 inch = 200 feet).

scarify To break the surface of the soil with a narrow-bladed implement.

scour To abrade and wear away; used to describe the wearing away of channels or stream beds.

SCS Soil Conservation Service (now known as the USDA Natural Resource Conservation Service or NRCS).

sediment load Amount of sediment carried by running water or wind.

sedimentation Deposition of waterborne or windborne particles resulting from a decrease in transport capacity.

sedimentation basin A surface water runoff storage facility intended to trap suspended solids, suspended and buoyant debris, and adsorbed or absorbed potential pollutants which are carried by surface water runoff.

seeding A process of establishing a stand of vegetation through the use of seed or other vegetative material capable of establishing itself.

seepage The movement of water into, through and out of the soil (generally observed at its discharge point from the soil).

sequence The logical order of progressive series of activities that will result in the completion of a single phase project or an individual phase of a multi-phased project.

settling efficiency The percentage of particles of a prescribed size trapped in a sediment basin under design conditions.

sheet erosion The removal of a thin, fairly uniform layer of soil from the land surface by the overland flow of water.

sheet flow Runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

side slope The slopes of the of any cut or fill section, such as dams, ditches, diversions and channels. Usually given as a ratio of horizontal distance to vertical distance or in degrees.

silt A mineral soil generally consisting of soil particle ranging between 0.076 and 0.002 millimeter in size. See Appendix H for various soil classification systems.

slash The residue (e.g., tree tops and branches) left on the ground after logging or accumulating as a result of storm, fire, girdling or delimbing.

slope The degree of deviation of a surface from horizontal, measured as a percentage, as a numerical ratio, or in degrees.

slough A failed earthen surface, as in land slide.

sodding Stabilizing fine-graded disturbed areas with the use of cut pieces of turf.

soil The unconsolidated minerals and material on the immediate surface of the earth that serve as a natural medium for the growth of plants.

soil amendment	Any material, such as lime, compost or fertilizer, that is worked into the soil to make it more amenable to plant growth.
soil erosion	Detachment and movement of soil from the land surface by water or wind (see erosion).
soil horizon	A layer of soil differing from adjacent genetically related layers in physical, chemical and biologic properties or characteristics.
spillway	An open or closed channel or both, used to convey excess water from a reservoir or other storage facility.
spoil	Excess soil or rock excavated from a channel, ditch basin or other area that will not be reused on the project site.
spreader	A device for distributing water uniformly in or from a channel.
sq. ft. or ft^2	Square feet.
standpipe	A vertical pipe or box connected to a horizontal pipe or box which controls the level of water in a detention or sediment trap or basin.
stilling basin	An open structure or excavation at the foot of an overfall, drop or spillway to reduce the energy of the descending stream.
stone check dam	A temporary stone dam placed across a swale, waterway or channel used to reduce the velocity of concentrated storm water flows, thereby reducing erosion of the swale, waterway or channel.
stone slope protection	Applying stone aggregates for permanent protection on slopes where vegetative soil cover measures are either impractical or difficult to establish.
stormwater	The water which drains off a catchment area during and after a fall of rain or snow; waters consisting of precipitation runoff.
stormwater runoff	The water and associated material draining into streams, lakes or sewers as a result of a rain storm.
subgrade	The soil prepared and compacted to support a structure or a pavement system.
substrate	The undisturbed natural soil base used to support a structure.
subsurface drain	An underground water conveyance system consisting of a perforated conduit, such as pipe, tubing, tile or a stone filled trench installed beneath the ground to intercept and convey ground water.
sump	Pit, tank or reservoir in which water is collected, stored or withdrawn.
surface roughening	Providing a rough soil surface with horizontal depressions created by operating a tillage or other suitable implement on the contour, or by leaving slopes in a roughened condition by not fine-grading them, used to promote the establishment of vegetative cover with seed, reduce storm water run-off velocity, increase infiltration, and reduce sheet erosion and provide for sediment trapping.
surface runoff	Precipitation that falls onto the surfaces of roofs, streets, ground, etc., and is not absorbed or retained by that surface, but collects and runs off.
surface water	All water whose surface is exposed to the atmosphere.
suspended load	The relatively fine part of the sediment load that is distributed throughout the flow across section and stays in suspension of appreciable lengths of time. The particle suspension is the result of vertical velocity fluctuations characteristic of turbulent flow. The suspended load consists mainly of clay, silt and sand.
swale	A type of drainageway consisting of a shallow longitudinal depression that conveys storm water. It is commonly heavily vegetated and is normally without flowing water.
SWCD	Soil and Water Conservation District.
tackifier	Any granular, powder, liquid, liquid concentrate or jelled substance that when mixed with water, applied to a target and allowed to dry and cure, will provide sufficient adhesive characteristics to cause mulch materials to adhere to one another.
tacking	The process of binding mulch fibers together by the addition of a sprayed chemical compound.
tailwater	Water located or discharged immediately downstream of a hydraulic structure on a stream.

temporary diversion	A temporary channel with a berm of tamped or compacted soil placed in such a manner so as to divert flows.
temporary erosion control blankets	A manufactured blanket composed of biodegradable/photodegradable, natural or polymer fibers and/or filaments that have been mechanically, structurally or chemically bound together to form a continuous matrix used as temporary surface protection to newly seeded and/or disturbed soils to absorb raindrop impact and to reduce sheet and rill erosion and to enhance the establishment of vegetation.
temporary fill berm	A very temporary berm of soil placed at the top of an unprotected fill slope.
temporary lined channel	A channel designed to convey flows on a short term basis and is lined with a flexible impermeable geomembrane or other erosion resistant covering.
temporary lined chute	A temporary structure made of concrete, bituminous concrete, riprap, sacked concrete, gabions, half round pipes, revetment erosion control mats with cement grout or similar materials used to carry concentrated runoff down a slope.
temporary pipe slope drain	A flexible or rigid conduit used to conduct water from the top of a slope to the toe of the slope.
temporary sediment basin	A temporary dam, excavated pit or dugout pond constructed across a waterway or at other suitable locations with a controlled outlet(s) such that a combination of wet and dry storage areas are created.
temporary sediment trap	A temporary ponding area with a stone outlet formed by excavation and/or constructing an earthen embankment used to detain sediment-laden runoff from small disturbed areas long enough to allow the majority of the sediment to settle out.
temporary seeding	Establishment of temporary stand of grass and/or legumes by seeding and mulching soils that will be exposed for a period greater than 1 month but less than 12 months.
temporary soil protection	Application of a degradable material that will protect the soil surface on a temporary basis without the intention of promoting plant growth.
temporary stream crossing	A temporary bridge, or culvert(s) across a watercourse for use by construction traffic.
terrace	An embankment or combination of an embankment and channel constructed across a slope to control erosion by diverting surface runoff instead of allowing it to flow uninterrupted down a slope.
test pit	A general term for any type of hole, pit, shaft, etc. dug or drilled for subsurface reconnaissance.
three dimensional geosynthetic turf reinforcement	A permanent turf reinforcement mat.
tidal wetland	Those areas which border on or lie beneath tidal waters whose surface is at or below an elevation of one foot above local extreme high water (see section 22a-29(2), CGS for regulatory definition).
time of concentration	Time required for water to flow from the most remote point of a watershed to the design point.
topsoiling	The application of topsoil to promote the growth of vegetation following the establishment of final grades.
total suspended solids (TTS)	The concentration of suspended solids in a liquid (mg/l).
TR-20	Computer program with associated manual by the USDA-NRCS referenced as Technical Release #20 used to calculate stormwater peak flows (dated 1984 or latest version).
TR-55	Publication with ancillary computer program by the USDA-NRCS referenced as Technical Release #55 detailing techniques used to solve for peak flows in small watersheds (1986 or latest version).
tracking	Using tracked equipment on cut and fill slopes and embankments to establish a series of indentations parallel to the contour of the slope that will retain seed and moisture.
trap efficiency	The amount (expressed as a percent) of the total sediment delivered to the basin that will remain in the sediment basin. It is a function of residence time, characteristics of the sediment, nature and properties of inflow, and other factors.

trash rack	A structural device (i.e., screen or grate) used to prevent debris from entering a spillway, channel, drain, pump or other hydraulic structure.
tree protection	The protection of desirable trees from mechanical and other injury during construction.
tree well	A device constructed to maintain the original grade around an existing tree and allow air to the roots.
trunk	The portion of a stem or stems of a tree before branching begins.
turbidity	A measure of the light-scattering ability of a material suspended in water, visually the cloudiness of a liquid, caused by suspended solids.
turbidity curtain	A temporary impervious barrier installed in a stream, river, lake or tidal area which will retain silts, sediment and turbidity within the construction area used to promote the settling of suspended solids in water.
turf	A layer of soil containing a dense growth of grass and its matted roots, also may be referred to as sod.
underdrain	See subsurface drain.
upstream	Toward, at or from a point nearer the source of a watercourse; in a direction from which a watercourse or drainageway is flowing.
USACOE	United States Army Corps of Engineers.
USDA	United States Department of Agriculture.
USGS	United States Geological Survey.
vegetated filter	A maintained area of well established herbaceous or woody vegetation through which small volumes of sediment-laden water pass and are filtered.
vegetated waterway	A natural or constructed channel or swale shaped or graded in earth materials and stabilized with non-woody vegetation for the non-erosive conveyance of water.
velocity	Speed at which an object or medium moves. Usually measured as a function of distance over time (i.e., feet per second).
water bar	A channel with a supporting berm on the down slope side constructed across a construction access road, driveway, log road or other access way.
watershed	All the surface area of land that contributes runoff to a common point. Usually measured in acres, hectares or square miles. Same as drainage area, may be referred to as drainage basins or catchment area.
watertable	The upper surface or top of the saturated portion of the soil or bedrock, indicates the uppermost extent of groundwater.
waterway	A type of drainageway that is a natural course or constructed channel for conducting the flow of water that carries only intermittent flows. Examples of waterways include but are not limited to drainageways that serve as a collector of a series of swales, outlet for diversions and collectors of runoff from large, impervious areas such as commercial parking lots and shopping centers.
weir	A horizontal edge, surface, or dam used to regulate the water level to cause ponding, diversion, pumping or downstream eddies.
wet storage	The volume in a sediment basin or sediment trap that is located below the invert of the lowest outlet structure for the basin that will create a pool for settling suspended sediment during a runoff event.
wind erosion	Detachment and transportation of soil by wind.
x:y	Expression of slope gradient of run to rise where x equals the number of distance units horizontal for every y number of distance units vertical. (see 2:1).

Appendix D

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National Planning Procedures Handbook. USDA Natural Resources Conservation Service. Portions periodically updated, last update January 2000.

Naval Facilities Design Manual 7.1. US Department of the Navy. Alexandria, VA. May 1982.

New York Guidelines for Urban Erosion and Sediment Control. USDA Soil Conservation Service (now known as the Natural Resource Conservation Service). October 1991.

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Appendix E

Directory of Related Agencies (Including Useful Internet Web Pages)

Federal Agencies

US Army Corps of Engineers, New England District

Attention: CENAE-OD-R, 696 Virginia Road, Concord, MA 01742-2751
Tel.: (978) 318-8502 and toll free (800) 343-4789, Fax: (978) 318-8303
Web Page: http://www.usace.army.mil/public.html (includes information on regulatory/permitting programs)

US Environmental Protection Agency, Region 1

1 Congress Street Suite 1100, Boston, MA 02114-2023
Tel.: (617) 918-1111 and toll free within Region 1: (888) 372-7341, Fax: (617) 565-3660
Web Page: http://www.epa.gov/region01/

USDA Natural Resources and Conservation Service

Web Page: http://www.nrcs.usda.gov/,

NRCS CT State Office
344 Merrow Road Suite A, Tolland, CT 06084
Tel.: (860) 871-4011 or (860) 875-6928, Fax: (860) 871-4054

NRCS Brooklyn Service Center
Agricultural Center, 139 Wolf Den Road, Brooklyn, CT 06234
Tel.: (860) 774-8397, Fax: (860) 774-7009

NRCS Norwich Service Center
Yantic River Plaza, 238 West Town Street, Norwich, CT 06360
Tel.: (860) 887-3604, Fax: (860) 887-4082

NRCS Torrington Service Center
1185 New Litchfield Street, Torrington, CT 06790
Tel.: (860) 626-8258, Fax: (860) 626-8850

NRCS Wallingford Service Center
North Farms Executive Park, 900 Northrop Road, Wallingford, CT 06492
Tel.: (203) 269-7509, Fax: (203) 294-9741

NRCS Windsor Service Center
627 River Street, Windsor, CT 06095
Tel.: (860) 688-7725, Fax: (860) 688-0083

Connecticut State Agencies

Web Page: http://www.state.ct.us/ (Identifies a single point of entry for public access to all of the official information, programs and services provided on the Internet by the three branches of Connecticut state government: Executive, Judicial and Legislative, including search engines for licenses and permits issued by various state agencies and a telephone directory listing phone numbers by agency and staff name.)

CT Agricultural Experiment Station

Web Page: http://www.caes.state.ct.us/

New Haven Laboratories
123 Huntington Street, P.O. Box 1106, New Haven, CT 06540-1106
Tel.: (203) 974-8500, Toll Free in CT: 1-877-855-2237, Fax: (203) 974-8502

Valley Laboratory in Windsor
153 Cook Hill Road, P.O. Box 248, Windsor, CT 06095
Tel.: (860) 683-4977, Fax: (860) 683-4987

Lockwood Farm
890 Evergreen Avenue; Hamden, CT 06518
Tel.: (203) 974-8618

CT Council on Soil and Water Conservation

c/o DEP Bureau of Water Management Planning & Standards Division
79 Elm Street Hartford, CT 06106.

CT Council on Environmental Quality
79 Elm Street Hartford, CT 06106
Tel.: (860) 424-4000, Web Page: http://www.ceq.state.ct.us/

CT Department of Agriculture
State Office Building, 165 Capitol Avenue, Hartford, CT 06106-1630
Tel.: (860) 566-4667, Web Page: http://www.state.ct.us/doag/

CT Department of Administrative Services
Office of the Commissioner, 165 Capitol Avenue - Room 491, Hartford, Conn. 06106
Tel.: (860) 713-5100, Fax: (860 713-7481, Web Page: http://www.das.state.ct.us/

CT Department of Economic and Community Development
505 Hudson Street, Hartford, CT 06106-7107
Tel.: (860) 270-8000, Web Page: http://www.state.ct.us/ecd/

CT Department of Environmental Protection
79 Elm street, Hartford CT 06106-5127
Tel.: (860) 424-3000, Web Page: http://www.dep.state.ct.us/

Office of Long Island Sound Programs
Tel.: (860) 424-3034, Fax: (860) 424-4054

Bureau of Air Management
Tel.: 860) 424-3026, Fax: (860) 424-4063

Bureau of Water Management
Tel.: (860) 424-3704, Fax: (860) 424-4067

Inland Water Resources Division: Tel.: (860) 424-3019 and (860) 424-3706

Permitting, Enforcement and Remediation Division

Discharge Permits and Enforcement, Tel.: (860) 424-3018
Remediation, Tel.: (860) 424-3705

Planning and Standards Division: Tel.: (860) 424-3704 and (860) 424-3020, Fax: (860) 424-4067

Bureau of Waste Management
Tel.: (860) 424-3021, Fax: (860) 424-4060

Oil and Chemical Spill Response Division

Director, Tel.: (860) 424-3024, Fax: 860) 424-4062
Emergency Spill Reporting (24-hour), Tel.: (860) 424-3338

Pesticide, PCB and Underground Storage Tank Division: Tel.: (860) 424-3369, Fax: (860) 424-4061
Waste Engineering and Enforcement: Tel.: (860) 424-3023
Waste Planning and Standards: Tel.: (860) 424-3022

Bureau of Natural Resources
Tel.: (860) 424-3010, Fax: (860) 424-4078

Fisheries Division, Tel.: (860) 424-3474, Fax: (860) 424-4070
Wildlife Division, Tel.: (860) 424-3011, Fax: (860) 424-4078
Forestry Division, Tel.: (860) 424-3630, Fax: (860) 424-4070

Bureau of Outdoor Recreation
Tel.: (860) 424-3014.

Boating Division, Tel.: (860) 434-8638, Fax: (860) 434-3501
Land Acquisition and Management, Tel.: (860) 424-3016, Fax: (860) 424-4070
Law Enforcement Division, Tel.: (860) 424-3012, Fax: (860) 424-4070
State Parks Division, Tel.: (860) 424-3200, Fax: (860) 424-4070

Environmental and Geographic Information Center.

General Information, Tel.: (860) 424-3540, Fax: (860) 424-4058
DEP Store – Tel.: (860)-424-3555, Fax: (860) 424-4088, email address: dep.store@po.state.ct.us
Web Page: connect through DEP webpage

CT Department of Public Health
Water Supply Section, 410 Capitol Avenue, PO Box 340308, MS# 51WAT, Hartford, CT 06134-0308
Tel.: (860) 509-7333, http://www.dph.state.ct.us

CT Department of Transportation
2800 Berlin Turnpike, PO Box 317546, Newington, CT 06134-7546
Tel: (860) 594-2000, http://www.dot.state.ct.us/
Office of Environmental Planning, Tel.: (860) 594-2920

CT Department of Public Utility Control

10 Franklin Square, New Britain, CT 06051
Tel.: (860) 827-2801 and for Toll-Free in CT Consumer Assistance (1-800) 382-4586, Fax: (860) 827-2613
Web Page: http://www.state.ct.us/dpuc/

CT Cooperative Extension System

1380 Storrs Road, U-115, Storrs, CT 06269-4115
Tel.: (860) 486-6271, Fax.: (860) 486-6338, http://www.canr.uconn.edu/ces/

Fairfield County Extension Center
67 Stony Hill Road, Bethel, CT 06801-3056
Tel.: (203) 207-8440, Fax: (203) 207-3273

Windham County Extension Center
139 Wolf Den Road, Brooklyn, CT 06234-1729
Tel.: (860) 774-9600, Fax: (860) 774-9480

Middlesex County Extension Center
1066 Saybrook Road, P.O. Box 70, Haddam, CT 06438-0070
Tel.: (860) 345-4511, Fax: (860) 345-3357

New Haven County Extension Center
305 Skiff Street, North Haven, CT 06473-4451
Tel.: (203) 407-3161, Fax: (203) 407-3176

New London County Extension Center
562 New London Turnpike, Norwich, CT 06360-6599
Tel.: (860) 887-1608, Fax: (860) 886-1164

Litchfield County Extension Center
843 University Drive, Torrington, CT 06790-2635
Tel.: (860) 626-6240

Tolland County Extension Center
24 Hyde Avenue, Vernon, CT 06066-4599
Tel.: (860) 875-3331, Fax: (860) 875-0220

Hartford County Extension Center
1800 Asylum Avenue, West Hartford, CT 06117-2600
Tel.: (860) 570-9010, Fax: (860) 570-9008

CT Secretary of State

30 Trinity Street, Hartford CT 06106
http://www.sots.state.ct.us/

Concord – a computer program providing details on corporations registered to do business in Connecticut: http://www.concord.state.ct.us/

State Register and Manual (known as the "Blue Book") containing many facts on state and local government: http://www.sots.state.ct.us/#

CT Siting Council

10 Franklin Square, New Britain, CT 06051
Tel.: (860) 827-2935, Fax: (860) 827-2950
http://www.state.ct.us/csc/, e-mail address: siting.council@po.state.ct.us

CT State Library

http://www.cslib.org/psaindex.htm
Contains current copy of the Connecticut General Statutes, Public and Special Acts.

Non-State Agency Organizations

CT Soil and Water Conservation Districts

Fairfield County SWCD
69B Stony Hill Road, Bethel, CT 06801-9629
Tel.: (203) 774-6108.

Hartford County SWCD
627 River Street, Windsor, CT 06095-3003
Tel.: (860) 688-7725.

Litchfield County SWCD
1185 New Litchfield Street, Torrington, CT 06790
Tel: (860) 626-8258.

Middlesex County SWCD
P.O. Box, Extension Center, Haddam, CT 06438-0070
Tel.: (860) 345-3219
New Haven County SWCD
North Farms Executive Park, 900 Northrop Road, Suite A, Wallingford, CT 06492
Tel.: (203) 269-7509
New London County SWCD
238 West Town Street, Norwich, CT 06360
Tel.: (860) 887-4163
Tolland County SWCD
24 Hyde Avenue, Vernon, Ct 06066-4503
Tel.: (860) 875-3881
Windham County SWCD
Wolf Den Road, P.O. Box 112, Brooklyn, CT 06234
Tel.: (860) 774-0224

The Metropolitan District Commission

555 Main Street, P.O. Box 800, Hartford, CT 06142-0800
Tel.: (860) 278-7850, Fax: (860) 724-2679, http://www.themdc.com/

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Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

Federal Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
CLEAN WATER ACT, SECTION 404 of the FEDERAL CODE	Permit required for discharge of dredged or fill materials, including excavation activities, soil movement and placement of pilings.	Waters of the United States	Erosion and sediment control generally required as a condition of approval.	US Army Corps of Engineers
CLEAN WATER ACT, SECTION 401 of the FEDERAL CODE (Water Quality Certifications)	Any applicant for a federal license or permit for an activity which may result in a discharge into the navigable waters of the state, including all wetlands, water-courses, and natural and man-made ponds, must obtain a certification from DEP that such discharge will comply with the applicable provisions of the Federal Water Pollution Control Act and Connecticut's Water Quality Standards.	When federal 404 permits are required	Erosion and sediment control generally required as a condition of approval.	CTDEP
RIVERS AND HARBOR ACT, SECTION 10 of the FEDERAL CODE	Permit required for all activities that affect the course, location and capacity of navigable waters including all activities in, on, above or underneath navigable waters.	Navigable waters[2] of the United States	Erosion and sediment control generally required as a condition of approval.	US Army Corps of Engineers
FEDERAL COASTAL ZONE MANAGEMENT ACT of 1972	Activities by federal agencies that directly affect the coastal zone, and activities affecting the coastal zone which require a federal license or permit are reviewed to ensure that they comply with and will be conducted in a manner consistent with Connecticut's federally approved Coastal Management Program.	The coastal zone is defined as the water within Connecticut's share of Long Island Sound and all of the land within the coastal communities.	Erosion and sediment control generally required to be incorporated into federal projects.	CTDEP
COASTAL ZONE ACT REAUTHORIZATION AMENDMENTS OF 1990 SECTION 6217 of the FEDERAL CODE	Specific management measures addressing soil erosion and sediment control which must be applied during the review of federal, state, municipal, and private development projects.	See Section 6217 Management Area[3]	Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, reduce the average annual total suspended solid (TSS) loadings by 80 percent, or reduce the postdevelopment loadings of TSS so that average annual TSS loadings are no greater than predevelopment loadings, erosion and sediment control plan required for all construction activities and activities on roads, highways, and bridges.	CTDEP, CTDOT, and municipal governments within the Section 6217 Management Area through their land use authorities
NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) of 1969	Requires full disclosure of potential environmental impacts associated with proposed federal actions.	Generally, the NEPA process occurs concurrently with the Section 404 reviews by the US Army Corps of Engineers	Soil erosion and sediment control plan may be required to avoid or minimize environmental impacts and/or may be a condition of approval.	Lead agency is usually the federal agency issuing the approval. Varies with the proposed action.

Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

State Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
WATER POLLUTION CONTROL ACT Chapter 446k, CGS	All discharges of pollution or potential pollution to waters of the State.	All waters of the State	Erosion and sediment controls as required to prevent pollution (pollution not authorized except under General Permit referenced below).	CTDEP
GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER AND DEWATERING WASTEWATERS FROM CONSTRUCTION ACTIVITIES per CGS § 22a-430b and authority delegation from FEDERAL CLEAN WATER ACT, SECTION 4051	All discharges comprised solely of stormwater and dewatering wastewater from construction activities which result in the disturbance of five or more total acres land area on a site[4].	All waters of the State	Requires a stormwater pollution control plan designed to address pollution caused by soil erosion and sedimentation during and after construction, sediment basins and traps required under certain conditions, requirements for inspection and record keeping included.	CTDEP
INLAND WETLAND AND WATERCOURSES ACTCGS § 22a-36 through 22a-45a, inclusive	Any state agency proposing to perform regulated activity in or affecting a wetland or watercourse must obtain a permit prior to conducting the activity. Some exceptions may apply. Failure of local wetlands agency to act within time line provided by statute may result in the processing of the application at the State level.	Statewide inland wetlands and watercourses. Also see local authority section.	Submission of erosion and sediment control plans may be required during the application process; erosion and sediment control implementation may be made a condition of wetland permit approval.	CTDEP for activities by State agencies and for applications that are submitted when local wetland agency fails to process in a timely fashion (see Local Authority for non-State agency activities)
TIDAL WETLAND ACT CGS § 22a-28 through 22a-35, inclusive	Regulated activities including draining, dredging, excavation or removal of soil, mud, sand, gravel, aggregate of any kind, rubbish or similar material, either directly or otherwise, and the erection of structures, driving of pilings, or placing of obstructions, whether or not changing the tidal ebb and flow shall be subject to the provisions of this Act.	Tidal wetland boundary maps generally define the areas that are at or below an elevation of one foot above local extreme high water, on-site confirmation required	State regulations establish criteria for conditioning permits, giving due regard for the impact of regulated activities on erosion, sedimentation and water quality.	CTDEP
STRUCTURES, DREDGING and FILL IN TIDAL, COASTAL OR NAVIGABLE WATERSCGS § 22a-359 through 22a-336f, inclusive	Dredging, erecting any structure, placing any fill, obstruction or encroachment or carrying out any work incidental thereto or retaining or maintaining any structure, dredging or filling, in the tidal, coastal or navigable waters of the state waterward of the high tide line.	Tidal, coastal or navigable waters of the state waterward of the high tide line.	State regulations establish criteria for conditioning permits giving due regard for the impact of regulated activities on erosion, sedimentation and water quality.	CTDEP

Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

State Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
CONNECTICUT COASTAL MANAGEMENT ACT CGS § 22a-90 through 22a-112, inclusive	All regulatory programs of the DEP with permitting authority in the coastal area must be coordinated to ensure that the administration of those programs is consistent with the goals and policies contained in the CCMA. Each state department, institution, or agency responsible for the primary recommendation or initiation of actions within the coastal boundary which may significantly affect the environment shall ensure that such actions are consistent with the goals and policies contained in the CCMA.	The coastal area is defined as the water within Connecticut's share of Long Island Sound and all of the land within the coastal communities listed below. The coastal boundary is defined as a continuous line delineated within the coastal area on the landward side by the interior contour elevation of the one-hundred year frequency coastal flood zone, or a one thousand foot linear setback measured from the mean high water mark in coastal waters, or a one thousand foot linear setback measured from the inland boundary of tidal wetlands, whichever is farthest inland.	Erosion and sediment control plans generally required as a condition of approval.	CTDEP and local land use agencies
DIVERSION OF WATER CGS § 22a-365 through 22a-379	Prior to altering the flow of surface waters or withdrawing surface or ground water, a diversion permit must be obtained unless the activity is registered with Connecticut DEP or is exempted from diversion permit requirements. In general, any alteration of surface water flows from a watershed area of 100 acres or more and any withdrawal of water exceeding 50,000 gallons in a 24-hour period requires a permit.	Statewide	The owner/operator is required to employ best management practices to control storm water discharges, to prevent erosion and sedimentation, and to otherwise prevent pollution of wetlands and other waters of the State. Erosion and sediment control implementation generally required as condition of approval.	CTDEP
AQUIFER PROTECTION AREAS ACT CGS § 22a-354b through 22a-354bb	Farm Resource Management Plans will be developed for farmland over major public water-supply aquifers.	Public water supply aquifers	Erosion control generally required as condition of approval	CTDEP
STREAM CHANNEL ENCROACHMENT LINE CGS § 22a-342 through 22a-349a	Prior to placing any encroachment or obstruction riverward of stream channel encroachment lines[5], a permit must be obtained.	Statewide - specific watercourses.	Erosion and sediment control implementation generally required as condition of approval.	CTDEP

Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

State Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
DAM CONSTRUCTION/SAFETY CGS § 22a-401 through 22a-411	Prior to constructing a new dam, dike, reservoir or similar structure or repairing, altering or removing an existing dam, dike, reservoir or similar structure, a dam construction permit must be obtained unless DEP determines that a dam construction permit is not required. Unsafe dams may be required to be restored/removed. Unsafe dams may be ordered to be "placed in a safe condition".	Statewide dams, which by breaking away or otherwise might endanger life or property.	Erosion and sediment control implementation generally required as condition of approval.	CTDEP
SOLID WASTE MANAGEMENT Chapter 446d, CGS	Permitted construction and operation of solid waste facilities, such as resources recovery, transfer stations, disposal areas, recycle facilities, and volume reduction facilities	Statewide	The owner/operator is required to employ best management practices to control storm water discharges, to prevent erosion and sedimentation, and to otherwise prevent pollution of wetlands and other waters of the State. Erosion and sediment control implementation generally required as condition of approval.	CTDEP
FLOOD MANAGEMENT CERTIFICATION APPROVALS CGS § 25-68(b) through 25-68(h)	Requires all state agencies proposing any activity within or affecting a floodplain, or that impacts natural or man-made storm drainage facilities, to certify that such activity conforms with the state's flood management standards.	Statewide	Erosion and sediment control implementation generally required as condition of approval.	CTDEP
FORESTRY PRACTICES ACT CGS § 23-65f through 23-65o (regulations pending under 23-65j)	The harvesting of commercial forest products on a tract of land in excess of 50 cords or 150 tons or 25,000 board feet in a 12 month period and related activities.	To be determined.	Expected to require the implementation of best management practices which include erosion and sediment control.	To be determined.
CONNECTICUT ENVIRONMENTAL POLICY ACT CGS § 22a-1 through 22a-g	State agency actions as defined in the Environmental Classification Document	Statewide	All types of BMP's can be required, including erosion and sediment controls	All state agencies
PUBLIC UTILITY ENVIRONMENTAL STANDARDS ACT CGS § 16-50g through 16-50aa	CGS § 16-50g, power generation plant and transmission lines for electricity and fuels, community antenna television towers and telecommunication towers	Statewide	BMPs required	DPUC and Connecticut Siting Council
	CGS § 16-50x, location approval of certain public utility facilities under the jurisdiction of the Connecticut Siting Council	Zoning commissions and inland wetland agencies may regulate and restrict the proposed location of certain public utility facilities	BMPs required, local review of site plans enabled	Connecticut Siting Council

Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

State Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
PUBLIC UTILITY; CONTROL BY LOCAL AUTHORITIES, CGS § 16-235	Location approval of certain utility facilities not under the jurisdiction of the Connecticut Siting Council	Zoning commissions and inland wetland agencies may regulate and restrict the proposed location of certain public utility facilities	BMPs required, local review of site plans enabled	DPUC
JURISDICTION OF DPUC OVER ELECTRIC TRANSMISSION LINES CGS § 16-243	All electric line construction and reconstruction methods	Statewide	BMPs required	DPUC
MUNICIPAL & BUSINESS DEVELOPMENT PROJECTS CGS § 8-186 through 8-200b	Applications by towns for state financial assistance in economic development projects.	Statewide	All types of BMP's can be required, including erosion and sediment controls	Department of Economic & Community Development

Appendix F

Matrix of Laws Which May Require Erosion and Sediment Control Implementation

Local Authority	Threshold	Jurisdiction	Erosion and Sediment Control Requirements	Implementing Agency[1]
SOIL EROSION AND SEDIMENT CONTROL ACT (PA 83-388) CGS Section 22a-325 through 22a-329	Requires planning and zoning commissions to develop erosion and sediment control regulations for all development projects that will disturb an area larger than 1/2 acre. A single family house that is not part of a subdivision and agricultural activities are exempt.	All land use proposals subject to planning and zoning approvals that disturb 2 acre or more (individual single family dwellings not part of subdivision are exempt).	Submission and certification of erosion and sediment control plans for all activities that require planning and zoning approval.	Municipal governments through their Planning and Zoning Commissions.
PLANNING REGULATIONS (including SUBDIVISION/SITE PLAN APPROVAL)	Varies by municipality. When in the coastal boundary coastal site plan review is required for any use, building or structure fully or partially in the coastal boundary	Lands within municipal boundaries and coastal boundary.	See Soil Erosion and Sediment Control Act and Coastal Management Act above. Requirements may vary. See municipal regulations.	Municipal Planning Commission
ZONING REGULATIONS (may include mining, topsoil removal and other soil disturbing activities)	Varies by municipality. When in the coastal boundary coastal site plan review is required for any use, building or structure fully or partially in the coastal boundary.	Lands within municipal boundaries and coastal boundary.	See Soil Erosion and Sediment Control Act and Coastal Management Act above. Requirements may vary. See municipal regulations.	Municipal Zoning Commission
INLAND WETLAND AND WATERCOURSES REGULATIONS	Varies by municipality	Any alteration or pollution of wetlands or watercourses and any buffer (or setback areas).	Erosion and sediment control implementation is generally required as condition of approval.	Municipal Inland Wetlands Agency
TIMBER HARVESTING ORDINANCES	Varies by municipality	Determined by ordinance	Erosion and sediment control requirements depend on ordinance.	Varies

[1] This table provides an overview of federal, state and local regulations that may require the preparation of erosion and sediment control plans for certain activities. To be sure of the specific requirements for your project, contact the appropriate implementing agency.

[2] Navigable waters include all presently, historically, and reasonably potential navigable waters and all waters subject to the ebb and flow of the tide up to mean high water in tidal waters and up to ordinary high water in freshwater areas.

[3] Coastal Zone includes the towns of Ansonia, Beacon Falls, Bethany, Branford, Bridgeport, Cheshire, Chester, Clinton, Cromwell, Darien, Deep River, Derby, Durham, East Haddam, East Hampton, East Hartford, East Haven, East Lyme, Easton, East Windsor, Enfield, Essex, Fairfield, Glastonbury, Greenwich, Groton, Guilford, Haddam, Hamden, Hartford, Killingworth, Ledyard, Lyme, Madison, Meriden, Middlefield, Middletown, Milford, Monroe, Montville, Naugatuck, New Canaan, New Haven, New London, North Branford, North Haven, North Stonington, Norwalk, Norwich, Old Lyme, Old Saybrook, Orange, Oxford, Portland, Preston, Prospect, Redding, Ridgefield, Rocky Hill, Salem, Seymour, Shelton, South Windsor, Stamford, Stonington, Stratford, Suffield, Trumbull, Wallingford, Waterford, Westbrook, West Haven, Weston, Westport, Wethersfield, Wilton, Windsor, Windsor Locks, Woodbridge

[4] As of October 29, 1999, EPA's Phase 2 stormwater program became effective. Part of Phase 2 is the reduction of the disturbed area threshold for the General Permit coverage requirements from 5 acres to 1 acre. This is not expected to be incorporated into the general permit process until 2002.

[5] CTDEP has designated about 270 miles of floodplain throughout the state on "stream channel encroachment line maps." These maps are on file in the Town Clerk's Offices in the affected town. The maps and an index to the maps are also available from CTDEP. Contact the Inland Water Resources Division at (860) 424-3019 for further information.

Appendix G
Construction Network Scheduling

Background

A helpful tool to insure timely installation of sediment and erosion control measures on any construction project is a construction network schedule. There are basically two network scheduling systems:

PERT (Program Evaluation and Review Technique) was a program developed by the Navy for its Polaris development program. This Polaris program involved 250 prime contractors and 9000 subcontractors at one time. The primary thrust of PERT was toward time. In other words, "Getting the job done as fast as possible."

CPM (Critical Path Method) was developed by DuPont to combine money and time. This allowed the user to examine time - cost trade-offs to arrive at the fastest and most economical schedule.

Today these two programs have basically merged and are commonly referred to as CPM or Critical Path Method scheduling. There is no standardized format or program for CPM as yet, however, there is a generally accepted notation that is for the most part used by schedulers.

There are numerous computer programs available in the marketplace that range from use on mainframe to laptop computers. Since there is not a standardized program, there are currently no standardized computer programs. As a result, the reviewer may be subjected to a large variety of program outputs. If you understand the basic concepts of CPM scheduling, you can review and follow through almost all the various program outputs with a reasonable understanding of the proposed schedule.

Which Type of Scheduling to Use

Most contractors customarily use the bar (Gantt) chart, which is the forerunner of PERT and CPM. The Gantt chart was developed by scientist Henry Gantt around 1910, and is commonly referred to as the bar graph. The logic used to develop the bar chart is nearly the same logic used to develop a CPM chart. The method of displaying the logic is significantly different. Each chart, the bar chart and the CPM chart, has its application and its advantages and disadvantages.

The bar chart shows the schedule in a simple to understand format. It is usually developed to some scale which gives a visual impression of progress, although maybe not an accurate one. It is easy to determine what is to be done on a day-to-day- basis. Often milestones (completion targets) are shown on the bar chart. Milestones are an after the fact notice that you are behind schedule. On the bar chart, the items lying along the critical path are not readily apparent nor is the slack time. It is hard to judge the contractor's management effectiveness and schedule intent for items.

The CPM (Critical Path Method), though more complicated to the eye, is easy to adjust to after you have used it for a while. It normally does not have a scale. It provides a good overall management tool for the contractor. It provides a good visual of the critical path items and what items are being done concurrently. It allows the user to easily evaluate impact on other parts of the project if one item is delayed or accelerated.

Each scheduling method has its own application. For simple jobs with a small number of items and a simple straight forward construction sequence, the bar chart is adequate. For large jobs with numerous items that will be going on simultaneously, CPM scheduling is better. .

Remember that there is no one scheduling technique that is perfect for all occasions. Using more than one technique normally improves the management of the project. For example, a weekly CPM may be best for the overall management, while a daily CPM may be needed for the superintendent. For specific jobbers, a bar chart may be the best tool to use. Most computer programs have the capability to print out a CPM chart and a bar chart from the logic put into the program.

Construction Network Scheduling Using CPM

The CPM scheduling technique determines the critical path through the project. The critical path is the longest continuous path(s) along activity arrows through the project from beginning to end.

Consider CPM when:

- *Major expenditures of money, time, or materials are to be made.*
- *Project requires more than one department, company, or contractor.*
- *Project is subject to rigid time constraints.*
- *Close control is needed to ensure an orderly progress of the project.*
- *New type of work, or a project with some vaguely defined task is to be undertaken.*

What the CPM does for you:

- *Forces detailed planning, major decisions, and commitments at the beginning of the project.*
- *Provides a basis for logical and detailed planning.*
- *Provides a means to evaluate the project plan, to check for omissions, and to make improvements.*
- *Provides an extremely successful communication tool, and acts as a common point of reference.*
- *Points out possible problem areas in advance.*
- *Increases the probability of success in reaching the*

Figure G-1 Sheet 1 of Critical Path Method Example

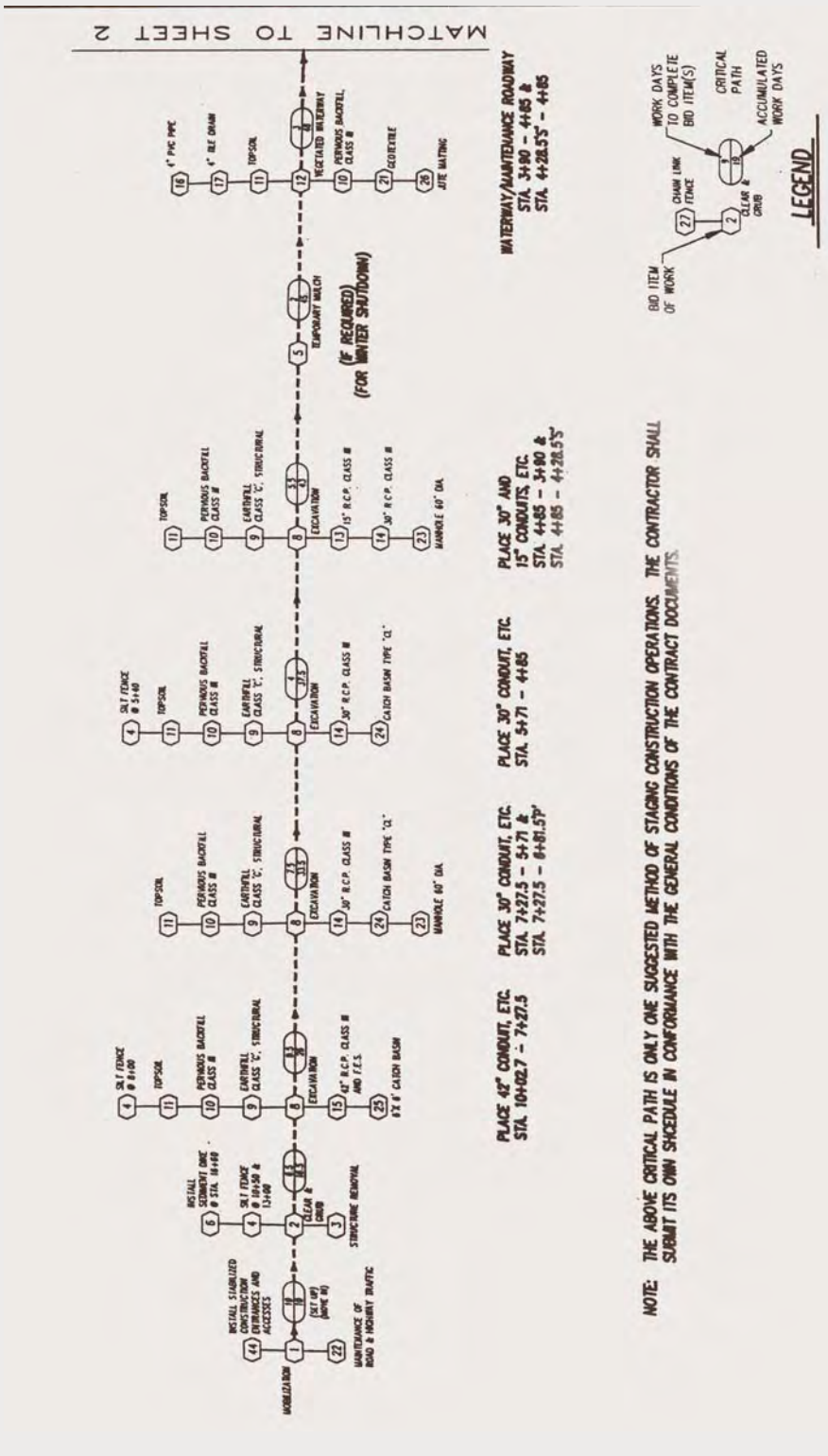
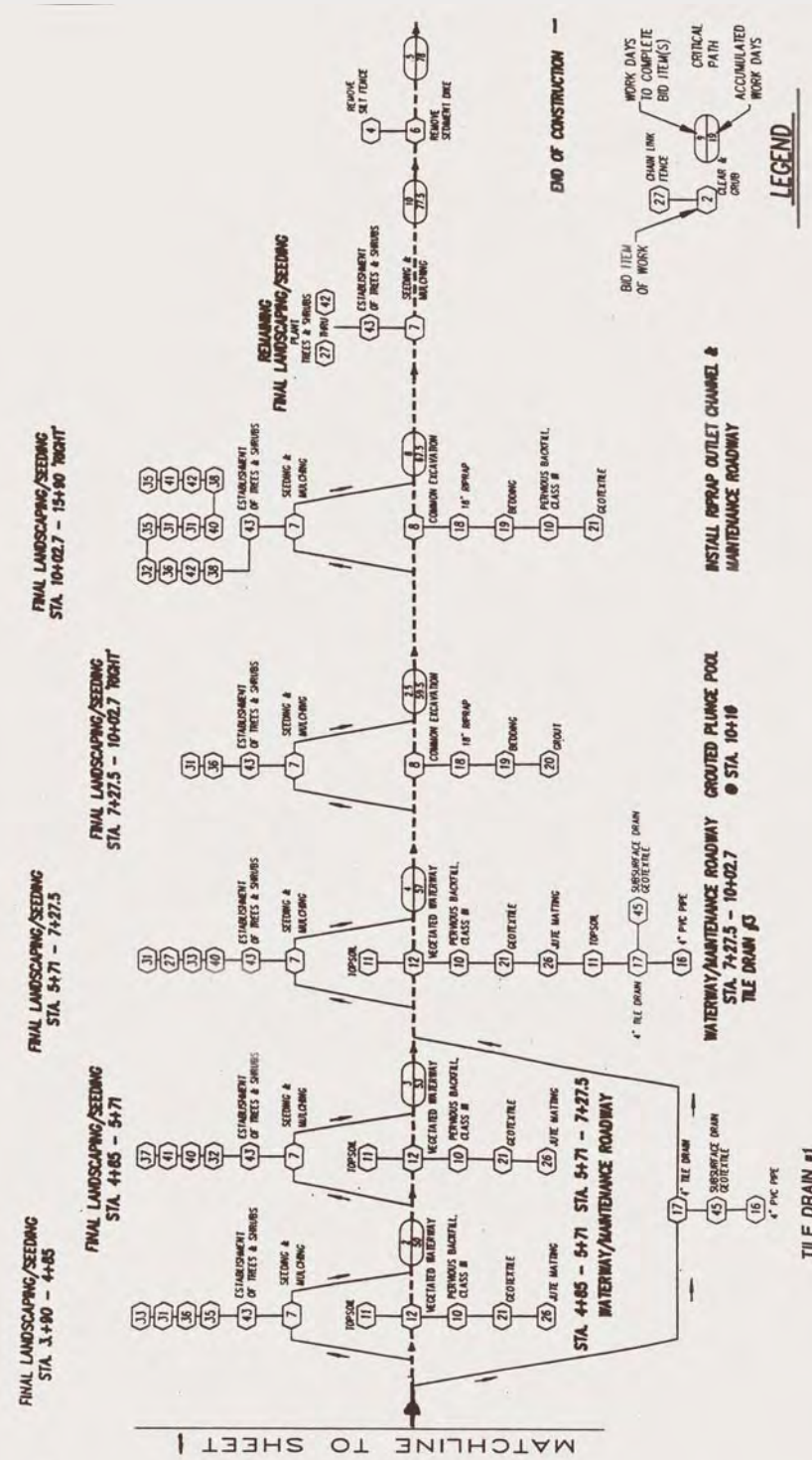


Figure G-2 Sheet 2 of Critical Path Method Example



NOTE: THE ABOVE CRITICAL PATH IS ONLY ONE SUGGESTED METHOD OF STAGING CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL SUBMIT ITS OWN SCHEDULE IN CONFORMANCE WITH THE GENERAL CONDITIONS OF THE CONTRACT DOCUMENTS.

project objectives.

What the CPM can be used for:

- *To determine manpower, cost, materials, and other resource requirements for the project.*
- *To provide a detailed timetable and sequence for the critical items of the project.*
- *To keep management informed as to what tasks are critical to timely completion of the project and the current status of the project.*
- *To provide a logical method of evaluating the impacts of delays and changes during construction.*
- *To provide a method of evaluating progress and changes needed to compensate from delays, inefficiencies, or changes.*
- *To provide a permanent record of agreements and contractor's intent.*

What CPM will not do:

- *Solve problems merely by its use.*
- *Replace the user's judgement and need for analysis.*
- *Replace the need for management and inspection.*

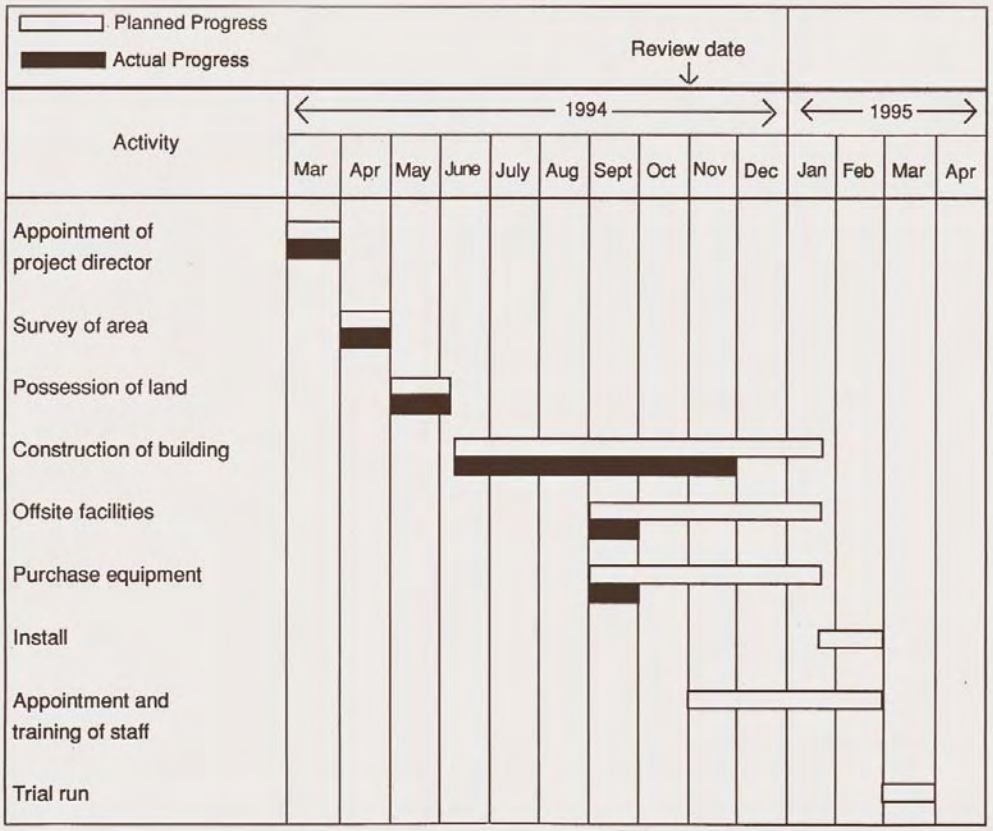
Including the Requirement of a Construction Network Schedule in a Contract

Most construction contracts require the contractor to submit "...a practicable schedule showing the order in which the contractor proposes to perform the work, and the dates on which he contemplates starting and completing the several salient features of work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period...". This allows the contractor to use bar charts, CPM schedules, PERT schedules, or any other logical scheduling scheme he chooses.

Samples of Construction Network Schedules

See **Figure Appendix G-1**, **Figure Appendix G-2**, and **Figure Appendix G-3.**

Figure G-3 Example of Gantt Chart



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Appendix H
Soil Classification Systems

Soil is an aggregate of loose mineral and organic particles being distinguished from rock, which exhibits strong permanent cohesion between the mineral particles. The primary components of soil are gravel, sand, silt, and clay. Organic material is commonly present in surface samples of soil. A soil's properties are dependent upon its composition from these components.

A number of soil classification systems have been established by different organizations to be used for specific purposes. They include:

- *Textural Soil Classification System (USDA)*
- *American Association of State Highway Transportation Officials System (AASHTO)*
- *Unified Soil Classification System (USCS)*
- *American Society for Testing and Materials System (ASTM)*
- *Federal Aviation Agency System (FAA)*
- *Geologic Soil Classification System*
- *Agronomic Soil Classification System*

Only the first three in this list will be discussed here.

These systems index various qualities of the soil, depending on need. Indexing of the soil is needed to apply some of the qualitative and quantitative property relationships contained in these classification systems.

Indexed properties are of two types: grain properties and aggregate properties. Grain properties include particle size distribution, density and mineral composition. Particle size distribution is determined by a sieve test for coarse soils and a dispersion test for fine soils. Aggregate soil properties are weight-volume relationships. The aggregate properties are derived from the percentages of solid material in the soil sample in relation to the air-filled and water-filled voids. The aggregate soil properties include soil porosity, void ratio, water content, degree of saturation, soil density, dry density, bulk density, compacted density, percent pore space and the density index.

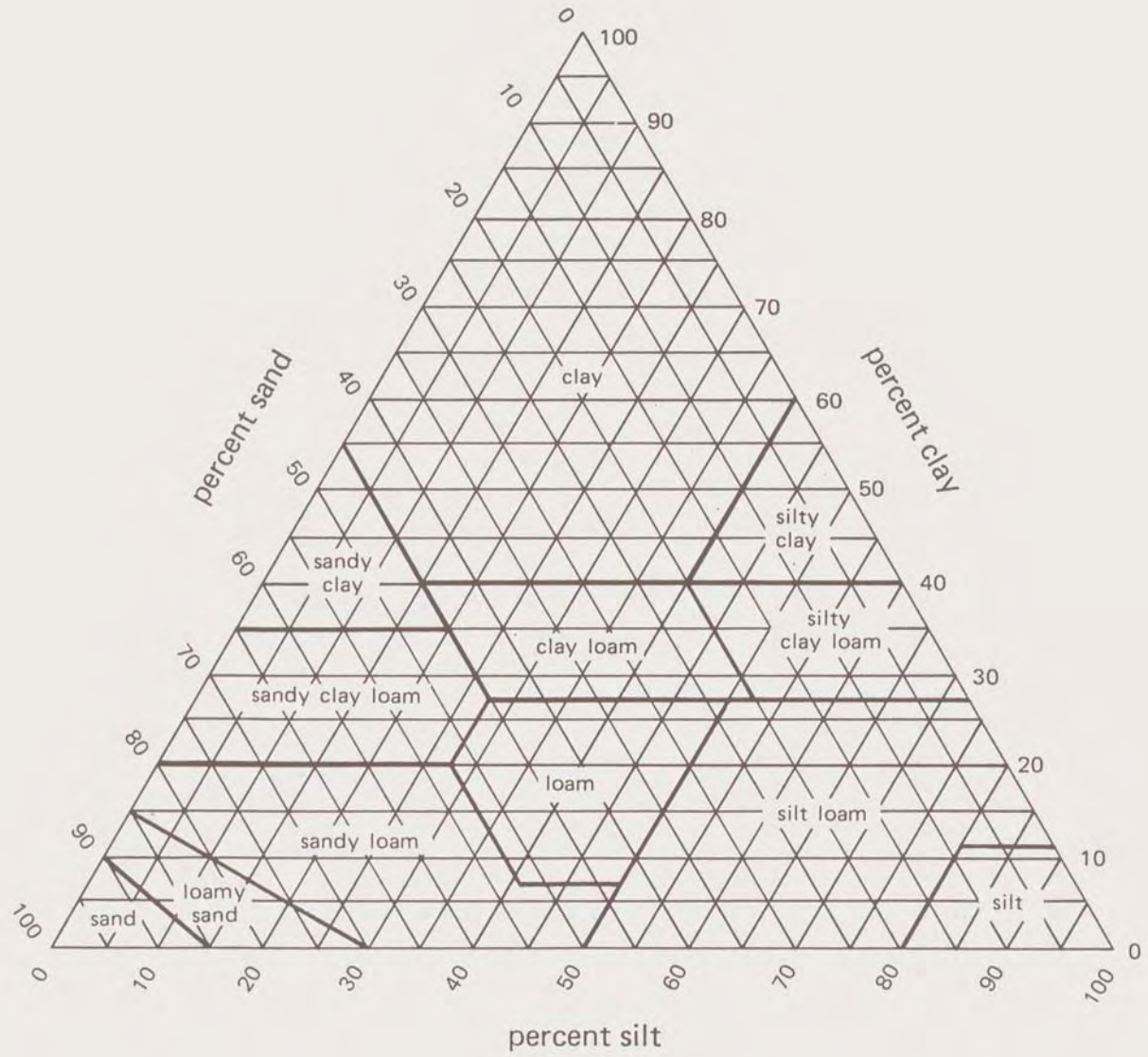
The most commonly used indexed property is particle size. The actual classification of a soil will depend on the percentage of each constituent (i.e. gravel, sand, silt and clay).

The Textural Soil Classification System by the USDA uses a qualitative description of each soil's texture and ignores the presence of gravel. A mechanical analysis is performed in the laboratory and a percentage obtained for each of the soil constituents. Total amount of sand, from coarse to very fine, is used, along with silt and clay contents, to determine the soil textural name from the USDA textural triangle (see **Figure Appendix H-1**). This system is commonly used for agricultural and farming practices. Since this system provides only a general qualitative description, other methods have been developed which more fully reflect the mechanical properties of the soil.

The AASHTO System and Unified System classify soils specifically for their engineering properties. The AASHTO system classifies soils according to the properties that affect roadway construction and maintenance. The fraction of mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in Group A-1 are coarse grained and low in silt and clay. Soils in Group A-7 are fine grained. Highly organic soils are classified on the basis of visual inspection and assigned a Group A-8 classification. The AASHTO classification system is summarized in **Figure Appendix H-2**.

The Unified System classifies soils according to their suitability for construction material, including its stability, permeability, resistance to erosion, compressibility and ability to bear loads without deformation. It considers grain-size distribution, plasticity index, liquid limit, and organic matter content in the soil. The Unified System is based on that portion of soil having particles smaller than 3 inches in diameter. Soil classes include coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC), fine-grained soils (ML, CL, OL, MH, CH, OH), and highly organic soils (PT). Borderline soils require a dual classification symbol. **Figure Appendix H-3** summarizes the classification description of each class.

Figure H-1 USDA Textural Triangle



Source: USDA-NRCS

Figure H-2 AASHTO Soil Classification System

Classification procedure: Using the test data, proceed from left to right in the chart. The correct group will be found by process of elimination. The first group from the left consistent with the test data is the correct classification. The A-7 group is subdivided into A-7-5 or A-7-6 depending on the plastic limit. For plastic limit $w_p = w_l - I_p$ less than 30, the classification is A-7-6. For plastic limit $w_p = w_l - I_p$ greater than or equal to 30, it is A-7-5. NP means non-plastic.

	granular materials (35% or less passing no. 200 sieve)							silt-clay materials (more than 35% passing no. 200 sieve)				
	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-8
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 or A-7-6	
sieve analysis: % passing												
no. 10	50 max											
no. 40	30 max	50 max	51 min									
no. 200	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min	
characteristics of fraction passing no. 40:												
w_l: liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min	
I_p: plasticity index	6 max		NP	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min	
usual types of significant constituents	stone fragments gravel and sand		fine sand	silty or clayey gravel and sand				silty soils		clayey soils		peat, highly organic soils
general subgrade rating	excellent to good			fair to poor								unsatisfactory

Figure H-3 Unified Soil Classification System

Major Divisions			Group Symbol	Group Name
Coarse Grained Soils More Than 50% Retained On No.200 Sieve	Gravel More than 50% of Coarse Fraction Retained on No.4 Sieve	Clean Gravel	GW	Well-Graded Gravel, Fine to Coard Gravel
			GP	Poorly-Graded Gravel
		Gravel with Fines	GM	Silty Gravel
			GC	Clayey Gravel
	Sand More than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sand	SW	Well-Graded Sand, Fine to Coarse Sand
			SP	Poorly Graded Sand
		Sand with Fines	SM	Silty Sand
			SC	Clayey Sand
Fine Grained Soils More Than 50% Passes No.200 Sieve	Silt and Clay Liquid Limit Less than 50	Inorganic	ML	Silt
			CL	Clay
		Organic	OL	Organic Silt, Organic Clay
	Silt and Clay Liquid Limit 50 or More	Inorganic	MH	Silt of High Plasticity, Elastic Silt
			CH	Clay of High Plasticity, Fat Clay
		Organic	OH	Organic Clay, Organic Silt
Highly Organized Soils			PT	Peat

Appendix I
RUSLE

(Excerpted from USDA Agricultural Research Service National Sedimentation laboratory Web page http://www.sedlab.olemiss.edu/rusle/)

Introduction

The Revised Universal Soil Loss Equation (RUSLE) is an easily and widely used computer program that estimates rates of soil erosion caused by rainfall and associated overland flow.

This website is the "official" USDA-Agricultural Research Service (ARS) site for RUSLE. A copy of the current version of RUSLE, version 1.06b (Jan. 19, 2001), and associated data files can be downloaded from this site. Information is also provided on how to access RUSLE documentation, application guides for RUSLE, and help contacts. The current 1.06b version contains a calculation change for the soil moisture (SM) subfactor of the cover-management (C) factor. This change brings the SM calculation in line with that in the upcoming release of RUSLE 2.

RUSLE is used by numerous government agencies, and private organizations and individuals to assess the degree of rill and interrill erosion, identify situations where erosion is serious, and guide development of conservation plans to control erosion. RUSLE has been applied to cropland, rangeland, disturbed forest lands, landfills, construction sites, mining sites, reclaimed lands, military training lands, parks, land disposal of waste, and other land uses where mineral soil material is exposed to the erosive forces of raindrop impact and overland flow.

RUSLE has been developed and is maintained by the USDA-Agricultural Research Service (ARS) in cooperation with the USDA-Natural Resources Conservation Service (NRCS), USDI-Office of Surface Mining, Reclamation, and Regulation, USDI-Bureau of Land Management, Soil and Water Conservation Society, University of Tennessee, Purdue University, and University of Minnesota. Other users include the Department of Defense, U.S. Environmental Protection Agency, U.S. Department of Energy, USDA Forest Service, state agencies regulating land fills, surface mine companies, commercial firms that develop and retail erosion control products, private consultants that develop conservation plans and teach erosion control technology, and university faculty who teach RUSLE in the classroom. RUSLE is used in numerous foreign countries as well.

In the United States, the NRCS is the principal user of RUSLE and has implemented RUSLE in most of its local field offices. The NRCS is the major source for data needed to apply RUSLE and is the leading authority on field application of RUSLE.

About RUSLE

RUSLE uses a particular set of definitions, partly because the disciplines involved in soil erosion have not developed a standard set of definitions. Observance of RUSLE definitions is critical to getting accurate results.

RUSLE estimates average annual soil loss, expressed as mass per unit area per year, which is defined as the amount of sediment delivered from the slope length assumed in the RUSLE computation. RUSLE uses U. S., customary units and computes soil loss in units of tons/acre/year, which is the sediment load at the end of the slope length divided by the slope length. In that context, RUSLE is a sediment yield equation that describes sediment yield at the end of the RUSLE slope length.

The RUSLE slope length is defined according to the problem being addressed. The typical application for RUSLE is development of a conservation plan to protect the eroding portion of a landscape from being excessively degraded by soil erosion, that is, to protect the soil as a resource. In this application, slope length is defined as the distance from the origin of overland flow along the flow path to the point where deposition begins to occur on concave slopes or to a concentrated flow channel. In some cases, the slope can flatten to cause deposition and then steepen so that erosion occurs on the lower portion of the slope. Slope length passes through the depositional area when soil loss is being estimated on the lower portion of this slope.

Another application of RUSLE is to estimate the amount of sediment leaving a landscape that may cause off-site damages such as sedimentation in a road ditch. In this case, the slope length is the distance from the origin of overland flow through depositional overland flow areas to the first "concentrated flow" area that collects the overland flow to the point that the runoff can no longer be considered overland flow. Consideration outside of RUSLE must be given to deposition that occurs in concentrated flow areas, except terrace and diversion channels that are considered by RUSLE, to fully estimate sediment yield from a landscape area.

RUSLE also computes soil loss for individual slope segments. These soil loss values represent net sediment production for those segments, which is the net between detachment and deposition within the segment.

Detachment is the removal of soil particles from the soil mass, which adds sediment to the sediment load being transported downslope. Deposition is the transfer of sediment from the sediment load back to the soil mass. Local deposition is the deposition of sediment very near to the point where the sediment was detached. Deposition of sediment eroded from soil clods in nearby depressions formed by the clods is an example of local deposition. Remote deposition is the deposition of sediment far from its point of origin such as deposition in a terrace channel or on the toe of a concave slope.

Sediment load is a measure of the amount of sediment being transported downslope. Sediment yield, as used by RUSLE, is the sediment load at the end of the slope length, at the outlet of terrace diversion channels, or sediment basins that are considered by RUSLE.

Revised Universal Soil Loss Equation

RUSLE is an index method having factors that represent how climate, soil, topography, and land use affect rill and interrill soil erosion caused by raindrop impact and surface runoff. In general, erosion depends on the amount and intensity of rainfall and runoff, protection provided to the soil by land use against the direct forces of raindrop impact and surface runoff, susceptibility of soil to erosion as a function of intrinsic soil properties and soil properties modified by land use, and the topography of the landscape as described by slope length, steepness, and shape.

These influences are described in RUSLE with the equation:

A = R K L S C P

where: A = average annual soil loss,
K = soil erodibility factor,
L = slope length factor,
S = slope steepness factor,
C = cover-management factor, and
P = supporting practices factor.

A soil loss (erosion rate) in tons per acre per year is computed by substituting values for each RUSLE factor to represent conditions at a specific site.

RUSLE is a "lumped" process-type model based on the analysis of a large mass of experimental data and equations based on fundamental erosion processes where experimental data are inadequate to define RUSLE factor values. Rather than explicitly representing the fundamental processes of detachment, deposition, and transport by rainfall and runoff, RUSLE represents the effects of these processes on soil loss.

The product RK in RUSLE is an estimate of soil loss from unit plot conditions. These two factors have dimensions and units, whereas the other RUSLE factor are dimensionless relative to unit plot conditions. A unit plot is 72.6 ft long on a 9 percent steepness, is maintained in continuous fallow, is tilled up and down hill according to a particular sequence of operations much like those used in clean-tilled row crops, and is cultivated periodically to break the crust that forms from rainfall and to control weeds. The soil surface is left relatively smooth and free of ridges after the last tillage operation in the sequence.

R factor: The R factor represents the erosivity of the climate at a particular location. An average annual value of R is determined from historical weather records and is the average annual sum of the erosivity of individual storms. The erosivity of an individual storm is computed as the product of the storm's total energy, which is closely related to storm amount, and the storm's maximum 30 minute intensity. Erosivity range from less than 8 (US customary units) in the western US to about 700 for New Orleans,. All other factors being the same, soil loss is 100 times greater at New Orleans, Louisiana than at Las Vegas, Nevada.

Maps of R values have been computed from historical weather records and have been plotted onto maps and placed in databases used by RUSLE.

K factor: The K factor is an empirical measure of soil erodibility as affected by intrinsic soil properties. Erosion measurements based on unit plot conditions are used to experimentally determine values for K.

The factor K is a measure of soil erodibility under this standard condition. Land use, such as incorporation of organic material into the soil, affects soil erodibility, but such effects are considered in the C factor. The K factor is influenced by the detachability of the soil, infiltration and runoff, and the transportability of the sediment eroded from the soil.

The main soil properties affecting K are soil texture, including the amount of fine sand in addition to the usual sand, silt, and clay percentage used to describe soil texture, organic matter, structure, and permeability of the soil profile. In general terms, clay soils have a low K value because theses soils are resistant to detachment. Sandy soils have low K values because these soils have high infiltration rates and reduced runoff, and sediment eroded from these soils is not easily transported. Silt loam soils have moderate to high K values because soil particles are moderate to easily detached, infiltration is moderate to low producing moderate to high runoff, and the sediment is moderate to easily transported. Silt soils have the highest K values because these soils readily crust producing high runoff rates and amounts. Also, soil particles are easily detached from these soils, and the resulting sediment is easily transported.

This mixture of effects illustrates that K is empirical. It is not a soil property, but is defined by RUSLE definitions. The definition for K, and for all RUSLE factors as well, must be carefully observed to achieve accurate results. For example, using K to account for reduced soil loss from incorporation of manure is not proper and produces incorrect results.

LS factor: The L and S factors jointly represent the effect of slope length, steepness, and shape on sediment production. RUSLE represents the combined effects of rill and interrill erosion. Rill erosion is primarily caused by surface runoff and increases in a downslope direction because runoff increases in a downslope direction. Interrill erosion is caused primarily by raindrop impact and is uniform along a slope. Therefore, the L factor is greater for those conditions where rill erosion tends to be greater than interrill erosion.

Erosion increases with slope steepness, but in contrast to the L factor for the effects of slope length, RUSLE makes no differentiation between rill and interrill erosion in the S factor that computes the effect of slope steepness on soil loss.

Slope shape is a variation of slope steepness along the slope. Slope steepness and position along the slope interact to greatly affect erosion. Soil loss is greatest for convex slopes that are steep near the end of the slope length where runoff rate is greatest and least for concave slopes where the steep section is at upper end of the slope where runoff rate is least.

The LS factor is a measure of sediment production. Deposition can occur on concave slopes where transport capacity of the runoff is reduced as the slope flattens. This deposition and its effect on sediment yield from the slope are considered in the supporting practices P factor.

C factor: The C factor for the effects of cover-management, along with the P factor, is one of the most important factors in RUSLE because it represents the effect of land use on erosion. It is the single factor most easily changed and is the factor most often considered in developing a conservation plan. For example, the C factor describes the effects of differences between vegetation communities, tillage systems, and addition of mulches.

The C factor is influenced by canopy (cover above but not in contact with the soil surface), ground cover (cover directly in contact with the soil surface), surface roughness, time since last mechanical disturbance, amount of live and dead roots in the soil, and organic material that has been incorporated into the soil. These variable change through the year as plants grow and senesce, the soil is disturbed, material is added to the soil surface, and plant material is removed. The C factor is an average annual value for soil loss ratio, weighted according to the variation of rainfall erosivity over the year.

The average annual distribution of erosivity during a year varies greatly with location. In the US, erosivity is nearly uniform throughout the year in the mid-south region, is concentrated in the late spring in the western corn belt, and is concentrated in late fall and early winter in the Pacific coast region.

Soil loss ratio is the ratio of soil loss from a given land use to that from the unit plot at a given time. RUSLE computes soil loss ratio values as they change through time with each half month period using equations for subfactors related to canopy, ground cover, roughness of the soil surface, time since last mechanical disturbance, amount of live and dead roots in the upper soil layer, amount of organic material incorporated into the soil, and antecedent soil moisture in the Northwest Wheat and Range Region.

P factor: The supporting practice P factor describes the effects of practices such as contouring, strip cropping, concave slopes, terraces, sediment basins, grass hedges, silt fences, straw bales, and subsurface drainage. These practices are applied to support the basic cultural practices used to control erosion, such as vegetation, management system, and mulch additions that are represented by the C factor.

Supporting practices typically affect erosion by redirecting runoff around the slope so that it has less erosivity or slowing down the runoff to cause deposition such as concave slopes or barriers like vegetative strips and terraces. The major factors considered in estimating a P factor value include runoff rate as a function of location, soil, and management practice; erosivity and transport capacity of the runoff as affected by slope steepness and hydraulic roughness of the surface; and sediment size and density.

Appendix J

Risk Assessment Adapted From CT DOT Drainage Manual (Section 6.15 Hydrology for Temporary Facilities and Appendix F)

Section 1: Introduction

Temporary hydraulic facilities include all channels, culverts or bridges which are required for haul roads, channel relocations, culvert installations, bridge construction, temporary roads or detours. They are to be designed with the same care which is used for the primary facility.

These designs are to be included in the plans for the project. Hydraulic approval is required from the Connecticut Department of Environmental Protection for those designs which they regulate.

Section 2: Detours and Temporary Roadways

Drainage systems for these are to be designed for a 2-year frequency if the roadway is required for a year or less and a 5-year frequency if required for longer than a year. All other temporary hydraulic facilities connected with these roads are to be designed for frequencies as determined by using the factors detailed below.

Section 3: Haul Roads

Hydraulic facilities for haul roads which cross or encroach into a watercourse are to be designed for a frequency as determined by using a Design Risk of 50% in **Figure J-2**, below. As a general rule, to avoid excess upstream flooding, the profile of the road should connect the tops of the channel embankments and the road designed to be overtopped by those events which exceed the design discharge. Sufficient cover must be provided over the temporary conduit to ensure structural integrity. The structural analysis of the conduit is to be included with the design.

The plan is to include a warning to the Contractor that this road is expected to be under water during certain rainfall events for undetermined lengths of time.

Section 4: Design Procedure

The selection of a design flood frequency for the remaining temporary hydraulic facilities involves consideration of several factors. These factors are rated considering their severity as 1, 2, or 3 for low, medium or high conditions (see **Figure J-1**).

Factors

Potential Loss of Life: If inhabited structures, permanent or temporary, can be inundated or are in the path of a flood wave caused by an embankment failure, then this item will have a multiple of 15 applied. If no possibility of the above exists, the loss of life will be the same as the severity used for the A.D.T.

Property Damages: Private and public structures (houses, commercial, or manufacturing), appurtenances such as sewage treatment and water supply (public and private well heads and reservoirs), utility structures either above or below ground, trout management areas, streams stocked by DEP, ponds located immediately downstream before the confluence with other watercourses, and wetlands greater than 5 acres in size are to have a multiple of 10 applied. Active cropland, parking lots, recreational areas are to have multiple of 5 applied. All other areas shall use the severity determined by site conditions.

Traffic Interruption: Includes consideration for emergency supplies and rescue; delays; alternate routes; busses; etc. Short duration flooding of a low volume roadway might be acceptable. If the duration of flooding is long (more than a day), and there is nearby good quality alternate route, then the flooding of a higher volume highway might also be acceptable. The severity of this component is determined by the detour length multiplied by the average daily traffic projected for bi-directional travel.

Detour Length: The length in miles of an emergency detour by other roads should the temporary facility fail.

Height Above Streambed: The difference in elevation in feet between the traveled roadway and the bed of the waterway.

Drainage Area: The total area contributing runoff to the temporary facility, in acres.

Figure J-1 Impact Rating Selection

Factor	Rating		
	1	2	3
Loss of Life	See Instructions		
Property Damage	See Instructions		
Traffic Interruptions	<2000	2000-4000	>4000
Detour Length, km (mi)	< 8 (<5)	8-16 (5-10)	>16 (>10)
Height Above Streambed, m (ft)	<3 (≤10)	3-6 (11-20)	>6 (>20)
Drainage Area, ha (mi^2)	<260 (<1)	260-2600 (1-10)	>2600 (>10)
Rural ADT	<400	400-1500	>1500
Suburban ADT	<750	750-1500	>1500
Urban ADT	<1500	1500-3000	>3000

Source: DOT Drainage Manual

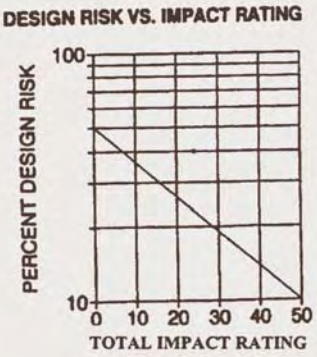
Figure J-2 Design Frequency Risk Analysis

IMPACT RATING TABLE

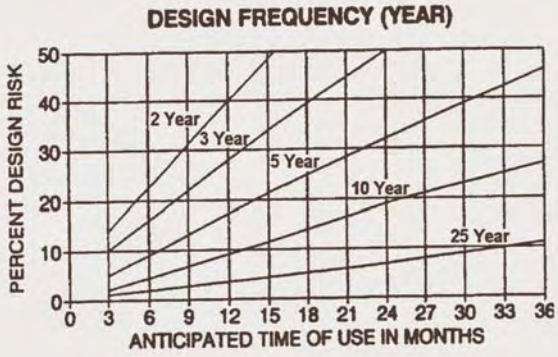
Loss of Life Rating X 15 = _____
Property Damage Rating X 10 or X 5 = _____
Traffic Interruption Rating = _____
Detour Length Rating = _____
Height Above Streambed Rating = _____
Drainage Area Rating = _____
Average Daily Traffic Rating = _____

Total Impact Rating = (sum of the above) = _____

Step 2: Determine risk percentage



Step 3:Determine Temporary Design Frequency



Note: If sufficient discharges have been developed either by the designer or a Flood Insurance Study then a frequency curve should be plotted to determine the Design Discharge instead of the final formula using the ratio.

Design Frequency = _____ years

Step 4: Determine Multiplying Ratio

Year	Ratio	Year	Ratio
2.0	0.8	5.0	1.4
3.0	1.2	10.0	1.9
4.0	1.3	25.0	2.7

Step 5: Determine Temporary Flow Rate (Select the higher flow rate)

Ratio = _____ × 0.27 (Q_{50} _____) = _____ m^3/s (cfs)

Ratio = _____ × 0.20 (Q_{100} _____) = _____ m^3/s (cfs)

Source: DOT Drainage Manual

Appendix K

Conversion Factors for Select English/Metric Measurements

Length

Unit of Measure	Abbreviation	mm	cm	m	km	in	ft	mi
millimeter	mm	1	0l1	0l001	-	0.0394	0.003	-
centimeter	cm	10	1	0.01	-	0.394	0.033	-
meter	m	1000	100	1	0.001	39.37	3.281	621
kilometer	km	-	100000	1000	1	-	3281	0.621
inch	in	25.4	2.54	0.0254	-	1	0.083	-
foot	ft	304.8	30.48	0.3048	0.0003	12	1	0.0002
mile	mi	-	-	1609	1.609	-	5280	1

Area

Unit of Measure	Abbreviation	m^2	ha	km2	ft^2	acre	mi^2
square meter	m^2	1	-	-	10.76	-	-
hectare	ha	10000	1	0.01	107600	2.471	0.00386
square kilometer	km^2	$1x10^6$	100	1	-	247.1	0.386
square foot	ft^2	0.093	-	-	1	-	-
acre	acre	4047	0.4047	-	43560	1	0.00156
square mile	mi^2	2590000	259	2.59	-	640	1

Volume

Unit of Measure	Abbreviation	km^3	m^3	L	Mgal	acre-ft	ft3	gal
cubic kilometer	km3	1	$1x10^9$	-	-	811000	-	-
cubic meter	m^3	-	1	1000	-	-	35.3	264
liter	L	-	0.001	1	-	-	0.0353	0.264
million U.S. gallons	Mgal	-	-	-	1	3.07	14000	$1x10^6$
acre-foot	acre-ft	-	1233	-	0.3259	1	43560	325848
cubic foot	ft^3	-	0.0283	28.3	-	-	1	7.48
gallon (U.S.)	gal	-	0.0038	3.785	-	-	0.134	1

Flow Rate

Unit of Measure	Abbreviation	km^3/yr	m^4/sec	L/sec	mgd	gpm	cfs	acre-ft/day
cubic kilometers/year	km^3/yr	1	31.7	-	723	-	1119	2220
cubic meters/second	m^3/sec	0.0316	1	1000	22.8	15800	35.3	70.1
liter/second	L/sec	-	0.001	1	0.0228	15.8	0.0353	0.070
million U.S. gallons/day	mgd	-	0.044	43.8	1	694	1.547	3.07
U.S. gallons/min	gpm (gal/min)	-	-	0.063	-	1	0.0022	0.0044
cubic feet/second	cfs (ft^3/sec)	-	0.0283	28.3	0.647	449	1	1.985
acre-feet/day	acre-ft/day	-	-	14.26	0.326	226.3	0.504	1

Temperature

Unit of Measure	Abbreviation	F	C
Fahrenheit	F	-	0.56 (after subracting 32)
Celsius	C	1.8 (then add 32)	-