SECTION 2
EROSION CONTROL PLANNING AND SITE MANAGEMENT

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SITE PLANNING, PREPARATION, AND MANAGEMENT

Natural Resource & Watershed Planning

The most effective solutions to erosion and sediment problems begin with natural resource and watershed planning. This type of planning can guide and control development growth, preventing wasteful and haphazard development. The natural resource planning process integrates ecological (natural resource), economic, and social considerations to meet private and public needs. This approach, which emphasizes identifying desired future conditions, improves natural resource management, minimizes conflict, and addresses problems and opportunities.

Watershed planning is another useful tool for building a community's land use plans because watersheds are defined by natural hydrology, representing the most logical basis for managing water resources. The resource becomes the focal point, and planners are able to gain a more complete understanding of overall conditions in an area and the stressors which affect those conditions.

Regional, county and local planning agencies, Soil and Water Conservation Districts (SWCD), and the Natural Resource Conservation Service (NRCS) have technical expertise, resource data and information that can assist decision making by local authorities. These decisions should consider reserving quality agricultural areas for cropland; maintaining the economic viability of agriculture; protecting historical, scenic, and natural beauty areas; protecting wetlands and stream corridors; providing for open spaces and parks; developing attractive residential, institutional and industrial areas; and maintaining floodplains for flood storage, groundwater recharge, water supply source protection, critical habitat preservation by connecting wildlife populations in fractured landscapes, recreation buffer zones, and conservation education uses. Environmental quality is enhanced when open spaces, parks, recreational areas, ponds, wildlife habitat and other areas of public use become integral parts of the plan. These areas should be well delineated and protected from damage that may occur from nearby construction. Selections of such areas should be based upon soils, vegetation, water, topography, accessibility, wildlife, and aesthetic values.

Environmental Site Design (ESD) Plan

As land is subdivided or proposals brought forward for land development, an assessment of suitability of the site for the proposed development needs to be made. ESD is using small scale stormwater management practices, non-structural techniques, and site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. ESD emphasizes conserving natural features, drainage patterns, and vegetation; minimizing impervious surfaces; slowing down runoff; and increasing infiltration. Erosion and sediment control needs to be considered from the beginning planning stages and the design and review of erosion and sediment control and stormwater management plans. This includes elements for the preservation of natural features and green infrastructure techniques for the reduction of impervious cover which must be integrated into the site plan approval process (refer to NYS Stormwater Management Design Manual, Chapters 3 and 5).

Natural resources need to be identified in the planning process in order to design an appropriate ESC plan. The plan should have resource protection at its core and emphasize **EROSION CONTROL** (controlling runoff and stabilizing soil), first as its main component and sediment control, second as a management practice. The reduction of soil loss decreases the cost and maintenance of sediment control practices, reduces the risk of degrading natural resources and improves the overall appearance of the construction site.

Erosion and Sediment Control Plan Components

I. Technical Data Requirements

Features of the site including location, site boundaries, accessibility, present land use, delineation of areas protected by local, state and federal regulations (e.g. wetlands and streams), size of proposed tract(s), topography, drainage pattern, geology, hydrology, soils, vegetation and climate need to be assembled. Such information is obtained from on- site examinations and existing technical reports, maps, records, and other documented material usually available from local sources.

This technical data provides the framework necessary to make informed decisions about a site's ultimate use and the types of erosion and sediment controls that will work. Soils information such as detailed soil maps and interpretations are available on the USDA NRCS website, **http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm** and will specifically provide the following soils information:

a. Descriptions, erodibility, limitations, capabilities, and hydrologic soil groups;

b. Engineering properties of soils;

c. Suitability of the soil as a resource material for topsoil, gravel, highway sand, dams and levees;

d. Site suitability for buildings, roads, winter soil disturbance, foundations, septic tank disposal fields, sanitary land fills, vegetation, reservoirs, dams,

artificial drainage, recreational areas and wildlife development.

II. General Design Process

1. Plan the Development to Fit the Site

Assess the physical characteristics of the site during a site visit to determine how it can be developed with the lowest risk of environmental impact. Minimize grading by utilizing the existing topography wherever possible. Delineate and avoid disturbing wetlands, stream corridors and, to the extent practicable, wood lots, steep slopes and other environmentally sensitive areas. **Minimize impacts by maintaining vegetative buffer strips between disturbed area and water resources.** Existing woody or State protected vegetation on a project site should be delineated, retained, and protected as required. Planning of streets and lots should relate to site conditions. Streets laid out at right angles to contours often have excessive grades that increase erosion hazards and sedimentation.

2. Divide the Site into Natural Drainage Areas

Determine how runoff will drain from the site. Natural waterbodies should not be altered or relocated without the proper approvals. Pursuant to Article 15 of the Environmental Conservation Law (ECL), a protected waterbody and the bed and banks thereof should not be altered or relocated without the approval of the Department of Environmental Conservation. Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act also protects water resources and proposed disturbances may require approvals from The US Army Corps of Engineers.

Integrated surface and storm drainage systems are an essential part of any planned development. The plan should clearly specify: location and capacity of diversions and stormwater basins; paved or other types of lined channels, outlets and waterways; drop inlets; open or closed drains; stream channel protection and bank erosion structures. Consider how erosion and sedimentation can be controlled in each small drainage area before looking at the entire site. **Diversion of offsite surface water run on away from exposed soils provides the most economic and effective erosion control possible since it is more advantageous to control erosion at the source than to design controls to trap suspended sediment. However, attempting to divert large drainage areas can be problematic. Therefore, the channel should be stabilized and conveyed to a stable outlet/receiving stream. The receiving stream should be evaluated to ensure that its flow regime will not be disrupted. Whenever possible the diversion should be temporary to restore the natural drainage patterns.**

3. Determine Limits of Clearing and Grading

Decide exactly which areas must be disturbed in order to accommodate the proposed construction. Pay special attention to critical areas (e.g. steep slopes, highly erodible soils, surface water bodies), which must be disturbed. Additional erosion and sediment controls are often necessary to mitigate the potential impacts to critical or sensitive areas. Staged clearing and grading is necessary to keep unprotected areas of disturbance to less than 5 acres at one time.

4. Design The Erosion and Sediment Control (ESC) Plan

An ESC plan shows the site's existing topography, and how and when it will be altered. It also shows the ESC measures that will be used to reduce sediment pollution and how and when they will be constructed and maintained. The coordination of ESC practices with construction activities is explained on the plan by a phasing and construction sequencing schedule. All projects shall have ESC plans prepared for each phase of the work.

In addition to regulatory control, an ESC plan should be prepared for all land development and construction activity when uncontrolled erosion and sedimentation is anticipated. At a minimum, this includes:

a. sites on slopes that exceed 15%;

b. sites in areas of severe erosion potential;

c. sites within 100 ft. and draining to wetland;

d. sites within 100 ft. and draining to a watercourse; and/or;

e. sites with a high percentage of colloidal solids

It is essential for the ESC designer to remember that sediment control facilities, even when designed and constructed properly, rarely exceed 80 percent removal rates for sediment. A properly designed ESC plan for a large scale commercial or industrial site will typically involve several phases, possibly more than one ESC stage and utilize many different practices.

ESC practices are categorized as vegetative and/or structural controls. While more details on these practices are contained in other sections of this book of standards, general information on vegetative and structural controls is outlined below:

A. Vegetative Controls—The best way to protect the soil surface and limit erosion is to preserve the existing vegetative groundcover. Where land disturbance is necessary, temporary seeding or mulching must be used on areas which will be exposed for more than 14 days. Permanent stabilization should be performed as soon as possible

after completion of final grading. ESC plans must contain provisions for permanent stabilization of disturbed areas. Seed type, application rates, soil amendments, seedbed preparation in accordance with standards contained in this book, mulch, and mulch anchoring must be described on the plans. Selection of permanent vegetation will include the following considerations for each plant species:

1) establishment requirements;
2) adaptability to site conditions;
3) aesthetic and natural resource values;
4) maintenance requirements.

B. Structural Controls—Structural erosion control practices may be necessary when disturbed areas cannot be promptly stabilized with vegetation. Structural practices shall be constructed and maintained in accordance with the standards and specifications in this document. Structural practices may be temporary or permanent. Temporary practices are removed after site stabilization is completed. Permanent practices, such as diversions, are an integral part of the site design and are left in place.

The ESC plans shall include the following elements:

1. Existing and proposed contours shown at two foot intervals or less. Other scales or contour intervals may be favored for special types of land disturbance projects (i.e. plans are often drawn to scales of 1 in. = 200 ft. or 1 in. = 500 ft. with contour intervals of 5 to 20 feet). The following scales are recommended for use on ESC plans because they facilitate the review process for site specific detailed plans: 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in. = 50 ft.

2. Details of temporary and permanent structural and vegetative measures that will be used to control erosion and sedimentation for each stage of the project from land clearing to the finished stage. Stabilizing land with plant materials or mulches shall be part of a planned development. Retention of existing natural vegetation in strategic areas is beneficial, desirable, and cost efficient.

3. The location of structural ESC measures with standard symbols to facilitate the understanding and review of plans. Symbols should have a consistent line weight and be easily discernible on the plans.

4. The dimensions, material specifications, installation details, and operation and maintenance requirements, for all erosion and sediment control practices, including the locations and size of any temporary sediment traps, basins, or structural practice.

5. Notes regarding temporary ESC facilities which will be converted to permanent stormwater management facilities.

6. A schedule to establish the construction sequence of temporary and permanent practices and their timing relative to other construction activities.

7. An inspection and maintenance schedule for soil ESC facilities which describes maintenance activities to be performed.

8. Dewatering practices for subsurface construction activities.

A sample ESC checklist is contained in Appendix E.

III. Construction of ESCs

Effective erosion and sediment control requires good construction site management. Proper management can reduce the need for maintenance of structural controls, regrading of severely eroded areas, and reconstruction of controls that were improperly or poorly constructed or maintained. Good construction site management also results in efficient use of manpower, financial savings and improves the overall site appearance.

Good construction site management includes the following site phasing and construction sequencing measures:

1. Physically mark limits of land disturbance on the site with tape, signs, or orange construction fence, so that workers can see the areas to be protected.

2. Divert runoff from adjacent land away from exposed highly erodible soils and steep slopes on the construction site toward stable vegetated areas.

3. Clear only what is required for immediate construction activity. Large projects should be cleared and graded as construction progresses. Areas exceeding two acres in size should not be disturbed without a sequencing plan that requires practices to be installed and the soil stabilized, as disturbance beyond the two acres continues. Mass clearings and grading of the entire site should be avoided.

4. Re-stabilize disturbed areas as soon as possible after construction is completed. Fourteen days (seven days in certain cases) shall be the maximum exposure period. Waiting until all

disturbed areas are ready for seeding is unacceptable. Maintenance must be performed as necessary to ensure continued stabilization. Except as noted below, all sites shall be seeded and stabilized with erosion control materials, such as straw mulch, jute mesh, or excelsior, including areas where construction has been suspended or sections completed:

a. For active construction areas such as borrow or stockpile areas, roadway improvements and areas within 50 ft. of a building under construction, a down-slope perimeter sediment control system consisting, for example, silt fencing, shall be installed and maintained to contain soil. Exposed disturbed areas adjacent to a conveyance that provides rapid offsite discharge of sediment, such as a cut slope at an entrance, shall be covered with plastic or geotextile to prevent soil loss until it can be stabilized. Stabilized construction access will be maintained to control vehicle tracking material off site.

b. On the cut side of roads, ditches shall be stabilized immediately with rock rip-rap or other non-erodible liners (e.g. Rolled Erosion Control Products (RECP)), or where appropriate, vegetative measures such as sod.

c. Permanent seeding should optimally be undertaken in the spring from March through May, and in late summer and early fall from September to October 15. During the peak summer months and in the fall after October 15, when seeding is found to be impracticable, an appropriate temporary mulch shall be applied. Permanent seeding may be undertaken during the summer if plans provide for adequate watering. Temporary seeding with rye can be utilized through November.

d. All slopes steeper than 3:1 (h:v), or 33.3%, as well as perimeter dikes, sediment basins or traps, and embankments shall, upon completion, be immediately stabilized with sod, seed and anchored straw mulch, or other approved stabilization measures (e.g. RECP). Areas outside of the perimeter sediment control system shall not be disturbed. Maintenance shall be performed as necessary to ensure continued stabilization.

e. Temporary sediment trapping devices shall not be removed until permanent stabilization (i.e. 80% uniform density of permanent vegetation or permanent mulch/stone) is established in all contributory drainage areas. Similarly, stabilization shall be established prior to converting sediment traps/basins into permanent (post- construction) stormwater management practices.

5. Where temporary work roads or haul roads cross stream channels, adequate waterway openings shall be constructed using spans, culverts, washed rock backfill, or other acceptable, clean methods that will ensure that road construction and their use do not result in turbidity and sediment downstream. **All crossing activities and appurtenances on streams regulated by Article 15 of the Environmental Conservation Law shall be in compliance with a permit issued pursuant to Article 15 of the ECL**.

6. Make sure that the contractor(s) responsible for the implementation of the Stormwater Pollution Prevention Plan (SWPPP), understands the ESC plan and signs the certification statement required by NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP).

Inspection & Maintenance

The implementation of an erosion and sediment control inspection and maintenance program is critical for the proper operation of the plan and protection of water resources. Without proper vigil and timely repair and support for the installed erosion and sediment control measures, the practices can easily be overwhelmed and lose their functional effectiveness. To ensure the performance of the erosion and sediment control measures, the contractor(s) that has been identified by the owner as being responsible for the implementation of the SWPPP shall inspect the practices within the active work area daily and after every stormwater event that generates runoff. If deficiencies are identified, the contractor shall implement the necessary corrective actions within one business day of the inspection.

Maintenance for all erosion and sediment control practices shall be in accordance with the specific details included in the SWPPP and incorporated on the ESC plan drawings as appropriate.

Construction Activities

There is a wide array of different types of construction activities. These projects can be grouped into separate categories for the purpose of developing an erosion and sediment control strategy. These generalized categories of land development are:

1. Linear Projects
   a. Highway and Road Construction
   b. Gas and Oil Pipeline, Water Supply Line, and Sanitary Sewer Line Construction
   c. Wind Farm and Power Line Construction

d. Stream Restoration and Streambank Stabilization
e. Shoreline Stabilization
f. Flood Dike Systems

2. Residential Projects
   a. Small scale
   b. Large scale

3. Commercial/Industrial Development Projects
   a. Small scale
   b. Large scale

4. Institutional Construction Projects

5. Water Resources Projects

6. Large Overlot Grading Projects

Any one individual project may fall into more than one generalized category but these are offered to guide the development of an overall successful site erosion and sediment control plan for the project.

Site variables such as topography, depth to ground water, soil types, and rights- of- way (ROW) constraints all affect the methods of construction including choices of equipment to accomplish the work, phasing and sequencing of construction, and the appropriate erosion and sediment control practices to be employed on the project. In addition, site attributes such as very steep slopes, perched groundwater tables, tidal water fluctuations, stream corridor management, and traffic control requirements impose extra challenges in preparing a comprehensive erosion and sediment control plan.

Note: Performing activities within or adjacent to wetlands, streams and waterbodies may require permits from the New York State Department of Environmental Conservation (NYSDEC) pursuant to Article 15 (Protection of Waters), Article 24 (Freshwater Wetlands) and Article 25 (Tidal Wetlands) of the Environmental Conservation Law (ECL). Project owners should contact NYSDEC's Regional Division of Environmental Permits early in the site planning process to discuss the requirements for meeting permit issuance standards. Following the New York State Standards and Specifications for Erosion and Sediment Control may not ensure compliance with the above referenced sections of the ECL.

The following are examples of projects, with important considerations for plan evaluation, which illustrate the generalized land development categories shown above:

1. <u>Linear Projects</u>

a. Highway and Road Construction

In developing plans for highway and road construction, the plan designer will encounter design situations ranging from new highway construction, existing road expansion, intersection and drainage improvements and bridge and culvert rehabilitation; to shoulder widening and overlay projects. While these types of projects differ greatly in their scope and complexity, they all share similar challenges to the ESC plan designer.

These construction projects are typically linear in nature, with limited ROW. Given the limited space within the ROW it may be necessary to obtain temporary easements for control practices such as sediment basins. Working around waterways, streams, or drainage channels within a ROW will also require that special attention be given to the construction details and methods of construction being used in and around the waterways.

When an existing roadway is under construction, traffic must often times continue around and through the work area. In these situations, the ESC plan designer needs to address lane shifts, interim access roads being constructed, and other efforts taken to minimize the travel time delay when designing ESC practices. The ESC plan will also need to address the issue of highway

safety from sediment leaving the construction area, and employ a dust control strategy. The use of tire wash facilities and street brooms may also become part of the ESC plan. Proper ESC planning will be necessary to ensure that the use of storm drain inlet devices do not pose a flooding hazard or risk to existing travel lanes. Highway work is typically more dynamic than other types of construction with disturbed areas usually not being left inactive for long periods of time. This may require the use of rolled erosion control products (RECP's) or plastic in order to address temporary stabilization requirements. The following ESC measures must be addressed in the ESC plan:

- Sequence the work to minimize disturbance
- Protect existing drainage ways
- Evaluate de-watering needs and methods
- Minimize access locations
- Stabilize the exposed areas as each phase is completed

b. Gas and Oil Pipeline, Water Supply Line, and Sanitary Sewer Line Construction

The construction of underground pipelines for gas and oil conveyance, water supply lines, or sanitary sewer lines, can result in potentially adverse impacts to natural and cultural resources. Through advance planning of the pipeline construction work, working in the appropriate season, application of erosion and sediment control practices and appropriate construction techniques, natural resources will be protected and adverse impacts minimized.

Utility construction is generally performed in narrow ROW on a specified width. There are several unique aspects of utility work that pose challenges to the ESC plan designer and need to be recognized. Large utility projects pose the greatest risk for ESC problems during construction. Gas and oil transmission lines may be located across multiple watersheds, wetlands, streams, and up and down steep slopes. Pipeline construction involving welded steel pipe requires the trench to be open for multiple processes of pipe staging, welding, testing and placement. Construction methods must be employed to protect these natural resources. Sanitary sewer lines typically rely on gravity or a combination of gravity with lift stations as needed to operate efficiently. As such they are often sited in lower areas near wetlands, flood plains, and along stream corridors. Where streams must be crossed for utility line construction, the designer must plan for waterway construction permits as well as prepare detailed methods for temporary stream diversions, de-watering operations, and stream or wetland crossings as appropriate.

Smaller utility projects often include servicing residential development with water, sewer, telephone, electricity, gas, and cable TV. While the trend is toward using a common trench for several or more of these utilities, the installation of separate utilities can disrupt the overall sequence of construction, especially with street construction and stabilizing adjacent ROW areas. Direct bury techniques may be used to install electric lines, cable or fiber optic cables, which limits land disturbances by not requiring an open trench. In a residential plan, the installation of utilities must be coordinated, and ESC planned for, especially the restoration and stabilization of disturbed areas. The following objectives, where applicable, must be incorporated in the ESC plan:

- Consider the location of wetland stream resources during the design and planning phase of the project to minimize crossings of such resources;
- Limit vegetation clearing in accordance with safe construction practices to minimize adverse environmental and ecological impacts;
- Construction ROW has to be sized properly, with careful consideration of limiting disturbance yet providing sufficient space for safe operation of large equipment. Areas adjacent to river or large wetland crossings need to be large enough so that all

operations have sufficient space to support work tasks. Confining the crossing staging areas into locations of insufficient space is inefficient and may create extensive damage;
- Confine construction activities to the ROW and vehicular use to designated access roads, construction paths, and staging areas;
- Schedule construction for time periods when sensitive resources are least susceptible to damage or disruption;
- Use construction and pipe laying equipment that minimizes damage and disruption of soils during wet periods or in areas with high ground-water tables, and use the smallest sized equipment to complete the work;
- Limit equipment movement in or near sensitive resources. Phase and sequence the work to limit exposure of work areas such as road crossings, stream and river crossings, wetlands, steep slopes, rocky terrain, and agricultural land;
- Minimize topsoil loss and general soil erosion by limiting ROW grading and other soil scarifying activities, and promptly stabilize disturbed soil;
- Minimize traffic disruption on public roads during pipeline construction by providing adequate traffic controls;
- Provide adequate space for construction paths adjacent to trench systems, temporary sites for material storage and construction staging, and designate the disposition of construction waste material;
- Incorporate adequate trench and site de-watering facilities;
- Provide provisions for site clean-up and a soil and area restoration plan on a phase by phase basis as practical; and
- Provide for pipeline ROW maintenance that includes vegetative treatment, maintenance of erosion and sediment control practices, and landowner improvements as detailed in individual easement agreements.

c. Wind Farm and Power Line Construction

The construction of wind farms and power transmission lines has many similarities to the utility construction methods noted previously. Wind turbine construction, and to a lesser extent transmission line construction will require delivery of both large or long components and very heavy equipment. Wind turbine blades delivery requires a wide turning radius, which requires work at road intersections along the delivery route. Due to the length of blades, both horizontal and vertical profiles of access roads have to be considered. Cranes for wind farms typically arrive on three to five large flat bed trucks. The individual weights of trucks require special permits and road structures must be considered.

Transmission line substations require delivery of large, heavy components that also require special consideration. Of particular concern are the access routes to reach the wind farm pads and power-line towers, the construction at the turbine pad and power-line tower foundations, and the impact on natural resources at these sites. The following items, where applicable, must be included in the ESC plan:

- Design permanent access roads to avoid wetland and stream resources;
- Limit the amount of clearing and grubbing to that needed to provide access, staging and site construction;
- The construction ROW will have to accommodate large cranes and delivery of long components that will require additional clearing to provide space for turning movements;
- Confine construction to the ROW and vehicular use to the designated access road and staging areas;
- Phase and sequence the work for time periods when sensitive resources and land uses are least sensitive to damage;
- Design appropriate ESC practices to control runoff

during and after construction, and sediment loss while soils are disturbed;
- Provide for the handling of construction waste materials, proper site clean-up, and site stabilization plan; and
- Provide for an operations and maintenance, and inspection plan for the project.

d. Stream Restoration and Streambank Stabilization

Stream corridors and streambanks and their respective buffer areas are extremely sensitive areas and must be adequately protected during construction operations. Diligent planning is required to properly phase the work with particular attention paid to accessing the work locations, dewatering the work areas, providing adequate staging area for construction equipment and operation, and handling construction waste such as cleared and grubbed material and excess spoil.

To protect fish spawning, timing restrictions may be imposed for all instream work as well as any adjacent work that may result in suspension of sediment in a stream. In general, instream work should occur during low flow conditions, typically between June and September, to minimize impacts to fisheries and water quality. For additional information on timing restrictions, please contact the regional NYS DEC office for the county in which the project is located. The following measures, where applicable, must be incorporated in the ESC plan:

- Implement an appropriate de-watering scheme
- Utilize existing former channels where available
- Plan and conduct work in phases upstream to downstream
- Utilize pumps to remove standing turbid water to treatment areas such as traps, basins or filters appropriately sized and stabilized to reduce turbidity
- Stabilize each phase as the work moves downstream
- Timing of planting work is critical for successful vegetative stream bank stabilization

e. Shoreline Stabilization

Stabilization projects for eroded or undermined shorelines can range in scope from shallow grading of beach areas to very high steep banks. These sites can extend from small lot type applications to several hundred feet long. A major concern is the protection the water resource and any surrounding resource attributes such as buffers and wetlands. Slope stability should be assured prior to constructing a project on steep or very high slopes. Consideration of overland surface drainage must be incorporated in the site plan.

Additional items that must be included in the ESC plan are:

- Utilize turbidity curtains or appropriate structural barriers in close proximity to the work area
- Phase and conduct the work in lateral sections
- Permanently stabilize one section prior to disturbing the next section.

f. Flood Dike Systems

These linear structures are usually placed in close proximity to a stream or river extending significant distances to protect the interior area from flood waters. The construction, repair, or rehabilitation of these structures requires that the water resources and adjacent areas be protected from sediment from all disturbance activities. Management of the interior drainage water during construction is critical. Clean water should be bypassed or otherwise diverted around or through the work area. Materials handling should also be recognized and specified. This will include spoil, earthfill, topsoil, as well as waste such as cleared and grubbed vegetative material.

Key measures that must be included in the ESC plan are:

- Phase and conduct the work based on the topography and cut and fill needs
- Sequence the operations to minimize disturbed area exposure
- Install perimeter controls to protect adjacent resources
- Delineate stockpile areas, construction staging areas, and access points
- Bypass clean water around or through the construction site with a stable outlet
- Standing turbid water should be captured or pumped to a treatment device such as a trap, basin, or filter.
- Utilize temporary surface stabilization as the work progresses and apply final stabilization as each phase is completed

2. <u>Residential Development Projects</u>

a. Small Scale- This generally involves the development of interior roads only or single lot grading for home construction. Typical ESC plans for single family home construction are shown in Appendix D.

b. Large Scale- This activity involves large areas of disturbance for developing interior road access to multiple home sites. Mass or bulk grading is usually performed to complete the infrastructure, individual lots, and the stormwater management practices. There are three stages to a large scale residential development:

- Bulk Grading
- Site improvements
- Home Construction

Each stage is unique with respect to erosion and sediment control, and the management of stormwater during construction. Residential projects will often include multiple phases that may take years to complete. Depending on the size of the development, the developer may not construct the infrastructure (i.e. roads, stormwater conveyance system, other utilities, etc.) for all the phases at the same time. For this reason, it is important that the ESC plans include the necessary integration of the different phases of the project.

Bulk Grading Stage: Bulk or mass grading (sometimes referred to as overlot grading) would require a separate ESC component for that stage. As basins and traps are constructed, there is the added consideration for the planner that home lots will eventually become part of the plan, and the siting of these facilities needs to consider their long term use. As earthwork progresses, the road areas will be "roughed" or "boxed" out if the roadway is in cut; or earth brought in if the road area is in fill. The amount of bulk grading will depend on the earthwork balance for the site. If cuts and fills are balanced within a phase, typically, the bulk grading stage will be easier to manage. Once this stage is completed, the major infrastructure stage begins.

Site Improvements Stage: The next stage involves the installation of roads, major utilities such as sewer and water, and drainage systems. The ESC designer will need to realize that the construction of the roadway and drainage system will alter the interception of stormwater runoff and, in many cases, that the sheet flow occurring during the bulk grading is now concentrated. Energy dissipation with check dams, drop structures, and possibly turf reinforcement in swales and ditches is now necessary. Putting the base course of stone on the road as soon as possible will also reduce erosion potential.

As the roadway cuts and fills are completed and drainage established, temporary stabilization may take place on the lot areas and many of the roadway swales and completed drainage channels are ready for permanent stabilization treatment. It is still too early in the construction phase to activate any of the permanent infiltration/filtration facilities or systems that may have been installed. If located underground the storm drain system must be protected to prevent soil from migrating to the infiltration system. The contributing drainage area including lot areas must be stabilized before permanent infiltration/filtration facilities are put on-line. After the infrastructure is installed and before the site contractor leaves the site, the sediment basins and traps, and the rest of the site, should be checked to determine if maintenance is needed. Although the site should be inspected during the entire construction process, it is crucial to ensure that any major work is performed before the site contractor leaves. Often the building lots and homes are constructed by different sub-contractors that may not have the proper equipment

to perform the necessary maintenance.

Home Construction Stage: The final stage involves the home construction. The lot areas of the site that have been previously stabilized will be disturbed during the construction of the homes. Minor utility installation such as cable, electric, and telephone are generally installed in a common trench along the road right-of-way. This installation will sometimes interfere with previously installed silt fence and other ESC controls. Ideally, the utilities are installed before the home construction begins, and before the road right-of-way area is stabilized. When utility installation requests are high however, the installation priority may be tied to the number of building permits issued in a given development phase. This may necessitate the road right -of-way areas having to be stabilized twice.

3. Commercial and Industrial Development

These development projects share many of the attributes of large scale residential development; that is significant overlot grading and drainage challenges. It is important that the stormwater management systems and treatments be installed for the project site early in the development process to assure proper control. Particular care should be taken to stabilize access locations and control dust during the construction operations.

a. Small Scale- These sites are generally less than 3 acres with a building footprint of 5,000 to 20,000 square feet, such as **convenience stores, gas stations, fast food restaurants, individual retail outlets or industrial park building pad sites**. Typically, perimeter controls such as silt fence may be employed. A stabilized construction access to all point of ingress and egress is important and will need constant attention to maintenance due to frequent traffic from trucks hauling structural building materials. Depending on the permanent stormwater design of the site, a stormwater pond may be utilized as a temporary sediment basin. If not, a temporary sediment trap may be employed with perimeter berms to direct sediment laden runoff to the trap. These berms may be constructed from the topsoil stripped from the site. Used as berms around the perimeter, the topsoil does not take up room as a

stockpile, which is often a problem on a small site. After final grades are established, the topsoil should then be restored to areas of the site that will be permanently vegetated.

Generally, the building foot area or pad site is excavated first, with rough grading taking place around the remainder of the site. While the building area is being constructed, the stormwater system is installed and inlet protection is constructed. If the remainder of the site requires extensive grading later, temporary stabilization will be applied initially. Once stabilized, this site should require simple routine maintenance until the remainder of the site area is final graded for parking and landscaping. If only minor grading on the site is required, the sequence may be such that grading and base course stone could occur early in the construction. This would also reduce the amount of bare soil exposure. One important note; some small commercial sites rely on infiltration, filtration, or bio-retention for their permanent stormwater management. The function of these facilities is often compromised when they are utilized for sediment control, compacted by heavy equipment, or installed prematurely and allowed to become clogged with sediment. The ESC portion of the plan has to be developed to complement the post-development stormwater management strategy.

b. Large Scale- These projects are greater than 3 acres in area, such as **shopping centers, office complexes, industrial parks, transportation facilities, and multi-use development projects**. The designer can introduce phasing into the site planning process even when the site is less than 20 acres to make complex sites more manageable. In discussing phasing it is important to define the clearing, grubbing, and grading stages of construction. Land disturbing activities include land change such as clearing, grading, excavating, transporting and filling of land. On a wooded site, cutting down or clearing trees is a land disturbing activity. There is a way through proper sequencing, to develop a portion or phase of a site while simultaneously clearing and grading another phase. While phasing is an important tool in managing ESC activities, the plan needs to consider some flexibility among phases. If a sediment basin is to be constructed in Phase 1, it may be necessary to place the excavated material at a central location, possibly in another phase. Phasing also works well if the phases are broken into separate drainage areas.

A well designed ESC plan for commercial/industrial development will reflect that the site will likely be mass or bulk graded. There are typically very few areas of these sites that will remain undisturbed except for areas that are protected. In some cases extreme changes in grading are necessary to ensure a relatively flat building site. In other cases multiple drainage areas will be graded to one control point, or drainage areas may be divided to outlet at different locations.

During the bulk grading of a large site, the phasing is clearly the key to managing ESC activity. However, even within a phase of construction, it may be necessary to develop two ESC plans. The first plan would be developed for the bulk grading activity. Since the stormwater or drainage collection system is not installed at this time, the ESC plan will rely on temporary berms, swales, and diversions to convey sediment laden water to traps and basins. A second plan would be necessary when rough grading nears completion, buildings, roads, and parking areas are under construction, and now drain to the same traps and basins through an improved stormwater conveyance system. The ESC strategies are very different during the bulk grading and infrastructure development stages.

It is essential for the ESC designer to remember that sediment control facilities, even when designed and constructed properly, rarely exceed 80 percent removal rates for sediment. A properly designed ESC plan for a large scale commercial or industrial site will typically involve several phases, possibly more than one ESC stage and utilize many different practices.

4. <u>Institutional Development Projects</u>

These projects include the development of structures, facilities, and infrastructure such as roads, utilities and stormwater drainage systems in institutional settings such as **college campuses, correctional facilities, public and private school construction, and transportation terminals such as bus stations**. Many of the key points previously discussed for ESC plans are applicable here as well. It is especially important to note that often institutional construction projects are undertaken in close proximity to ongoing public activities and the drainage from these projects is often tied into the existing stormwater system. The following measures shall be incorporated in the

ESC plan:

- Establish safe, stabilized, controlled access points for the construction limits
- Develop a materials handling protocol for all potential pollutants and construction waste generated by construction activities
- Control dust from construction operations and vehicular traffic
- Maintain noise levels of the construction operations to acceptable levels for the surrounding environment
- Utilize temporary stabilization and permanently stabilize each phase as soon as its work is completed

5. Water Resources Projects

These projects are unique in that they are generally constructed within or in very close proximity to water resources. These include **dam construction for lakes, ponds, or reservoirs**, whose purposes may be flood protection, energy creation or recreational for fish and wildlife. It also includes **embankments and grading for wetland restoration projects** as well as construction activities for agricultural support such as **agricultural waste storage and management facilities such as lagoons, waste treatment wetlands, barnyard runoff treatment systems and composting facilities**. The ESC plan for these projects should contain many of the points listed previously for general grading activities. In addition, key elements of the construction sequence for earthen dam embankments shall include the following:

- Divert the stream flow in stable manner
- Construct the cutoff trench and service spillway system
- Utilize earthfill from the auxiliary spillway first
- Permanently stabilize the auxiliary spillway
- Re-locate the stream flow through the service spillway system
- Complete the earthfill and permanently stabilize all disturbed areas

6. Large Bulk, Overlot Grading Projects

These projects include construction of golf courses, recreational ski areas and facilities, large municipal projects such as airports and sewage treatment plants, and steep slope stabilization areas. The majority of these projects share many of the same attributes, concerns and ESC plan requirements as large scale residential, commercial, and industrial projects. However, the stabilization of steep slopes is unique and deserves separate evaluation. Many factors will determine the engineering treatment for stabilizing an unstable steep slope. These include, but are not limited to, soil type, gradation, groundwater levels and seepage, slope steepness and length, surface drainage, active erosive forces, and the proposed use of the area within the bigger site complex. Key measures that must be included in the ESC plan and construction sequence are:

- Divert surface runoff at the top of the slope
- Divert water by use of water bars
- Make sure the slope and its toe area are stable
- Utilize slope drains as necessary to control seepage
- Bench the slope as needed for stability, access, and surface drainage
- Plan and conduct the work to minimize exposure
- Stabilize exposed areas as soon as possible as the work progresses

In summary, these six categories of construction activities highlight some of the variables that should be addressed in ESC plans.

Recognize that every construction project is unique. It may involve a totally new land disturbance or re-configuring and re-developing previous work. It could be located in an urban, suburban or rural area and may involve working with existing impervious areas. Regardless of these circumstances, the erosion and sediment control plan must be prepared to deal with all the potential adverse impacts that could occur to on-site and off-site water resources.

The majority of the standards contained in this book are applicable and adaptable to most of the construction activities previously discussed. However, some of the standards will not be applicable for all activities. The Erosion and Sediment Control Practices Matrix, Table 2.1, indicates which construction activities summarized above, where a particular standard practice is most likely suited for implementation.

Design Process for Erosion and Sediment Control Plans

The design of erosion and sediment control needs to be integrated with the stormwater plan for the project. Since every project is different in its topography, soils, geometry, hydrology, groundwater depths, and intended purpose, it is important to consider all of these attributes as well as post construction stormwater management as ESC plans are developed. A firm knowledge of the New York State Stormwater Management Design Manual criteria and requirements is helpful when integrating green infrastructure planning and practices for runoff reduction such as preservation of natural areas and soil restoration as well as the implementation of standard stormwater treatment practices such as infiltration basins and others. The following design steps detail the process and required elements for developing an ESC plan:

Step 1. Identify existing drainage patterns, drainage area boundaries, and slopes

Current drainage information for the project site, as well as off-site, needs to be obtained and verified through a site visit and survey. Field check drainage patterns, drainage area boundaries, vegetation and land use. Look for existing storm drains, culverts, underground utilities, and other drainage features. Evaluate flow onto, through, and off of the site for existing conditions. Examine the drainage areas to determine the size, slope, slope length, flow path, and, for areas with concentrated flow, the discharge. Decide if off-site flow can be diverted through or around the site. Using ESD principles and green infrastructure techniques, maintain or mimic the existing drainage patterns that give preference to sheet flow and small drainage areas.

Step 2. Identify areas of special concern

Areas of particular environmental concern, such as wetlands, streams, buffers, wooded areas, slopes 15 percent or steeper, and highly erodible and unique soils, need to be identified within both the project site and adjacent areas and shown on the plan. Other considerations include phosphorous impaired watershed areas; National Wetland Inventory; natural heritage areas; rare, threatened, and endangered species habitat; and impaired stream segments with a Total Maximum Daily Load for sediment. Areas of special concern must be verified with a site visit. Note any erosion, lack of vegetation, drainage problems, and other features that may be pertinent to the design. If an unmapped resource is found, contact the appropriate authority to determine additional regulatory requirements.

Step 3. Inventory site and layout development

The initial assessment of the layout needs to be based on the

existing features and proposed construction, minimizing the project's impervious area, acreage of soil disturbance and the encroachment on natural resources in accordance with the green infrastructure planning principles described in chapters 3 and 5 of the New York State Stormwater Management Design Manual and the environmental site design techniques noted earlier in this section. A site program plan has to provide space for the project water, sewer, stormwater facilities, parking, recreation areas and green space. A comprehensive approach to developing the erosion and sediment control and stormwater management plans will minimize changes from the natural hydrology. In addition, expansion of forest, wetland, and stream buffers needs to be considered for enhanced sediment control and improved water quality.

Step 4. Determine phasing requirements and design initial erosion and sediment controls

Depending on the scope of the project, phasing of sediment control and grading may be necessary (e.g., initial, interim, and final phase). Initial controls need to consider existing topography, drainage areas, ground cover, and access throughout the site. If possible, sediment controls installed during the initial phase should be designed to function for all phases of the project. The best designs incorporate careful phasing and sequencing into the overall erosion and sediment control plan and construction strategy. This is often evident in the project's contract construction schedule.

In designing erosion and sediment controls, consider possible locations for staging and stockpile areas and access or haul roads. If staging/stockpile areas are within the project's limit of disturbance, the proposed perimeter controls may suffice. However, if a soil stockpile creates a longer slope length or steeper slope, perimeter controls must be adjusted accordingly. Additionally, an access road may be required down a slope thereby concentrating flow that was previously sheet flow. Considerations must be made for handling this concentrated flow and stabilizing and maintaining the access road. The design and installation of erosion and sediment control practices must not impact areas identified for green infrastructure purposes. For example, compacting soils in areas designated for infiltration, or removing trees or other vegetation identified for stormwater management, is not permissible. However, infiltration basin locations may be used as sediment basins/ traps where partial excavation is performed to a minimum limit of 18" above the bottom of the infiltration basin.

Table 2.1 identifies the erosion and sediment control practices contained in this book of standards and lists the primary purpose of each practice along with design criteria and associated practices that might be found used in combination with the listed practice. For example, rock outlet protection, sediment trap, and storm drain inlet are listed as associated practices for the earth dike practice. Each practice application needs to be evaluated on a case-by-case basis for its associated practices due to the changing characteristics of the project.

The sequencing of a site must take into account the time and access needed to install the initial sediment controls. If earth dikes and a sediment basin are designed as initial controls, these must be completed before beginning other grading. This could require stockpiling the excavated material from the basin rather than using it immediately for fill on the site. Sequencing is also important to ensure that the basin is completed and stabilized prior to the construction of the berms. Additional sediment controls may be required if extensive clearing is needed to reach the proposed basin location.

Step 5. Identify interim drainage patterns, drainage areas, slopes; and design interim controls

Interim conditions are often overlooked yet are important considerations for erosion and sediment control design. Typically, evaluating interim conditions is more difficult than evaluating initial phase or final phase. Project plans always include existing and proposed site conditions. Unlike the initial or final phases, interim conditions are not definitive; they represent the in-between. Due to the shifts in drainage areas and changes in slope and exposure of sub-surface soils, drainage patterns and discharges for an interim phase may be entirely different from initial or final phase, and therefore the erosion and sediment controls may also need to be different. To design interim controls, apply the same procedures used to design initial phase sediment controls. Initial and final phase controls may need to be adjusted or modified to better correlate with the interim phase controls. Depending on the scope of the project, an interim phase erosion and sediment control plan may not be required.

Step 6. Identify proposed drainage patterns, drainage areas, slopes; and design final controls

Follow the same procedures used to design the initial phase erosion and sediment controls. Initial and interim phase controls may need to be adjusted or modified to better correlate with the final phase plans. As construction progresses, consider impacts to staging and stockpile areas and access roads. Also, consideration needs to be given to how the controls implemented for the final phase will be removed.

Step 7. Prepare the Construction Sequence

The sequence of construction describes how the plan will progress. It directs the installation and removal of the different erosion and sediment controls shown on the plan. Sequencing of the project needs to be considered throughout the entire design process. When writing a

sequence of construction, consider whether additional instructions will be helpful to ensure that the controls function as intended. Different types of construction activities will require different sequences for construction. If the disturbed area in any one particular phase of the construction work exceeds 5 acres at any one time, additional control efforts will be required and written acceptance of this plan from the Regional NYSDEC office or MS4 (for projects subject to a traditional land use control MS4) must be received and incorporated in the project documents.

Writing a sequence of construction requires the visualizing and the progression and connection of various site development activities (e.g. clearing, grubbing, grading, utility installation, maintenance of traffic, drainage systems, building systems, stream diversions, erosion and sediment control, stormwater management, etc.) to ensure that the erosion and sediment control practices will be installed and removed at the proper times, and function properly. Depending on the project's complexity, the sequence can be relatively simple or it can involve many small steps. Multiple steps can occur concurrently, while others must be sequential. Large projects that have been segmented into phases should have a separate sequence for each phase. Large projects often follow a prescribed critical path for the construction work. These paths are helpful in developing narratives to explain to contractors and inspectors why a certain erosion and sediment control practice was selected or why following the sequence is imperative to the proper progression of the construction and erosion control effectiveness.

The sequence of construction, at a minimum, must include the following:

- Schedule a pre-construction meeting with appropriate permitting authority
- Delineate resources to protect
- Establish staging area, construction entrance, topsoil stockpile, and concrete truck washout areas
- Protect post-construction practice areas during construction to preserve native soil permeability, install SMP's only after site is stabilized
- Clearing and grubbing as necessary for the installation of perimeter controls
- Establish method of spoils disposal (on-site or off)
- Construction and stabilization of perimeter controls
- Install initial runoff controls and stabilization
- Remaining clearing and grubbing within perimeter
- Road grading
- Grading for the remainder of the site or phase
- Utility installation and connections
- Construction of buildings, roads, and other construction
- Installation of permanent stormwater management measures
- Conduct soil restoration
- Final fine grading, landscaping and stabilization
- Removal of temporary erosion and sediment controls
- Restore and stabilize any disturbed areas remaining upon removal of temporary ESC measures

Most sequences of construction will be more detailed, especially for plans requiring stream diversion, ground water management, or the coordination between the removal of controls in one phase and the installation of different controls in a subsequent phase. If traffic control is a factor, then the erosion and sediment control plan should coordinate with the maintenance of the traffic plan. For subdivision projects, the sequence of construction must identify lots having sediment control practices that preclude the lot from being developed until the contributing drainage area has been final graded and stabilized. Each project is unique and the level of detail in the sequence of construction needs to be tailored to each specific project.

The Erosion and Sediment Control Practices Matrix was prepared as a quick reference for designers and reviewers to obtain major pertinent information about a practice. The matrix is alphabetical and is sectioned by each major control group in this book of standards. Each practice has listed its primary use on the site, the important site characteristics and criteria for application, the type of construction activity where it is best applied, and other associated practices that are often used with it to complement its performance.

The Construction Activity Key, shown below, assigns a number or number and letter to indicate a specific construction activity. Those symbols are listed in the Construction Activity column of the matrix to indicate the applicability of a practice to a particular type of construction. This information is presented as a guide for use and is not to be considered as limiting any particular practice to the activity listed.

Erosion and Sediment Control Practice Matrix Construction Activity Key

1. Linear Projects
   a. Highway and Road Construction
   b. Gas and Oil Pipeline, Water Supply Line, and Sanitary Sewer Line Construction
   c. Wind Farm and Power Line Construction
   d. Stream Restoration and Streambank Stabilization
   e. Shoreline Stabilization
   f. Flood Dike Systems
2. Residential Projects
   a. Small scale
   b. Large scale
3. Commercial/Industrial Development Projects
   a. Small scale
   b. Large scale
4. Institutional Construction Projects
5. Water Resource Projects
6. Large Overlot Grading Projects

Table 2.1
Erosion and Sediment Control Practices Matrix
Site Planning, Preparation and Management

Practice	Primary Purpose	Site Characteristics	Construction Activity*	Associated Practices
Concrete Truck Washout	Collect Waste	Concrete construction	All	Stabilized Access
Construction Road Stabilization	Control sediment	All construction routes	A1l	Dust control, temporary swales, temporary or permanent seeding
Dust Control	Stabilize soil	Access points, construction roads	1a,1b,2,3,4,6	Stabilized construction access, construction road stabilization
Protecting Vegetation During Construction	Preserve existing vegetation	Site specific	All	Recreational area improvement
Site Pollution Prevention	Manage waste	Site logistics	All	Those in this section
Stabilized Construction Access	Control sediment	Access points	All	Filter fence, construction road stabilization
Temporary Access Waterway Crossing	Prevent sediment	Streams and banks	All	Construction road stabilization, streambank protection
Winter Stabilization	Soil stabilization	Disturbed areas	All	Seeding, mulching, buffer strips
* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15				

Table 2.2
Erosion and Sediment Control Practices Matrix
Erosion Control Part 1 - Runoff Control (See Section 3)

Practice	Primary Purpose	Site Characteristics	Construc-tion Activity	Associated Practices
Check Dam	Control runoff	Drainage area ≤ 2 Ac.	All	Lined waterway, rock outlet protection
Construction Ditch	Divert runoff	Drainage area ≤ 10 Ac.	All	Sediment traps, storm drain inlet protection, sediment basin, level spreader
Dewatering Sump Pit	Control sediment	Site specific	All	Sediment trap, sediment basin
Diversion	Intercept and divert run-off	Minimum 10 year de-sign Q	1a,2b,3b,4,5,6	Permanent seeding, rock outlet protection, flow spreader, sedi-ment basin
Earth Dike	Control runoff	Drainage area ≤ 10 ac.	1a,1b,1c,2,3,4 ,5,6,	Sediment trap, rock outlet pro-tection, sediment basin
Flow Diffuser	Control runoff	Minimum design Q = 10 yr. 24 hr.	1a,1b,1c,5,6	Seeding, sodding, land grading, diversion
Flow Spreader	Control runoff	Minimum design Q = 10 yr. 24 hr.	1a,1b,1c,5,6	Diversion, grassed waterway, construction ditch
Grade Stabilization Structure	Prevent erosion	Minimum design Q = 10 yr. 24 hr.	1d,1e,5,6	Permanent seeding, rock slope protection, structural stream-bank protection
Grassed Waterway	Convey runoff	Minimum 10 year de-sign Q	2a,3b,5,6	Rock outlet protection, vegetat-ed waterways, sediment basin, flow spreader
Lined Waterway (rock materials)	Convey runoff	Minimum design Q = 10 yr. 24 hr.	1a-c,2,3,4,5,6	Rock outlet protection, subsur-face drain
Paved Flume	Convey runoff	Minimum design Q = 10 yr. 24 hr.	1a,3,4,6	Rock outlet protection
Perimeter Dike/Swale	Divert runoff	Drainage area ≤ 5 Ac.	1a-c,2a,3a,5,6	Sediment trap, flow spreader, check dam, temporary seeding
Pipe Slope Drain	Convey runoff down slope	Drainage area ≤ 3.5 Ac.	1a,1d,5,6	Rock outlet protection
Rock Outlet Protection	Prevent erosion	Rock varies with pipe discharge	All	Diversion, grassed waterway, sediment basin, sediment traps
Storm Drain Diversion	Divert runoff	On-site drainage area > 50% total drainage area	1a,2,3,4,6	Sediment trap/basin
Subsurface Drain	Intercept and convey drainage water	1” Drainage Coefficient	1a,2,3,4,6	Rock outlet protection, land grading, retaining wall
Water Bars	Divert runoff	Slope areas < 100 ft. width	1b,1c,5	Rock outlet protection, flow spreader

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.3
Erosion and Sediment Control Practices Matrix
Erosion Control Part 2 - Soil Stabilization (See Section 4)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Anchored Stabilization Matting	Stabilize soil	Site specific	All, steep slopes	Seeding, topsoiling
Armored Slope and Channel Stabilization	Prevent erosion	Minimum design Q= 10 yr. 24 hr., velocity > 6 feet per second	1d,1e,1f	Live facines, live stakes, retaining walls
Branch Packing	Stabilize soil	Maximum 1.5:1 slopes	1d,5,6	Diversion, subsurface drain, temporary swale
Brush Layer	Stabilize soil	Site specific slopes	1d,1e,3,4,5,6	Rock slope protection, armored streambank protection
Brush Mattress	Stabilize soil	Stream bank slopes	1a, 6	Rock slope protection
Establishing Trees, Shrubs, and Vines	Stabilize soil	Site specific	All	Topsoiling, seeding, fertilizer application
Fertilizer Application	Promote seeding	Site specific	All	Seeding, mulching, topsoiling, land grading
Fiber Roll	Provide growth medium	Site specific	1d,1e,5	Live facines, live stakes
Land Grading	Stabilize soil	Site specific shaping	All	Topsoiling, subsurface drain, seeding
Lime Application	Stabilize soil	Site specific	All	Topsoiling, seeding
Live Crib Wall	Stabilize soil	Site specific	All	Retaining walls
Live Fascines	Stabilize soil	Max. 1.5:1 slope	1a,1d,1e,5,6	Diversion, seeding
Live Stakes	Stabilize soil	Site specific	1d,1e,4,5,6	Armored streambank protection, fiber roll
Loose Stabilization Blankets	Stabilize soil	Site Specific	All	Permanent and temporary seeding, Recreation area
Mulching	Stabilize soil	Site specific	All	Permanent and temporary seeding, Recreation area
Permanent Seeding for Construction Areas	Stabilize soil	Site specific	All	Surface roughening, top soiling, sodding
Recreation Area Seeding	Protect areas/soils	Site specific	All	Permanent seeding, mulching, topsoiling
Retaining Walls	Stabilize soil	Site specific constraints	1a,2,3,4,6	Rock slope protection, permanent seeding, subsurface drain

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.3 (Continued)
Erosion and Sediment Control Practices Matrix
Erosion Control Part 2 - Soil Stabilization (See Section 4)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Soil Restoration	Stabilize soil, promote infiltration	Compacted areas	All	Topsoiling, seeding
Stabilization of Sand and Gravel Pits	Stabilize soil	Site specific	1a,1c,3,4,5,6	Topsoiling, seeding
Stabilization With Sod	Stabilize soil	Need quick cover, aesthetics	2,3,4	Inlet protection, top soiling, permanent seeding
Surface Roughening	Stabilize soil	Construction slopes	All	Temporary seeding, permanent seeding, mulching
Temporary Seeding for Construction Areas	Stabilize soil	Site specific	All	Surface roughening, top soiling, sodding
Topsoiling and Amendments	Enhance growing conditions	Poor site soil characteristics	All	Surface roughening, temporary seeding, permanent seeding
Tree Revetment	Stabilize soil	Site specific	1d,1e	Armored streambank protection
Vegetated Gabions	Stabilize soil	Site specific	1a-e,2,3,4,5,6	Live cribwall, retaining wall
Vegetating Sand Dunes and Tidal Banks	Stabilize sand dunes	Sand dune reinforcement	1e, 2,3,4,5,6	Sediment trap, rock outlet, storm drain inlet protection
Vegetating Waterways	Stabilize soil	Site specific	2a,3b,5,6	Grassed waterways, permanent seeding
* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15				

Table 2.4
Erosion and Sediment Control Practices Matrix
Sediment Control (See Section 5)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Buffer Filter Strip	Filter sediment	Turbid sheet flow	All	Storm drain inlets, water conveyances
Compost Filter Sock	Filter sediment	Turbid sheet flow	All	Storm drain inlets, water conveyances
Dewatering Device	Discharge clean water	Turbidity in sediment basin	All	Sediment basins, sediment traps
Geotextitle Filter Bag	Filter sediment	Small areas, pumped	All	Subsurface drain, dewatering sump pit, buffer filter strip
Portable Sediment Tank	Retain sediment	16 times pump discharge	2a,3a,4	Sediment trap, sediment basin
Rock Dam	Trap sediment	Drainage area ≤ 50 Ac.	1a,1b,1c,2b3b,4,5,6	Rock outlet protection
Sediment Basin	Capture sediment	Drainage area ≤ 50 Ac.	1a,2b,3b,4,5,6	Rock outlet protection, temporary seeding
Sediment Dike	Capture sediment	Small disturbed areas	2a,2b,3a	Buffer filter strip, filter bag
Sediment Trap - Compost Sock	Trap sediment	Drainage area ≤ 5 Ac.	All	Seeding, sodding
Sediment Trap - Pipe Outlet	Trap sediment	Drainage area ≤ 5 Ac.	All	Sediment basin, rock outlet protection
Sediment Trap - Stone Outlet	Trap sediment	Drainage area ≤ 5 Ac.	All	Rock outlet protection
Silt Fence	Control sediment	2:1 slopes maximum, 50 ft. spacing	All	Straw bale dike
Storm Drain Inlet Protection - Excavated	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Fabric	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Inserts	Trap sediment	Drainage area ≤ 1 Ac.	1a,2,3,4,6	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Paved Surface	Trap sediment	Drainage area ≤ 1 Ac.	1a	Sediment traps, storm drain diversion
Storm Drain Inlet Protection - Stone and Block	Trap sediment	Drainage area ≤ 1 Ac.	2,3,4,6	Sediment traps, storm drain diversion
Straw Bale Dike	Control sediment	2:1 slopes maximum, 25 ft. spacing	All	Silt fence

* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15

Table 2.4 (Continued)
Erosion and Sediment Control Practices Matrix
Sediment Control (See Section 5)

Practice	Primary Purpose	Site Characteristics	Construction Activity	Associated Practices
Turbidity Curtain	Control sediment	Calm water	1b,1d,1e,1f,5	Sediment traps, basins, seeding, mulching
Water structures/barriers	Control sediment	Large area for place-ment	1d,1e,1f,5	Armored streambank pro-tection, retaining walls
* See Erosion and Sediment Control Practice Matrix Construction Activity Key on page 2.15				

Table 2.5
Erosion Risk

Soil Type and Parameters	Slope %		
	0-5	5-15	>15
Gravelly, K< 0.35 Non-cohesive PI= NP, Fines: 0-10%	Low	Low	Med
Sandy, K> 0.35 PI= NP, Fines: 0-30%	Med	High	High
Silty, K> 0.35 PI= NP, Fines: 50+%	Med	High	Very High
Clay, K< 0.35 Cohesive PI=7+, Fines: 50+%	Low	Med	High
Dispersive Clay Soils	High	Very High	Extreme

Note: Erosion risk is the probability that the combination of parameters presented will generate a significant amount of soil loss. There are other factors that contribute to erosion, such as slope length and rainfall intensity and duration. Also, even though there may be low erosion risk, there can be a high risk to water quality when the soil disturbance is close to water resources. Each site needs to be evaluated on its own merit to determine actual soil loss. Methodology for this analysis is presented in Appendix A.

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION

Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT

Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR PROTECTING VEGETATION DURING CONSTRUCTION

Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

   A. Inventory:

      1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

      2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

   B. Planning:

      1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See "Determine Limits of Clearing and Grading" on page 2.2).

      2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

      3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

      4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

      5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

      6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

   A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

   B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

   C. Trenching across tree root systems should be the same minimum distance from the trunk, as in "B". Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

   D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable

vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the “Susceptibility of Tree Species to Compaction.”

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

Table 2.6
Susceptibility of Tree Species to Compaction[1]

Resistant:

Box elder……	*Acer negundo*	Willows……	*Salix spp.*
Green ash……..	*Fraxinus pennsylvanica*	Honey locust……	*Gleditsia triacanthos*
Red elm……..	*Ulmus rubra*	Eastern cottonwood…….	*Populus deltoides*
Hawthornes……	*Crataegus spp.*	Swamp white oak…….	*Quercus bicolor*
Bur oak……..	*Quercus macrocarpa*	Hophornbeam……	*Ostrya virginiana*
Northern white cedar….	*Thuja occidentalis*		

Intermediate:

Red maple…….	*Acer rubrum*	Sweetgum…….	*Liquidambar styraciflua*
Silver maple……..	*Acer saccharinum*	Norway maple…….	*Acer platanoides*
Hackberry…….	*Celtis occidentalis*	Shagbark hickory…….	*Carya ovata*
Black gum……	*Nyssa sylvatica*	London plane……..	*Platanus x hybrida*
Red oak……	*Quercus rubra*	Pin oak…….	*Quercus palustris*
Basswood…….	*Tilia americana*		

Susceptible:

Sugar maple…….	*Acer saccharum*	Austrian Pine……	*Pinus nigra*
White pine……	*Pinus strobus*	White ash…….	*Fraxinus americana*
Blue spruce……..	*Picea pungens*	Paper birch……..	*Betula papyrifera*
White oak……	*Quercus alba*	Moutain ash…….	*Sorbus aucuparia*
Red pine……..	*Pinus resinosa*	Japanese maple……	*Acer palmatum*

[1] If a tree species does not appear on the list, insufficient information is available to rate it for this purpose.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION

Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS

Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

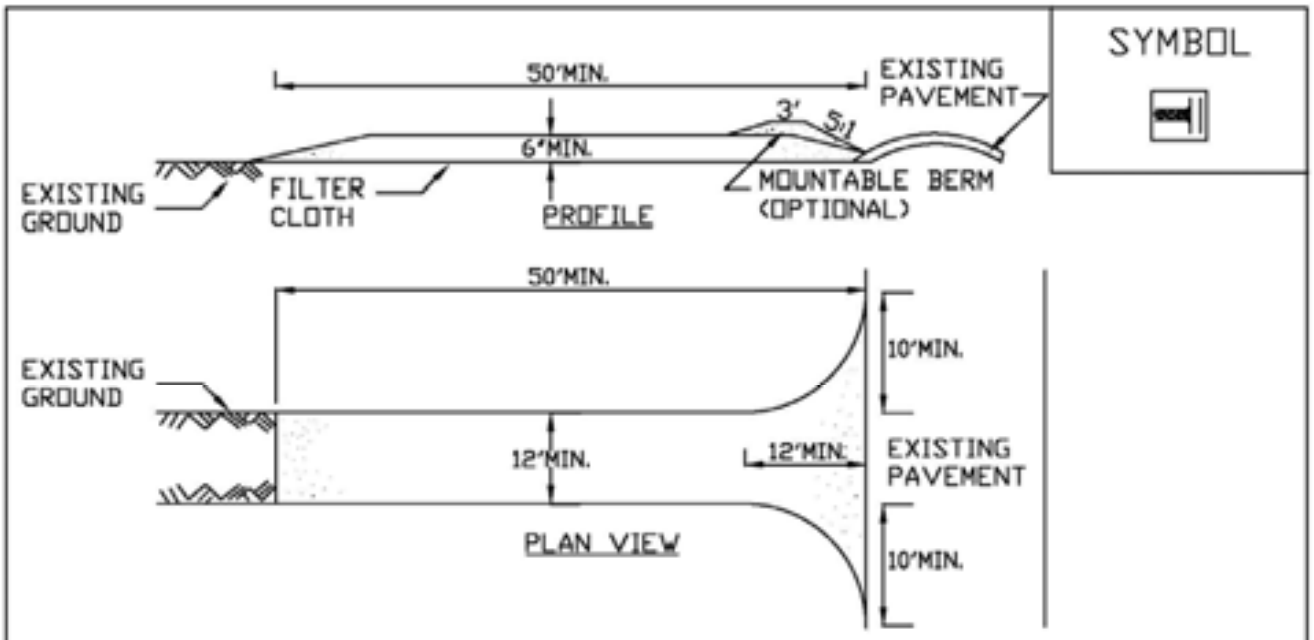
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING

Definition & Scope

A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Consideration should be given to stream flow capacity and velocity anticipated during the period of time that the temporary structures will be in place. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of the temporary access waterway crossing is to provide safe, environmentally sound access across a waterway for construction equipment by establishing minimum standards and specifications for the design, construction, maintenance, and removal of the structure. This standard and specification may represent a channel constriction, thus, the temporary nature of waterway access crossing must be stressed. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

Conditions Where Practice Applies

This standard and specification for temporary access waterway crossings is applicable in non-tidal waterways. It provides designs based on waterway geometry rather than the drainage area contributing to the point of crossing.

The principal consideration for development of the standard and specifications is concern for erosion and sediment control, tracking soil into waterways, blocking fish passage and destruction of aquatic habitat. Structural utility and safety must also be considered when designing temporary access waterway crossings to withstand expected loads.

The three types of standard temporary access waterway crossings are bridges, culverts, and fords.

General Requirements

1. In-Stream Excavation: In-Stream excavation shall be limited to only that necessary to allow installation of the standard methods as presented in Subsection "Temporary Access Waterway Crossing Methods."

2. Elimination of Fish Migration Barriers: Of the two basic methods presented in Subsection "Temporary Access Waterway Crossing Methods," bridges pose the least potential for creating barriers to aquatic migration. The construction of any specific crossing method as presented in Subsection "Temporary Access Waterway Crossing Methods," shall not cause a significant water level difference between the upstream and downstream water surface elevations. Fish spawning or migration within waterways generally occurs between October 1 to May 31 for water classified for trout and from March 15 to July 15 for other streams. Fish spawning or migration dates can vary across New York and restrictions imposed by the NYS Department of Environmental Conservation may vary and must be checked.

3. Crossing Alignment: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. Road Approaches: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. Surface Water Diverting Structure: A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the "Standard and Specification" for

the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

6. Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Time of Operation: All temporary crossing shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained, all structures shall be removed within one year from the date of the installation.

8. Materials

A. Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. NYS DOT specifications for coarse aggregate designation No. 4 (2" to 4"), also referenced as AASHTO designation No. 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.

B. Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil. The designer shall specify the appropriate filter fabric/cloth for a specific use.

Temporary Access Waterway Crossing Methods

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access waterway crossing standard method:

1. Site aesthetics: Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Site location: Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

3. Physical site constraints: The physical constraints of a site may preclude the selection of one or more of the standard methods.

4. Time of year: The time of year may preclude the selection of one or more of the standard methods due to fish spawning or migration restrictions.

5. Vehicular loads and traffic patterns: Vehicular loads, traffic patterns, and frequency of crossing should be considered in choosing a specific method.

6. Maintenance of crossing: The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require more intensive maintenance.

7. Removal of the Structure: Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard method.

Temporary Access Bridge (Figure 2.2 on page 2.36)

A temporary access bridge is a structure made of wood, metal, or other materials, which provides access across a stream or waterway.

Considerations:

1. This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings.

4. Span width will be limited by the length of the bridging material and weight of equipment that will drive over the temporary bridge. Spans of over 10 feet are difficult to construct.

5. Restrictions and Permits: A permit from the New York State Department of Environmental Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

Construction Specifications:

1. Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions if construction, use, or

removal does not disturb the stream or its banks.

2. Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments: Abutments shall be placed parallel to and on stable banks.

4. Bridge Span: Bridges shall be constructed to span the entire channel. If a footing, pier, or bridge support is constructed within the waterway, a stream- disturbance permit may be required.

5. Stringers: Stringers shall either be logs, saw timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Deck Material: Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or Fenders: Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

9. Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specification for Temporary Construction Area Seeding on page 4.58.

Bridge Maintenance Requirements

1. Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

2. Maintenance: Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal and Clean-Up Requirements

1. Removal: When the temporary bridge is no longer needed, all structures including abutments and other bridging materials shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within one year of installation.

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Method: Removal of the bridge and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Temporary Access Culvert (Figure 2.3 on page 2.37)

A temporary access culvert is a structure consisting of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate, which is used to convey flowing water through the crossing.

Considerations

1. Temporary culverts are used where a) the channel is too wide for normal bridge construction, b) anticipated loading may prove unsafe for single span bridges, or c) access is not needed from bank to bank.

2. This temporary waterway crossing method is normally preferred over a ford type of crossing, since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Construction Specifications

1. Restrictions and Permits: A permit from the New York State Department of Environmental

Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

2. Culvert Strength: All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size: The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is 12-inch diameter pipe.

4. Culvert Length: The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth: Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement: The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection: The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 in. of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in the General Requirements subsection.

8. Stabilization: All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

Culvert Maintenance Requirements

1. Inspection: Periodic inspection shall be performed to ensure that the culverts, streambed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance: Maintenance shall be performed, as needed in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway flood plain.

Culvert Removal and Clean-Up Requirements

1. Removal: When the crossing has served its purpose, all structures, including culverts, bedding, and filter cloth materials shall be removed within 14 calendar days. In all cases, the culvert materials shall
be removed within one year of installation. No structure shall be removed during the spawning season (generally October 1 through May 31 for trout waters and March 15 through July 15 for other waters).

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section, and protection of the streambanks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Method: Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

NOTE: Any temporary access crossing shall conform to the technical requirements of this Standard and Specifications as well as any specific requirement imposed by the New York State Department of Environmental Conservation and the US Army Corps of Engineers. Permits may be required for streambank disturbance.

Figure 2.2
Temporary Access Bridge

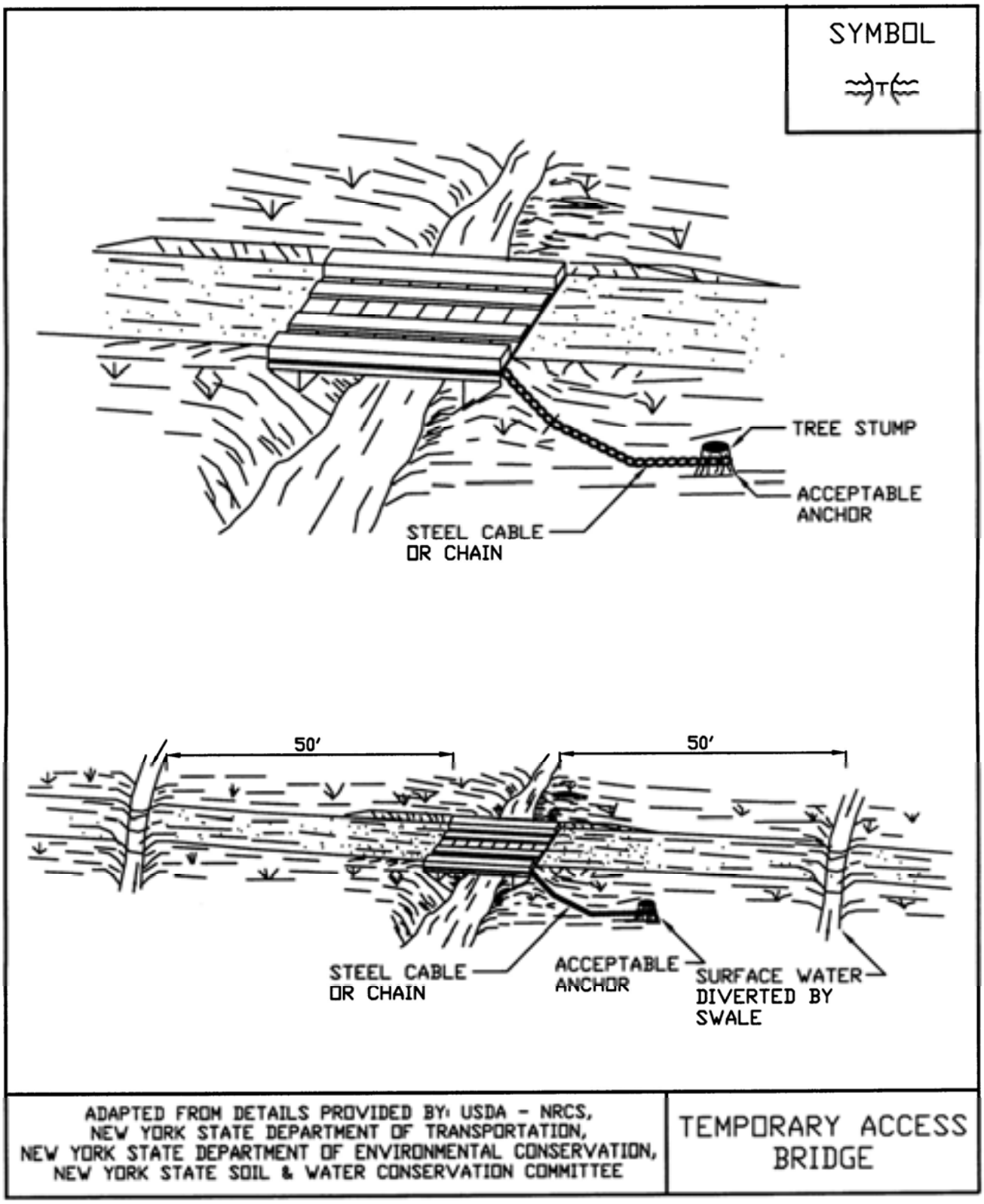
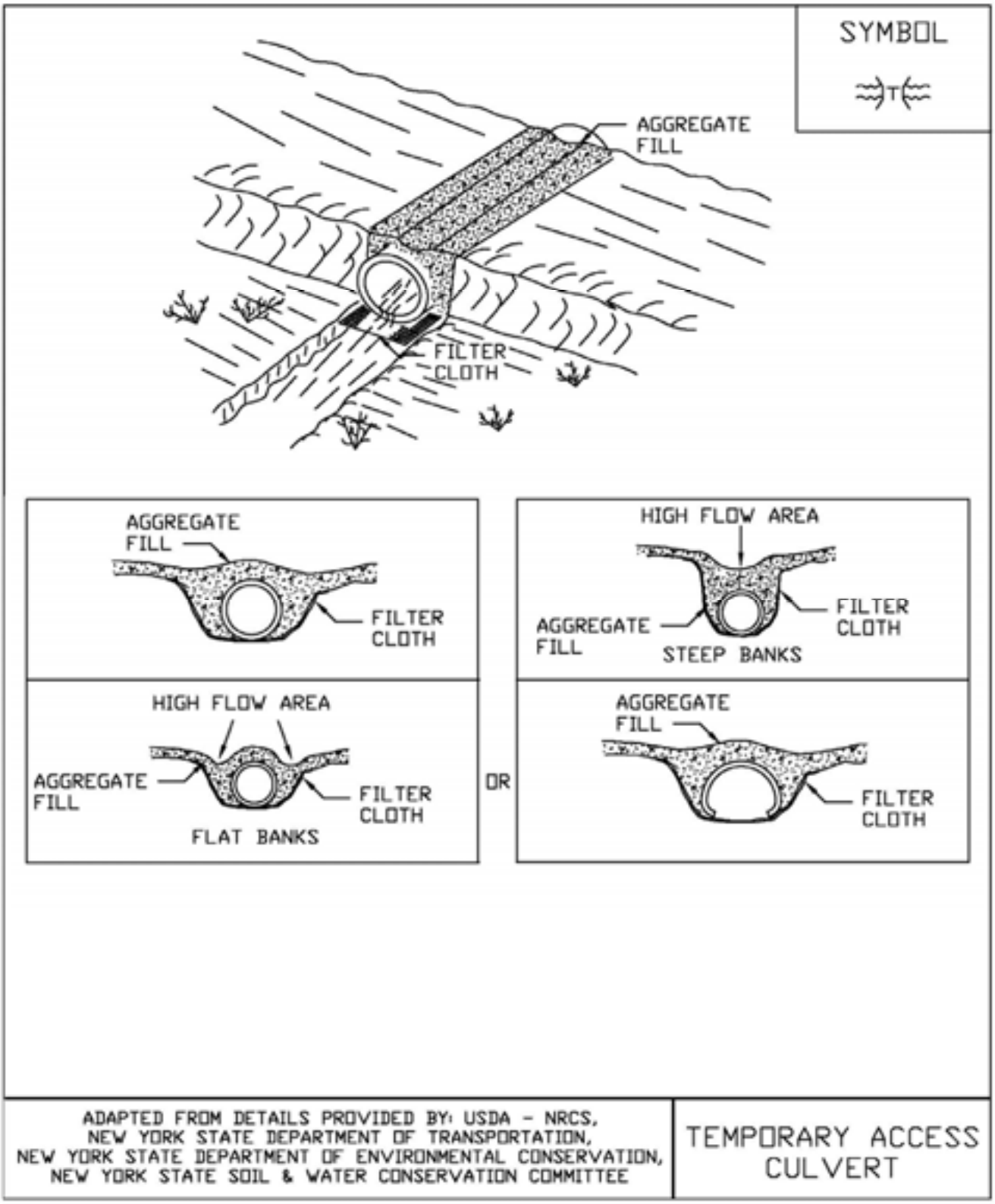


Figure 2.3
Temporary Access Culvert



STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

References

1. Northeastern Illinois Soil and Sedimentation Control Steering Committee. October 1981. Procedures and Standards for Urban Soil Erosion and Sediment Control in Illinois.
2. J.F. Rushing, V.M. Moore, J.S. Tingle, Q. Mason, and T. McCaffery, 2005. Dust Abatement Methods for Lines of Communication and Base Camps in Temperate Climates. ERDC/GSL TR-05-23, October 2005.