SECTION 2 - RESOURCE PLANNING IN URBAN AREAS

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RESOURCE PLANNING IN URBAN AREAS

Resource Planning

Effective solutions to urban erosion and sediment problems begin with planning. Resource plans can guide and control urban growth preventing wasteful and haphazard developments.

Districts and the NRCS have technical resource data and information that can serve as a basis for decision making by local authorities to fulfill the objectives established by plans. These objectives may include reserving best agricultural areas for cropland; maintaining an economic agricultural use; protecting historical, scenic and natural beauty areas; providing for open spaces and parks; developing attractive residential, institutional and industrial areas; and using floodplains and other problem areas for recreation buffer zones and conservation education uses.

Land Development Plans

As more specific plans, such as plans for subdivisions, are developed for smaller areas, NRCS can furnish more detailed information and interpretations. This information will help determine the suitability of the site for the kind of development to be made. It will also help in planning and treating these lands to greatly reduce erosion and sediment problems during construction.

Certain basic data need to be assembled before adequate technical information and interpretations can be provided for a subdivision or other type of specific plan. These data consist primarily of:

1. Geography of the Area to be Developed

   Conditions of proposed areas to be developed need to be examined early in the planning stages. These conditions include location, accessibility, present land use, size of proposed tract, topography, drainage pattern, geology, hydrology, soils, vegetation and climate. Such information is obtained from on-site examinations and existing technical reports, maps, records and other documented material usually available from local sources.

2. Study of Soils in the Area to be Developed

   Soils information, interpretations and data are basic to urban land uses. These studies provide an understanding of the capabilities and general limitations of the site. They point out the feasibility of planned land uses, economic considerations and conservation requirements of the site.

   Soils information such as detailed soil maps and interpretation sheets may be available in local NRCS and Soil and Water Conservation District offices and will specifically provide the following soils information:

   A. descriptions, erodibility, limitations and capabilities;

   B. engineering properties of soils;

   C. suitability of the soil as a resource material for topsoil, gravel, sand highways, dams and levees;

   D. site suitability for buildings, roads, winter grading, foundations, septic tank disposal fields, sanitary land fills, vegetation, reservoirs, dams, artificial drainage, recreational areas and wildlife development. Generalized soils information, also useful for some purposes, is usually available in NRCS and SWCD offices.

Erosion and Sediment Control Plan

An erosion and sediment control plan should be prepared for all land development and construction activities when it is determined that soil erosion and sedimentation, if not controlled, may have a significant affect on the environment. Appendix A, New York State Department of Environmental Conservation TOGS 5.1.10 provides guidance for initiating erosion and sediment control plans.

In accordance with the New York State SPDES Permit a plan must be prepared for any construction activity that exceeds five acres in size. Appendix G contains a copy of the EPA approved permit.

A great deal of information must be assimilated to develop an efficient plan to minimize erosion and control sedimentation at a construction site. An erosion and sediment control plan shows the site's existing topography, and how and when it will be altered. It also shows the erosion and sediment control measures that will be used to minimize the risk of sediment pollution, and how and when they will be implemented and maintained. The coordination of erosion and sediment control practices with construction activities is explained on the plan by a phasing schedule.

The Planning Process

The following procedure is recommended to develop a plan that will efficiently control erosion and sedimentation throughout the site development process.

1. Plan the Development to Fit the Site

   Assess the physical characteristics of the site to determine how it can be developed with the smallest risk of environmental damage. Minimize grading by utilizing the existing topography wherever possible. Avoid disturbing wetlands or other environmentally sensitive ar-

eas. Minimize offsite impacts by maintaining vegetative buffer strips between disturbed and adjacent areas.

2. 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 borders) which must be disturbed. Staged clearing and grading should be considered as an alternative to massive clearing and grading.

3. Divide the Site into Natural Drainage Areas

Determine how runoff will drain from the site. Consider how erosion and sedimentation can be controlled in each small drainage area before looking at the entire site. Remember, it is more advantageous to control erosion at the source and prevent any problems than to design perimeter controls to trap sediment.

4. Select Erosion and Sediment Control Practices

Erosion and sediment control practices can be divided into vegetative and structural controls. This handbook should be used for the selection and design of vegetative and structural practices. Vegetative and structural controls are 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 should be used on areas which will be exposed for long periods of time prior to construction. Permanent stabilization should be performed as soon as possible after completion of grading. Erosion and sediment control plans must contain provisions for permanent stabilization of disturbed areas. Seed type, soil amendments, seedbed preparation, and mulching should be described on the plans. Selection of permanent vegetation should 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 sediment control practices may be necessary when disturbed areas cannot be promptly stabilized with vegetation. Structural practices shall be constructed and maintained in accordance with these guideline standards and specifications.

An acceptable erosion and sediment control plan includes:

1) a map of the existing topography and proposed grading;
2) provisions for erosion and sediment control;
3) a time schedule of proposed construction activity and erosion and sediment control implementation; and
4) maintenance phasing.

Standard symbols are used to facilitate the understanding and review of plans. The symbols, Figure 4.1 on page 4.3, are designed to be easy to apply to plans by drafting or by using stick on materials. They should be bold and easily discernible on the plans. The following scales are recommended for use on erosion and sediment control plans because they facilitate the plan review process: 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in. = 50 ft.

The contour interval for these plans shall be two feet or less. Other scales or contour intervals may be favored for special types of land disturbance projects. For example, strip mine plans are often drawn to scales of 1 in. = 200 ft. or 1 in. = 500 ft. with contour intervals of 5 to 20 feet. Consult the appropriate plan review agency prior to finalizing the selection of plan scale. A sample checklist is contained in the appendix.

Implementation of Erosion and Sediment Controls

Effective implementation of erosion and sediment controls requires good construction management. Proper management can reduce the need for maintenance of structural controls, regrading of severely eroded areas, and reconstruction of controls that were improperly implemented. Good site management results in efficient use of manpower and financial savings.

Site management for effective implementation of erosion and sediment controls involves the following:

1. Clear only what is required for immediate construction activity. Large projects should be cleared and graded as construction progresses. Mass clearing and grading of the entire site should be avoided.

   Restabilize disturbed areas as soon as possible after construction is completed. Certain sections of large construction projects may be completed before others and be ready for stabilization before the total project is completed. Waiting until the end of the project to commence all site stabilization may leave areas exposed for an unnecessarily long duration.

2. Divert offsite runoff from highly erodible soils and steep slopes and convey to stable areas.

3. Physically mark off limits of land disturbance on the site with tape, signs, or other methods, so the workers can see areas to be protected.

4. Make sure that all workers understand the major provisions of the erosion and sediment control plan.
5. Designate responsibility for implementing the erosion and sediment control plan to one individual.
6. Implement a daily inspection program to determine when erosion and sediment control measures need maintenance or repair. Pay particular attention to the inspection following rainfall events.

Predicting Soil Losses

Estimates of soil losses can be made for construction sites by using the Universal Soil Loss Equation. This equation uses site specific rainfall intensity or erosion index, soil erodibility, and slope factors in calculating the estimated soil loss. The equation is used to determine sheet and rill erosion losses on the site.

Predictions of soil losses in areas to be developed is directly related to resource planning. The predictions will influence the degree of planning and treatment required for proper control of erosion and sediment. Predicted soil losses may also create an awareness among developers, local government agencies and others of the urgent need to install conservation measures before or concurrent with construction.

Soil losses on a construction site may be predicted for a whole year, a part of a year or on the basis of "probability" storms and magnitudes of single storms. (Refer to Chapter 8 for instructions and examples on how the Universal Soil Loss Equation is used for this purpose.)

Estimating Sediment Yield

Sediment yield involves both soil erosion on the site and the transport mechanism acting to carry the eroded material off the site.

Where sediment yields from a developing area are needed for estimating sediment basin design volumes, the methods in Appendix B can be used for determining the amount of the eroded material that will leave the site as sediment.

Planning Assistance

Planning assistance may be available from the county Soil and Water Conservation District.

Based upon data and information described above, planning assistance during the development of a plan may include the following considerations:

1. 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. Construction plans for public utilities should include steps needed to reduce sediment producing hazards when pipelines, electric transmission and telephone lines are installed.
3. 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 damages that may occur from nearby construction. Selections of such areas should be based upon soils, vegetation, water, topography, accessibility, wildlife, and aesthetic values.
4. Integrated surface and storm drainage systems are essential parts of any planned development. The plan should clearly specify: location and capacities of diversions and debris basins; paved or other types of lined chutes, outlets and waterways; drop inlets; open or closed drains; stream channel protection and bank erosion structures.
5. Stabilizing land with plant materials or mulches should be part of a planned development. Retention of existing natural vegetation in strategic areas is beneficial and desirable.
6. Installation of the control measures before or as soon as possible during construction will greatly reduce erosion and sediment damages.
7. Temporary and/or permanent erosion control measures may be needed. They should also be installed as soon as possible. Provisions for maintenance of these measures should be part of the plan and enforced.

Erosion and Sediment Control Ordinances and Subdivision Regulations

Local ordinances or regulations dealing with erosion and sediment controls enhance and implement resource planning and development in areas that are to be urbanized. The NRCS does not, in any way, participate in the enactment or enforcement of ordinances. This is strictly the responsibility of authorized government agencies and officials. At the request of local Districts, the NRCS can furnish any available technical information or data that may be useful to authorized local government agencies when preparing to formulate ordinances or regulations.

STEPS IN THE SELECTION OF CONTROL MEASURES

Step 1: Identify Control Method - On any construction site the objective in erosion and sediment control is to prevent off-site sedimentation damage. Three basic methods are used to control erosion on construction sites: runoff control, soil stabilization, and sediment control. Controlling erosion should be the first line of defense. Where soil properties and topography of the site make the design of sediment trapping facilities impractical, runoff control and soil stabilization should be used. Controlling erosion is very effective for small disturbed areas such as single lots or small areas of a development that do not drain to a sediment trapping facility.

Sediment trapping facilities should be used on large developments where mass grading is planned, where it is impossible or impractical to control erosion, and where sediment particles are relatively large. A minimum of cost for erosion and sediment control is usually accomplished by using a combination of vegetative and structural erosion control and sedimentation control measures.

Step 2: Identify Problem Areas - Once a method of control is selected, potential erosion and sediment control problem areas are identified. Areas where erosion is to be controlled will usually fall into categories of slopes, graded areas or drainage ways. Slopes include graded rights-of-way, stockpile areas, and all cut or fill slopes. Graded areas include all stripped areas other than slopes. Drainage ways are areas where concentrations of water flow naturally or artificially, and the potential for gully erosion is high. Problem areas where sediment is to be controlled fall into categories of large or small drainage areas. Small areas are usually 1 acre or less while large areas are larger than 1 acre.

Step 3: Identify Required Strategy - The third step in erosion and sediment control planning is to follow the planning matrix from the problem area to the strategy that can be taken to solve the problem. Strategies can be used individually or in combination. For example, if there is a cut slope to be protected from erosion, the strategies may be to protect the ground surface, divert water from the slope or shorten it. Any combination of the above can be used. If no rainfall except that which falls on the slope has the potential to cause erosion and if the slope is relatively short, protecting the soil surface is often all that is required to solve the problem.

Step 4: Identify Control Measure Group - Once required strategies are identified, the planning matrix leads to the group or groups of control measures that will accomplish one strategy. Control measures within each group have similar purpose, scope, application, design, criteria, standard plans, and construction specifications. Therefore, any measure within a group will solve the problem in question.

Step 5: Select Specific Control Measure - The final step in erosion and sediment control planning can be accomplished by completing final design. This involves adaptation of any control measure within a group to solve the specific erosion and sediment control problem. From descriptions given to the right of each control measure, the one measure which is most economical, practical, efficient, and adaptable to the site can be chosen.

Once the specific control measure has been selected, the plan key symbol given in the matrix can be placed on the erosion and sediment control site plan to show where control measures will be used. Standardized design, plan, and construction specification sheets can then be completed for each control measure. This completes the planning for sedimentation control and soil erosion as part of the total natural resource plan.

Figure 2.1
Planning Flow Chart - Runoff Control

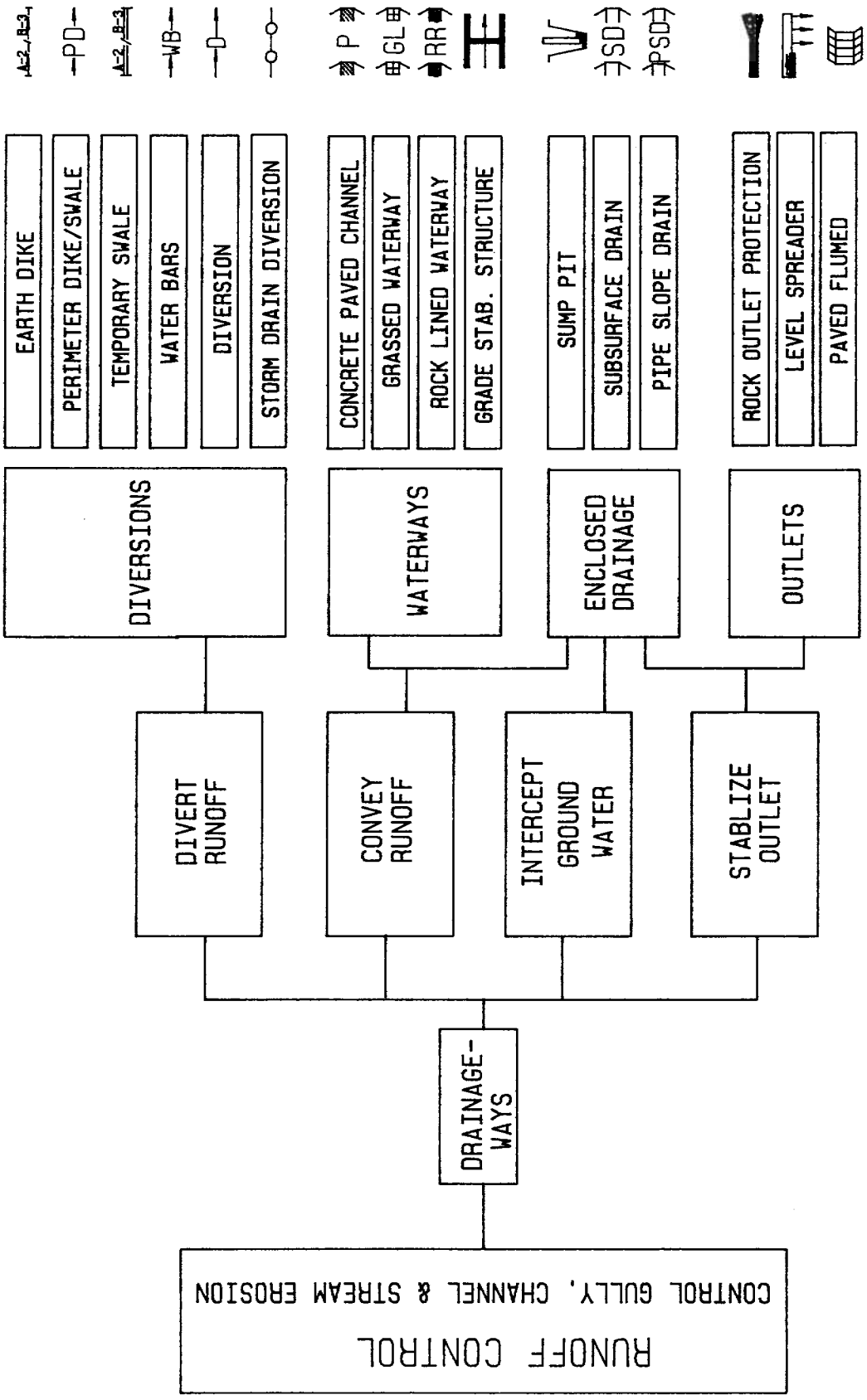

Figure 2.2
Planning Flow Chart - Soil Stabilization

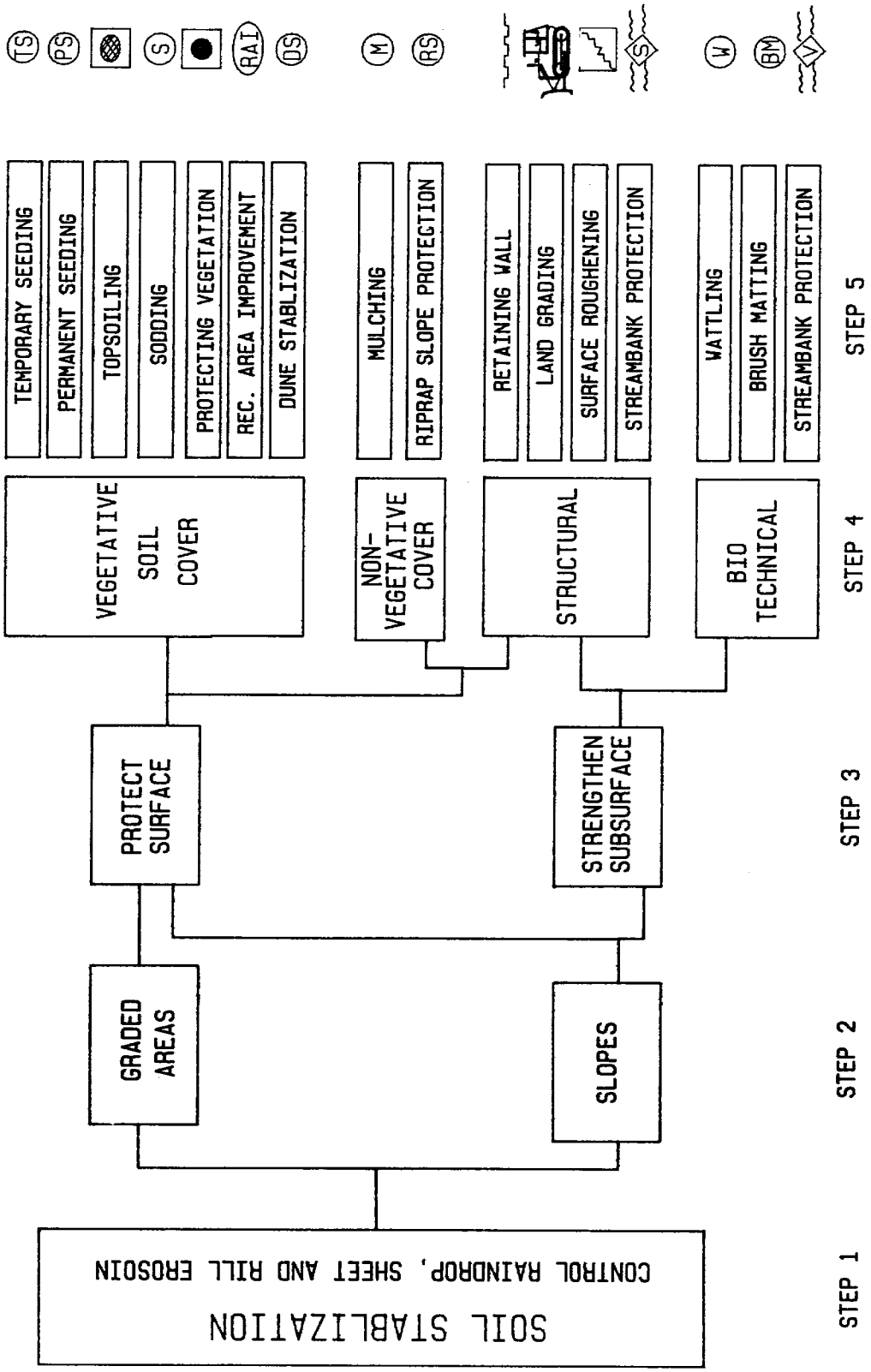

Figure 2.3
Planning Flow Chart - Sediment Control

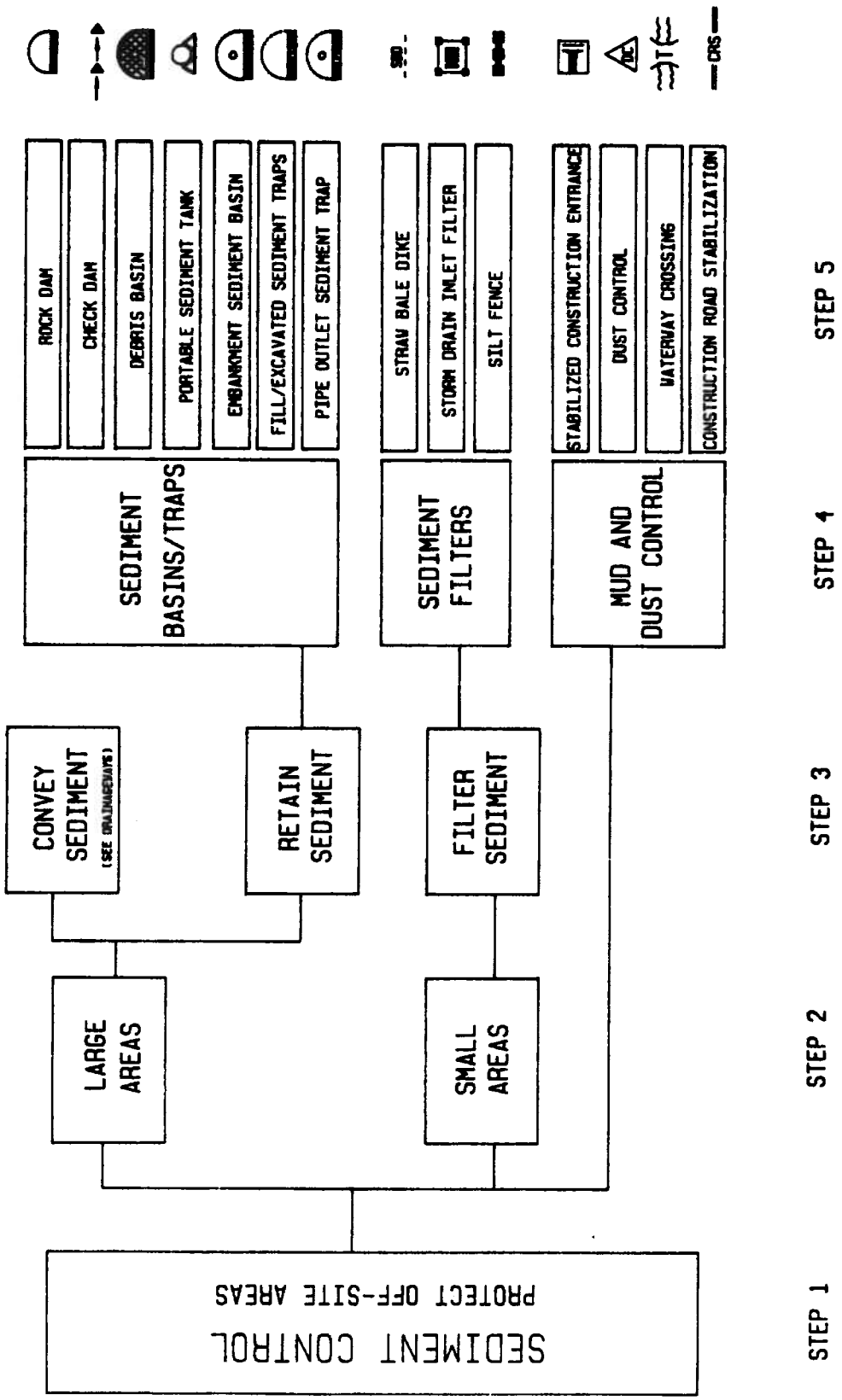

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Table 2.1
Erosion and Sediment Control Matrix

Practice	Primary Purpose	Site Characteristics	Estimated Design Life	Associated Practices
Brush Matting	Stabilize soil; prevent erosion	Streambank slopes	5-10 years	Rock slope protection, structural streambank protection, subsurface drain
Check Dam	Control sediment/ runoff	Drainage area ≤ 2 Ac.	1 year	Lined waterway, rock outlet protection
Construction Road Stabilization	Control sediment	All construction routes	2 years	Dust control, temporary swales, temporary or permanent seeding.
Debris Basin	Capture sediment	Maximum drainage area = 200 acres	Up to 25 years	Sediment basin
Diversion	Intercept and divert runoff	Minimum 10 yr. Design Q	10-25 years	Permanent seeding, rock outlet protection, level spreader, sediment basin
Dune Stabilization	Stabilize sand dunes	Sand dune reinforcement	5-10 years	—
Dust Control	Stabilize soil	Access points, construction roads	Site specific	Stabilized construction entrance, contruction road stabilization
Earth Dike	Control runoff	DA ≤10 Acres	1 year	Sediment trap, rock outlet protection, storm drain inlet
Grade Stabilization Structure	Prevent erosion	Minimum Design Q = 10 yr.; 24 hr.	10+ years	Permanent seeding, rock slope protection, structural streambank protection
Grassed Waterway	Convey runoff	Minimum 10 yr. Design Q	Min. 10 years	Rock outlet protection, vegetated waterways, sediment basin, level spreader
Land Grading	Stabilize soil	Site specific shaping	Permanent	Topsoiling, subsurface drain, seeding
Level Spreader	Discharge runoff	10 year Q ≤30 cfs; outlet <10%	1 year	Diversion, grassed waterway, temporary swales
Lined Waterway, (rock materials)	Convey runoff	Minimum design Q = 10 yr. 24 hr.	Min. 10 years	Rock outlet protection, subsurface drain

Table 2.1 (cont'd)
Erosion and Sediment Control Matrix

Practice	Primary Purpose	Site Characteristics	Estimated Design Life	Associated Practices
Mulching	Stabilize soil	Site specific	1-2 years	Permanent seeding, Recreation area improvement
Paved Channel, (concrete)	Convey runoff	Minimum design Q = 10 yr. 24 hr.	Min. 10 years	Rock outlet protection, subsurface drain
Paved Flume	Convey runoff	Minimum design Q = 10 yr. 24 hr.	10 years	Rock outlet protection
Perimeter Dike/Swale	Divert runoff	Drainage area ≤5 Ac.	1 year	Sediment trap, level spreader, temporary seeding
Pipe Slope Drain	Convey runoff downslope	Drainage area ≤5 Ac.	1 year	Rock outlet protection
Portable Sediment Tank	Retain sediment	16 times pump discharge	2 years	Sediment trap, sediment basin
Protecting Vegetation	Preserve existing vegetation	Site specific	1-10 years	Recreation area improvement
Recreation Area Improvement	Protect areas/soils	Site specific	Permanent	Permanent seeding, mulching, topsoiling
Retaining Wall	Stabilize soil	Site specific constraints	10+ years	Rock slope protection, permanent seeding, subsurface drain
Riprap Slope Protection	Stabilize soil, Prevent erosion	Max. 1:5 to 1 slope	10 years	Lined waterway, rock outlet stabilization, structural streambank protection
Rock Dam	Capture sediment	Drainage Area ≤50 Ac.	3 years	Debris basin, sediment basin
Rock Outlet Protection	Prevent erosion	Rock varies with pipe discharge	10+ years	Diversion, grassed waterway, sediment basin, sediment traps
Sediment Basin	Capture sediment	Drainage Area ≤100 Ac.	3 years	Rock outlet protection, temporary seeding
Sediment Traps				
I. Pipe Outlet	Trap Sediment	Drainage Area ≤5 Ac.	2 years	Sediment basin, debris basin
II. Grass Outlet	Trap Sediment	Drainage area ≤5 Ac.	1 year	Rock outlet protection

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Table 2.1 (cont'd) Erosion and Sediment Control Matrix

Practice	Primary Purpose	Site Characteristics	Estimated Design Life	Associated Practices
III. Storm Inlet	Trap Sediment	Drainage area ≤3 Ac.	1 year	Rock outlet protection
IV. Swale	Trap Sediment	Drainage area ≤2 Ac.	1 year	Rock outlet protection
V. Stone Outlet	Trap Sediment	Drainage area ≤5 Ac.	2 years	Rock outlet protection
VI. Riprap Outlet	Trap Sediment	Drainage area ≤15 Ac.	2 years	Rock outlet protection
Seeding, Temporary	Stabilize soil	Site specific	1-2 years	Surface roughening, topsoiling, sodding
Seeding, Permanent	Stabilize soil	Site specific	Permanent	Surface roughening, topsoiling, sodding
Silt Fence	Control sediment	2:1 slopes maximum 50 ft. spacing	1 year	Strawbale dike
Sodding	Stabilize soil	Need quick cover, aesthetics	Permanent	Inlet protection, topsoiling, permanent seeding
Stabilized Construction Entrance	Control sediment	Access points	2 years	Filter fence, construction road stabilization
Storm Drain Inlet Protection				
I. Excavated	Trap Sediment	Drainage area ≤1 Ac.	1 year	Sediment traps, storm drain diversion
II. Filter Fabric	Trap Sediment	Drainage area ≤1 Ac.	6 months	Sediment traps, storm drain diversion
III. Stone and Block	Trap Sediment	Drainage area ≤1 Ac.	6 months	Sediment traps, storm drain diversion
IV. Curb	Trap Sediment	Drainage area ≤1 Ac.	6 months	Sediment traps, storm drain diversion
Straw Bale Dike	Control sediment	2:1 slopes maximum 25 ft. spacing	3 months	Silt fence
Streambank Protection				
I. Structural	Prevent erosion	Minimum 10 yr. design Q; velocity >6 fps	10 years	Rock slope protection

Table 2.1 (cont'd)
Erosion and Sediment Control Matrix

Practice	Primary Purpose	Site Characteristics	Estimated Design Life	Associated Practices
II. Vegetative	Prevent erosion	Minimum 10 yr. design Q; velocity <6 fps	10 years	Structural streambank protection
Subsurface Drain	Intercept and convey drainage water	Drainage Coefficient - 1"	10 years	Rock outlet protection, land grading retaining wall
Sump Pit	Control sediment	Site specific	6 months	Sediment trap, sediment basin
Surface Roughening	Stabilize soil	Construction slopes	Permanent	Temporary seeding, perm. seeding, mulching
Temporary Access Waterway Crossings				
Temporary Access Bridge	Prevent sediment	8 ft. centerline piers	2 years	Rock slope protection
Temporary Access Culvert	Prevent sediment	Minimum 12 in.; 40 ft. length	2 years	Structural streambank protection
Temporary Access Road	Prevent sediment	Streambanks <4 ft.	1 year	Structural streambank protection
Temporary Storm Drain Diversion	Divert runoff	On site drainage area >50% total	1 year	Sediment trap/basin
Temporary Swale	Divert runoff	Drainage area ≤10 acres	1 year	Sediment traps, storm drain inlets, sediment basin, level spreader
Topsoiling	Provide growing conditions	Poor site soil characteristics	Permanent	Surface roughening, temporary seeding, permanent seeding
Turbidity Curtain	Control Sediment	Calm Water	Generally <1 month	Sediment traps, basins
Vegetating Waterways	Stabilize soil	Site specific	Permanent	Grassed waterways, permanent seeding
Water Bars	Divert runoff	Slope areas <100 ft. width	2 years	Rock outlet protection, level spreader
Wattling	Stabilize soil	Maximum 1.5:1 slopes	10 years	Diversion, subsurface drain, temporary swale

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References

1. Northeastern Illinois Soil and Sedimentation Control Steering Committee. October 1981. Procedures and Standards for Urban Soil Erosion and Sediment Control in Illinois.