

**ENGINEERING STANDARDS FOR PUBLIC WORKS
CONSTRUCTION**



VOLUME 3

**EROSION CONTROL PLANS
TECHNICAL GUIDANCE HANDBOOK**

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TECHNICAL GUIDANCE HANDBOOK

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EROSION CONTROL PLANS TECHNICAL GUIDANCE HANDBOOK

1.0 Introduction

Each year tons of sediment are washed and blown from construction sites into local streams, rivers and lakes. It is a major source of pollution to these water bodies. Eroded materials also clog streets, storm drains, culverts and stream channels and cause private property damage. The degradation of wildlife habitat and water quality and the burden placed on taxpayers for cleanup could be largely avoided through implementation of adequate erosion control practices.

The City of Ridgefield is committed to protecting the environment and public and private property. This handbook introduces plan submittal requirements and recommended measures for construction site erosion control. All construction activities, public and private, which involve disturbance of the land surface are covered by the requirements in this handbook.

Erosion control measures are required for construction areas where the ground surface will be disturbed with clearing, grading fills, excavations and other construction activities. Failure to implement adequate erosion control measures may result in fines and/or a stop work order.

An important concept to keep in mind when developing construction and erosion control plans is: construction practices which minimize the amount of disturbed land area and avoid or minimize work on steep slopes are encouraged. Such practices can provide the following positive results:

- Less chance of soil washing off the site and clogging streets, drainage systems, and neighbor's yards.
- The number and size of erosion control measures required will be minimized.
- The costs of maintaining erosion control facilities are minimized.
- As much top soil as possible is retained on the site, making revegetation and landscaping easier to establish.

2.0 Erosion Control Plan Submittal Requirements

Planning considerations and submittal requirements for erosion control plans for various types of construction projects are presented below. Full details of construction project erosion control requirements, submittal requirements, and review/enforcement procedures are outlined in the City of Ridgefield Engineering Standards for Public Works Construction.

Approval of a construction erosion control plan by the City does not relieve the applicant's responsibility to ensure that erosion control measures are constructed and maintained to contain sediment on the construction site.

2.1 Considerations in Planning for Erosion Control

Following are recommended steps and check lists to use in the development and implementation of an acceptable erosion control plan. This information will provide the necessary tools to gain jurisdictional approval of construction activities for all types of construction sites and developments.

STEP 1: Identify Site Characteristics:

EXISTING:

- topography/contours
- existing drainage patterns and existing drainage systems on and immediately up and downstream of site
- site soils, as necessary
- wetlands and sensitive areas, creeks, and other identified areas of concern

FUTURE:

- future site contours
- future site drainage system type and location
- future impervious areas

STEP 2: Lay Out Preconstruction Plan and Proposed Base Measures:

- determine construction timing and sequence
- establish primary site access point(s) for construction traffic
- lay out limits of clearing and construction activities
- establish base protection measures including sediment barriers at toe of disturbed area and stabilized construction entrances
- establish maintenance procedures for erosion control measures

STEP 3: Measures During Construction:

- continue establishment of site interior base measures as site clearing and other site disturbances occur, including stockpile protection and sediment filters along slope contours
- determine if construction may occur during wet season (November 1 through April 30)
- establish and schedule wet weather measures including cover measures over exposed soils
- establish maintenance procedures for erosion control measures

STEP 4: Post Construction Measures

- establish stabilized cover or other measures before removing base erosion control measures and as by approved by permitting agency

2.2 Permit Application Requirements: Single Family Homes & Duplexes on Existing Lots of Record

Single family home and duplex construction on existing lots of record and construction of additions to existing single family homes and duplexes which will cause ground surface disturbance in excess of 500 square feet of area have the following requirements for construction period erosion control.

Erosion control methods are as designated in Table 3-1 in Chapter 3.

Submit with application for permit the following information:

- completed Erosion Control Information form from Appendix A,
- construction schedule information, as required, including:
 - construction start and completion dates,
 - dates when erosion control measures will be in place,
 - timing of site clearing & grading, fills placement, excavations,
 - projected date of removal of erosion control measures (after landscaping is established or after establishment of a healthy grass stand or other vegetation).

The following may also be required by the permitting jurisdiction:

- a site plan showing locations of the various required erosion control measures; or
- a typed sheet stating locations of the various required erosion control measures (can be submitted as part of the construction schedule, above).

2.3 Other Private Developments Construction

Construction on private property, other than those sites covered in Section 2.2 above, which will cause ground surface disturbance, have the following requirements for erosion control.

Minimum required erosion control measures are designated in Chapter 3, Tables 3-2 and 3-3.

Submit with construction plans for subdivision approval, grading, building, or erosion control permits, the following information:

- completed Erosion Control Information form from Appendix A,
- construction schedule with the following information:
 - construction start and completion dates,
 - dates when erosion control measures will be in place,
 - timing of site clearing & grading, fills placement, excavations,
 - projected date of removal of erosion control measures (after landscaping is established or after establishment of a healthy grass stand or other vegetation).

Submit also with construction plans:

- An erosion control plan drawing on a site plan showing:
 - locations, types and applicable dimensions of erosion control measures,
 - applicable details of erosion control measures showing full dimensions and construction information,
 - existing and proposed ground contours,
 - locations and sizes of existing and proposed drainage pipes and channels (labeled as such and with arrows indicating flow direction),
 - site entrances/exits,
 - applicable standard erosion control notes from (Appendix B), with additions or changes as required,
 - other notes including references to timing of placement and removal of erosion control measures, and erosion measure specifications such that types and quantities of materials necessary for the installation of the erosion control measures are fully detailed.

If the site erosion control plan includes sediment traps or ponds, the applicant shall also submit calculations used for determining trap or pond sizing.

Because of particular site conditions or preferences, the applicant may desire in certain cases to use different erosion control measures than are recommended in Tables 3-2 or 3-3. In such cases, the applicant must submit calculations or other supporting information used to determine the sizing and layout of the submitted erosion control plan.

2.4 Private Construction in Public Rights-of-Way

Private construction in public rights-of-way has the same erosion control plan submittal requirements as noted in Section 2.3 above.

An exception is construction of private utilities and similar localized construction or maintenance activities. Such construction must meet noted erosion control measures in Table 3-3 for utilities construction and stock piles as applicable. For such construction, the applicant need only submit the Erosion Control Information form in Appendix A as required, unless different erosion measures than indicated in Table 3-3 are desired, in which case an erosion control site plan drawing must be submitted per Section 2.3 above.

2.5 Public Works Construction

Public works construction projects have the same erosion control plan design requirements as noted above for private construction in public rights-of-way. Erosion control plan submittal/review requirements are per the City's existing public works design review process.

3.0 Recommended Erosion Control Measures

3.1 Introduction and General Plan Requirements

Recommended construction period erosion control measures are detailed in this chapter. The methods and measures outlined in this handbook are recommended for use in the development of appropriate erosion control plan permit submittals as outlined in Chapter 2.

Erosion control measures are required during all construction and site disturbance activity and until permanent site ground covers are in place. As further detailed in Sections 3.2 and 3.3, certain base erosion control measures are required for construction sites at all times of the year. Also, additional cover or filtration measures are required during the wet weather season (November 1 through April 30).

The designer should keep in mind when laying out an erosion control plan that the purpose of the plan is to minimize erosion and sedimentation from disturbed ground surfaces. Minimizing the area of clearing and grading, phasing of construction, and use of other methods to reduce the amount of land area disturbed will provide the greatest erosion control benefits.

The site owner/developer is responsible for seeing that erosion control measures are installed, maintained and working as designed. An approved erosion control plan does not waive the owner/developer's responsibility for ensuring that erosion control is achieved. An installed erosion control system does not adequately contain sediment on site, then the erosion measures must be field adjusted as necessary by the applicant, and as approved by the permitting jurisdiction.

3.2 Erosion Control Matrices

Tables 3-1 through 3-3 are matrices presenting recommended erosion control measures for various site and construction types.

Table 3-1 is a matrix summarizing recommended erosion controls for single family residential and duplex construction activities on single lots of record. Table 3-2 summarizes recommended erosion control measures for larger construction sites including commercial, industrial and subdivision development and construction. Table 3-3 is a matrix presenting recommended erosion controls for small, linear utilities construction and ditches /swales.

Erosion control measures are divided into two categories:

- Base measures which are required for construction sites at all times while there is disturbed, unstabilized ground surface on the site, and
- supplementary wet weather measures which are required between November 1 and April 30 in addition to the base measures.

Base measures are indicated on Tables 3-1 through 3-3 with an 'X' or an 'A', 'X' indicating primary recommended base measures and 'A' indicating alternate measures. Wet weather measures are indicated on Tables 3-1 through 3-3 with an '*' for primary recommended measures and with an "O" for alternate measures.

Each erosion control measure presented in the matrices is presented in further detail with design, construction and maintenance criteria in Section 3.3. Applicable subsections of Section 3.3 are referenced in parenthesis after each erosion control measure presented in the matrices.

**Table 3-1 Erosion Control Matrix
 Single Family/Duplex Residential**

<u>Base Measures</u>	<u>Single Family</u> slope<2%	<u>Duplex Res.</u> slope>2%	<u>Stock Piles</u>
1. Gravel construction entrance (sec. 3.3.1)	X	X	
2. Sediment fence/barrier @ toe of disturbed area or stock pile (sec. 3.3.2 & 3.3.3)	X	X	X
3. Sidewalk subgrade gravel barrier (site slopes to street @<5% grade) (alternate to #2.) (sec. 3.3.4)		A(2.)	
4. Undisturbed buffer @ toe of disturbed areas (alternate to #2.) (site slopes <10% (sec. 3.3.5)		A (2.)	
<u>WET WEATHER MEASURES</u>			
5. 6-mil plastic sheet cover (sec. 3.3.9)	*	*	*
6. 2"-min.straw mulch cover (sec. 3.3.7)	O	O	O
<u>POST CONSTRUCTION</u>			
7. Reestablish ground cover or landscape prior to removing erosion measures (sec 3.3.6)	X	X	

KEY: X = Base Measure
 A = Alternate to Base Measure Indicated in Parenthesis
 * = Supplemental Wet Weather Measure (November 1 - April 30)
 O = Alternate Wet Weather Measure to *

**Table 3-2 Erosion Control Matrix
 Commercial, Subdivision & Large Site Construction**

	SITE SLOPE ¹							STOCK PILES
	<2%	<10%	<15%	<20%	<30%	<50%	>50%	
BASE MEASURES								
1. Gravel construction entrance (sec. 3.3.1)	X	X	X	X	X	X	X	
2. Sediment fence or barrier @ toe of disturbed area (sec. 3.3.2 & 3.3.3)	X	X	X	X	X	X	X	X
3. Undisturbed buffer @ toe of disturbed area (sec. 3.3.5)		X	X	X	X	X	X	
4. Sediment fence installed on contours (spacing) (sec. 3.3.2)		X (300')	X (150')	X (100')	X (50')	X (25')	X (25')	
5. Temp. interceptor dikes/swales around active work areas (sec. 3.3.11)	#	#	#	#	#	#	#	
6. Sediment trap or pond (sec. 3.3.10)	X	X	X	X	X	X	X	
WET WEATHER MEASURES								
7. Established grass (sec. 3.3.6)	*	*	*	*	*	*	*	
8. 2" -min straw mulch cover (sec. 3.3.7)	O	O	O	O	O	O	O	O
9. Erosion blankets w/anchors (sec. 3.3.8)	O	O	O	O	O	O	O	
10. 6-mil plastic sheet cover (sec. 3.3.9)	O	O	O	O	O	O	*	*
POST CONSTRUCTION								
11. Reestablish ground cover or landscape prior to removing erosion measures (sec. 3.3.6)	X	X	X	X	X	X	X	

- KEY: X = Base Measure
 A = Alternate to Base Measure Indicated in Parenthesis
 # - Optional Base Measure, Can Use as Applicable
 * = Supplemental Wet Weather Measure (November 1 - April 30)
 O = Alternate Wet Weather Measure to *

¹NOTE: If different areas of the site have considerably different slopes, the site may be divided up and erosion measures selected for each area from the appropriate column in the matrix.

**Table 3-3 Erosion Control Matrix
 Utilities Construction & Stock Piles/Ditches/Swailes Protection**

	UTILITIES CONSTRUCTION		STOCK PILES	DITCHES/SWALES
	catch basin drainage	ditch drainage		(construction & protection)
BASE MEASURES				
1. Sediment fence or barrier @ toe (sec. 3.3.2 & 3.3.3)			X	
2. Check dams (sec. 3.3.13 & 3.3.3)		X		X
3. Storm drain inlet protection barrier (sec. 3.3.12)	X			
WET WEATHER MEASURES				
4. Established grass (sec. 3.3.6)				*
5. 6-mil plastic sheet cover (sec. 3.3.9)			*	
6. 2"-min. straw mulch cover (sec. 3.3.7)			O	O
7. Erosion blanket w/anchors (sec. 3.3.8)				O
POST CONSTRUCTION				
8. Reestablish ground cover or landscape prior to removing erosion measures (sec. 3.3.6)	X	X		X

KEY: X = Base Measure
 * = Supplemental Wet Weather Measure (November 1 - April 30)
 O = Alternate Wet Weather Measure to *

3.3 Recommended Design Criteria

The following sections provide design, construction and maintenance criteria and recommendations for the erosion control measures listed in the matrices in Section 3.2.

3.3.1 Gravel Construction Entrances

Purpose

To reduce the amount of mud, dirt, rocks, etc, transported onto roads by motor vehicles or storm water runoff by constructing a stabilized pad of gravel at entrances/exits to construction sites.

Conditions Where Practice Applies

At any construction site where traffic will be leaving the site and moving directly onto public roads, other paved areas, or other approved access points.

Design Criteria/Specifications

- See Figure 3-1A for details.
- Material should be clean pit run or 3” -4”- quarry spalls (or larger, as needed).
- The gravel pad shall be at least 8 inches thick and 50 feet in length. Width shall be the full width of the vehicle ingress and egress area. (A 20-foot minimum pad length may be acceptable as approved for single family and duplex residential construction sites.)
- Use subgrade reinforcement geotextile under gravel pads for all but construction of a single family/duplex residence on existing lots of record.
- Additional gravel may be added periodically to maintain proper function of the pad.
- Additional Measures:
 - If the gravel pad does not adequately remove dirt and mud from vehicle wheels such that mud and dirt tracking is evident off site, additional measures must be taken. Such measures may include washing off wheels before vehicles leave the site or other construction techniques/work operations modifications.
 - Wheel washing should be done on the gravel pad or in an approved wheel wash structure located onsite, adjacent to and on the site interior side of the gravel pad. Wash water shall be drained through a silt-trapping structure prior to leaving the construction site. See Figure 3-1B for details of a typical wheel wash structure.
 - Another additional measure is to construct gravel filter berms across on-site traffic wheel paths to capture and retain sediment. Berms shall be 1 foot high with 3:1 side slopes, constructed of 3/4 to 3-inch well-graded or crushed rock with less than 5 percent fines. Berms must be inspected regularly and accumulated sediment removed and rock added or replaced as needed. Berms should be spaced as follows:
 - every 300 feet on slopes less than 5 percent,
 - every 200 feet on slopes between 5 and 10 percent,
 - every 100 feet on slopes greater than 10 percent.

3.3.2 Temporary Sediment Fences

Purpose

To reduce the transport of sediment from a construction site by providing a temporary physical barrier to sediment and reducing runoff velocities.

Conditions Where Practice Applies

- Down slope of disturbed areas where runoff occurs as sheet runoff.
- At the toe of soil stock piles.
- At intervals as indicated on Table 3-2 along the contours of large disturbed areas.
- At grade breaks exceeding 20%.
- Following discharge from a sediment trap or pond.

- Sediment fences shall not be installed across streams.

Design Criteria/Specifications

- See Figure 3-2 for details.
- Maximum sheet or overland flow path length to sediment fence is per Table 3-2.
- Selection of filter fabric tensile and bursting strength characteristics depends on the support fence. Fabric attached to chain-link fence need not possess the same strength as one attached to a fence of 6 by 6-inch reinforcing wire or one attached only to posts. Selection is thus based on standard engineering principles. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.
- Unless otherwise waived by the jurisdiction, when standard strength filter fabric is used, a wire support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wire or hog rings. The wire shall extend into the trench a minimum of 4 inches and shall not extend more than 36 inches above the original ground surface.
- When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of the above standard note for standard strength filter fabric applying.
- All materials to be in good physical condition to provide proper sediment retention.
- Where practical the filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and both ends securely fastened to the post.
- Sediment fences shall be inspected by applicant/contractor immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
- At no time shall more than a one foot depth of sediment be allowed to accumulate behind a sediment fence. Sediment should be removed or regraded into slopes, and the sediment fences repaired and reestablished as needed.

3.3.3 Straw Bale Sediment Barrier

Purpose

To reduce the transport of sediment from a construction site by providing a temporary physical barrier to sediment and reducing runoff velocities. Also may be used to divert runoff around active work areas or into sediment filtration/sedimentation areas.

Conditions Where Practice Applies

- May be substituted for temporary sediment fence for installations of less than 200 lineal feet and for single family or duplex residential construction activities on existing

lots of record, as approved.

- At toe of soils stock piles.
- In existing, undisturbed drainage ditches/swales used to convey drainage through disturbed areas of construction site (as allowed by the jurisdiction). Note: see Section 3.3.13 "Check Dams" for use of straw bales and other methods to protect new and disturbed swales and ditches.
- Note: see Section 3.3.11 "Temporary Interceptor Dikes and Swales" for use of straw bales as flow interceptor dikes.

Design Criteria/Specifications

- See Figures 3-3A and 3-3B for details of straw bale sediment barriers.
- Straw bales shall be standard 40 to 60 pound rectangular bales of cereal grain or seed straw.
- Stakes shall be wood of size as shown on Figures 3-3A & B and driven through bales and into ground to a minimum depth of 12 inches.
- Straw bales shall be keyed into existing ground 4 to 6 inches.
- Straw Bale Sediment Barriers may be left in place or used as mulch after completion of site work if approved by the jurisdiction.
- At no time shall more than a one foot depth of sediment be allowed to accumulate behind straw bale sediment barriers. Sediment should be removed or regraded into the slope, or new lines of barriers installed uphill of sediment-laden barriers.

3.3.4 Sidewalk Subgrade Gravel Barrier

Purpose

To reduce the transport of sediment from a construction site by using the sidewalk subgrade gravel as a temporary filter for sediment-laden runoff

Conditions Where Practice Applies

Single family/duplex residential construction sites, where the site slopes to a street with planned but unconstructed sidewalks, and site slopes are less than 5 percent.

Design Criteria/Specifications

- Sidewalk subgrade gravel must be in place during the entire construction period, from the time of initial site clearing/grading through establishment of permanent site cover. If the sidewalk concrete is to be poured prior to established permanent site cover, approved sediment barriers must be installed prior to pouring concrete.
- Sidewalk subgrade gravel must have a minimum 4-inch depth and a 4-foot width.
- If the sidewalk subgrade gravel does not provide an effective filter such that sediment is leaving the construction site, additional measures must be applied. These may include replacement of gravel or installation of sediment barriers.

- Subgrade gravel may not meet the local jurisdiction's specifications for sidewalk concrete placement if too much sediment has infiltrated the rock. The permittee must therefore weigh the benefits of eliminating sediment barriers versus the possibility that the subgrade gravel may be rejected by the local jurisdiction.

3.3.5 Undisturbed Buffers

Purpose

To provide a natural vegetated buffer area for filtering erosion from construction areas, as an alternate in certain cases or supplemental measure to sediment barriers.

Conditions Where Practice Applies

An undisturbed buffer may be used as approved as an alternate to a sediment barrier at the toe of the site slopes if the buffer meets the following criteria:

- the buffer is an undisturbed grassy area or covered with other approved dense vegetation,
- the buffer is downhill and in the drainage path of the construction/disturbed area,
- there are no concentrated flows from the disturbed site entering the buffer,
- the buffer area is owned by the applicant or approved for such use in writing by the owner,
- slopes in the buffer and its drainage area are less than 10 percent,
- the grassed buffer area impacted by the potential disturbed area runoff is at least equal in area to the uphill construction/disturbed area draining to it.

3.3.6 Establishing Temporary Grasses and Permanent Vegetative Cover

Purpose

To reduce erosion and sedimentation by stabilizing exposed soils with vegetation and mulching.

Conditions Where Practice Applies

- Ground surfaces exposed during the wet season (November 1 through April 30).
- Areas which will not be subjected to heavy wear by on-going construction traffic.
- Exposed ground surfaces at end of construction period (permanent cover must be established prior to removal of any erosion control measures).
- Temporary or permanent stabilization of new or disturbed ditches or swales.

Design Criteria/Specifications: Temporary Erosion Control Grasses

- Temporary grass cover measures must be fully established by November 1 or other cover measures will have to be implemented until adequate grass coverage is achieved. To establish an adequate grass stand for controlling erosion by November 1, it is recommended that seeding and mulching occur by October 1.
- Hydromulch shall be applied with grass seed at a rate of 2000 lb./acre. On slopes steeper than 10%, hydroseed and mulch shall be applied with a bonding agent (tackifier). Application rate and methodology to be per seed supplier recommendations.

- Dry, loose, weed-free straw used as mulch shall be applied at double the hydromulch application requirement (4000 lb./acre, approximately 2” deep). Anchor straw by working in by hand or with equipment (rollers, cleat tracks, etc.).
- Mulch shall be spread uniformly immediately following seeding.
- Soil Preparation - Top soil should be prepared according to landscape plans, if available, or recommendations of grass seed supplier. It is recommended that slopes be roughened before seeding by 'track-walking', (driving a crawling tractor up and down slopes to leave a pattern of cleat imprints parallel to slope contours) or other method to provide more stable sites for seeds to rest.
- Seeding - Recommended erosion control grass seed mixes are as follows. Similar mixes designed to achieve erosion control may be substituted if approved by jurisdiction.
 1. Dwarf Grass Mix (low height, low maintenance):
Dwarf Perennial Ryegrass, 80% by weight
Creeping Red Fescue, 20% by weight
Application Rate: 100 pounds minimum per acre
 2. Standard Height Grass Mix
Annual Ryegrass, 40% by weight
Turf-type Fescue, 60% by weight
Application Rate: 100 pounds minimum per acre
- Fertilization for grass seed - As per supplier's recommendations. Development areas within 50 feet of water bodies and wetlands must use a non-phosphorus fertilizer.
- Netting and Anchors, as needed - For disturbed areas on slopes and in ditches/swales, biodegradable netting or jute is desirable and may be used instead of bonding agents to provide a stable area for seeding. Netting should be anchored per manufacturer's recommendations.
- Watering - Seeding shall be supplied with adequate moisture to establish grass. Supply water as needed, especially in abnormally hot or dry weather or on adverse sites. Water application rates should be controlled to provide adequate moisture without causing runoff.
- Re-seeding - Areas which fail to establish grass cover adequate to prevent erosion shall be re-seeded as soon as such areas are identified, and all appropriate measures taken to establish adequate cover.

Design Criteria/Specifications: Permanent Vegetative Groundcover

- At the end of site construction, paving, approved permanent site landscaping or establishment of a healthy stand of grass (or alternative vegetation as approved) must occur prior to removal of site erosion control measures.

3.3.7 *Straw Mulch*

Purpose

To reduce erosion by providing a protective cover over disturbed bare or reseeded soils. Also can be used to enhance success of seeding/revegetation.

Conditions Where Practice Applies

- As a cover on ground surfaces and stockpiles exposed during the wet season (November 1 through April 30).
- As a mulch to enhance vegetation establishment in areas that have been seeded.

Design Criteria / Specifications

- Loose, weed-free straw mulch shall be applied at a rate of no less than 4000 pounds (2 tons) per acre, and shall have a minimum depth in-place of 2 inches.
- Mulch must be stabilized in place by hand or machine punching the straw into the soil, spraying it with a tacking agent, or covering it with an erosion blanket. See Section 3.3.8 "Erosion Blankets" for appropriate design criteria for such coverings.

3.3.8 *Erosion Blankets*

Purpose

To provide immediate protection and physical stabilization of disturbed soils. Typically used when vegetative cover cannot be achieved due to soils, slopes or time of year. Can be used to enhance success of seeding, planting and/or sodding.

Conditions Where Practice Applies

- On areas of steep slopes (greater than 50%) and areas of moderate slopes that are prone to erosion.
- As a cover on ground surfaces exposed during the wet season (November 1 through April 30).
- As supplemental aid to seed and/or mulch treatment on slopes or in ditches or swales.

Design Criteria/Specifications

- Erosion blankets may be used on level areas and on slopes up to 1:1. Where soil is highly erodible, netting shall only be used in conjunction with an organic mulch such as straw or wood fiber. The blanket must be applied so that it is in complete contact with the soil; if it is not, erosion will occur beneath it. Erosion blankets shall be securely anchored to the slope per manufacturer's recommendations.
- Deformed plastic filament matting such as Enkamat (and other erosion control blankets as approved) may be used for stream velocity protection and other special applications when approved by the jurisdiction.

3.3.9 *Plastic Sheet Covering*

Purpose

To provide immediate erosion protection to slopes and disturbed areas when vegetative cover cannot be achieved due to soils, slopes or time of year. To provide erosion protection on soils, spoils, and other erodible stockpiles.

Conditions Where Practice Applies

- Disturbed areas which require immediate erosion protection.
- On areas of steep slopes (greater than 50%) and areas of moderate slopes that are prone to erosion.
- On ground surfaces and stockpiles exposed during wet weather season (November 1 through April 30).
- As a temporary measure to provide erosion protection and assist in germination on areas seeded between November 1 and March 31.

Design Criteria/Specifications

- Plastic sheeting shall be polyethylene and have a minimum thickness of 6 mil.
- Covering shall be installed and maintained tightly in place by using sandbags or tires on ropes with a maximum 10 foot grid spacing in all directions. All seams shall be taped or weighted down full length and there shall be at least a 12-inch overlap of all seams. For seams parallel to the slope contour, the uphill sheet shall overlap the downhill sheet. No runoff shall be allowed to run under the plastic covering.
- **Drainage from areas covered by plastic sheeting shall be controlled such that no discharge occurs directly onto uncontrolled, disturbed areas of the construction site.**
- Clear plastic sheeting may be installed on areas seeded between November 1 to March 31 to provide a greenhouse-type environment, and remain until vegetation is firmly established.

3.3.10 *Sediment Traps & Ponds*

Purpose

To collect and store sediment eroded from exposed ground surfaces, disturbed during the construction period, prior to establishment of permanent vegetation and drainage facilities.

Conditions Where Practice Applies

- Downhill of areas with exposed soils.
- Sediment Traps: where the tributary drainage area is 3 acres or less (but not including single family and duplex residences constructed singly, on existing lots of record), and slopes are less than 50%.
- Sediment Ponds: where the tributary drainage area is 10 acres or less and slopes are less than 50%.

Design Criteria/Specifications

- Temporary interceptor dikes or swales may be constructed to divert runoff to sediment traps or ponds.
 - a. **Sediment Traps.** The sediment trap may be formed completely by excavation or by construction of a compacted embankment. It shall have a sediment storage depth not to exceed 1.5 feet, topped by a 2 foot deep settlement zone. Sediment trap side slopes shall be 3:1 or flatter. The outlet of the trap should be a weir/spillway, providing a minimum 1 foot overflow depth between the spillway and embankment. A filter fabric fence or similar filter must be constructed to filter runoff from the trap prior to discharge from the construction site.
 - See Figure 3-4 for details.
 - Calculate the required sediment storage volume using the criteria from the 1992 Puget Sound Stormwater Management Manual and assuming a minimum one year sediment accumulation period for design purposes. To convert tons of sediment calculated to cubic feet, multiply by 0.05 tons per cubic foot.
 - Determine the bottom surface area of the sediment trap using the calculated sediment volume and the maximum 1.5 foot depth and 3:1 side slope requirements.
 - pond size using the criteria in the Department of Ecology Stormwater Management Manual for Western Washington.
 - Determine the total trap dimensions by adding an additional 2 feet of depth for settling volume (before overtopping of spillway) above the sediment storage volume, while not exceeding 3:1 side slopes.
 - Alternatively, the pond may be sized using the criteria in the 2001 Department of Ecology Stormwater Management Manual for Western Washington.
 - A 3:1 ratio of trap length to width is desirable. Length is defined as the average distance from the inlet to the outlet of the trap.
 - b. **Sediment Ponds.** A sediment pond may be formed by partial excavation and/or by construction of a compacted embankment. It may have one or more inflow points carrying polluted runoff. Baffles to spread the flow throughout the pond should be included. A securely anchored riser pipe is the recommended principal discharge mechanism, with an emergency overflow spillway. The riser pipe should be perforated and covered with filter fabric and gravel 'cone' for filtration; or solid with a 1" diameter dewatering hole and perforated drain pipe. Outlet protection shall be provided to reduce erosion at the pipe outlet. A filter fabric fence or similar filter must be constructed to filter runoff from the pond prior to discharge from the construction site.
 - The sediment pond shall have a sediment storage depth no greater than 3 feet, topped by a 2-foot (minimum) to 4-foot (maximum) deep settlement zone and an additional 1 foot minimum of freeboard. The pond side slopes shall be 3:1 or flatter.
 - See Figure 3-5 for details.
 - The sediment storage volume is determined in the same manner as mentioned

above for sediment traps.

- The pond riser pipe and outlet pipe shall be sized to carry the 10-year design storm (or as otherwise required by the City Engineer).
- A 3:1 ratio between the pond length and width is desirable. Length is defined as the average distance from the inlet to the outlet of the trap. Use baffles in the pond to help prevent short-circuiting and to increase the effective pond length where site conditions prohibit constructing a pond with a direct 3:1 length to width ratio.

3.3.11 *Temporary Interceptor Dikes and Swales*

Purpose

To intercept storm runoff from drainage areas above unprotected slopes and direct to a stabilized outlet. To intercept storm runoff from a disturbed site and direct it to a sediment trap or pond.

Conditions Where Practice Applies

- Where the volume and velocity of runoff from disturbed slopes must be reduced. When an interceptor dike or swale is placed above a disturbed slope, it reduces the volume of water reaching the disturbed area by intercepting runoff from above.
- Where sediment traps or ponds are to be used. Interceptor dikes and swales can be used to direct site runoff to a sediment trap or pond.

Design Criteria/Specifications

- Intercepted runoff must be directed to a stabilized area such that no erosion occurs due to the additional water and velocity, or to a sediment pond or trap.
- See Figure 3-4 for details. Straw Bales may also be used to intercept runoff. See Section 3.3.3 "Straw Bale Sediment Barrier" for installation criteria and specifications.
- Interceptor dikes and swales shall be stabilized with approved cover before put into use. Such cover may include grass, rock or erosion blankets.
- Spacing between interceptor dikes and swales along slope contours is as follows:

Slope	Spacing
< 5%	300 feet
5-10%	200 feet
10-40%	100 feet
- Minimize construction traffic over dikes and swales.
- The upslope side of interceptor dikes shall provide positive drainage to the dike outlet. Provide energy dissipation measures as necessary to minimize erosion at dike outlet.
- Grades for drainage parallel to interceptor dikes shall be between 0.5 and 1.0 percent.
- Maximum grade of interceptor swales shall be 5 percent, and provide positive drainage to outlet.
- Outlets shall lead to sediment trap/pond when runoff from disturbed areas is

intercepted by dikes/swales. Outlets shall be stabilized to prevent erosion.

- Temporary dikes and swales shall be graded out at the completion of construction, when permanent vegetation has been established.

3.3.12 Storm Drain Inlet Protection

Purpose

To prevent sediment from entering storm drain systems prior to permanent stabilization of disturbed areas.

Conditions Where Practice Applies

- Where interior site storm drain inlets are operational before permanent stabilization of the disturbed drainage area, as approved by jurisdiction.
- Adjacent to and immediately downhill of utility type construction in existing paved areas with catch basin drainage.
- In public right-of-way areas for use during approved flushing operations.

Design Criteria/Specifications

- Design criteria and specifications for three recommended alternative methods of storm drain inlet protection are presented on Figures 3-7 A, B, & C. Alternative methods of inlet protection, such as wood chip filter pillows, and filter sock inserts may also be used.
- Berms may be required to direct drainage to flow through the filters and prevent bypassing of the inlets.
- At no time shall more than a one foot depth of sediment be allowed to accumulate against storm drain inlet protection measures. Sediment must be removed and inlet protection measures restored as needed to maintain their sediment trapping and filtering capability.

3.3.13 Check Dams

Purpose

To reduce the velocity of concentrated flows, reducing erosion of the swale or ditch, and providing for sedimentation of suspended soil particles.

Conditions Where Practice Applies

- In new or disturbed ditches and swales to reduce velocities and erosion.
- In interior site ditches or swales conveying runoff from disturbed areas (other base and cover measures still required in addition to the check dams for disturbed drainage areas).
- No check dams may be placed in streams, without local jurisdiction and state agencies approval as required.

Design Criteria/Specifications

- See Figure 3-8 for details.
- Check dams shall be constructed of either rock or logs. Check dams may also be constructed of straw wattles, wood chip filter pillows, or triangular silt dikes.
- Construct a 1-foot deep sump immediately upstream of check dams for storage of settled sediment.
- Check dams shall be spaced such that the toe of the upstream dam is at the same elevation as the top of the next downstream dam.
- Rock check dams shall be constructed of rock spalls, 4"-minus. The rock must be placed by hand or mechanical placement (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Log check dams shall be constructed of 4 to 6-inch diameter logs. The logs shall be embedded into the soil at least 18 inches.
- Check dams shall be checked for sediment accumulation after each significant rainfall. Sediment shall be removed before filling sump.

APPENDIX A

EROSION CONTROL DETAILS

STANDARD EROSION CONTROL DETAIL LIST

Figure 3-1A	Gravel Construction Entrance
Figure 3-1B	Wheel Wash
Figure 3-2	Sediment Fence
Figure 3-3A	Straw Bale Sediment Barrier
Figure 3-3B	Straw Bale Sediment Barrier in Ditches or Swales
Figure 3-4	Sediment Trap
Figure 3-5	Sediment Pond
Figure 3-6	Interceptor Swales & Dikes
Figure 3-7A	Filter Fabric Inlet Barrier
Figure 3-7B	Block & Gravel Inlet Barrier
Figure 3-7C	Gravel & Wire Mesh Inlet Barrier
Figure 3-8	Check Dams

APPENDIX B

GRADING/EROSION CONTROL INFORMATION FORM

GRADING/EROSION CONTROL INFORMATION

General Contractor Name & Address:

Case File No.: _____
 Permit No.: _____

Excavation Contractor Name & Address:

Applicant Name & Address:

Telephone Numbers:
 Applicant: _____
 Owner: _____
 General Contractor: _____
 Excavation Contractor: _____
 Site/Job: _____

Owner Name & Address:

24 Hr./After Hours Emergency
 Contact Person, Title, Telephone:

Property Description:
 (Street Address and Cross Street/Located)

Location & Address Where Spoils Leaving Site Will be Taken
 (NOTE: Permits may be required)

Legal Description:
 Tax Lot No.: _____
 1/4 Section: _____
 Site Size, Acres: _____

Disturbed/Work Area, Acres: _____
 Site Runoff Drains To: (Circle One)
 Catch-Basin Ditch Pipe Creek
 (Circle One) Private Property
 Public Right-of-Way

EROSION/SEDIMENTATION CONTROL (ESC) MEASURES

Minimum ESC Requirements
 During Construction:

- Sedimentation Facilities
- Stabilized Construction Entrance
- Perimeter Runoff Control
- Clearing and Grading Restrictions
- Cover Practices
- Construction Sequence
- Other _____

Minimum ESC Requirements
 Following Construction:

- Stabilize Exposed Surface
- Remove and Restore Temporary
 ESC Facilities
- Clean and Remove All Silt and Debris
- Ensure Operation of Permanent Facilities
- Other _____

Plan for erosion control prepared and submitted in accordance with "Technical Guidance Handbook". Erosion control plan drawing, as required, has plan construction notes complete, including emergency phone number, schedule/staging for installation and removal of erosion control measures, and applicable standards notes.

I have read and will comply with the above and will construct and maintain ESC measures as necessary to contain sediment on the construction site.

_____ Owner Signature

_____ Applicant Signature

Official Use Only

Fee _____

Receipt
 Number _____

Date
 Received _____

Accepted
 By _____

APPENDIX C

RECOMMENDED STANDARD NOTES FOR EROSION CONTROL PLANS

Standard Notes for Erosion Control Plans:

- 1) Approval of this erosion/sedimentation control (ESC) plan does not constitute an approval of permanent road or drainage design (e.g. size and location of roads, pipes, restrictors, channels, retention facilities, utilities, etc.)
- 2) The implementation of these ESC plans and the construction, maintenance, replacement, and upgrading of these ESC facilities is the responsibility of the applicant/contractor until all construction is completed and approved and vegetation/landscaping is established.
- 3) The boundaries of the clearing limits shown on this plan shall be clearly flagged in the field prior to construction. During the construction period, no disturbance beyond the flagged clearing limits shall be permitted. The flagging shall be maintained by the applicant/contractor for the duration of construction.
- 4) The ESC facilities shown on this plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to insure that sediment and sediment laden water do not enter the drainage system, roadways, or violate applicable water standards.
- 5) The ESC facilities shown on this plan are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded as needed for unexpected storm events and to ensure that sediment and sediment-laden water do not leave the site.
- 6) The ESC facilities shall be inspected daily by the applicant/contractor and maintained as necessary to ensure their continued functioning.
- 7) The ESC facilities on inactive site shall be inspected and maintained a minimum of once a month or within the 48 hours following a storm event.
- 8) At no time shall more than one foot of sediment be allowed to accumulate within a trapped catch basin. All catch basins and conveyance lines shall be cleaned prior to paving. The cleaning operation shall not slush sediment laden water into the downstream system.
- 9) Stabilized construction entrance shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to insure that all paved areas are kept clean for the duration of the project.

Standard Notes for Sediment Fences:

- 1) The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and both ends securely fastened to the post.
- 2) The filter fabric fence shall be installed to follow the contours where feasible. The fence posts shall be spaced a maximum of 8 feet apart and driven securely into the ground a minimum of 24 inches.
- 3) When standard strength filter fabric is used, a wire support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wire or hog rings. The wire shall extend into the trench a minimum of 4 inches and shall not extend more than 36 inches above the original ground surface.
- 4) The standard strength filter fabric shall be stapled or wired to the fence, and 12 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
- 5) When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other

provisions of the above standard note for standard strength filter fabric applying.

- 6) Sediment fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
- 7) Sediment fences shall be inspected by applicant/contractor immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.