Pierce County

Department of Planning and Land Services
Development Engineering Section

PROJECT NAME: _____ DATE: _____

APPLICATION NO.: _____ PCDE NO.: _____

Circled items need to be addressed. Checked items are OK. A determination cannot yet be made on items left blank. Address these items. If you believe a particular blank item does not apply, state this explicitly.

GENERAL SITE DEVELOPMENT REVIEW CHECKLIST
ORDINANCE 2004-56S
TITLE 17A

EROSION AND SEDIMENT CONTROL DRAWINGS

1. ____ All plans and specifications dated and bear the engineer's seal and signature. (4.3)

2. ____ Inspection schedule for all ESC facilities provided. (8.2)

3. ____ Untreated sediment-laden waters do not discharge directly to an N.B.A. (4.6)

4. ____ Prevent sediment from leaving a project site or discharging to an N.B.A.. (1.2.1) (4.6)

5. ____ Properties and waterways downstream from development sites protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site. (1.2.1)

6. ____ Stabilization adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches provided at the outlets of all conveyance systems. (8.4)

7. ____ Dewatering devices discharge into a sediment trap or sediment pond. (8.4)

STOCKPILE MANAGEMENT

8. ____ Soil stockpiles set back a minimum of 50’ from down gradient drainage features such as channels, ponds, stream banks, etc. (8.10.3)

9. ____ Stockpiles stabilized per Table 8.1, “Seasonal Requirements for Site Stabilization.” Refer to Appendix “G,” page G-8, for standard notes on this practice. (8.10.3)

CONSTRUCTION ENTRANCES

10. ____ Construction entrance rock pad at every access point (Appendix “C,” Detail 4.0, “Construction Entrance Rock Pad”).

11. ____ Construction entrances drains to either sediment ponds or traps unless in well drained soils. (8.10.6)

SEDIMENT TRAPS/PONDS

12. ____ Refer to Appendix “C,” Details 5.0, 5.1, 6.0, 7.0, 21.0, and 22.0 for standard details regarding this practice. (8.10.7)

13. ____ Traps effective for < 3 acres of contributing drainage. (8.10.7)

14. ____ The minimum size for a sediment trap is 400 s.f. of surface area. (8.10.7)

15. ____ If a permanent stormwater detention facility will be used for a temporary sediment pond, describe how and when the sediment will be removed. (8.10.7)

SEDIMENT TRAPS/PONDS (Continued)

16. ____ Retention facility not be used for temporary sediment and erosion control unless:

The sediment trap or pond is left at least 2 feet above the finished grade of the infiltration facility

OR

The sediment trap or pond is completely lined with filter fabric or other device to prevent migration of sediment to the plane of infiltration and is at least 6 inches above the finished grade.

AND

The project engineer or designee shall inspect the excavation and the placement of filter fabric and/or other protective devices at least once during construction and after construction is complete.

AND

Other conditions necessary in the judgment of the County to protect the retention facility's ability to infiltrate stormwater. (8.10.7)

DESIGN PARAMETERS

17. ____ All traps/ponds provided with a staff gauge with a prominent mark 1 foot above the bottom of the facility. (8.10.7.1)

18. ____ Required surface area at the top of the riser. (8.10.7.1)

19. ____ Type A and B soils with an average gradient across the site of 5% or less may use a minimum of 0.5' - 1.0' sediment storage depth respectively, all other conditions and soil types shall provide for a minimum of 1.5' of sediment storage. (8.10.7.1)

20. ____ Minimum 2.5 - 3.5 foot depth to the top of the riser from the bottom of the pond/trap (deepest section, soil type dependent). (8.10.7.1)

21. ____ Maximum 3:1 interior and 2:1 exterior side slopes. (8.10.7.1)

22. ____ One foot of freeboard between the top of the riser and the crest of the emergency spillway. (8.10.7.1)

23. ____ Provide an emergency spillway designed to pass the 100-year, 24-hour storm. (8.10.7.1)

24. ____ Flat bottomed. (8.10.7.1)

25. ____ Minimum one foot deep spillway. (8.10.7.1)

26. ____ Length to width ratio between 3:1 and 6:1. (8.10.7.1)

TRAP/POND RELEASE

27. ____ Release from a trap is through the gravels and rock on the outlet berm. (8.10.7.2)

28. ____ Release from the pond is through the use of either a dewatering orifice or through a perforated riser pipe with the perforations sized to release the 2-year event without overtopping and while maintaining a 24-hour dewatering time. (8.10.7.2)

POND DIVIDERS

29. ____ The pond divided into two equal volume cells by a permeable divider. See Appendix "C," Detail 5.0, "Sediment Pond - Example." (8.10.7.3)

30. ____ If the pond is > 6' deep, a different mechanism than shown in Detail 5.0 proposed. (8.10.7.3)

31. ____ Alternatives are permeable, structurally sound, and designed to prevent erosion under or around the barrier. (8.10.7.3)

32. ____ For shallow depths, pea gravel berms are suitable. (8.10.7.3)

33. ____ The divider must be 1/2 the height of the riser and a minimum of 1' below the top of the riser. (8.10.7.3)

FILTER FABRIC FENCES

34. ____ Refer to Appendix "C," Detail 8.0, "Filter Fabric Fence Detail," and Appendix "G," page G-3, for standard notes regarding this practice. (8.10.8)

FILTER FABRIC FENCES (Continued)

35. ____ See limitations shown in Table 8.2. (8.10.8)

36. ____ 100' maximum sheet or overland flow path length to the fence. (8.10.8)

37. ____ No concentrated flows > 0.5 cfs. (8.10.8)

STRAW/HAY BALE BARRIERS

38. ____ See Appendix "C," Detail 9.0, "Straw and Hay Bale Barriers – Schematic," and Detail 10.0, "Straw and Hay Bale Barriers," and Appendix "G" for standard notes. (8.10.9)

39. ____ Straw/hay bale barriers consist of a row of entrenched and anchored straw or hay bales installed across the toe of a slope. (8.10.9)

40. ____ Limitations shown in Table 8.2 addressed. (8.10.9)

41. ____ Straw and hay bales may be used at the base of the slope below areas subject to sheet flow and rill erosion. (8.10.9)

42. ____ The size of the drainage area < 0.25 acre and the length of the slope behind the < 100'. (8.10.9)

43. ____ If the slope has a gradient >10%, slope length $\leq$ 50'. (8.10.9)

GRAVEL FILTER BERM

44. ____ Refer to Appendix "C," Detail 12.0, "Gravel Filter Berm," and Appendix "G" for standard notes regarding this practice. (8.11.2)

45. ____ The maximum area to be drained is 5 acres. (8.11.2)

SANDBAG BERM

46. ____ Refer to Appendix "C," Detail 13.0,"Sandbag Berm," and Appendix "G " for standard notes. (8.11.3)

TRIANGULAR SEDIMENT FILTER DIKES

47. ____ Refer to Appendix "C," Detail 14.0, "Triangular Sediment Filter Dikes," and Appendix "G" for standard notes. (8.11.4)

48. ____ Constructed of wire mesh and geotextile fabric, installed along a flat area or across the toe of a slope.

49. ____ Used where there is no concentration of water in a channel or other drainageway above the barrier.

INLET SEDIMENT PROTECTION

50. ____ Refer to Appendix "C," Detail 1.0, "Inlet Fabric Fence Filter," Detail 2.0, "Inlet Block and Gravel Filter – Schematic," and Detail 3.0, "Temp. Sediment Control Inlet Gravel and Filter Fabric," and Appendix "G" for standard notes. (8.11.5)

51. ____ Drop-in catch basin filters may be used in place of other standard inlet protection practices shown in Appendix "C," Detail 1.0, "Inlet Fabric Fence Filter," Detail 2.0, "Inlet Block and Gravel Filter – Schematic," and Detail 3.0, "Temp. Sediment Control Inlet Gravel and Filter Fabric." (8.11.5)

PIPE SLOPE DRAINS

52. ____ Refer to Appendix "C," Detail 15.0, "Pipe Slope Drains," and Appendix "G" for standard notes regarding this practice. (8.11.6)

53. ____ The entrance consists of a standard flared end section for culverts > 12" Ø a minimum 6" metal toe plate. (8.11.6)

54. ____ The slope of the entrance $\geq$ 3%. (8.11.6)

STAIR STEPPING CUT SLOPES AND GROOVING SLOPES

55. ____ Refer to Appendix "G" for standard notes. (8.11.7)

56. ____ Graded areas with slopes > 3:1 but < 2:1 roughened before seeding. (8.11.7)

STAIR STEPPING CUT SLOPES AND GROOVING SLOPES (Continued)

57. ____ Graded areas > 2:1 stair-stepped with benches. (8.11.7)

EROSION CONTROL BLANKETS

58. ____ Refer to Appendix "C," Detail 16.0, “Erosion Control Blankets – Schematic,” and Appendix "G" for standard notes. (8.11.8)

59. ____ Erosion blankets (nets and mats) may be used on level areas, on slopes ≤ 2:1, and in waterways. (8.11.8)

60. ____ Where soil is highly erodible, nets used in conjunction with an organic mulch such as straw and wood fiber. (8.11.8)

61. ____ Jute net heavy, uniform cloth woven of single jute yarn, which if 36 to 48” wide, weigh an average of 1.2 lbs/linear yard. (8.11.8)

62. ____ Netting securely anchored to the soil with No. 11 gauge wire staples ≥ 6” long. (8.11.8)

TEMPORARY INTERCEPTOR DIKES AND SWALES

63. ____ Refer to Appendix "C," Detail 17.0, “Temporary Interceptor Dikes and Swales – Schematic,” and Appendix “G-7” for standard notes. (8.11.9)

DIKES AND SWALES CRITERIA

64. ____ Interceptor dikes shall meet the following criteria:

Dimension	Criteria
Top Width	2’ minimum
Height	18” minimum. Measured from upslope toe and at a compaction of 95% Modified Proctor Density
Side Slopes	2:1 or flatter
Grade	Topography dependent, except that dike limited to grades between 0.5 and 5.0%. (8.11.9.1)

65. ____ Interceptor swales meet the following criteria:

Dimension	Criteria
Bottom Width	2’ minimum; the bottom width level.
Depth	1’ minimum
Side Slopes	2:1 or flatter
Grade	1 - 3% with a positive drainage to a suitable outlet

DIKES AND SWALES SPACING

66. ____ Horizontal Spacing of Interceptor Dikes/Swales:

Slope	Spacing
< 5%	300’
5-10%	200’
10-40%	100’ (8.11.9.2)

67. ____ Stabilization Action

Slope	Action
< 5%	Seed and mulch applied within 5 days of dike construction (see vegetation).
5-40%	Dependent on runoff velocities and dike materials. (8.11.9.3)

DIKES AND SWALES OUTLET

68. ____ Upslope side of the dike provided with positive drainage to the dike outlet. (8.11.9.4)

69. ____ Provide energy dissipation measures as necessary. (8.11.9.4)

70. ____ Sediment laden runoff released through a sediment trapping facility. (8.11.9.4)

TEMPORARY GRAVEL OUTLET STRUCTURE

71. ____ Refer to Appendix "C," Detail 18.0, and Appendix "G" for standard notes. (8.11.10)

72. ____ Installed in conjunction with an interceptor dike or other structure designed to temporarily pond sediment-laden surface runoff. (8.11.10)

73. ____ Maximum drainage area is 5 acres. (8.11.10)

74. ____ Gravel 5/8-inch minus washed rock. (8.11.10)

75. ____ A layer of filter fabric embedded in the gravel. (8.11.10)

76. ____ Minimum length in feet of the gravel outlet structure equal to 6 times the number of acres of contributing drainage area. (8.11.10)

77. ____ The invert of the gravel outlet shall not be less than 6” lower than the minimum elevation of the top of the dike. (8.11.10)

78. ____ Water discharged from the gravel outlet onto an already stabilized area or into a stable watercourse. (8.11.10)

CHECK DAMS

79. ____ Refer to Appendix "C," Detail 19.0, “Log Check Dam and Rock Check Dams,” and Appendix “G” for standard notes. (8.11.11)

80. ____ Maximum area to be drained is 10 acres. (8.11.11)

81. ____ Check dams can be constructed of either rock, logs or pea gravel bags. (8.11.11)

82. ____ The maximum spacing between the dams such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. (8.11.11)

83. ____ Rock check dams constructed of 2 to 4” Ø rock. (8.11.11)

84. ____ Log check dams constructed of 4 to 6” Ø logs. (8.11.11)

85. ____ Logs embedded into the soil at least 18”. (8.11.11)

PLASTIC COVERING

86. ____ Refer to Appendix “G-8” for standard notes. (8.11.12)

MULCHING

87. ____ Refer to Appendix “G-8” for standard notes. (8.11.13)

88. ____ See Table 8.3 for guides to mulch materials, rates, and uses. (8.11.13)

EROSION CONTROL SEEDING

89. ____ Refer to Appendix “G-9” for standard notes. (8.11.14)

90. ____ Seed mixture as shown in Table 8.4. (8.11.14)

91. ____ Seed shall not be used in areas subject to wear by construction traffic. (8.11.14)

92. ____ Applicable in areas of 5% or less slope and in steeper areas (< 10% slope) for a maximum horizontal distance of 100’. Use mulch or netting or other treatments for steeper and longer slopes. (8.11.14)

PERMANENT EROSION AND SEDIMENT CONTROL

93. ____ Identify the means by which the site is to be permanently stabilized and the schedule by when it shall be completed. (8.12)

TOPSOILING

94. ____ Refer to Appendix "G" for standard notes regarding this practice. (8.12.1)

95. ____ Applied to areas with highly dense or impermeable soils. (8.12.1)

96. ____ Applied where mulch and fertilizer alone would not provide a suitable growth medium. (8.12.1)

97. ____ Applied where slopes do not exceed 2:1. (8.12.1)

STABILIZATION WITH SOD

98. ____ Sod may be used on sites that can be maintained with ground equipment (slopes not to exceed 2:1). (8.12.2)

SITE DEVELOPMENT DRAWINGS

DRAINAGE COURSE - NATURAL BUFFER AREAS

1. ____ Natural Buffer Areas (N.B.A.) required to protect drainage courses from erosion and pollutants. (4.6)

2. ____ Native vegetative cover such as salal, ferns, or forest duff is preserved intact. (4.6)

3. ____ Mowed lawns and/or grazed pastures not proposed as N.B.A.s. (4.6)

4. ____ Concentrated flows discharging into N.B.A.s are not proposed. (4.6)

5. ____ Roads, septic tank drainfield areas, and reserve drainfield areas are not proposed in N.B.A.s. (4.6)

EASEMENTS, ACCESS, AND DEDICATED TRACTS, NATURAL CHANNELS, AND STORMWATER FACILITIES

6. ____ 25' minimum on each side of the centerline of the drainage course, easements, access, and dedicated tracts. (4.6)

7. ____ All man-made drainage facilities and conveyances and all natural channels (on the project site) used for conveyance of altered flows due to development (including swales, ditches, stream channels, lake shores, wetlands, potholes, estuaries, gullies, ravines, etc.) located within easements or dedicated tracts. (4.7.1)

8. ____ Easements contain the natural features and facilities and allow County access. (4.7.1)

9. ____ R/D systems to be maintained by the County located in separate tracts and dedicated to the County. (4.7.1)

10. ____ Drainage facilities are not located in dedicated public road right-of-way areas, with the exception of County facilities. (4.7.1)

11. ____ Drainage facilities designed to function as multi-use recreational facilities located in separate tracts or in designated open space, privately maintained and owned. (4.7.1)

MAINTENANCE ACCESS FOR PUBLIC FACILITIES

12. ____ 15' minimum wide access easement provided to drainage facilities from a public street or right-of-way. (4.7.1.1)

13. ____ Access easements surfaced with 12' minimum width of crushed rock or other approved surface. (4.7.1.1)

14. ____ Maintenance access provided to manholes, catch basins, vaults, or other underground drainage facilities to be maintained by the County. (4.7.1.1)

15. ____ Maintenance provided via an access easement or dedicated tract. (4.7.1.1)

16. ____ Drainage structures for conveyance without vehicular access are channeled. (4.7.1.1)

ACCESS TO CONVEYANCE SYSTEMS

17. ____ Conveyance systems located in dedicated tracts, drainage easements, or public rights-of-way. (4.7.1.2)

ACCESS TO CONVEYANCE SYSTEMS (Continued)

18. ____ Conveyance systems to be maintained and operated by Pierce County located in a dedicated tract or drainage easement granted to Pierce County. (4.7.1.2)

19. ____ Any new conveyance system located on private property designed to convey drainage from other private properties located in a private drainage easement granted to the contributors of stormwater to the systems. (4.7.1.2)

20. ____ Pipes and channels located within the easement such that each pipe face or top edge of channel is $\geq$ 5' from its abutting easement boundary. (4.7.1.2)

21. ____ Pipes > 5' in Ø and channels with top widths > 5' placed in easements adjusted accordingly. (4.7.1.2)

22. ____ Drainage easement widths per Table 4.2, 15' minimum. (4.7.1.2)

GENERAL REQUIREMENTS

23. ____ Sheets have a north arrow, scale, a benchmark reference, Section, Township, and Range. (4.8.2.2.1)

24. ____ At least 2 coordinates matching Washington State Plane Coordinate System. (4.8.2.2.1)

25. ____ Legend. (4.8.2.2.1)

26. ____ All lettering $\geq$ 0.1". (4.8.2.2.1)

27. ____ Existing spot elevations $\geq$ 0.05". (4.8.2.2.1)

28. ____ Road alignments with 100' stationing and stationing at points of curve, tangent, and intersection, with ties to section or quarter corners or other established and monumented survey control points to include at the intersection of any proposed road or roads and the existing County road or State highway. (4.8.2.2.2)

29. ____ Lettering right reading. (4.8.2.2.2)

30. ____ Bearing on all centerlines. (4.8.2.2.2)

31. ____ Curve data including radius, delta, and arc length on horizontal lines. (4.8.2.2.2)

32. ____ Right-of-way, easement, and tract lines and dimensions for all existing and proposed facilities including proposed roads and intersecting roads. (4.8.2.2.2)

33. ____ Lots, tracts and easements shown. Lot numbers shown. (4.8.2.2.2)

34. ____ All topographic features within project limits and sufficient area beyond to resolve questions of setback, slope, drainage, access onto abutting property, and road continuations. (4.8.2.2.2)

35. ____ All ditch flow lines, all drainage structures with invert elevations, utility locations, fences, structures, existing curbing and approaches, pertinent trees and shrubbery, and other appurtenances that would effect the construction of the project. (4.8.2.2.2)

36. ____ Identification of all existing public roads and adjoining subdivisions. (4.8.2.2.2)

37. ____ Scale: 1"=20' or 1"=50' for public facilities and roads to be dedicated to the County. (4.8.2.2.2)

38. ____ Scale: 1"=50' for plats, 1"=20', 30', or 40' for all others. (4.8.2.2.2)

39. ____ North arrow points to the top or to the left of the sheet. (4.8.2.2.2)

40. ____ Existing features ghosted or shaded. (4.8.2.2.2)

COVER SHEET

41. ____ Cover sheet for plans sets of $\geq$ 3 sheets provided. (4.8.2.2.3)

The cover sheet is sheet 1 of the drawing set and contains the following information:

42. ____ A vicinity map, with north arrow oriented to the top of the sheet, showing project site, existing public road system, and any other pertinent information. (4.8.2.2.3)

43. ____ Minimum scale 4" = 1 mile. (4.8.2.2.3)

44. ____ An overall site plan or location map showing the project site. (4.8.2.2.3)

COVER SHEET (Continued)

45. ____ Road and storm drainage system network including its connection to an existing public road or state highway. (4.8.2.2.3)

46. ____ The applicant's and project engineering firm's names, address, and telephone numbers, current owner, and parcel numbers. (4.8.2.2.3)

47. ____ An index of drawings. (4.8.2.2.3)

48. ____ Title block descriptive of project. (4.8.2.2.3)

SITE AND/OR GRADING PLAN SHEETS

49. ____ The project's proposed storm drainage along with easements, tracts, drainage facilities, all buffer and screening areas, off-site and on-site existing drainage courses, delineated wetlands, and associated buffers. (4.8.2.2.4)

50. ____ Soil logs and soil log locations. (4.8.2.2.4)

51. ____ Wells - existing and proposed. (4.8.2.2.4)

52. ____ Topographic information including contour lines of the property in its existing condition

53. ____ Proposed grades. (4.8.2.2.4)

54. ____ Property lines, parcel numbers, and ownership. (4.8.2.2.4)

55. ____ Contour intervals per the following table:

Slope %	Contour Interval (feet)
0 - 15	2
16 - 40	5
> 40	10 (4.8.2.1)

PLAN AND PROFILE SHEETS

56. ____ Profiles provided for storm pipes ≥ 12" Ø. (4.8.2.2.5)

57. ____ Original ground line at 100' stations and at significant ground breaks and topographic features, with accuracy to within 0.1' on unpaved surface and 0.01' on paved surfaces. (4.8.2.2.5)

58. ____ Typical roadway/storm drainage cross-sections. (4.8.2.2.5)

59. ____ Existing and proposed drainage features indicating direction of flow, size and kind of each drainage channel, pipe and structure. (4.8.2.2.5)

60. ____ The status of existing drainage structures noted as either "existing-abandon" or "existing-remove." (4.8.2.2.5)

61. ____ Final surface and storm drain profile with stationing the same as the site/grading plan sheets. (4.8.2.2.5)

62. ____ Stationing of points of curve, tangent, and intersection of vertical curves, with elevations to 0.01' shown. (4.8.2.2.5)

63. ____ Surface grade and vertical curve data; roads measured at centerline. (4.8.2.2.5)

64. ____ Datum and bench mark information referenced to U.S.C. & G.S. control or County bench marks when there is an existing bench mark within ½ mile of the project. (4.8.2.2.5)

65. ____ Vertical scale 1"=5'. Clarifying details drawn to scale. Use 1"=10' for vertical scale when horizontal scale is at 1"=100'. (4.8.2.2.5)

66. ____ When roads end at a property line, the existing ground profile continued a minimum of 200' to show the proposed vertical alignment. (4.8.2.2.5)

67. ____ Storm drainage text shown only in profile. (4.8.2.2.5)

68. ____ Structure number shown in the plan and profile views. (4.8.2.2.5)

PLAN AND PROFILE SHEETS (Continued)

The following information shall be shown in the profile view:

69. ____ Type of structure. (4.8.2.2.5)

70. ____ Structure number. (4.8.2.2.5)

71. ____ Stationing/offsets (coordinates to be shown in the plan view). (4.8.2.2.5)

72. ____ Rim elevation. (4.8.2.2.5)

73. ____ Invert elevations (in & out). (4.8.2.2.5)

74. ____ Pipe length, pipe size, material and slope (%). (4.8.2.2.5)

DETAIL SHEETS

75. ____ Applicable standard notes per Appendix "H." (4.8.2.2.7)

76. ____ A minimum of 2 cross-sections of each R/D pond showing original property lines, slope catch points, and other pertinent information to adequately construct the pond. (4.8.2.2.7)

77. ____ Standard Open Conveyance System (OCS) cross-sections. (4.8.2.2.7)

78. ____ Right-of-way cross sections. (4.8.2.2.7)

79. ____ Construction recommendations from a soils report. (4.8.2.2.7)

80. ____ Sheet size is 22 x 34 inches.

HORIZONTAL CONTROL AND VERTICAL DATUM

81. ____ Drainage facilities tied to a known ¼ corner or section corner. (4.10.5)

82. ____ Drainage facilities tied to a known National Geodetic Vertical Datum (NGVD) monument identified in the Pierce County elevation bench marks book when a bench is located within 1/2 mile (by straight line) of the proposed project. (4.10.5)

83. ____ The Pierce County bench mark elevation, location, and designation shown on the plans. Elevation equations not used. (4.10.5)

84. ____ If a U.S. Coast and Geodetic Survey bench mark is not available, a temporary bench mark established on or adjacent to the project site and its assumed elevation shown on the drainage and/or site plan. (4.10.5)

85. ____ Cut slopes < 2 horizontal to 1 vertical or as recommended by a soils engineer. (17A.30.010.A.1)

86. ____ The catch point of the top of the slope set back from the site boundary line in accordance with the table. (17A.30.010.A.2 & B)

Cut Depth	Setback Distance
< 5'	2'
5 – 20'	Height/2
> 20'	10' (10.1.1)

FILL

87. ____ Fill slopes not steeper than 1-½ horizontal to 1 vertical or as recommended by a soils engineer. (17A.30.020.B)

88. ____ Ground surface for fills over 5' in height prepared by removing vegetation, noncomplying fill, topsoil and other unsuitable materials, scarifying. (17A.30.020.C)

89. ____ Ground surface for fills where existing slopes are > 5 horizontal to 1 vertical by benching into competent material as determined by the engineer. (17A.30.020.C)

90. ____ The bench under the toe of a fill on a slope > 5 horizontal to 1 vertical at least 10' wide or as recommended by a soils engineer. (17A.30.020.C)

91. ____ No material other than earth material buried or placed in fills. (17A.30.020.D)

92. ____ The toe or catch point of fill slopes set back from the site boundary line in accordance with the following table unless a retaining wall is designed by the engineer and constructed for the project: (17A.30.020.F)

Fill Depth	Setback Distance
< 5’	2’
5 – 40’	Height of Fill
> 40’	20’ (10.1.1.2)

STORM DRAINAGE ROUTE DESIGN

93. ____ Unless topography or existing site conditions prohibits, new conveyance system alignments on private property located in drainage easements that are adjacent and parallel to property lines. (6.8.5)

***EXCEPTION**:* Streams and natural drainage channels will not be relocated strictly to meet this requirement.

94. ____ Storm drainage pipe, except as otherwise provided for in these standards, is a rubber-gasketed concrete pipe, minimum 12” Ø, or double-walled, corrugated, polyethylene pipe, with a smooth internal diameter (AASHTO M-294 (Type-S) ADS N-12 plastic pipe 12” – 24” Ø only) or approved equal, coupled with a company produced PVC coupling or approved equal, except for perforated pipe and major underground detention facilities. Storm sewer pipe used for private roof/footing/yard drain systems can be < 12” Ø. (6.8.8.2)

95. ____ ADS N-12 pipe has a minimum cover of 2’. (6.8.8.2)

96. ____ Pipe located under the pavement flow line or lie outside of the pavement. Perpendicular crossings and cul-de-sacs are exempted. (6.8.8.2)

97. ____ Prior County approval obtained when extreme slope conditions or other unusual topographic conditions exist, other pipe materials and methods such as, but not limited to, PVC, HDPP, or ductile iron pipe may be used. (6.8.8.2)

98. ____ Approved pipe types:

- Ductile Iron, Class 50 or 52
- Reinforced concrete pipe
- Galvanized corrugated iron or steel pipe (with Treatment 1 through 6)
- Galvanized steel spiral rib pipe (with Treatment 1 through 6)
- Corrugated aluminum pipe
- Aluminum spiral rib pipe
- Aluminized Type 2 corrugated steel (meeting AASHTO treatment M274 and M56)
- Corrugated high density polyethylene pipe (CPEP) - smooth interior (maximum 24” Ø) meeting AASHTO standard M-294
- Corrugated high density polyethylene pipe (CPEP) - single wall, fully corrugated meeting AASHTO standard M-252 (permitted only outside public right-of-way and for use in temporary storm sewer systems and as downspout/footing/yard drain collectors on private property)
- Polyvinyl chloride (PVC) sewer pipe (SDR 35, meeting requirements of ASTM D3034)
- High density polyethylene pipe (HDPP). Pipe complies with requirement of Type III C5P34 per ASTM D1248 and have the PPI recommended designation of PE3408 and have an ASTM D3350 cell classification of 345434C or 345534C. Pipe has a manufacturer's recommended hydrostatic design stress rating of 800 psi based on a material with a 1600 psi design basis determined in accordance with ASTM D2837-69. Pipe has a design working pressure of 50 psi at 73.4° F and SDR of 32.5. (6.8.8.2)

99. ____ Designs utilizing HDP pipe include consideration of the material's thermal expansion/contraction properties for anchoring. (6.8.8.2)

100. ____ Plain concrete, 8” Ø, storm sewer pipe used for a cross street connection from a concrete inlet to a Type 1 or 2 catch basin or manhole (CB leads). (6.8.8.2)

101. ____ See Appendix “A,” Detail 12.1, “Pipe Anchor Details - Example.” (6.8.8.3)

102. ____ Downsizing of pipes is only allowed under special conditions (i.e. no hydraulic jump can occur; downstream pipe slope is significantly greater than the upstream slope; velocities remain in the 3 - 8 fps range, etc.). (6.8.8.3)

103. ____ Downsizing of downstream culverts within a closed system with culverts 18” Ø or smaller will not be permitted. (6.8.8.3)

STORM DRAINAGE ROUTE DESIGN (Continued)

104. ____Steep slopes (> 25%) has all drainage piped from the top to the bottom in HDP pipe (butt fused) or ductile iron pipe welded or mechanically restrained. Additional anchoring design is required for these pipes. (6.8.8.4)

PIPE SYSTEM LAYOUT CRITERIA

105. ____Pipes must be laid true to line and grade with no curves, bends, or deflections in any direction (except for HDPP and Ductile Iron with flanged restrained mechanical joint bends, not > 30°, on steep slopes). (6.8.8.5)

106. ____A break in grade or alignment or changes in pipe material occurs at catch basins or manholes. (6.8.8.5)

107. ____Connections to a pipe system made at catch basins or manholes. (6.8.8.5)

108. ____Wyes or tees are allowed on private roof/footing/yard drain systems on pipes 8" Ø, or less, with clean-outs upstream of each wye or tee. (6.8.8.5)

109. ____6" minimum vertical and 3' minimum horizontal clearance (outside surfaces) between storm drain pipes and other utility pipes and conduits provided. (6.8.8.5)

110. ____Suitable pipe cover over storm pipes in road rights-of-way calculated for HS-20 loading. (6.8.8.5)

111. ____PVC, SDR 35, minimum cover 3' in areas subject to vehicular traffic; maximum cover 30'. (6.8.8.5)

112. ____Pipe cover in areas not subject to vehicular loads 1' minimum. (6.8.8.5)

113. ____Access barriers on all pipes $\geq$ 18" exiting a closed pipe system. (6.8.8.5)

114. ____Debris barriers on pipes entering a pipe system. (6.8.8.5)

115. ____See debris barrier details, Appendix "A," Detail 13.0, "Debris Barrier 1 (45º) & (90º)," Detail 14.0, "Debris Barrier 3," and Detail 15.0, "Debris Barrier 4." (6.8.8.5)

116. ____Where a minimal fall is necessary between inlet and outlet pipes in a structure, pipes aligned vertically by 1 of the following in order of preference:

a) Match pipe crowns
b) Match 80% diameters of pipes
c) Match pipe inverts. (6.8.8.5)

117. ____High Density Polyethylene pipe systems > 100' anchored at the upstream end if the slope exceeds 25% and the downstream end placed in a minimum 4' long section of the next larger pipe size. (6.8.8.5)

118. ____Within subdivisions, roof drain interceptors that are intended to run parallel to the right-of-way before connecting to the back of a catch basin should be designed to be located 10 feet or greater from the right-of-way line. Appropriate easements should be provided for the interceptor line. The intent is to minimize conflicts with other utilities."

STRUCTURE CRITERIA

Type 1 catch basins used at the following locations or for the following situations:

119. ____When overall structure height $\leq$ 8' or when invert is $\leq$ 5'. (6.8.8.6)

120. ____When pipe sizes $\leq$ 18" and connect at right angles to the long side of the structure; or 12" connecting to the short side. (6.8.8.6)

121. ____When pipes tying into the structure connect at or very near to right angles. (6.8.8.6) Unless otherwise required by the County, Type 1L catch basins must be used at the following locations or for the following situations:

122. ____When any pipes tying into the structure > 18" connecting to the long side, or 15" connecting to the short side at or very near to right angles. (6.8.8.6)

Type 2 (48" minimum Ø) catch basins used at the following locations or situations:

123. ____When overall structure height $\leq$ 15'. (6.8.8.6)

124. ____Type 2 catch basins > 4' in height have standard ladders. (6.8.8.6)

STRUCTURE CRITERIA (Continued)

125. ____Connection of a private storm drainage system into a County system occurs, a minimum of a Type 1 catch basin. (6.8.8.6)

126. ____A plan view (and sections if necessary) of the junction structure, drawn to scale, when more than 4 pipes enter the structure on the same plane, or if angles of approach and clearance between pipes is of concern. The plan view (and sections if necessary) must insure a minimum distance (of solid concrete wall) between pipe openings of 8" for 48" and 54" Ø catch basins and 12" for 72" and 96" Ø catch basins. (6.8.8.6)

127. ____See Table 6.8 for allowable structure and pipe sizes. (6.8.8.6)

128. ____The maximum slope of the ground surface for a radius of 5' around a catch basin grate is 3:1. (6.8.8.6)

129. ____Catch basins provided within 50' of the entrance to a pipe system. (6.8.8.6)

130. ____Maximum spacing of structures for storm drainage conveyance lines running within an easement area 350' for pipe grades > 0.3% and 200' for grades < 0.3%. (6.8.8.6)

131. ____Structures not acting as points of entry for stormwater have solid, locking lids. (6.8.8.6)

132. ____Locking lids installed on structures containing restrictor or flow devices. (6.8.8.6)

133. ____Maximum spacing of catch basins 200' for pipe grades < 0.3%. 350' for pipe grades $\geq$ 0.3%. (6.8.8.6)

134. ____Maximum surface runs between inlet structures on the paved roadway surface shall be as follows:

Roadway Slope (%)	Pierce County Max. Spacing (ft)
0.7 to 1	200
1 to 6	350
6 to 8	250
8 to 12	150

135. ____A metal frame and grate for catch basin and inlet, WSDOT Standard Plan B-2a or B-2b used for structures collecting drainage from the paved roadway surface. (6.8.8.6)

136. ____Asphalt berm installed around the inlet of the structure when the road profile $\geq$ 6% between structures. (6.8.8.6)

137. ____All catch basins, inlets, etc., marked as shown in Appendix "A," Detail 17.0, "Fish Stencil." (6.8.8.6)

CULVERT CRITERIA

138. ____Galvanized or aluminized pipe not used in marine applications. (6.8.9)

139. ____For cross culverts under public roadways - minimum 18", 12" if grade and cover do not allow for 18". (6.8.9.1)

140. ____For roadside culverts, including driveway culverts, - minimum 12". (6.8.9.1)

141. ____For culverts on private property - minimum 8". (6.8.9.1)

142. ____Inlets and outlets protected from erosion by riprap per Table 6.9, Channel Protection. (6.8.9.1)

143. ____Debris and access barriers on inlet and outlet ends of all culverts >18" in Ø. Culverts > 36" in Ø within stream corridors are exempt. (6.8.9.1)

144. ____CPEP and PVC culverts and pipe systems have concrete or rock headwalls at exposed pipe ends. (6.8.9.1)

145. ____No bends in culvert pipes. (6.8.9.1)

146. ____2' minimum cover under roads. (6.8.9.1)

147. ____1' minimum cover under roadside applications and on private property, exclusive of roads. If the minimum cover cannot be provided on a flat site, use ductile iron pipe and analyze for loadings. (6.8.9.1)

148. ____Maximum culvert length: 250'. (6.8.9.1)

CULVERT CRITERIA (Continued)

149. ____ Minimum separation from other pipes: 6" vertical (with bedding), 3' horizontal. (6.8.9.1)

150. ____ Trench backfill specified as bankrun gravel or suitable native material compacted to 95% Modified Proctor test to a depth of 2', 90% below 2' compacted in 8" – 12" lifts. (6.8.9.1)

151. ____ All driveway culverts of sufficient length to provide a minimum 3:1 slope from the edge of the driveway to the bottom of the ditch. (6.8.9.1)

152. ____ Culverts shall have beveled end sections to match the side slope. (6.8.9.1)

OUTFALLS

153. ____ All piped discharges to streams, rivers, ponds, lakes, or other open bodies of water provide for energy dissipation. (6.8.10)

154. ____ See Table 6.9, "Rock Protection At Outfalls," and Appendix "A," Details 3.0 and 3.1. (6.8.10)

155. ____ Outfalls that discharge to Puget Sound or a major waterbody require tide gates. (6.8.10)

OPEN CONVEYANCES

156. ____ Channel side slopes < 2:1 for undisturbed ground (cuts) and disturbed ground (embankments). (6.8.11)

157. ____ Constructed channels specified to be compacted to a minimum 95% compaction as verified by a Modified Proctor test. (6.8.11)

DISCHARGE LOCATIONS

158. ____ Stormwater does not discharge directly onto County roads or into a County system without prior approval. (6.9.1)

159. ____ Discharges to a County system by a structure such as an inlet, catch basin, manhole, through an approved sidewalk underdrain or curb drain, or into an existing or created County ditch. (6.9.1)

160. ____ Concentrated drainage does not discharge across sidewalks, curbs or driveways. (6.9.1)

161. ____ Buildings have roof downspouts and subsurface drains directed to either an infiltration system or to the storm drainage system. (6.9.1)

DRAINAGE STUB-OUTS

162. ____ Each outlet located at the lowest elevation on the lot, so as to service all future roof downspouts and footing drains, driveways, yard drains, and any other surface or subsurface drains. (6.9.2)

163. ____ Each outlet has a free-flowing, positive drainage to an approved storm water conveyance system or to an approved outfall location. (6.9.2)

164. ____ Outlets on each lot located with a 5' high, 2" x 4" stake marked "STORM" or "DRAIN". (6.9.2)

165. ____ Stub-outs to a surface drainage, the stub-out visibly extend above surface level and is secured to the stake. (6.9.2)

WATER QUALITY FACILITIES

166. ____ Stormwater treatment BMPs not built within a natural buffer area. (1.2.4)

167. ____ All runoff from disturbed areas on a project site, except from roofs and stabilized non-vehicular traffic areas, receives treatment for water quality prior to discharge. (7.2)

168. ____ Treatment precedes retention systems with the exception of clean roof runoff, landscaping, non-vehicular traffic areas, and single family systems. (7.2)

169. ____ Projects with $\geq$ 2 acres of impervious surface subject to vehicular traffic provide <u>both</u> biofiltration and sediment control. (7.2)

170. ____ If the development discharges to a lake or wetland that has been determined to be in an accelerated eutrophication process or discharges to groundwater and poses a risk of nitrate contamination, then both source control and runoff treatment provided. (7.4)

BIOFILTRATION - GENERAL

171. ____ Vegetated filter strips have flow that is distributed broadly along the width of the vegetated area by sheet flow. (7.6)

172. ____ If the field measured soil infiltration rate is > 2.4"/hour, the presettling basin or swale is lined with a minimum of 18" depth of borrow material having an infiltration rate < 2.4"/hour or a geomembrane liner. (7.6.1)

173. ____ If the percolate from a biofilter could contaminate groundwater, the bed is sealed with a clay liner (see Section 7.6.1).

174. ____ On sites where the biofilter will intercept groundwater or where there is little or no slope to allow for good drainage, emergent herbaceous native wetland vegetation is an acceptable planting alternative. (7.6.1)

175. ____ Grass mixes that are suitable are listed in Table 7.1, "Characteristics of Grasses Suitable for Lining Puget Sound Region Biofilters." (7.6.1)

Other recommended grasses and legumes:

Meadow foxtail	Creeping red fescue	Tall fescue
Timothy	White clover	Redtop
Seaside colonial bentgrass		

Other water-resistant grasses that grow well in regional conditions are Poa trivialis (roughstalk bluegrass) and Lolium perenne (perennial ryegrass). (7.6.1)

176. ____ If flow is to be introduced via curb cuts, place pavement slightly above the biofilter elevation. Curb cuts ≥ 12" wide. (7.6.1)

177. ____ Energy dissipation at the biofilter inlet provided. (7.6.1)

178. ____ If rip rap is used, 6 – 9" rocks fit tightly together across the bed and for a distance of 5 – 10' downstream. (7.6.1)

179. ____ High-flow bypass if the biofilter is upstream of the flow control BMPs and erosive velocities cannot be prevented, or if the biofilter discharges directly to a sensitive receiving water without quantity control. (7.6.1)

180. ____ If a bypass is used, it may consist of an inlet flow regulating device and a pipe or reinforced channel. (7.6.1)

181. ____ Install a flow-spreading device to uniformly distribute flow at the biofiltration swale inlet or across the width of a filter strip. The flow-spreading device allow removal of sediment and debris. (7.6.1)

182. ____ No heavy and prolonged shading of the biofilter by buildings and/or trees. (7.6.1)

183. ____ A spacing of at least 20' for trees planted close to a biofilter. Landscape beds near biofilters should preferably be at a slightly lower elevation than the ground surface. Provide landscape plan. (7.6.1)

184. ____ Vegetate the ground upslope from the grassed treatment area of the biofilter to prevent erosion. (7.6.1)

BIOFILTRATION SWALES - SPECIFIC DESIGN CRITERIA

185. ____ Use a wide radius curved path where a linear swale is not feasible. (7.6.2)

186. ____ Located outside of a wetland buffer area. (7.6.2)

187. ____ Meets design criteria of Table 7.2. (7.6.2)

TABLE 7.2

BIOFILTER DESIGN CRITERIA

Design Element	Criterion
Biofilter length	100' minimum for swales, 75' minimum for filter strips parallel to flow.
Biofilter bottom width	2' – 8' maximum for swales. [a]
Design flow water depth	3" maximum for swales, 0.5" max. for filter strips.

Design Element	Criterion
Design flow velocity	<0.9 fps[b]
Flow line slope – swales	1% minimum, 6% maximum[c]; 0.5% minimum for retrofits
Slope - filter strips	10%
Residence time	5 minutes for retrofits 9 minutes min. for new systems
Side slopes – swales	< 3:1[d]
Mannings "n" for treatment	0.20 for regularly mowed, 0.24 else

a) Widths over 8' may be approved by the County if uniform sheet flow in the swale can be ensured through use of spreaders or special construction techniques.

b) For quantity control, verify stability with calculations. Where the swale carries all storm flows, the swale must be able to carry the design event (see Section 6.8).

c) Slope of biofilters shall be between one to six percent (1%-5% for filter strips). Slopes of 4-6% may require the use of check dams depending on soil type. The County may approve a steeper slope provided that check dams or other means to slow velocity are installed. Flatter slopes, 1%-2%, may require the use of underdrains.

d) If the biofilter is designed as a channel, the specified surface area shall be shaped as a trapezoidal cross-section with side slopes of 3:1 or less and a minimum length of 100'. Side slopes of 2:1 may be used if the depth of the swale is less than 18" and the flow is less than 2 cfs. The freeboard required is 3" for flows less than 1 cfs, 6" for flows between 1 and 5 cfs, and 1' for all other flow ranges.

188. ____If the biofilter is designed as a channel, the specified surface area shall be shaped as a trapezoidal cross-section with side slopes of 3:1 or less and a minimum length of 100'. (7.6.2)

189. ____The freeboard required is:

< 1 CFS	3"
≥ 3 CFS & < 5 CFS	6"
≥ 5 CFS	12" (7.6.2)

190. ____If designed as a filter strip the minimum width 75'; the surface contributing to the strip shall be sloped so as to ensure that the runoff is evenly distributed to the strip; curb cuts for tributary paved area shall have a least 12" openings and occur at least every 10'. (7.6.2)

191. ____Irrigation and other maintenance as necessary provided to ensure that the vegetation remains viable and that a hardy root structure forms in the first year. Provide irrigation plan. (7.6.2)

192. ____Where located over Hydrologic Group A soils (soils with a weighted average field-saturated percolation rate of 6" per hour or greater), the biofilter shall be lined per Section 7.6.1. The topsoil shall be predominantly sandy loam, but must include small amounts (about 10%) of clay and organic matter to provide treatment of percolated water. (7.6.2)

WET POND TYPE BMPs
TABLE 7.3

SURFACE AREA - POOL DEPTH RELATIONSHIPS FOR WET POND-TYPE BMPS

Detention BMP	Pool Depth (feet)	Surface Area (as percent of total BMP surface area)	Maximum Average BMP Depth (feet)*
Constructed Wetland	0 - 0.5 0.5 – 1 2 – 3 3 – 6	50% 15% 15% 20%	2.0
Wet Pond (Nutrient Control)	0 – 2 2 – 6	30% 70%	5.0
Wet Pond (Conventional) or Wet Vault/Tank	0 – 6	100%	6.0

*The average BMP depth is found by summing the products of the pool depths and surface areas, e.g., for the Wet Pond (Nutrient Control), d = (2 ft * 0.30) + (6 ft. * 0.70) = 4.8'.

IMPERMEABLE LINERS AND GEOTEXTILE FABRIC

193. ____A minimum depth of 3' and a maximum of 6' used in permanent pool. (7.7)

194. ____Where a pond intersects with local groundwater, the treatment portion of the pond lined with an impermeable liner if the soils have an infiltration rate greater than 2.4"/hour. (7.7.1)

195. ____Impermeable liners may be either clay, concrete or synthetic geomembrane. (7.7.1)

IMPERMEABLE LINERS AND GEOTEXTILE FABRIC (Continued)

196. ____Clay liner meets the specifications in Table 7.4, “Clay Liner Specifications.” (7.7.1)

197. ____The clay liner shall have a minimum thickness of 12”. (7.7.1)

198. ____Geomembrane liner has a minimum thickness of 30 mils and is ultraviolet resistant. (7.7.1)

199. ____The geomembrane fabric is protected by installing geotextile fabric on the top and bottom of the geomembrane. (7.7.1)

200. ____Geotextile specified per the WSDOT Standard Specifications as Amended, Section 9-33 Construction Geotextile. (7.7.1)

CONCRETE LINER

201. ____Concrete liners may also be used for sedimentation chambers and for sedimentation and filtration basins < 1,000 square feet in area. (7.7.1)

202. ____Concrete 5” thick Class 3000 or better and reinforced by steel wire mesh. (7.7.1)

203. ____Steel wire mesh 6 gage wire or larger and 6” by 6” mesh or smaller. (7.7.1)

204. ____When the underlying soil is clay or has an unconfined compressive strength of < 500 PSI, the concrete has a minimum 6” compacted aggregate base consisting of coarse sand and river stone, crushed stone or equivalent with a Ø of 0.75 - 1”. (7.7.1)

CONSTRUCTED WETLANDS

205. ____2 main components, a shallow marsh area and a deeper. (7.7.2)

206. ____"Live Storage" can be accomplished by designing for a volume above the permanent pool depth. See Appendix "B," Detail 3.0, “Typical Wet Pond.” (7.7.2)

207. ____Runoff quantity control is managed through the "live storage" portion of the pond. (7.7.2)

208. ____All constructed wetlands designed for water quantity and quality control meet the applicable criteria of both Chapters 6 and 7. (7.7.2)

209. ____Designed per Chapter III-4.4.3 of the *Department of Ecology Stormwater Management Manual for the Puget Sound Basin*. (7.7.2)

210. ____Designed in conjunction with a qualified Wetland Consultant. (7.7.2)

211. ____Constructed wetlands placed in soils with a field saturated percolation rate > 0.5” per hour are lined. (7.7.2)

212. ____Lining is 4” – 6” of silt loam, sandy clay loam, or organic muck. (7.7.2)

WET PONDS

213. ____A wet pond can also be designed for quantity control through the use of "live storage." See Appendix "B," Detail 4.0, “Typical Wet Pond-Type Detention BMP – Schematic,” and Detail 5.0, “Wet Pond (Nutrient Control).” (7.7.3)

214. ____Wet ponds shall be between 3’ and 6’ deep and constructed of 2 or 3 cells. (7.7.3)

215. ____The first cell a minimum of 3’ deep. (7.7.3)

216. ____Length to width ratio 3:1 to 5:1. (7.7.3)

217. ____Inlet and outlet at opposite ends or baffles installed. (7.7.3)

218. ____Bottom level. (7.7.3)

219. ____Outlets have a device for trapping floatable contaminants. (7.7.3)

220. ____Detention ponds utilized for water quality meet the criteria for bottom porosity of constructed wetlands. (7.7.3)

221. ____In excessively drained soils, the pond lined per constructed wetlands. (7.7.3)

222. ____ Pond slopes above the permanent pool storage water level hydroseeded with an appropriate wetness-tolerant seed and planted with screening vegetation (shrubbery). (7.7.3)

WET VAULTS/TANKS

223. ____ If a wet vault/tank is designed to provide runoff treatment but not runoff quantity control, located "off-line" from the primary conveyance/detention system. (7.7.4.1)

224. ____ Flows above the peak flow for the water quality design storm bypass the facility in a separate conveyance to the point of discharge. (7.7.4.1)

225. ____ Mechanism provided at the bypass point to take the facility "off-line" for maintenance purposes. (7.7.4.1)

226. ____ Demonstrated that more desirable BMPs are not practicable. (7.7.4.2)

227. ____ Minimum of 20' from any structure, property line, and from any septic tank/drain field. (7.7.4.3)

228. ____ Minimum of 50' from the top of any steep slope. A geotechnical report must address the potential impact on a steep slope if it is proposed to be closer. (7.7.4.3)

229. ____ Designed per Wet Ponds (conventional pollutants). (7.7.4.3)

230. ____ The length-to-width ratio at the design surface area $\geq$ 3:1. (7.7.4.3)

231. ____ Where the wet vault/tank is designed to provide sediment containment, a minimum of 0.5 feet of dead storage depth provided. (7.7.4.3)

232. ____ Laid flat or the wet vault/tank divided into 2 cells using a baffle, with the forebay, occupying 25% of the area. (7.7.4.3)

233. ____ Top of the baffle wall same as the depth of the permanent pool. (7.7.4.3)

PRESETTLING BASINS

234. ____ Runoff treated by a presettling basin further treated by a water quality infiltration or filtration BMP prior to discharge to groundwater. (7.8)

235. ____ Located "off-line" from the primary conveyance/detention system if used to protect infiltration or filtration BMPs from siltation. (7.8)

236. ____ See Appendix "B," Detail 6.0, "Presettling Basin Schematic." (7.8)

237. ____ Used when there is no requirement to provide runoff quantity control. (7.8)

238. ____ See Appendix "B," Detail 7.0, "Basin Configurations With Baffles." (7.8.1)

239. ____ Short-circuiting of flow through the basin avoided through the use of baffles or an acceptable alternative. (7.8.1)

240. ____ The basin bottom shall be flat. (7.8.1)

241. ____ If the field measured soil infiltration rate > 2.4"/hr., the presettling basin or swale lined with a minimum of 18" depth of borrow material having an infiltration rate < 2.4"/hr. or a geomembrane liner. (7.8.1)

242. ____ If reverse slope pipe(s) are to be used as outlet control, then a micropool incorporated at the outlet. (7.8.1)

OFF-LINE ISOLATION/DIVERSION STRUCTURES

243. ____ Located off-line when used to protect infiltration and filtration BMPs from siltation. (7.8.2)

244. ____ Isolation of the treatment storm achieved by using isolation/diversion baffles and weirs. See Appendix "B," Detail 8.0, "Isolation/Diversion Structure - Schematic," and Detail 9.0, "Isolation/Diversion Structure - Schematic." (7.8.2)

OUTLET STRUCTURE

245. ____ The outlet structure for water quality facilities not incorporating detention storage, designed to provide a range of detention times for different runoff volumes with a draw-down time of 40 hours for the 6-month, 24-hour storm. (7.9)

246. ____ A perforated pipe or equivalent used as the outlet structure. (7.9)

247. ____ The perforated riser pipe can be selected from Table 7.5. (7.9)

248. ____ Trash rack provided for the outlet. (7.9)

249. ____ Openings in the rack < 1/3 Ø of the vertical riser pipe. (7.9)

OUTLET STRUCTURE (Continued)

250. ____ Rack made of durable material, resistant to rust and ultraviolet rays. (7.9)

251. ____ Bottom rows of perforations of the riser pipe protected from clogging. See Appendix "B," Detail 10.0, “Perforated Riser Pipe Outlet Structure w/Debris Barrier - Schematic.” (7.9)

252. ____ Geotextile fabric wrapped over the pipe's bottom rows and a cone of 1” – 3” Ø drain rock placed around the pipe. See Appendix "B," Detail 11.0, “Gravel Cone W/Riser.” (7.9)

INLET STRUCTURES

253. ____ Inlet structures installed prior to the water quality BMP, adequate for isolating the water quality volume and conveying the peak flows for the quantity control design storms past the water quality BMP. (7.10)

SAND FILTRATION

254. ____ A presettling basin and/or biofiltration swale (site dependant) used to pretreat runoff discharging to a sand filter. (7.11) (7.11.1)

255. ____ Inlet structure, sand bed, underdrain piping and basin liner provided. (7.11)

256. ____ Basin liner required if the treated runoff is not to be allowed to percolate into the soil underlying the filtration basin. (7.11)

257. ____ Appendix "B," Detail 12.0, “Sand Filtration System Configuration,” illustrates sand filtration basin systems. (7.11)

258. ____ Sand filtration BMPs not used as sediment basins during construction. (7.11)

259. ____ If a sand filtration basin is used as a substitute for an API or CPS-type oil/water separator, then pretreatment will not be necessary if the contributing drainage area is < 2 acres and completely impervious. (7.11)

260. ____ Designed according to the guidelines described in Chapter III-3.7.2 and III-3.7.3 of the *Stormwater Management Manual for the Puget Sound Basin*. (7.11.1)

261. ____ The top surface layer level. (7.11.1)

262. ____ Configured to utilize either a gravel layer or a trench design which utilizes drainage matting as a substitute for the gravel layer. (7.11.1)

Gravel Layer

263. ____ Sand Bed with Gravel Layer (Appendix "B," Detail 12.0, “Sand Filtration System Configuration”). (7.11.1)

264. ____ Top layer a minimum of 18” of 0.02-0.04” Ø sand (smaller sand size is acceptable). (7.11.1)

265. ____ Under the sand a layer of ½ - 2” Ø gravel which provides a minimum of 2” of cover over the top of the underdrain lateral pipes. (7.11.1)

266. ____ Sand and gravel separated by a layer of geotextile fabric meeting the specifications the WSDOT State Standard Specifications as Amended, Section 9-33 Construction Geotextile. (7.11.1)

Drainage Matting

267. ____ Sand Bed with Drainage Matting (Appendix "B," Detail 12.0, “Sand Filtration System Configuration”). (7.11.1)

268. ____ Laterals placed in trenches with a covering of ½ - 2” gravel and geotextile fabric. The lateral pipe underlain by a layer of drainage matting. (7.11.1)

General

269. ____ Specifications for the fabric and/or drainage matting are found in the WSDOT State Standard Specifications as Amended, specifically, Section 9-33 Construction Geotextile. (7.11.1)

270. ____ The underdrain piping consists of the main collector pipe(s) and perforated lateral branch pipes. The piping adequate to withstand the weight of the overburden. (7.11.1)

271. ____ Internal diameters of lateral branch pipes ≥ 6" with 3/8 perforations. (7.11.1)

272. ____ Piping schedule 80 PVC or greater strength. (7.11.1)

273. ____ Maximum spacing of 10' between laterals. (7.11.1)

274. ____ Maximum spacing between rows of perforations ≤ 6". (7.11.1)

275. ____ Minimum slope of piping 1% slope. (7.11.1)

276. ____ Access for cleaning all underdrain piping provided by installing cleanout ports which wye into the underdrain system and surface above the top of the sand filtration media. (7.11.1)

277. ____ An impermeable liner provided if the soil porosity exceeds the criteria for wet ponds and the runoff is to be treated; it shall meet the specifications in Table 7.4, "Clay Liner Specifications." (7.11.1)

278. ____ If an impermeable liner is not required then a geotextile fabric liner shall be installed which meets the specifications listed in the WSDOT State Standard Specifications as Amended unless the basin has been excavated to bedrock. (7.11.1)

279. ____ Impermeable liners either clay, concrete or geomembrane. (7.11.1)

SAND FILTRATION TRENCH

280. ____ Pretreatment provided. (7.11.2)

281. ____ Trench designs per Appendix "B," Detail 13.0, "Sand Filtration System - Schematic." (7.11.2)

WATER QUALITY INFILTRATION TRENCH

282. ____ Water quality infiltration trenches are designed primarily to provide runoff treatment but not runoff quantity control. (7.12)

283. ____ The soils underlying must be capable of removing pollutants and will unlikely be suitable for quantity control. (7.12)

284. ____ Trenches 2 to 10' in depth backfilled with a coarse stone aggregate suitable for temporary storage of runoff in the voids. See Appendix "B," Detail 14.0, Water Quality Infiltration Trench System - Schematic." (7.12)

285. ____ Designed with an observation well per Appendix "A," Detail 10.4, "Observation Well Detail." (7.12)

OIL/WATER SEPARATORS, FILTER VAULTS, COALESCING PLATE FILTERS

286. ____ Design criteria and maintenance criteria for gravity oil/water separators are available through the Washington Department of Ecology (DOE), document WDOE 82-1, "Design Criteria for Quantity Oil/Water Separators" and through the American Petroleum Institute (API), document API 421, published in 1990. (7.13)

287. ____ Used for high intensity vehicle use areas such as automobile service station pump aprons, bus barns, auto repair facilities, wrecking yards, etc. (7.13)

288. ____ If oil/water separators will discharge to surface or groundwater, effluent routed through water quality treatment facilities per Section 7.7. (7.13)

OIL/WATER SEPARATORS, FILTER VAULTS, COALESCING PLATE FILTERS (Continued)

289. ____ A sample oil/water separation control structure is shown in Appendix "B," Detail 15.0. (7.13)

290. ____ Vault must be easily accessible by tank cleaning trucks. (7.13)

COALESCING PLATE FILTERS

291. ____ Proceeds all other treatment flow rate facilities. (DOE III-7.2)

292. ____ Removable covers for observation and maintenance. (DOE III-7.2)

293. ____ Roofs and other impervious areas not subject to oil shall not discharge to CPS. (DOE III-7.2)

294. ____ Any pump installed downstream of CPF. (DOE III-7.2)

295. ____ Plates ≥ 3/4" apart. (DOE III-7.2)

296. ____Plate angle: 45° - 60° from horizontal. (DOE III-7.2)

FUELING STATIONS
BMP S1.10

297. ____ Fueling pad paved w/P.C.C., not asphalt. (DOE IV-4.1)

298. ____ Designed to prevent spill from running into storm system. (DOE IV-4.1)

299. ____ Fuel island runoff/spills collected in trench drains or CBs. (DOE IV-4.1)

300. ____ Fueling pad sloped to drain. (DOE IV-4.1)

301. ____ Drains routed to dead end sump. (DOE IV-4.1)

BMP S1.10

302. ____ Fuel island covered to edge of concrete. (DOE IV-4.1)

EROSION/SEDIMENT CONTROL REPORT

EROSION/SEDIMENT CONTROL REPORT SECTION 1
CONSTRUCTION SEQUENCE AND PROCEDURE

1. ____ State which construction elements are contingent upon completion of erosion control facilities. Sequence must be on construction plan sheets. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 2
SOIL STABILIZATION AND SEDIMENT TRAPPING

2. ____ Describe methods and procedures for trapping sediment before it reaches the storm drainage detention system, adjoining property, or natural channels. (4.8.1.2)

3. ____ Describe how loss of soil due to vehicles tracking it away from the site will be prevented. (4.8.1.2)

4. ____ Describe clean-up methods both on and off site. (4.8.1.2)

5. ____ Describe frequency of sediment removal. (4.8.1.2)

6. ____ Describe procedures for stabilizing exposed soil in or near environmentally sensitive areas. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 3
PERMANENT EROSION CONTROL AND SITE RESTORATION

7. ____ Describe retaining walls, revetments, energy dissipaters, geotextiles, paving or bank reinforcement, landscaping, and other permanent site features. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 4
GEOTECHNICAL ANALYSIS AND REPORT

8. ____ If a retention and/or detention facility is near the top of a regulated slope (see Section 6.6.7), then a geotechnical report addressing effects of seepage and the potential for slope failure during any precipitation event through the design event will be required as part of the Drainage and Erosion/Sediment Control Plan. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 5
INSPECTION SEQUENCE

9. ____ Itemize the erosion/sediment control measures necessary to ensure erosion and sedimentation are addressed. (4.8.1.2)

10. ____ Indicate a schedule for inspections to ensure the erosion/sediment control facilities are functioning adequately. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 6
CONTROL OF POLLUTANTS OTHER THAN SEDIMENTS

11. ____ Describe how pollutants other than sediments are anticipated to be controlled on the work site. (4.8.1.2)

12. ____ Provide a plan of action that includes elements such as centralized areas for equipment and concrete truck washing, and for temporary storage of debris and other stockpiled materials. (4.8.1.2)

EROSION/SEDIMENT CONTROL REPORT SECTION 7
UTILITIES

13. ____ Describe how new utilities are to be brought to the site and provided to individual lots. (4.8.1.2)

14. ____ Describe the construction processes to be used to ensure that erosion or sediment transport will not occur during ditching activities and while the ditch is open. (4.8.1.2)

15. ____ Describe how utilities will be installed to ensure no conflicts with proposed stormwater quantity and quality control measures. (4.8.1.2)

16. ____ If trenching activities are part of the submittal either in the development's Drainage and Erosion/Sediment Control Plan or the Abbreviated Plan, the Utility(ies) will not be required to make a separate submittal for approval. (4.8.1.2)

EROSION CONTROL DRAWING(S)

17. ____ Construction entrance detail. (4.8.2.1)

18. ____ Filter Fabric (silt) fences and traps. (4.8.2.1)

19. ____ Mulching and vegetation details and notes. (4.8.2.1)

20. ____ Clearing and grubbing limits. (4.8.2.1)

21. ____ Existing and finished grade. (4.8.2.1)

22. ____ Standard erosion control plan notes. Example notes are found in Appendix "G." Provide only those notes that apply. (4.8.2.1)

23. ____ Details of sediment control facilities to include all dimensions, descriptions of materials and typical sections. (4.8.2.1)

24. ____ Location of washdown areas and stockpile areas. (4.8.2.1)

25. ____ Locations of all joint utility trenches and details of erosion and sediment transport control features. (4.8.2.1)

26. ____ Permanent erosion control features. (4.8.2.1)

DESIGN FOR EROSION/SEDIMENT CONTROLS DURING CONSTRUCTION

27. ____ Temporary Erosion/Sediment Control facilities designed for a developed condition, 2-year, 24 hour SCS Type 1A storm event. (8.4)

28. ____ Sediment ponds sized for a 10-year, 24-hour SCS Type 1A storm event. (8.4)

29. ____ All temporary on-site conveyance channels designed, constructed and stabilized to prevent erosion from the expected velocity of flow from a 2-year, 24-hour SCS Type 1A storm for the developed condition unless otherwise specified per Section 8.5.3, Plan of Action. (8.4)

DESIGN PARAMETERS

30. ____ The design of a sediment trap or pond is dependant upon the peak inflow from a 2-year, 24-hour storm, the soil particulate size (based on SCS classification) on the site, and the area draining to the trap or pond. (8.10.7.1)

31. ____ The design inflow is based on the peak discharge from the developed 2-year or 10-year, 24-hour design storm from the contributing drainage area as computed in the hydrologic analysis. The 10-year, 24-hour event is used if the project is proposing to use a Plan of Action for ESC cover measures. If the site is small and no hydrologic analysis is required, the rational method used to determine the peak inflow rate. (8.10.7.1)

32. ____ The necessary design surface area (SA) of the facility, measured at the invert of the weir is based the following equation:

    SA = 2(Q/Vs)
    For Trap: Q_2
    For Pond: Q_{10} (8.4)

    Where Q_2 is the peak inflow rate in cfs, and Vs is the settling velocity of the soil particle of interest.

33. ____ Correct settling velocities used per the following table:

Type A soils: Vs = 0.0018 ft/sec.
Type B soils: Vs = 0.0012 ft/sec.
Type C soils: Vs = 0.00095 ft/sec.
Type D soils: Vs = 0.00095 ft/sec. (8.10.7.1)

34. ____ If filling has occurred on the site which changes the naturally occurring gradation of particulate sizes on site, appropriate settling velocity based on the gradation of the fill material or native soil, whichever is dominant and most likely to erode. For sites with a large percentage of silts, the selected particle size is 18 microns. (8.10.7.1)

Note: if permanent facilities are used for the temporary traps/ponds, they must have a surface area equivalent or larger than that derived from the above formula. If not, the facility must be temporarily enlarged. (8.10.7.1)

35. ____ Provide a 24 hour draw-down. (8.10.7.1)

TRAP/POND RELEASE

36. ____ The riser pipe sized the minimum necessary to pass the pre-developed 10-year, 24 hour design storm (Q_{10}). (8.10.7.2)

37. ____ If a dewatering orifice is used, determining the size of the dewatering orifice(s) (minimum 1" Ø) is accomplished through using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation: (8.10.7.2)

where: A_0 = orifice area (square feet)

$$A_0 = \frac{(A_s(2h)^{0.5})}{(0.6 \times 3600\ Tg^{0.5})}$$

A_s = pond surface Area (square feet)
h = head of water above orifice (height of riser in feet)
T = dewatering time (24 hours)
g = acceleration of gravity (32.2 fps^2)

38. ____ Convert the required surface area to the required Ø of the orifice:

$$D = 24x \sqrt{\frac{A_0}{3.14}}$$

The orifice diameter (D) in inches is:

The vertical, perforated tubing connected to the dewatering orifice at least 2" larger in Ø than the orifice. (8.10.7.2)

The flow rate controlled by orifice. (8.10.7.2)

STORMWATER CALCULATIONS - REPORT

DRAINAGE AND EROSION/SEDIMENT CONTROL

39. ____ Cover sheet with the project name; proponent's name, address, and telephone number; project engineer's name, address, and phone number; date of submittal; contact's name, address, and telephone number; and the name, address, and phone number of the contractor, if known. (4.8.1)

40. ____ Project Engineer's Certification: A page with the Project Engineer's seal with the following statement:

"I hereby state that this Drainage and Erosion/Sediment Control Plan for _____ (name of project) has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that Pierce County does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me." (4.8.1)

41. ____ Table of Contents with page number for each section of the report shown. (4.8.1)

42. ____ All pages numbered. (4.8.1)

43. ____ Facility Summary Form for each R/D facility. See Appendix "O." (4.8.1)

44. ____ Vicinity Map with site location relative to other geographic features such as major roads, freeways, lakes, etc. Minimum scale 4" = 1 mile. (4.8.2.1)

Basin Map

45. ____ Showing project boundaries, sub-basin boundaries, and off-site area tributary to the project. Scale of 1" = 200'. (4.8.2.1)

46. ____ Major drainage features (such as channels and detention facilities and floodways) and flow path to receiving waters shown. (4.8.2.1)

Site Map

47. ____ Scale of 1" = 100'. (4.8.2.1)

48. ____ Project Limits. (4.8.2.1)

49. ____ Existing topography for the site. (4.8.2.1)

50. ____ Finished grades. (4.8.2.1)

51. ____ Existing structures within 100 feet of project boundaries. (4.8.2.1)

52. ____ Utilities. (4.8.2.1)

53. ____ Existing paved surfaces and roads. (4.8.2.1)

54. ____ Existing and proposed easements. (4.8.2.1)

55. ____ Areas of environmental concern (e.g. gullies, ravines, swales, wetlands, steep slopes, estuaries, springs, creeks, lakes, etc.). (4.8.2.1)

56. ____ Direction of flow for natural drainage features shown. (4.8.2.1)

57. ____ 100-year flood plain boundary. (4.8.2.1)

58. ____ Existing and proposed wells on site and on abutting properties (both "of record" and not "of record") within 100'. (4.8.2.1.6.6.7)

59. ____ Proposed structures, roads and parking surfaces. (4.8.2.1)

60. ____ Lot dimensions and areas. (4.8.2.1)

61. ____ Proposed drainage facilities. (4.8.2.1)

62. ____ Limits of clearing and grading. (4.8.2.1)

63. ____ Natural buffer areas. (4.8.2.1)

64. ____ Minimum contour intervals on the site plan as follows:

Slope %	Contour Interval (feet)
0 - 15	2
16 - 40	5
> 40	10

(4.8.2.1)

65. ____ Contours extend a minimum of 25' beyond property lines and extend sufficiently to depict existing conditions. (4.8.2.1)

Work Map.

66. ____ Scale of 1" = 100'. (4.8.2.1)

67. ____ Unit areas > 1 acre as contributing to a reach of swale or to a catch basin including off-site area. Identify areas contributing to retention/detention facilities. (4.8.2.1)

68. ____ Area, % impervious, average slope, and estimated ultimate infiltration rate and SCS Soil Group. (4.8.2.1)

69. ____ Conveyance data, identifier (for reference to model output), length, slope, inverts up and down. (4.8.2.1)

70. ____ Overland flow paths and distances. (4.8.2.1)

71. ____ Soil types. (4.8.2.1)

72. ____ Locations of soil pits and infiltration tests. (4.8.2.1)

73. ____ Spot water surface elevations, discharges and velocities for the design event. (4.8.2.1)

Schedule of Structures.

74. ____ Catch basin/manhole diameter. (4.8.2.1)

75. ____ Street name. (4.8.2.1)

76. ____ Cross street (nearest). (4.8.2.1)

77. ____ Stationing. (4.8.2.1)

78. ____ Street side. (4.8.2.1)

79. ____ Invert in/out. (4.8.2.1)

80. ____ Pipe diameter in/out. (4.8.2.1)

81. ____ Type of each structure and pipe, i.e. Type II, concrete. (4.8.2.1)

82. ____ Plans or worksheets of open channel systems show water surface elevation for the design storm, invert elevations at breaks in grade, design discharge and design velocity. (4.8.2.1)

CONVEYANCE SYSTEMS

DESIGN EVENT

83. ____ The project's internal drainage system designed for a 25-year, 24-hour storm event. (6.8.2)

84. ____ Culverts for and bridges over natural channels convey the 100-year, 24-hour storm event under fully developed conditions. (6.8.2)

85. ____ Conveyances within public roads or rights of way designed to pass a 25-year, 24-hour storm event from the contributing area under fully developed conditions. (6.8.2)

DETERMINATION OF DESIGN FLOWS

86. ____ All existing and proposed conveyance systems analyzed and designed using the peak flows from the hydrographs developed through the hydrologic analysis in Section 6.5 and the release rates specified in Section 6.8.2. (6.8.3)

EXCEPTION: For drainage subbasins 25 acres or less, and having a time of concentration of less than 100 minutes, the capacity of conveyance elements may be determined using the Rational Method. See Section 6.8.7. (6.8.3)

METHODS OF ANALYSIS FOR PIPES

87. ____ If the County determines that, runoff for any event through the 100-year, 24-hour event would cause damage or interrupt vital services, a backwater (pressure sewer) analysis provided. Results submitted in tabular and graphic format showing hydraulic and energy gradient. (6.8.8.1)

88. ____ When using the Manning's Equation, each pipe within the system shall be sized and sloped such that its barrel capacity at normal full flow is equal or greater than the required conveyance capacity as identified in Section 6.8.2. Nomographs may be used for sizing the pipes or Manning's Equation can be solved for pipe size directly. (6.8.8.1)

89. ____ For pipes flowing partially full, the actual velocity may be estimated from engineering nomographs by calculating Q_{full} and V_{full} and using the ratio of Q_{design}/Q_{full} to find V and d (depth of flow). (6.8.8.1)

90. ____ See Table 6.6, “Manning’s ‘n’ Value for Pipes.” (6.8.8.1)

BACKWATER ANALYSIS

91. ____ Analyze for the 25 and 100-year, 24-hr design storm events. (6.8.4)

92. ____ For the 25-year event, a minimum of 0.5 feet of freeboard between the water surface and the top of any manhole or catch basin. (6.8.4)

93. ____ For the 100-year event, overtopping of the pipe conveyance system may occur, additional flow does not extend beyond 1/2 the lane width of the outside lane of the traveled way and does not exceed 4" in depth at its deepest point. (6.8.4)

94. ____ Off-channel storage on private property allowed with recording of easements. (6.8.4)

95. ____ Additional flow analyzed by open channel flow methods. (6.8.4)

RATIONAL METHOD LIMITATIONS

96. ____ Drainage subbasin area (A) cannot exceed 25 acres for a single calculation. (6.8.7)

97. ____ The time of concentration (Tc) must be computed and is between 5 - 100 minutes. (6.8.7)

98. ____ See Appendix "E." See Table 6.5, "Runoff Coefficients – "C" Values for the Rational Method." (6.8.7)

PIPE SLOPE AND VELOCITY

99. ____ Minimum velocity is 2 fps at design flow. (6.8.8.3)

100. ____ Maximum slopes, velocities, and anchor spacings are shown in Table 6.7. (6.8.8.3)

101. ____ If velocities > 15 fps for the conveyance system design event, anchors at bends and junctions provided. (6.8.8.3)

CULVERT CRITERIA

102. ____ Flow capacity determined by analyzing inlet and outlet control for headwater depth. (6.8.9.1)

103. ____ All culverts designed to convey the flows per Section 6.8.2. The maximum design headwater depth 1.5 times the Ø of the culvert with no saturation of roadbeds. (6.8.9.1)

104. ____ Minimum culvert velocity 2 fps and maximum culvert velocity shall be 15 fps. (6.8.9.1)

OUTFALLS

105. ____ 30 fps may be used with an engineered outlet protection designed. (6.8.9.1)

106. ____ Designed for peak flows from a 100-year, 24 hour storm event. (6.8.10)

107. ____ For outfalls with a maximum flow velocity of < 10 fps, a rock splash pad is acceptable. (6.8.10)

108. ____ For velocities $\geq$ 10 fps, an engineered energy dissipator provided. (6.8.10)

109. ____ Open conveyances designed by one of the following methods:

Manning's Equation. (6.8.11)

Direct Step Backwater. (6.8.11)

Standard Step Backwater Method. (6.8.11)

110. ____ For velocities > 5 fps, channels have either rock-lined bottoms and side slopes to the roadway shoulder top with a minimum thickness of 8". (6.8.11)

111. ____ See Table 6.10, "Channel Protection." (6.8.11)

112. ____ Channels having a slope < 6% and having peak velocities < 5 fps lined with vegetation. (6.8.11)

113. ____ Minimum freeboard of 0.5 > when the design flow is $\leq$ 10 cfs. (6.8.11)

114. ____ Minimum freeboard of 1' when the design discharge is > 10 cfs. (6.8.11)

WATER QUALITY SYSTEMS

GENERAL

1. ____ The water quality design storm the 6-month, 24 hour, SCS Type 1A rainfall distribution, storm event. 64% of the 2-year, 24-hour storm. (7.3)

WET POND

2. ____ Sizing of wet-pond type BMPs is based upon the particulate size to be removed and its calculated residence time to settle out of the water column. See Section 7.8. (7.7)

WET VAULTS/TANKS

3. ____ Used with $\leq$ 1 acre of contributing. (7.7.4.2)

PRESETTLING BASINS

4. ____ Adhere to the design criteria established for temporary sediment traps/ponds in Section 8.10.7 except that the design particle settling velocity shall be 0.00095 ft/sec. for all soil classifications and the draw-down time shall be as specified in Section 7.8.1. (7.8)

5. ____ Draw-down time 40 hours, with the exception of the case when presettling basins are used in tandem with water quality infiltration BMPs. For that case, the *total* draw-down time for *both* the presettling basin and the infiltration BMP is 40 hours. (7.8.1)

INLET STRUCTURES

6. ____ The runoff discharged uniformly and at a velocity < 3 fps in Type A and B soils, and 5 fps in Type C & D soils or as necessary to prevent erosion and to insure quiescent conditions within the BMP. (7.10)

7. ____ Energy dissipation devices used to reduce inlet velocities > 3 fps. (7.10)

SAND FILTRATION

8. ____ Completely empty (draw-down time) in 40 hours or less. (7.11.1)

9. ____ Maximum tributary area 50 Ac. (DOE III-3.7.2)

10. ____ Designed using Darcy's Law. (DOE III 3.7.2)

$A_S = Q/f(h/h + L)$

Where:
- A_S = Surface area of sand bed
- Q = Flow
- F = Infiltration rate of sand media
- h = Height of water column over top of sand bed
- L = Thickness of sand bed (18" minimum)

11. ____ If a gravity or coalescing plate filter is to be used based on DOE criteria, "Stormwater Management Manual for the Puget Sound Basin," Chapters I-4 and IV-2, use the design criteria in the DOE Manual, Chapter III-7, or the manufacturers recommendations which achieve the effluent requirement of an average oil discharge of less than 10mg/l daily and at no time to exceed a daily maximum of 15mg/l. (7.13)

12. ____ $A_P = Q/0033_{\ FT/MIN}$

Where:
- A_P = projected surface area of plate (Ft^2).
- Q = design flow (CFS) 6 mo/24 hr. (DOE III – 7.2)

13. ____ Forebay surface area $\geq$ 20 sq. ft./10,000 sq. ft. of tributary area. (DOE III – 7.2)

MAINTENANCE PLAN

PRIVATE DRAINAGE FACILITIES

1. ____ Meets Pierce County Auditor's recording standards. (RCW 65.04.045 and RCW 65.04.047)

2. ____ Inclusion by reference of the operation and maintenance manual prepared by the Project Engineer in accordance with the Manual. (2.9)

3. ____ Power to assess fees to maintain storm drainage facilities. (2.9)

4. ____ Responsibility for payment of financial sanctions/repayments should the County have to conduct repairs/activities due to hazardous conditions. (2.9)

5. ____ A maintenance covenant will be recorded with the Pierce County Auditor for the plat and recorded against each lot within the subdivision or short division. (2.9)

CONTENTS OF PLAN

6. ____ Operation and Maintenance Plan describing required type and frequency of long-term maintenance of drainage facilities. (4.8.3.1)

7. ____ Identification of the responsible maintenance organization. (4.8.3.1)

8. ____ Frequency of sediment removal, cleaning of catch basins, vegetation control, etc., per Appendix "J" and described. (4.8.3.1)

9. ____ Operation and Maintenance Plan includes maintenance for erosion and sedimentation controls. (4.8.3.1)

10. ____ Estimate of the average annual cost of maintenance included. (4.8.3.1)

11. ____ Correct type of Maintenance Agreement (plat or commercial) provided. (Appendix "J")

12. ____ "Instruction for Person Maintaining Stormwater System" sheet included, page J-18. (Appendix "J")

13. ____ Attachment "A" cover sheet included, page J-17. (Appendix "J")

14. ____ Include only those maintenance checklists that apply (i.e., if stormwater system includes a pond, provide pond checklist). (Appendix "J")

15. ____ For residential projects, include a copy of "Residential Best Management Practices," from the *Stormwater Program Guidance Manual, Volume II*, Department of Ecology, July 1992, or latest revision. This provides information on source control. (Appendix "J")

16. ____ For commercial/industrial projects, include the appropriate source control language from *Volume IV, Urban Land Use BMPs, Stormwater Management Manual for the Puget Sound,* Department of Ecology, February 1992, or latest revisions. (Appendix "J")

VEGETATION MANAGEMENT PLAN

17. ____ Listing of the proposed native species for the design conditions and requirements for maintenance. (4.8.3.2)

18. ____ Specifications and requirements incorporated into the maintenance plan. (4.8.3.2)

POLLUTION PREVENT PROGRAM

POLLUTION SOURCE CONTROL

1. ____ Meets Pierce County Auditor's recording standards. (RCW 65.04.045 and RCW 65.04.047)

2. ____ Operation and Maintenance Plans contain language regarding pollution source control that is specifically developed for the type of site covered by the plan. (4.8.3.3)

3. ____ The pollution source control section of the plan incorporates the relevant information found in Volume IV of the *Stormwater Management Manual for the Puget Sound Basin*, or the Pierce County "Industrial,

Commercial and Residential Source Control Best Management Practices" Manual. (4.8.3.3)

FINANCIAL GUARANTEES

1. ____ Financial guarantees on a County form. (17A.20.010.B)

2. ____ Financial guarantees < $5,000.00 by an assignment of funds. (17A.20.010.C)

OR

Financial guarantees ≥ $5,000.00 by assignment of funds or bonds. (17A.20.010.C)

3. ____ Construction guarantee provided for project. 300% for short plats and large lot divisions; 125% for formal plats determined by submitting a scope of work and an engineer's estimate. Estimate based on current construction cost data. (17A.20.030.B)

4. ____ Reclamation guarantee provided in the amount of $1,500.00 per acre to be disturbed, $1,500.00 minimum. (17A.20.020.C)

MISCELLANEOUS DOCUMENTS

DRAINAGE COURSE – NATURAL BUFFER AREAS

1. ____ Data submitted by the Applicant prior to Plan approval and prior to final acceptance of the development documenting that the intended natural buffer area is undisturbed and that the native vegetative cover, together with its root structure, is substantially preserved. (4.6)

2. ____ Covenant placed on the plat or recorded with the County Auditor that runs with the land and provides for the perpetual preservation of the natural buffer area provided. (4.6)

EASEMENTS, ACCESS, AND DEDICATED TRACTS

NATURAL CHANNELS AND STORMWATER FACILITIES

3. ____ Statutory Warrantee Deed (Individual, Partnership, or Corporate) - convey Real Property to Pierce County. (2.14.2)

MISCELLANEOUS DOCUMENTS (Continued)

4. ____ Storm Sewer Easement - conveys to Pierce County the right to have and maintain a storm sewer system across a specific parcel of property. (2.14.2)

5. ____ Slope and Utility Easement - conveys the right to have fill material or a cut slope and utilities on private property. (2.14.2)

SOIL ENGINEERING-GEOLOGY REPORT

6. ____ Per Title 18E. See attached review checklist. (17A.30.030)

ADDITIONAL PERMITS

7. ____ Application/permit for private road gate. (17A.10.070.C.3.a.6)

8. ____ Application/permit for retaining wall > 4’ high. (17A.10.070.C.3.a.6)