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.

DETENTION SYSTEM REVIEW CHECKLIST
ORDINANCE 99-24S
TITLES 18C AND 17A

DETENTION SYSTEMS DRAWINGS

OVERFLOWS

1. ____ Runoff control facilities incorporate a means of bypassing the primary outlet in the event of failure. (6.6.6)

2. ____ Spillway located to direct overflows towards the downstream conveyance system. (6.6.6)

POND OVERFLOWS

3. ____ Located in existing soil. (6.6.6)

4. ____ Emergency overflow spillway armored with rip rap in conformance with Table 6.10 and extends to the toe of each face of the berm embankment. (6.6.6)

5. ____ See Appendix “A,” Detail 2.0, "Weir Section for Emergency Overflow Spillway." (6.6.6)

6. ____ Rip rap spillway elevation set to prevent flow through for maximum design stormwater surface elevation. (6.6.6)

SETBACKS

7. ____ Runoff quantity control BMPs not built within a natural buffer area. (1.2.5) (6.6.7)

8. ____ Detention ponds maintain minimum horizontal setback distances. (6.6.7)

9. ____ Detention ponds with permanent pools (all year) meet the setback distances. (6.6.7)

10. ____ Detention vaults and tanks a minimum of 20’ from any structure or property line. (6.6.7)

FENCING OF PUBLIC PONDS

11. ____ Minimum 6’ high WSDOT Type 1 chain link fence, per State Standard Plan L-2. (6.6.8)

12. ____ Minimum of 1 locking access road gate provided that is 14’ wide, consisting of 2 swinging sections 7’ in width, per WSDOT State Standard Plan L-3. (6.6.8)

13. ____ Pedestrian access gates a minimum of 4’ in width and meet WSDOT State Standard Plan L-3. (6.6.8)

14. ____ Fencing placed 1’ inside the tract or easement boundary or a minimum of 5’ from the top slope catch point. (6.6.8)

15. ____ Fence material No. 9 gauge galvanized steel fabric with bonded vinyl coating. (6.6.8)

16. ____ Vinyl coating green in open areas and black in wooded areas. (6.6.8)

17. ____ All posts, cross bars, and gates painted or coated the same color as the vinyl clad fence. (6.6.8)

18. ____ Any pipe stem access to a basin fenced with a WSDOT Type 4 chain link fence has a 14’ gate. (6.6.8)

POND EMBANKMENTS

19. ____ Pond berm embankments constructed on native consolidated soil (or adequately compacted and stable fill soils analyzed by a geotechnical report) which is free of loose surface soil materials, roots and other organic debris. (6.6.9)

20. ____ Pond berm embankments constructed by excavating a "key" equal to 50% of the berm embankment cross-sectional height and width (except on till soils where the "key" minimum depth can be reduced to 1’ of excavation into the till). (6.6.9)

21. ____ Pond berm embankment cores constructed of compacted soil (a minimum of 95% of the maximum dry density, standard proctor method per ASTM D1557). (6.6.9)

22. ____ Placed in 6” lifts, with the following soil characteristics per the United States Department of Agriculture's Textural Triangle: a minimum of 30% clay, a maximum of 60% sand, a maximum of 60% silt, with nominal gravel and cobble content or as recommended by a geotechnical engineer. (6.6.9)

23. ____ Anti-seepage collars placed on outflow pipes in berm embankments impounding water greater than 8’ in depth at the design water surface. (6.6.9)

24. ____ Exposed earth on the pond side slopes sodded or seeded with appropriate seed mixture (see Chapter 8, Erosion and Sedimentation Control). (6.6.9)

25. ____ Maintenance access along the top of the berm; the minimum width of the top of the berm 15’ (6.6.9)

26. ____ Embankments < 6’ in height shall have a minimum 6' top width and slopes not to exceed 2H:1V. (6.6.9)

27. ____ Embankments adjacent to a stream or other body of water sufficiently protected to prevent erosion of the pond embankment. (6.6.9)

28. ____ Exterior and interior side slopes of detention ponds > 2H:1V analyzed for stability by a qualified civil or geotechnical engineer. (6.6.9)

POND ACCESS

29. ____ Pond access roads provided when ponds do not abut county right-of-way. (6.6.10)

30. ____ Pond access roads located in tracts when the ponds themselves are in tracts. (6.6.10)

31. ____ Pond access roads provide access to the control structures and alongside the pond. (6.6.10)

32. ____ For ponds with forebay bottoms that cannot be accessed from the top edge of the forebay by a backhoe with a maximum reach of 20’, an access road constructed extending to the bottom of the forebay, having a minimum width of 15’ and a maximum grade of 12%. (6.6.10)

33. ____ For pond forebays < 15’ wide, an access road extended along 1 side of the forebay. (6.6.10)

34. ____ Access roads $\geq$ 15’ in width. (6.6.10)

35. ____ Access roads located either within a separate tract or within a minimum 15’ wide access road easement. (6.6.10)

36. ____ Vehicle access limited by a double-posted gate, if fenced, or by bollards. (6.6.10)

37. ____ Bollards consist of 2 fixed bollards and 2 removable bollards equally spaced between the fixed bollards. (6.6.10)

Pond access roads constructed by utilizing:

38. ____ Construct an asphalt surface roadway meeting the County's Road Standards. (6.6.10)

OR

39. ____ Construct a gravel surface road by removing all unsuitable material, laying a geotextile fabric over the native soil, placing quarry spalls (2"-4") 6” thick, then 2” thick crushed rock surface. (6.6.10)

40. ____ When the length of a pond access road to control structures exceeds 75’, a vehicle turn-around provided, designed to accommodate vehicles having a maximum length of 31’ and having an inside wheel path radius of 40’. (6.6.10)

41. ____ Access roads to control structures have a maximum slope of 12%, "Detention Pond Accesses Schematic." See Appendix “A,” Detail 22. (6.6.10)

POND CRITERIA

42. ____ Open ponds designed to have a minimum length to width ratio of 2:1 at the maximum water surface. Baffles may be used to reduce this length ratio provided the residence time does not decrease. (6.6.12)

43. ____ Minimum of 1' of freeboard above the design water elevation. (6.6.12)

44. ____ If the pond water surface area exceeds 20,000 square feet and the site is not fully fenced, a safety bench provided around the basin with a width of 5' and a depth $\leq$ 1' during non-storm periods. (6.6.12)

45. ____ Interior side slopes of all ponds < 4H:1V unless a fence is provided. (6.6.12)

Pond walls designed as retaining walls, provided that:

46. ____ At least 25% of the pond perimeter has a vegetated soil slope of $\leq$ 3H:1V. (6.6.12)

47. ____ Maintenance access provided to the bottom of the pond. (6.6.10)

48. ____ Signs placed so that at least 1 is clearly visible and legible from all adjacent streets, sidewalks or paths. (6.6.12)

49. ____ Signs meet the design and installation requirements illustrated in Appendix "L," Detail 1.0, "Aluminum Sign." (6.6.12)

50. ____ Energy dissipation provided at all inlet and outlet structures to ponds and natural drainage courses. (6.6.12)

51. ____ Rip rapping size and apron size in accordance with Table 6.9 and Appendix "A," Detail 3.0, "Rock Outfall (Culvert Discharge Protection)" and Detail 3.1, "Gabion Outfall." (6.6.12)

52. ____ All metal parts and surfaces made of corrosion-resistant materials. (6.6.12)

53. ____ Detention ponds designed as "flow-through" facilities with 2 or more sequential "cells" divided by a gravel filter window (see Appendix "A," Detail 4.0, "Quarry Spall and Gravel Filter Window"). (6.6.13)

54. ____ Top of the gravel filter window set at the 2-year design water surface elevation. (6.6.13)

55. ____ Forebay designed for the entrapment and containment of sediment. (6.6.13)

56. ____ Bottom of forebay flat and designed to provide a minimum of 0.5' of dead storage for sediment. The 0.5' of available sediment storage assumes that both cells of the pond are approximately equal in size. (6.6.13)

57. ____ Pond bottoms, with the exception of the dead storage area, sloped $\geq$ 0.1% toward the outlet to ensure positive drainage out of the basin. (6.6.13)

58. ____ Gravity drain suitable for draining the facility or wet pond if grade allows. (6.6.13)

59. ____ Drain has an inverted elbow within the pool. (6.6.13)

60. ____ Drain equipped with an adjustable gate valve located in the outlet structure or in the berm and the pipe $\geq$ 8" Ø. (6.6.13)

61. ____ Drain discharges through the outlet structure or at least to the same outlet location. (6.6.13)

POND CONTROL STRUCTURE CRITERIA

62. ____ Control structures have either weir structures or orifice structures. See Appendix "A," Detail 6.0, "Orifices-Tee Riser," Detail 6.1, "Overflow Structure #1," Detail 6.2, "Flow Restrictor/Oil Pollution Control Device," and Detail 7.0, "Orifices-Baffle." (6.6.15)

63. ____ Control manholes have solid locking covers. (6.6.15)

64. ____ Orifices constructed on a "Tee" riser section as shown in Appendix "A," Detail 6.0, or on a baffle as shown in Appendix "A," Detail 7.0," "Orifices-Baffle." (6.6.15)

PARKING LOT PONDS

65. ____ Maximum depth of water $\leq$ 0.5' at any location in the parking lot. (6.6.16)

66. ____ Limits of ponded water at maximum water depth does not encroach into any established fire lanes. (6.6.16)

67. ____ Limits of ponded water at maximum water depth does not encroach into the principal driveway lanes providing ingress and egress from the adjacent public right-of-way to any buildings. (6.6.16)

68. ____ Permanent signs shown adjacent to the parking lot pond area identifying the area as a stormwater detention control area subject to ponding and identifying the specific parking spaces subject to flooding. (6.6.16)

69. ____ The parking lot pond designed to completely drain, leaving no areas of entrapped water in puddles or behind curbs. (6.6.16)

70. ____ Overflow control provided by installing at least 1 Type 1 catch basin on the perimeter of the parking lot pond area, with the grate elevation equal to the design maximum water surface elevation. (6.6.16)

71. ____ Parking lot pond detention systems privately maintained. (6.6.16)

TANKS AND VAULTS

72. ____ Surface sediment containment pond upstream of the tank or vault, or the tank/vault oversized to allow for the temporary accumulation of sediment in the tank. (6.6.17)

73. ____ Where the tank or vault is designed to provide sediment containment, a minimum of 0.5' of dead storage provided and the tank/vault bottom is at 0% slope. (6.6.17)

DESIGN CRITERIA FOR TANKS

74. ____ Located outside the traveled way within public road rights-of-way. (6.6.17.1)

75. ____ Single-family plats, PUDs, PRDs, or PDDs tanks located in separate tracts. (6.6.17.1)

76. ____ Designed as flow through systems unless separate sediment containment is provided. (6.6.17.1)

77. ____ The minimum pipe size 36". If the collection pipe is designed to also provide storage, the resulting maximum water surface elevation has a minimum 1' of freeboard in any catch basin below the catch basin grate. (6.6.17.1)

Pipe material, joints, and protective treatment for tanks designed in accordance with WSDOT/APWA Standard Specifications Section 9.05, and AASHTO designations as noted below:

78. ____ Corrugated iron or steel pipe and pipe arch, Treatment 1 through 6. (6.6.17.1)

79. ____ Aluminized Type 2 corrugated steel pipe and pipe arch (meets AASHTO designations M274 and M36). (6.6.17.1)

80. ____ Steel spiral rib pipe, Treatment 1 - 6. (6.6.17.1)

81. ____ Aluminum spiral rib pipe. (6.6.17.1)

82. ____ Corrugated aluminum pipe and pipe arch. (6.6.17.1)

83. ____ Reinforced concrete pipe. (6.6.17.1)

84. ____ Corrugated high density polyethylene pipe (CPEP) - Smooth Interior (with prior approval). (6.6.17.1)

85. ____ Tanks placed on stable, well consolidated native material with a suitable bedding. (6.6.17.1)

86. ____ Not allowed in fill slopes unless analyzed in a geotechnical report for stability and construction practices. (6.6.17.1)

87. ____ The maximum depth to a tank invert 20'. (6.6.17.1)

88. ____ Spacing between access openings for tanks $\leq$ 100', measured from center of opening to center of opening. (6.6.17.1)

89. ____ Each access provides a standard ladder for access to the tank. Note: CMP riser-type manholes are not allowed for use in roadways, driveways, parking stalls, or anywhere subjected to vehicular loads. (6.6.17.1)

90. ____ Tank access openings and control structures readily accessible by maintenance vehicles. (6.6.17 & 6.6.17.1)

91. ____ See Appendix "A," Detail 10.0, "Detention Tank/Vault Access Details." (6.6.17.1)

92. ____ Access risers: Outside of any areas subject to vehicular loads, 36" (minimum) Ø access risers of the same gage as the tank material may be used for access along the length of the tank and at the upstream terminus of the tank if the tank is designed with a common inlet/outlet so that it is a backup system rather than flow-through system. (6.6.17.1)

93. ____ Tank access openings have round, solid, locking lids using ½" Ø allen head screw locks. (6.6.17.1)

94. ____ Maximum 12" Ø pipes permitted to connect directly to the side of detention tanks, if tank tee connection is manufactured as part of the tank manufacture process. All other tank connections will be at the ends. (6.6.17.1)

DESIGN CRITERIA FOR VAULTS

95. ____ Detention vaults are not located within the traveled way within public road rights-of-way. For single-family plats and PUDs, or PDDs or PRDs, detention vaults located in separate tracts. (6.6.17.2)

96. ____ Vaults designed as flow-through systems unless separate sediment containment is provided. (6.6.17.2)

97. ____ Detention vaults constructed of a minimum 3000 psi structural reinforced concrete. All construction joints provided with water stops. (6.6.17.2)

98. ____ Vaults designed by a structural engineer. (6.6.17.2)

99. ____ Structural designs bear the seal of a civil engineer. (6.6.17.2)

100. ____ Structural designs for cast-in-place vaults accompanied with a commercial building permit. (6.6.17.2)

101. ____ Vaults placed on stable, well consolidated native material with suitable bedding. (6.6.17.2)

102. ____ Vaults not be allowed in fill slopes unless analyzed in a geotechnical report for stability and construction practices. (6.6.17.2)

103. ____ 1 minimum 36" Ø access cover per 50' of length or width provided, and at least 1 access cover with ladder to the bottom of the vault per cell (if the vault is divided into cells) provided. (6.6.17.2)

104. ____ Minimum internal height 7' and the minimum width 4'. (6.6.17.2)

105. ____ Maximum depth to the vault invert 20'. (Note: concrete vaults may be a minimum of 3' in height and width if used as tanks with access manholes at each end). (6.6.17.2)

106. ____ Access roads to access covers for each cell for vaults not located in rights-of-way. (6.6.17.2)

107. ____ Access roads meet the requirements for access roads for ponds described in Section 6.6.10. (6.6.17.2)

108. ____ Vault access openings have round, solid, locking lids using ½" Ø allen head screw locks. (6.6.17.2)

DETENTION SYSTEM REPORT

EXEMPTIONS FROM RUNOFF QUANTITY CONTROL REQUIREMENTS

The following projects are exempted from providing on-site peak rate runoff control:

1. ____ Projects which construct < 5,000 square feet of new impervious surface on an individual parcel, with the exception of projects located in close proximity to critical and/or sensitive drainage areas where the County determines that stricter peak runoff rate or volume controls are warranted. (6.4)

2. ____ Projects which do not contribute to an existing capacity problem in a conveyance system and which discharge directly to a **Major Waterbody** defined as follows:

3. ____ **Puget Sound**

4. ____ **Lakes** with a surface area > 300 acres and for which the individual new development/redevelopment contributes < 10% of the flow to the water body.

5. ____ A **major river** as listed below for which the individual new development/redevelopment contributes less than 10% of the flow in the river for the 2, 10, and 100 year flood flow events.

Exempted Rivers

Nisqually downstream from Alder Lake
Puyallup downstream from junction with Carbon River
White downstream from junction with Greenwater River

Minimum Requirement #8: Off-Site Analysis and Mitigation

6. ____ Analysis extended a minimum of 1/4 of a mile downstream from the project. (1.2.8)

7. ____ Existing or potential impacts evaluated and mitigated, including:

(i) sedimentation
(ii) streambank erosion
(iii) discharges to ground water or recharge zones
(iv) violations of water quality standards
(v) spills and discharges of priority pollutants (WAC 173-201A-040)
(vi) habitat (1.2.8)

SOILS REPORTS

8. ____ A soils report by a Soils Professional submitted that includes evaluation of one or more soil test locations (yielding an overall site assessment). (4.8.1.1)

COMPUTATIONAL METHODS

9. ____ Runoff quantity control facilities designed using unit hydrograph analysis. (6.5.1)

10. ____ Storage facilities designed using appropriate storage routing techniques such as level pool routing. (6.5.1)

CURVE NUMBERS

11. ____ Western Washington SCS "curve numbers" used. Provide highlighted copy. See Appendix "E." (6.5.2)

12. ____ For storm durations of 7 days, CN values adjusted correctly. Category B discharge. (6.5.2)

ISOPLUVIAL MAPS

13. ____ National Oceanic and Atmospheric Administration (NOAA) isopluvial maps for Pierce County and Tacoma are included. See Appendix "E." (6.5.3)

TIME OF CONCENTRATION

14. ____ For lakes and submerged wetlands, the travel time determined with storage routing techniques if the stage-storage versus discharge relationship is known or assume it to be "zero." (6.5.4)

15. ____ Sheet flow travel time calculated correctly. (6.5.4)

16. ____ Maximum allowable distance for sheet flow 300'. (6.5.4)

17. ____ Shallow flow travel time calculated correctly. (6.5.4)

18. ____ Open channel travel time calculated correctly. (6.5.4)

19. ____ k_c values from Table 6.1 used. (6.5.4)

20. ____ Travel time assumed as zero for lakes or wetlands. Where significant attenuation may occur due to storage effects, the flows routed using a "level pool routing" technique. (6.5.4)

DESIGN STORM HYETOGRAPHS

21. ____ Standard design hyetograph is the SCS Type 1A 24 hour rainfall distribution resolved into 10 minute time intervals. Second hyetograph which may be required for design purposes is the 100 year, 7-day duration design storm. (6.5.5)

22. ____ For project sites with tributary drainage areas > 1000' MSL, an additional total precipitation must be added to the total depth of rainfall for the 25, 50, and 100 year design storm events. (6.5.5)

23. ____ The MSL factor is calculated correctly. (6.5.5)

SUB-BASIN DELINEATION

24. ____ Within an overall drainage basin it is necessary to delineate separate sub-basins based on similar land uses and/or runoff characteristics or when hydraulically "self-contained" areas are found to exist. Separate hydrographs generated, routed, and recombined, after travel time is considered, into a single hydrograph to represent runoff flows into the quantity or quality control facility. (6.5.6)

HYDROGRAPH ROUTING AND PHASING ANALYSIS

25. ____ Hydrographs routed through detention facilities or closed depressions by level pool routing technique. (6.5.7)

26. ____ Where flows from multiple basins or subbasins having different runoff characteristics and/or travel times combine, sum the hydrographs after shifting each hydrograph according to its travel time to the discharge point of interest. (6.5.8)

27. ____ The resultant hydrograph either routed downstream as required in the downstream analysis, Section 4.8.1.1, or routed through the control facility. (6.5.8)

CORRECTION FACTOR TO DETENTION FACILITY VOLUME

28. ____ Apply a correction factor to the design volume when using a unit hydrograph method to model 24-hour storm events. (6.5.9) CF = (% cover - 20) (0.375) + 20

29. ____ The detention facility depth and orifice not changed. (6.5.9)

UNCONTROLLED DISCHARGE CRITERIA

Projects not directly attributable to one of the defined categories, and not exempted in Section 6.4, use Category A for determining the allowable discharge rates. (6.6.1)

Category A: Discharge to a Minor Waterbody as defined below:

Any waterbody not defined as a Major Waterbody (see Section 6.4), closed depression, or a publicly owned regional retention and/or detention facility or privately-constructed regional retention/detention facilities. (6.6.1)

REQUIREMENTS:

30. ____ During the 2-year/24-hour design storm, the peak rate of runoff from the project site $\leq$ 50% of the existing condition 2-year/24-hour peak runoff. During the 10-year, and 100-year/24-hour design storms, the peak rates of runoff from new development/redevelopment sites shall be no greater than the existing condition 10-year and 100-year/24-hour peak runoff. (1.2.5) (6.6.1)

Category B: Discharge to a Closed Depression as defined below:

Any low-lying area(s) which has(ve) no outlet, or such a limited surface outlet that in most storm events the area acts as a retention basin holding water for infiltration or evaporation. When a proposed development is tributary to a pothole area, the Proponent's engineer will be required to determine the 100-year flood elevation for the pothole area. Direct discharge to the pothole will be allowed if condition 4 below can be satisfied or if the pothole is wholly within the Applicant's property. If the discharge is to a natural conveyance which drains to the pothole off the property, the discharge rates shall be held to the criteria in Category A. (6.6.1)

REQUIREMENTS:

Condition 4

31. ____ Each depression analyzed for the 2, 10, and 100-year, 24-hour design storm events and the 100-year, 7 day design storm event. The worst case shall govern for design purposes. (6.6.1)

32. ____ In case of excess stormwater flows, potential overflow routes analyzed to address adverse impacts per Chapter 4, Section 4.8.1.1. (6.6.1)

33. ____ Projects discharging to closed depressions meet the infiltration requirements of Section 6.6.14, 6.7 and the water quality criteria of Chapter 7. When selecting appropriate treatment BMPs, assume the soil is fully saturated all year within the closed depression. (6.6.1)

34. ____ If the project site discharges to a privately owned closed depression, the Proponent provided written permission/easements from the owner(s) of record for both the closed depression and potential overflow routes receiving the runoff. (6.6.1)

35. ____ The Proponent recorded the information with the Pierce County Auditor. This information recorded with all affected property titles including those for the depression, overflow route, and the Proponent's property. (6.6.1)

36. ____ If easements cannot be obtained, discharge to the pothole may be allowed, on a case by case basis, to match the predeveloped rates and volumes for storm events ranging from 2-year to 100-year, 24 hour and 7 day frequencies. The excess volumes must be retained fully on-site. (6.6.1)

Category C: Discharge to a publicly owned regional retention and/or detention (R/D) facility.

REQUIREMENTS:

37. ____ During the 2-year/24-hour storm, the peak rate of runoff from the project site ≤ 50% of the existing conditions 2-year/24-hour peak runoff. During the 10- and 100-year/24-hour design storm, the peak rate of runoff from individual new development/redevelopment sites ≤ the existing condition 10- and 100-year/24-hour peak runoff.

OR

38. ____ Paid anticipated costs for designing and constructing an on-site stormwater retention/detention facility including land costs as required above in lieu of constructing such a facility. The cost estimate shall be prepared by the project engineer and submitted for County approval. With this option, an on-site facility will not be required with the exception of water quality controls if not provided in the regional facility. (6.6.1)

AND

39. ____ The project site located within the existing natural drainage basin tributary to the publicly owned regional R/D System. (6.6.1)

AND

40. ____ The conveyance system between the proposed project and the publicly owned regional R/D facility adequate for the proposed project's design peak runoff with no significant adverse impacts. (6.6.1)

AND

41. ____ The publicly owned regional R/D facility available by the time of the construction of the new development or redevelopment with adequate capacity or the Development may use a temporary on-site facility in the interim. (6.6.1)

AND

42. ____ The developer may be required to pay a user fee, for the use or expansion of the associated publicly owned regional R/D facility. (6.6.1) User fee: _____

AND

43. ____ The Project Engineer verified that the facility is adequately sized to control the proposed project's increased peak rate of runoff. This information may be available from the County, an adopted basin plan, or a detailed drainage analysis shall be provided. (6.6.1)

Category D: Privately constructed regional detention and/or retention facilities.

REQUIREMENTS:

44. ____ In lieu of individual systems, applicants can design and build regional facilities in accordance with the design requirements of Category A or B, as applicable and with excess capacity which, when completed, may be dedicated to the County. Such a facility can be on site or off site.

RESTRICTED RELEASE RATES

45. ____ When downstream drainage courses are inadequate or systems are undersized, or the property or properties may be adversely affected by the existing and/or proposed stormwater release rate, a restricted release rate may be required. (6.6.2) Required Q = _____

46. ____ Release rate compatible with downstream drainage conditions. If a restricted release rate is required, the Proponent may correct and/or improve downstream drainage conditions so that the proposed release rate does not have to be further restricted. (6.6.2)

47. ____ When a restricted release rate is used, increase in storage provided. (6.6.2)

DISCHARGE WITH NO ESTABLISHED DRAINAGE COURSE

48. ____ Where soil conditions permit, stormwater will be retained on site in an approved stormwater retention system, as described in Section 6.6.7 and 6.7. (6.6.3)

OR

49. ____ Downstream drainage course and/or other facilities between the subject property and a well defined creek or drainage channel improved to the extent necessary to bring them up to adequate capacity to accommodate project impacts. (6.6.3)

50. ____ Off-site improvements accompanied by easements from the owners of property where work is to take place. (6.6.3)

OR

51. ____ An on-site trench dispersal system constructed that discharges stormwater from the site as sheetflow. (6.6.3)

52. ____ Slopes > 20%, a trench dispersal system permitted only in accordance with the recommendations of a geotechnical engineer. (6.6.3)

53. ____ Trench dispersal systems set back a minimum of 20' from property boundaries and run parallel to the existing contours. (6.6.3)

54. ____ Dispersion trench is at least 1' long for every 5' of property line lying on the downhill side. (6.6.3)

55. ____ Dispersion trenches not proposed in fill material. See Appendix "A," Detail 1.0, "Flow Dispersion Trench Detail." (6.6.3)

OR

56. ____ The release rate of stormwater from the project site reduced (below the rates required for stormwater detention as described in Section 6.6) to a level that will not adversely impact the downstream properties. (6.6.3)

OFF-SITE FLOWS

57. ____ Off-site flows routed around the project site control facility unless either of 2 conditions is met:

58. ____ The on-site facility is designed and constructed to control both on-site and off-site flows to the release criteria established for the site. Off-site flows are computed for existing conditions. (6.6.4)

OR

59. ____ The off-site flows for the 100-year, 24-hour event are < 50% of the developed on-site 2-year, 24-hour peak flow rate. (6.6.4)

60. ____ Off-site flows considered as if from a separate sub-basin. (6.6.4)

61. ____ If off-site flows are routed around the project site control facility and out of the existing flow path or if the flow path is altered, the travel time, velocity and storage volume through the altered/relocated channel is not significantly changed from the existing conditions. (6.6.4)

DISCHARGE CRITERIA

62. ____ Uncontrolled area is $\leq$ 10% of the on-site and upstream naturally contributing basin. (6.6.5)

63. ____ Demonstrate through the downstream analysis and capacity calculations that the downstream drainage course will not be adversely impacted by the increased runoff rate. (6.6.5)

64. ____ The total project release rate, including uncontrolled flows, does not exceed the total allowable rate as if all flows were controlled. (6.6.5)

65. ____ If any downstream impacts are identified, downstream improvements provided with necessary easements. (6.6.5)

OVERFLOWS

66. ____ Quantity control facilities address overflow. (6.6.6)

67. ____ Overflow routes identified to the point of re-entry into the downstream drainage system. (6.6.6)

68. ____ Where the overflow corridor or the quantity control facility itself could be damaged by overflow, improvements made to the downstream drainage system to the point of re-entry to provide sufficient flow capacity for the overflow event or an additional factor of safety of 25% applied to the size of the quantity control facility. (6.6.6)

69. ____ Ponds provided with an emergency overflow spillway designed to safely pass the developed 100-year, 24 hour design storm. (6.6.6)

70. ____ Emergency overflow spillway weir section (see Appendix “A,” Detail 2.0, "Weir Section for Emergency Overflow Spillway") designed for the maximum developed design storm conditions. (6.6.6)

STAGE-STORAGE DISCHARGE TABLES

71. ____ A separate, accurate, stage-storage discharge table developed for each separate quantity control facility designed for the site. (6.6.11)

72. ____ Each table shows the water stage elevations, the invert elevation of the outlet(s), and the outlet rates at no < 1’ increments above the facility bottom. (6.6.11)

73. ____ Orifice elevations shown along with the formula(s) used in calculating flow rates. (6.6.11)

74. ____ If a multi-orifice is used, the upper orifice set above the 2-year event elevation. (6.6.11)

GENERAL POND CRITERIA

75. ____ Energy calculations submitted along with an appropriate design such as rip rapping, stilling basins, drop structures, etc. (6.6.10)

DETENTION POND CRITERIA

76. ____ If the forebay is < 1/2 of the total pond volume, the depth of available sediment storage proportionately increased to provide the equivalent volume of sediment storage. (6.6.13)

77. ____ Drawdown time for the drain < 24 hours. (6.6.13)

POND CONTROL STRUCTURE CRITERIA

78. ____ Formulas referenced in the design calculations. (6.6.15)

PARKING LOT PONDS

79. ____ Investigation of the emergency overflow path provided. (6.6.16)

TANKS AND VAULTS

80. ____ Tanks and vaults limited to controlling runoff from ≤ 1 acre. (6.6.17)

DESIGN CRITERIA FOR TANKS

81. ____ Meet structural requirements for AASHTO HS-20 live loads for tanks lying under roadway or parking areas. (6.6.17.1)

82. ____ AASHTO H-20 live loads accommodated for tanks lying outside of these areas. (6.6.17.1)

83. ____ In moderately pervious soils where seasonal groundwater may induce flotation, calculations submitted which demonstrate stability. (6.6.17.1)

DESIGN CRITERIA FOR VAULTS

84. ____ Vaults meet structural requirements AASHTO H-20 traffic loading. (6.6.17.2)

85. ____ Cast-in-place wall sections designed as retaining walls. (6.6.17.2)