

Below is the text of the draft proposed changes to address surface water runoff management (stormwater runoff) for the 544-acre SCM Annexation Area.

Note:

- **The text presented below is in the form of a possible change/addition to Chapter 3 of the Beaverton Engineering Design Manual (EDM); the intent of this format is to show the difference from the current standards.**
- **The actual form of implementation of any potential changes or even if there will be changes has not been determined.**

330 STORMWATER QUANTITY STANDARDS

All development on sites one-half (0.5) acre or greater in area shall be required to provide onsite detention. Sites smaller than 0.5 acre that are in an area where undetained flows would cause a negative downstream impact shall be required to provide on-site detention. For sites smaller than one-half acre in area or where storm detention would have an adverse affect upon the receiving storm drainage system, as determined by the City Engineer, a system development charge will be assessed in lieu of a constructed facility.

Storm detention facilities shall be designed to provide storage using a 25-year event, with the safe overflow conveyance of the 100-year storm. Calculations of site discharge for both the existing and proposed conditions shall be checked using ~~the King County Hydrograph V4.20~~ a [Santa Barbara Unit Hydrograph Method](#).

Storms to be evaluated shall include the [6-month](#), 2, 10, 25, and 100-year events. Allowable post-development discharge rate for the [6-month](#), 2, 10, and 25-year events shall be that of the predevelopment discharge rate, with a maximum allowable release rate of one half (0.5) cubic feet per second per acre in the 25-year event. Should the downstream analysis, as outlined in the *CWS Design and Construction Standards* identify a downstream deficiency, then the detention requirement will be either increased to cause no net increase to that deficiency or the deficiency shall be corrected at which time the standard detention requirement shall apply.

An outfall structure such as a "Vee-Notch" weir or multiple orifice structure shall be designed to control the release rate for the above events. No flow control orifice for the 25-year event shall be smaller than ~~2.5~~ [2.0](#) inches. If the allowable release rate cannot be met with all the site drainage controlled by a single ~~2.5~~ [2.0](#)-inch orifice, the allowable release rate provided by a ~~2.5~~ [2.0](#)- inch orifice will be considered adequate at the discretion of the City Engineer.

When using ~~the King County Hydrograph V4.20~~ a [Santa Barbara Unit Hydrograph Method](#), use the following precipitation depths for the 24-hour storm:

Event Intensity

- [6 month 2.0 inches](#)
- 2 year 2.5 inches
- 10 year 3.5 inches
- 25 year 4.0 inches
- 100 year 4.5 inches

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333 INFILTRATION LIMITATIONS

The written opinion of a qualified soils engineer stating that the site is capable of supporting a functioning infiltration system that meets the design requirements for the development being proposed is required. Any requirements relating to steep slope, landslide hazard, or sensitive areas impacts shall be addressed in the report with infiltration locations noted.

Use of infiltration facilities require the one or more percolation tests. Location and number of tests shall correspond to design location of infiltration facilities at a minimum. All testing shall be performed under the conditions which the surrounding soil is saturated to simulate a rainy season condition after development is complete.

335 SOUTH COOPER MOUNTAIN STORMWATER QUANTITY STANDARDS

All development within the South Cooper Mountain Planning Area shall comply with the following additional stormwater quantity standards:

- a) For calculating the pre-developed discharge, the assumed land condition shall be:
 - Runoff Curve Numbers = “Woods: Good (Woods are protected from grazing, and litter and brush adequately cover the soil)
 - “n” and “k” values used in time calculation for Hydrographs= Woods or forest with dense underbrush.
- b) For the post developed condition, Interception and Capture of the first 0.2 inches of rainfall on a dry watershed is required wherever practicable and is disposed of via evaporation, transpiration, or infiltration. Please note that mechanical systems do nothing for interception of this water. The following methods may assist in achieving interception of this water:
 - Mature tree canopy of large landscape trees (not small decorative trees)
 - Landscape areas with vegetated cover or thick mulch cover
 - Pervious hardscape surfaces such as pavement, sidewalk, pavers
 - Green roofs
 - Other LIDA facilities
 - Impervious area that flows directly into a vegetated surface water management facility; for measurement use 16 times the treatment area of a swale or 32 times the bottom area of a pond or rain garden.
- ~~e) The 2-year, 24-hour post-development peak flow rate is to be limited to one-half the 2-year, 24-hour pre-developed peak flow rate. Allowable postdevelopment discharge rate for the 10 and 25-year events shall be that of the predevelopment discharge rate, with a maximum allowable release rate of one-half (0.5) cubic feet per second per acre in the 25-year event.~~

Note: Mark thinks that using a pre-developed condition of woods in good shape will be sufficient to achieve 'moving toward compliance with hydro-modification.

Curve number and Time of Concentration References:

Table 2.3.2				
Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Areas				
(Sources: TR 55, 1986, and Stormwater Management Manual, 1992. See Section 2.1.1 for explanation)				
	CNs for hydrologic soil group			
Cover type and hydrologic condition.	A	B	C	D
Curve Numbers for Pre-Development Conditions				
Pasture, grassland, or range-continuous forage for grazing:				
Fair condition (ground cover 50% to 75% and not heavily grazed).	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Woods:				
Fair (Woods are grazed but not burned, and some forest litter covers the soil).	36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).	30	55	70	77
Curve Numbers for Post-Development Conditions				
Open space (lawns, parks, golf courses, cemeteries, landscaping, etc.)¹				
Fair condition (grass cover on 50% - 75% of the area).	77	85	90	92
Good condition (grass cover on >75% of the area)	68	80	86	90
Impervious areas:				
Open water bodies: lakes, wetlands, ponds etc.	100	100	100	100
Paved parking lots, roofs ² , driveways, etc. (excluding right-of-way)	98	98	98	98
Permeable Pavement (See Appendix C to decide which condition below to use)				
Landscaped area	77	85	90	92
50% landscaped area/50% impervious	87	91	94	96
100% impervious area	98	98	98	98
Paved	98	98	98	98
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Pasture, grassland, or range-continuous forage for grazing:				
Poor condition (ground cover <50% or heavily grazed with no mulch).	68	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed).	49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)	39	61	74	80
Woods:				
Poor (Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning).	45	66	77	83
Fair (Woods are grazed but not burned, and some forest litter covers the soil).	36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).	30	55	70	77
Single family residential³:				
Dwelling Unit/Gross Acre	Should only be used for subdivisions > 50 acres		Average Percent impervious area ^{3,4}	
1.0 DU/GA			15	
1.5 DU/GA			20	
2.0 DU/GA			25	
2.5 DU/GA			30	
3.0 DU/GA			34	
3.5 DU/GA			38	
4.0 DU/GA			42	
4.5 DU/GA			46	
5.0 DU/GA			48	
5.5 DU/GA			50	
6.0 DU/GA			52	
6.5 DU/GA			54	
7.0 DU/GA			56	
7.5 DU/GA			58	
PUD's, condos, apartments, commercial businesses, industrial areas & subdivisions < 50 acres	%impervious must be computed		Separate curve numbers shall be selected for pervious and impervious portions of the site	
For a more detailed and complete description of land use curve numbers refer to chapter two (2) of the Soil Conservation Service's Technical Release No. 55, (210-VI-TR-55, Second Ed., June 1986).				

¹ Composite CN's may be computed for other combinations of open space cover type.

² Where roof runoff and driveway runoff are infiltrated or dispersed according to the requirements in Chapter 3, the average percent impervious area may be adjusted in accordance with the procedure described under "Flow Credit for Roof Downspout Infiltration" (Section 3.1.1), and "Flow Credit for Roof Downspout Dispersion" (Section 3.1.2).

³ Assumes roof and driveway runoff is directed into street/storm system.

⁴ All the remaining pervious area (lawn) are considered to be in good condition for these curve numbers.

Table 2.4	
“n” and “k” Values Used in Time Calculations for Hydrographs	
“n_s” Sheet Flow Equation Manning’s Values (for the initial 300 ft. of travel)	
Manning values for sheet flow only, from Overton and Meadows 1976 (See TR-55, 1986)	n _s
Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil)	0.011
Fallow fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover ≤20%	0.06
Cultivated soil with residue cover >20%	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods or forest with light underbrush	0.40
Woods or forest with dense underbrush	0.80
(210-VI-TR-55, Second Ed., June 1986)	

340 STORMWATER QUALITY STANDARDS

The minimum standards for the design and construction of storm water quality facilities in the City of Beaverton shall be the same as the current standards of CWS with the addition of Synthetic fields. Synthetic turf fields or similar facilities require stormwater quality treatment to the same or better levels as if the field was impervious surface.

If a fence is required to be provided, in addition to the standard CWS requirements, it shall be brown vinyl clad chain link (unless otherwise approved by the City Engineer) with a top bar added.

345 SOUTH COOPER MOUNTAIN STORMWATER QUALITY STANDARDS

The following amendments to the CWS and COB standards apply:

4.05.4d. The stormwater quality facilities shall be designed for a dry weather storm event totaling ~~0.36~~ **0.50** inches of precipitation falling in 4 hours with an average storm return period of 96 hours.

4.05.6.b Water Quality Volume (WQV)

The WQV is the volume of the water that is produced by the water quality storm. The WQV equals ~~0.36~~ **0.50** inches over the impervious area that is required to be treated as shown in the formula below:

$$\text{Water Quality Volume (cu.ft)} = \frac{0.50}{\del{0.36} \text{ (in.)} \times \text{Area (sq.ft.)}} \times 12 \text{ (in./ft.)}$$

4.05.6.c Water Quality Flow (WQF)

The WQF is the average design flow anticipated from the water quality storm as shown in the formulas below:

$$\text{Water Quality Flow (cfs)} = \frac{\text{Water Quality Volume (cu.ft.)}}{14,400 \text{ seconds}}$$

or

$$\text{Water Quality Flow (cfs)} = \frac{0.50 \times \text{Area (sq.ft.)}}{12(\text{in./ft})(4 \text{ hr})(60 \text{ min/hr})(60 \text{ sec/min})}$$

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