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Water and Land Resources Division
Department of Natural Resources and Parks
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April 13, 2018

TO: Scott Smith, Principal Engineer, Department of Permitting and Environmental Review (DPER)

FM: Curt W. Crawford, Manager, Stormwater Services Section, Water and Land Resources Division (WLRD), Department of Natural Resources and Parks (DNRP)

RE: Blanket Adjustment for Stormwater Management of Trails in Forested Areas (Revised March 21, 2018)

Background

King County DNRP has requested an update of previous Blanket Adjustment Number L09V0028, which allowed substitution of U.S. Forest Service (USFS) trail construction standards and best management practices (BMPs) in place of standards in the 2009 and 2005 King County Surface Water Design Manuals (SWDM) for management of stormwater. The updated blanket adjustment would be applied to projects vested under the 2016 SWDM.

Proposed Adjustment

Substitute use of surface water control techniques from USFS Publication Number 07232806 "Trail Construction and Maintenance Notebook, 2007 Edition" in place of the requirements ensconced in the 2016 SWDM to manage stormwater impacts from backcountry trails. These techniques include building trails into the sideslope, maintaining sustainable grades, adding frequent grade reversals, and providing outsloped tread to disperse surface water runoff.

Findings

Backcountry trails typically constitute a very small footprint within protected, predominately forested landscapes. Forested conditions and canopy limit any anticipated stormwater impacts or changes in surface water runoff as a result of construction of the trails. Any runoff from new constructed trails on these predominately forested sites should have ample opportunity for infiltration and dispersion, given that the surface water control techniques referenced above emphasize sheet flow dispersion techniques (grade reversals) into vegetation for every 20-50 feet of trail.

The following excerpt from USFS Publication Number 07232806 "Trail Construction and Maintenance Notebook, 2007 Edition" describes the approach to stormwater management for the trails:

Surface Water Control

Diverting surface water off the trail should be near the top of your list of priorities. Running water erodes tread and support structures, and can even lead to loss of the trail itself. Standing water often results in soft, boggy tread (figure 9) or failure of the tread and support structures. Water is wonderful stuff--just keep it off the trail. Your job is to keep that water ***off, Off, OFF*** *the tread!*

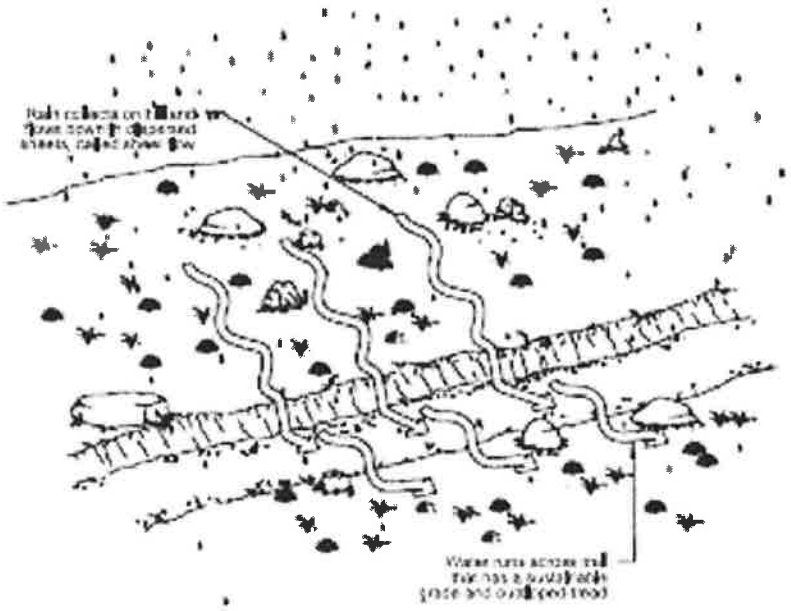
Figure 9—Standing water results in soft, boggy tread.

The very best drainage designs are those built into new construction. These include frequent grade reversals and outsloping the entire tread. The classic mark of good drainage is that it's self-maintaining, requiring minimal care.

Sheet Flow

When rain falls on hillsides, after the plants have all gotten a drink, the water continues to flow down the hill in dispersed sheets—called ***sheet flow*** *(Figure 10). All the design elements for a rolling contour trail—building the trail into the sideslope, maintaining sustainable grades, adding frequent grade reversals, and outsloped tread—let water continue to sheet across the trail where it will do little damage.*

Figure 10



Grade Reversals

Sometimes, grade reversals are called grade dips, terrain dips, Coweeta dips, or swales. For less confusion, let's call them grade reversals. The basic idea is to use a reversal in grade to keep water moving across the trail. Grade reversals are designed and built into new trails.

A trail with grade reversals and outsloped tread encourages water to continue sheeting across the trail—not down it. The beauty of grade reversals is that they are the most unobtrusive of all drainage features if they are constructed with smooth grade transitions. Grade reversals require very little maintenance.

Grade reversals take advantage of natural dips in the terrain (Figure 11). The grade of the trail is reversed for about 3 to 5 meters (10 to 15 feet), then "rolled" back over to resume the descent. Grade reversals should be placed frequently, about every 6 to 15 meters (20 to 50 feet). A trail that lies lightly on the land will take advantage of natural dips and draws for grade reversals.

The trail user's experience is enhanced by providing an up-and-down motion as the trail curves up and around large trees (Figure 12) or winds around boulders."

Figure 11

Figure 12

Conclusion/Decision

The blanket adjustment to substitute surface water control techniques from USFS Publication Number 07232806 "Trail Construction and Maintenance Notebook, 2007 Edition" in place of the requirements ensconced in the 2016 SWDM to manage stormwater impacts from backcountry trails is approved subject to the following conditions:

Conditions of Approval

1. The adjustment shall only be applied to trail projects on sites that are predominately forested—in particular, protected native vegetated surfaces shall make up no less than 92 percent of the site. *Note: According to the 2016 SWDM, "Site" means a single parcel; or, two or more contiguous parcels that are under common ownership or documented legal control; or a portion of a single parcel under documented legal control separate from the remaining parcel, used as a single parcel for a proposed project for purposes of applying for authority from King County to carry out a proposed project.*

2. The adjustment applies to stormwater management of trails only; it does not apply to parking areas or other pollution generating surfaces that may be associated with a trail construction project.

3. The adjustment shall only be applied on sites that are in permanent forest use or in protected open space.

4. Total impervious surfaces (new, replaced, and existing) including trails and any other areas defined as impervious (e.g., associated parking) by the 2016 SWDM shall be distributed throughout the site in a manner consistent with the goal of using dispersion into forested areas to manage stormwater runoff AND shall not exceed 4 percent of total site area. All impervious surface area, except 10,000 square feet of it, must be set back from its natural location of discharge from the site at least 100 feet. The 10,000-square-foot limit does not include areas that are otherwise mitigated by King County-approved flow control or infiltration facilities.

5. Developed pervious surfaces such as pasture, lawn, landscaping, etc., may constitute any remaining site areas as long as at least 92 percent of the site is forested (Condition #1) and impervious surfaces do not to exceed 4 percent of total site area (Condition #4).

6. The adjustment shall only be applied to trails up to Trail Class 4 for hiker/pedestrian, pack and saddle, and bicycle categories as cited in section 23, "Design Parameters" of USFS Trails Management Handbook (FSH 2309.18, effective October 16, 2008). Local deviations may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable trail class.

7. Dispersion into forested areas shall be prioritized to manage stormwater runoff. Where feasible, trails shall be placed to maximize flow path lengths through forested areas to manage stormwater flowing off the trail.

8. Use of this blanket adjustment does not excuse consideration of offsite or resource impacts. Stormwater runoff and surface water from the project must be discharged at the natural location so as not to be diverted onto or away from downstream properties. The manner in which runoff is discharged from the project site must not create a significant adverse impact to downhill properties or drainage facilities, according to Core Requirement #1 of the 2016 SWDM. Increased runoff from the new trail surface must not significantly impact a critical area, severe flooding problem, or severe erosion problem. Where no conveyance system

exists at the abutting downstream property line/natural discharge location and the project is proposing to concentrate runoff that is currently unconcentrated, DPER staff will either determine the project's compliance with the discharge requirements of SWDM Core Requirement #1 or may require that a licensed civil engineer be hired by the applicant to demonstrate the same.

Please note that approval of this adjustment does not relieve applicants from other county, state, or federal requirements, including any requirements imposed through the SEPA process. Individual designs proposing use of this adjustment will be reviewed and approved during plan review to ensure that compliance with the conditions stated herein is achieved.

If you have any questions, please call Mark Wilgus, Engineer IV with the Stormwater Services Section, at 206-477-4848.

Approved by WLRD and DPER as follows:

Curt W. Crawford, Manager
Stormwater Services Section
King County WLRD

4/15/18
Date

Scott Smith, Principal Engineer
King County DPER

4/15/2018
Date

CC:MW:bgD01

cc: Mark Wilgus, Engineer IV, Stormwater Services Section, Water and Land Resources Division, Department of Natural Resources and Parks