



In-Line Ditch BMP Installations

148th Avenue SE

In-line ditch best management practices (BMPs) for 148th Ave SE were installed on Thursday, June 4, 2009 in a section of ditch on the east road shoulder just south of SE 102nd Street. The BMPs, designed to provide stormwater quality treatment are a series of modified rock check dams that contain a compost-gravel mixture encased in geotextile fabric. A total of three BMPs were installed at this location following engineering designs prepared by King County Roads Maintenance Section (KCRMS) and approved by the Washington Department of Ecology (Ecology) under Stormwater Management Implementation Grant Number G0900039. The installation was completed by a KCRMS crew from Division 3 (Star Lake facility).

BMP Design

Rock Check Dam with Treatment Cell

The BMPs are based on a modified rock check dam design (see Figures 1 and 2) that encase a media filled “treatment cell” (in this case a compost-gravel mixture) wrapped in a highly permeable, non-woven geotextile (Figure 1, C). The check dam holds the media in place while allowing stormwater to filter through the cell. Higher flows will bypass over the top of the weir.

The check dam consists of two ramps built from a mix of 4-8” and 2-4” inch angular rock (Figure 1, A and B). The ramps are placed with a 3 to 1 slope; each ramp is three feet long, sloping up to a peak height of one foot above the floor of the ditch. The treatment cell is placed in a 2 foot gap left between the upper and lower ramps (Figure 5).

When the rock structure of the BMP is completed, a geotextile fabric is placed over the area of the treatment cell and filled with media. The fabric is wrapped over the media with the outer fabric facing down-slope and secured with additional rock.

Splash Pad

A rock-filled “splash pad”, consisting of a small rock filled trench with a geotextile fabric liner is located just downstream of each check dam (Figure 1, D). The splash pads provide energy dissipation, erosion control and allows for infiltration of stormwater. Splash pads are also installed just down-slope of flumes placed in the ditch for flow monitoring.



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The splash pad is constructed as a 4 foot long by 1 foot deep trench immediately down-slope from the check dam. The trench is lined with geotextile fabric and filled with the rock mixture. The length of each BMP, including the splash pad is 12 feet.

Figure 1. Profile of In-line Ditch Modified Rock Check Dam BMP

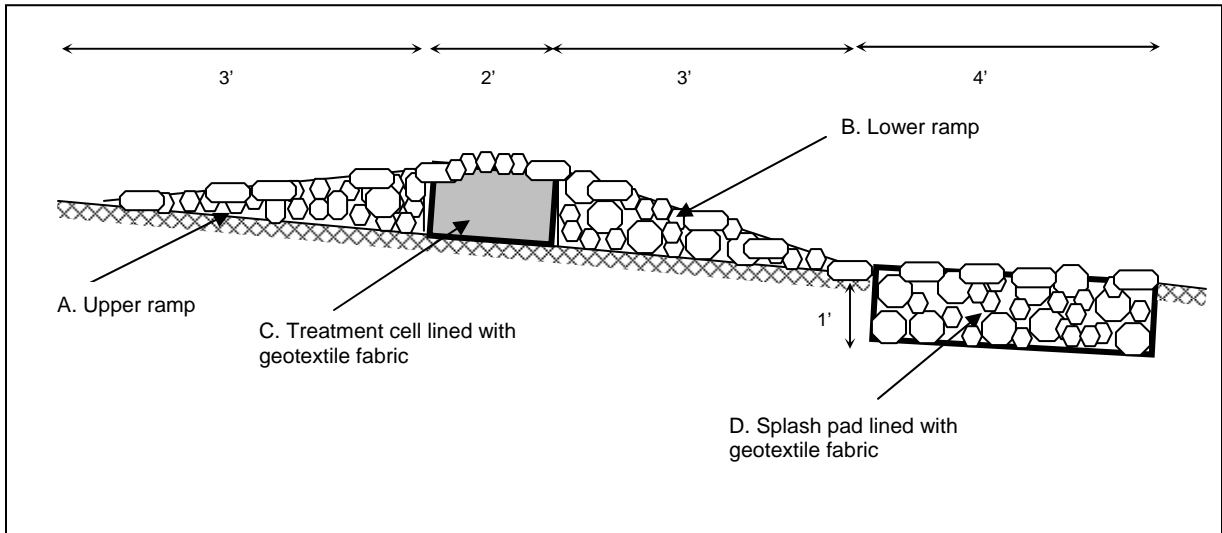
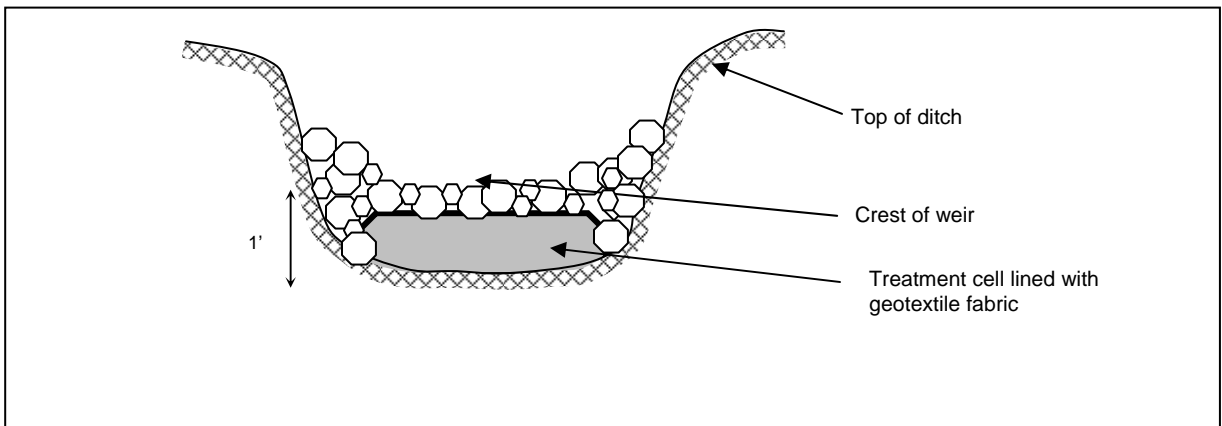


Figure 2. Cross-section of ditch with In-line Ditch Modified Rock Check Dam BMP



King County Roads Maintenance Crew

The crew consisted of a Lead, two utility workers, a truck driver, a backhoe operator and two flaggers. KCRMS Environmental Unit (EU) staff were on site during the entire installation to provide quality control and document that the



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installation was completed per the design specifications. Documentation included a hand written record, photos and video.

- Crushed rock (a mix of 2-4" and 4-8") from stockpiles staged at the Star Lake Maintenance Facility was brought to the site in a dump truck. Approximately 4 yards of rock were used for the construction of three BMPs.
- Compost from Cedar Grove Composting based on the WSDOT specification, mixed three to one with 2" minus rounded washed gravel purchased from Palmer Coking Coal was brought to the site in a small utility trailer. About 5½ cubic feet of compost mix was used per BMP, or about half a yard for the site.
- Washed sand for sandbags purchased from Palmer Coking Coal (for the flume installation) was staged at the King County Renton Maintenance Facility.
- BMP fabric (801 geotextile) purchased from ACF West, Inc. of Woodinville, Washington was brought by EU staff in pre-cut sections 10 x 7.5 feet in size.
- Jute netting, straw wattles and wood stakes were used as temporary construction erosion control measures.

Site Prep

The location of each BMP was spray painted on the road shoulder along the ditch during a pre-construction site visit by the crew lead and design engineer a few days before installation.

The crew arrived on site at 8:30am on the day of installation and mowed down tall grass where the BMPs would be installed. The backhoe prepped the site by excavating all the splash pads. The ditch just upstream from the splash pads was given a light scraping by the backhoe to remove vegetation and topsoil. Excavated soils were used to build up a short section of the ditch bank at the downstream monitoring location so that a flume could be properly installed. This action was completed to address a site-specific condition and will not necessarily be required at other flume locations.

BMP Installation

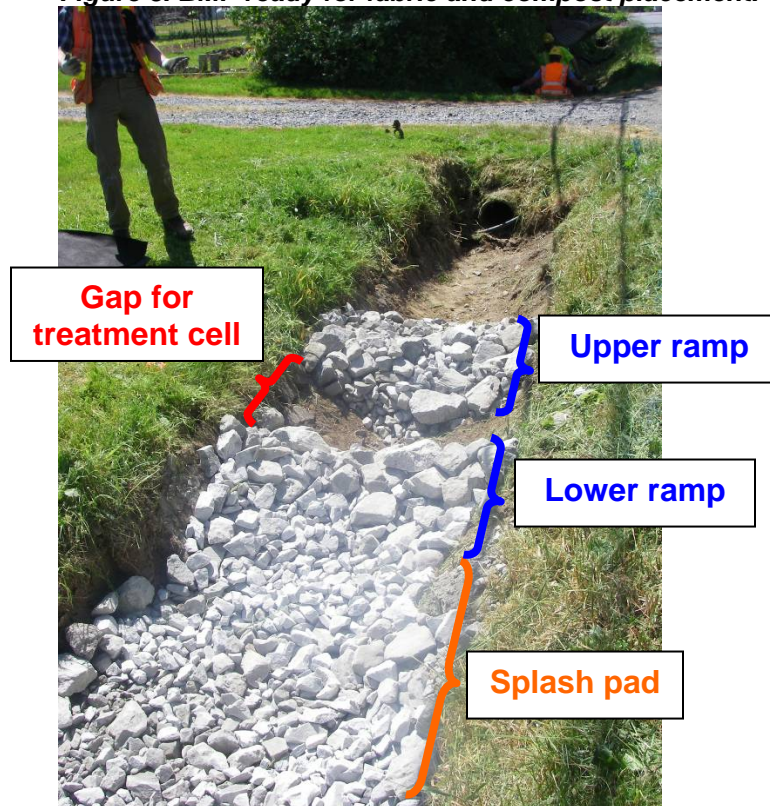
Once the site preparation was completed the trenches excavated for the splash pads were lined with geotextile fabric and filled with the crushed rock mixture. The ends of the fabric were brought over the splash pad as a cover and secured with additional rock. At the 3rd down-slope splash pad the downstream end of



the fabric was allowed to drape down the ditch below the pad instead of overlapping the pad; this was done to see if there is any difference in how the fabric in the splash pads remains secured and if this offers any additional protection to the ditch.

When the splash pads were finished, the backhoe placed mixed rock immediately upslope from each pad. This rock was positioned by hand to form the lower ramp. Additional rock was placed two feet above the lower ramp to form the upper ramp while leaving an open space for the treatment cell.

Figure 3. BMP ready for fabric and compost placement.



A pre-cut piece of geotextile was laid over the area of the treatment cell in the gap between the two ramps. The fabric covered cell was then filled with the compost-gravel mixture from the trailer. The compost and gravel had been brought to the site pre-mixed; it was given additional mixing using shovels before placement in the treatment cell. The compost mix was placed by filling 5-gallon buckets with the mixture and pouring them by hand onto the fabric (see step A in Figure 4). Between eight and nine 5-gallon buckets (or about 5½ cubic feet) of compost-gravel mix was used to fill each treatment cell. The fabric was folded over the compost with the sides folded in (see step B), then the down-slope fabric was folded up (see step C) and finally the upslope fabric folded down (see step D). The fabric was then secured with rock to complete the BMP.



Figure 4. Fabric (801 geotextile) placed over crushed rock weir ramps in preparation for placement of compost-washed gravel mixture.



Figure 5. Compost-washed gravel mixture being placed in treatment cell.





Figure 6. Compost-filled treatment cell ready for securing with rock.



Straw wattles were placed (temporarily) at the upstream side of each culvert below BMP work areas. The repaired bank section was covered with jute netting staked in place. The crew completed work and left the site by 2:30pm. EU staff remained onsite to re-install the downstream flume. Re-installation of the downstream and upstream flumes was finished by EU staff on June 8, 2009.



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Figure 7. Straw wattle secured upstream of culvert immediately below treatment cell.

