



## **In-Line Ditch BMP Installations**

### ***SE 136<sup>th</sup> Street***

The in-line ditch best management practices (BMPs) for SE 136<sup>th</sup> Street were installed on Thursday, June 11, 2009 in two sections of roadside ditch located on the north side of SE 136<sup>th</sup> Street between 169<sup>th</sup> Avenue SE and 170<sup>th</sup> Avenue SE. The BMPs use the same water-quality treatment design as the BMPs placed at the 148<sup>th</sup> Avenue SE site on June 4, 2009. They are comprised of a series of modified rock check dams that contain a compost-gravel mixture encased in geotextile fabric. A total of four 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 Description**

#### *Rock Check Dam with Treatment Cell*

The BMPs are based on a modified angular rock check dam design (see Figures 1 and 2) that encase a media filled “treatment cell” (in this case a 3 to 1 mixture of compost and ½-minus washed gravel) wrapped in a highly permeable, non-woven geotextile (Figure 1, C). The BMP holds the media in place while allowing stormwater to filter through the cell. The BMPs are designed to allow higher flows to bypass over the top of the check dam.

The check dams consist of two ramps built from a mix of 2-4” and 4-8” 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 two-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 between the ramps and filled with media. The fabric is wrapped over the media with the outer fabric facing down-slope and secured with additional rock.



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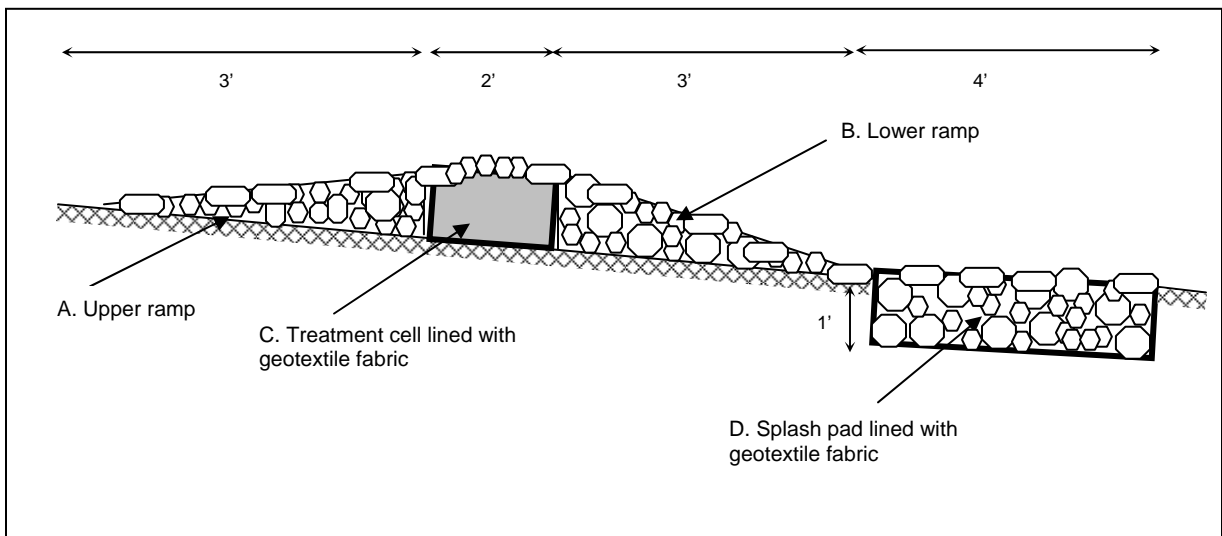
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## Splash Pad

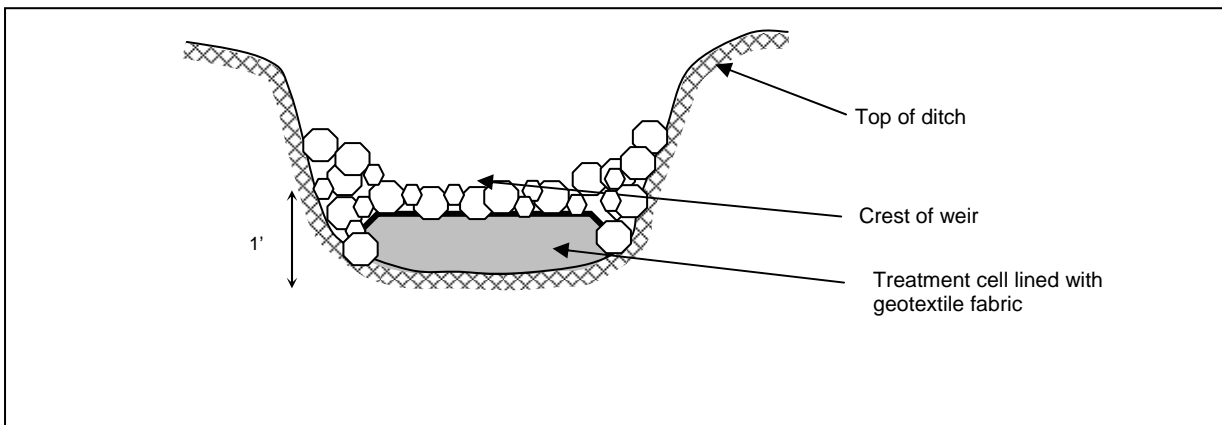
A rock filled “splash-pad” consisting of a small rock filled trench with a geotextile fabric liner is located just downstream of each check dam (Figure 1, D). The splash pads provide permanent energy dissipation, BMP erosion control, stormwater storage and infiltration areas.

The splash pad is constructed as a four foot long by one foot deep trench immediately down-slope from the check dam. The splash pad trench is lined with geotextile fabric and filled with an angular rock mix. The complete footprint of each BMP, including the splash-pad, is 12-feet in length.

**Figure 1. 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 KCRMS crew used to install the in-line ditch BMPs consisted of two utility workers, a truck driver, a backhoe operator and one flagger. The same crew was used to install the in-line ditch BMPs at both 148<sup>th</sup> Avenue SE and SE 136<sup>th</sup> Street. Upon completion of the first BMP installation, the crew was able to complete the second BMP installation with minimal supervision. The crew chief gave initial direction and stopped in during the installation but felt that his crew was trained in this work and did not stay at the site. KCRMS Environmental Unit (EU) staff was on site during the entire installation to provide quality control and document that the installation was completed per the design specifications. Documentation included a hand written record, photos and video.

## **Materials**

- Crushed rock (a mix of 2-4" and 4-8") staged at the King County Roads Renton Maintenance Facility. Approximately 4 yards of rock were used for BMP construction.
- Cedar Grove Composting (WSDOT spec), 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 were 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 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' in size.
- No additional construction erosion controls were used due to continuing forecast for dry weather.

## **Site Prep**

During a pre-construction site visit by the crew chief and EU staff, the location of each BMP was located using spray paint on the road shoulder adjacent to the ditch.

The complete crew assembled on site by 8:30am on the day of installation and weed-wacked the tall grass where the BMPs would be installed. The backhoe prepped the site by excavating all of the splash pads. The ditch area just upstream from the splash pads was given a light scraping by the backhoe to remove vegetation and a thin layer (1-2 inches) of topsoil (figure 3) that provided better surface contact for the treatment cell.



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No flumes will be installed at the SE 136<sup>th</sup> Street location (flow monitoring is being done inside of culverts and catch basins); and no other ditch maintenance was needed.

Only one dump truck was used at this site. Once the site preparation work was completed, the truck was used to transport excavated soils to the King County Renton Maintenance Facility, after which the truck returned to the site with the 2-4" and 4-8" angular rock mix.

### **BMP Installation**

As described above in the BMP Design Description, the splash pad trenches were excavated four-feet long by one-foot deep as shown below in Figure 3.



*Figure 3. Ditch section prepped for BMP placement with excavations for spill pads. Lower end of ditch looking east.*



The splash pad trenches were lined with geotextile fabric and filled with the angular rock mixture. The ends of the fabric were partially wrapped inward over the splash pads and secured with additional rock as shown in Figure 4.



*Figure 4. Splash pad trench lined with geotextile fabric, filled with angular rock mixture, and wrapped inward over the splash pad edges, which is then secured with angular rock.*

When each splash pad was completed, the backhoe placed mixed rock immediately upslope from the 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 as shown below in Figure 5.



*Figure 5. Lower rock ramp and upper rock ramp installation with 2-foot long gap left to allow for treatment cell installation.*

A pre-cut piece of geotextile was laid over the area of the treatment cell in the gap between the two check dam ramps. The fabric covered cell was then filled with the compost-gravel mixture. The compost and gravel were pre-mixed off site and brought to the site for installation using a small utility trailer. The mixture was remixed using shovels before use. Five-gallon buckets were filled with the compost mixture and poured by hand into the fabric until each treatment cell was filled. Approximately eight to nine 5-gallon buckets (or about 5.5 cubic feet) of

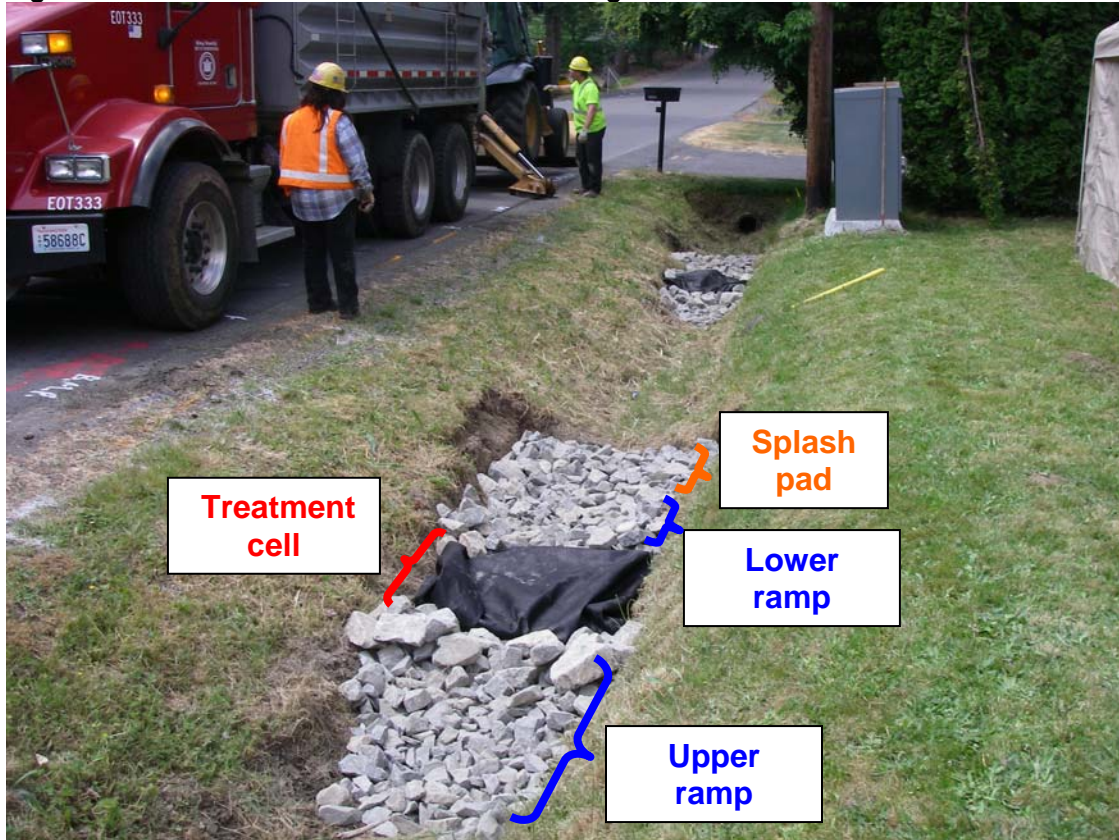


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compost-gravel mix was used to fill each treatment cell. The fabric was folded over the compost with the sides folded in, then the down-slope fabric was folded up, and finally the up-slope fabric folded down as shown below in Figure 6. The fabric was then secured with rock to complete the BMP as shown in Figure 7.

**Figure 6. BMP detail. Lower end of ditch looking west.**





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**Figure 7. Completed BMPs. Lower end of ditch looking east.**

