

# SE Ankeny Green Street Project

## SE Ankeny between SE 56th and SE 57th avenues Portland, Oregon

### PROJECT SUMMARY

<b>Project Type:</b>	Stormwater retrofit of an existing residential street – demonstration project
<b>Technology:</b>	Stormwater curb extensions
<b>Major Benefits:</b>	<ul style="list-style-type: none"> <li>• Two stormwater curb extensions capture runoff from 7,300 square feet of paved surface. They treat and infiltrate most of the runoff they receive, providing volume and flow control and water quality benefits.</li> <li>• By managing runoff onsite, the project decreases the amount of stormwater that enters the city’s combined sewer system and helps protect residents from sewer backups.</li> <li>• The facilities are attractive extensions of the adjacent landscaping.</li> </ul>
<b>Cost:</b>	The cost for construction and project management was \$11,946. The unit cost was \$1.64 per square foot of impervious area managed.
<b>Constructed:</b>	May/June 2004
<b>Maintenance</b>	The City of Portland maintains the facilities with assistance from adjacent residents.

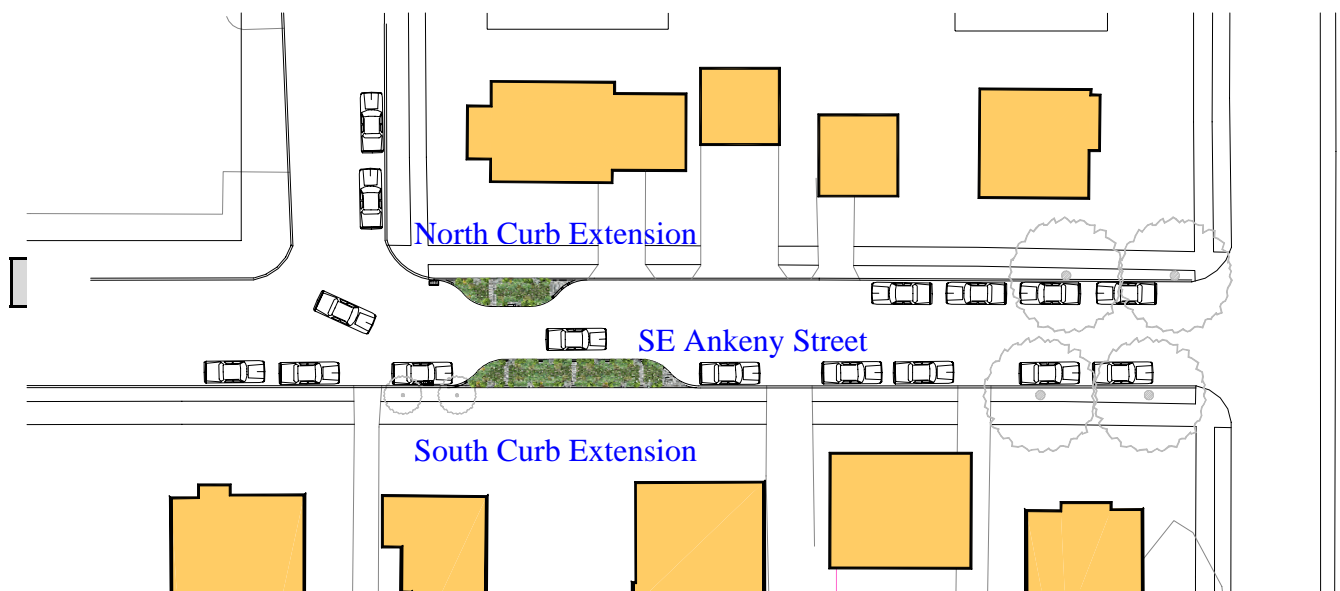
### Features

- The project converted about 495 square feet of pavement to a vegetated system for stormwater management.
- The curb extension on the north side of the street is smaller than its companion unit on the south side of the street. Existing residential driveways dictated the asymmetrical design,
- The project demonstrates one of the simplest types of Green Street retrofits. The existing street curb was left intact, and no modifications were made to the stormwater collection system.
- The design integrates well with its surroundings; low evergreen plantings enhance landscaped areas on the adjacent residential properties.
- Neighbors help maintain the two facilities, providing weeding and seasonal watering during the plant establishment period.

## BACKGROUND

The Bureau of Environmental Services (BES) constructed the project in 2004 as part of an evaluation of techniques for managing street runoff. Urban stormwater runoff, if not managed properly, can pollute rivers and streams and contribute to combined sewer overflows (CSOs). It can also cause sewer backups during large storms.

Stormwater curb extensions are a sustainable practice for managing runoff from existing streets. These natural systems capture and filter runoff and allow it to soak into the ground. They also add green space and enhance the urban environment.



SE Ankeny Green Street Plan View

## SITE SELECTION CRITERIA

- **Traffic Impacts:** The low-traffic residential setting was ideal for a demonstration project. The addition of two 6.5-foot-wide curb extensions created an acceptable queuing configuration on the 28-foot-wide street.
- **Stormwater Catchment Areas:** The size of the catchment area, 7,300 square feet, is considered representative of catchment areas in the surrounding neighborhood.
- **Utility Conflicts:** An existing water line was the only subsurface utility within the project area. It did not present a constraint because it was not directly under the facility.

- **Loss of Parking Spaces:** The project transformed three on-street parking spaces to stormwater curb extensions. Property owners agreed in advance of the project that this was acceptable.
- **Street Slope:** The street slope is approximately 1 percent from east to west.
- **Soil Infiltration Rates:** Soil infiltration rates were not tested at the site before construction. (See “Geotechnical Evaluation,” below.) Staff conducted a flow test in 2006; the lowest draw-down rate over the course of the 5-hour test was 1.8 inches per hour.
- **Space Available for the Facilities:** The north extension is half the size of the south extension because of the short curb length adjacent to residents’ driveways.



Compilation photo of Ankeny Green Street looking west.

## STORMWATER CAPACITY AND SYSTEM CONFIGURATION

### Stormwater Management Goals

The goal was to maximize the capture, treatment, and infiltration of street runoff, while providing a visual amenity for the neighborhood and reducing the risk of sewer backups.

### Geotechnical Evaluation

An infiltration test was not required before construction because adequate documentation already existed concerning local soil drainage. The Natural Resources Conservation Service soil survey for Multnomah County classifies the soils as 51A-Urban Land and well-drained Multnomah soils. The surface horizon typically is dark brown silt loam about 25 inches thick. Soil below this depth is gravelly silt loam and gravelly sand to a depth of approximately 60 inches.

### System Configuration

*Catchment Area (street and driveways):*

- North curb extension: 2,500 square feet
- South curb extension: 4,800 square feet

*Street Slope:*

- Approximately 1%

Southern Curb Extension

*Facility Dimensions:*

- Length: 60 feet
- Width: 6 feet (does not include 0.5-inch wide curb)
- Total vegetated area: 330 square feet
- Maximum ponding depth at center: 6 inches
- Radius of curved portion of the extension: 10 feet



Earthen check dam in South facility

*Surface Storage Capacity:*

- 165 cubic feet

*Overflow:*

- Overflow exits through a curb notch at the downhill (west) end of the facility, draining to the combined sewer via an existing street inlet. No modifications were made to the inlet.

*Check Dams:*

- Originally, three check dams created four separate compartments for retaining and infiltrating runoff. The design was subsequently modified to include only one check dam, with two compartments. (See “Successes and Lessons Learned” below.)

Northern Curb Extension

*Facility Dimensions:*

- Length: 30 feet
- Width: 6 feet (does not include 0.5-inch wide curb)
- Total vegetated area: 165 square feet
- Maximum ponding depth at center: 6 inches
- Radius of curved portion of the extension: 10 feet
- 

*Surface Storage Capacity:*

- 83 cubic feet

*Overflow:*

- Overflow exits through a curb notch at the downhill (west) end of the facility, draining to the combined sewer via an existing street inlet. No modifications were made to the inlet.



Stormwater retained in North curb extension facility

*Check Dams:*

- No check dams were necessary because of the short length of the curb extension and shallow slope.

Additional Information:

- The configuration of the curb extensions in the southern facility is similar to a swale with side slopes and check dams.
- The two extensions were excavated to 18 inches below grade. The native soil was tilled before importing 12 inches of a three-way mix of topsoil, sand, and compost and tilling it into the native soil. The soil mix was acquired from the City of Portland’s Sunderland Recycling Yard.
- There is no gravel trench underneath the facility (a common feature of some designs) because the goal was flow control and water quality treatment rather than complete disposal.
- Check dam composition is compacted clay covered with pea gravel and river rock to minimize erosion. (See “Successes and Lessons Learned” below.)
- The first compartment (forebay) is concrete to allow for easy removal of street sediment and debris. About 3 to 4 inches of sediment can accumulate in the forebay.

**Landscaping**

Plants were selected for their drought tolerance, evergreen foliage, and typical short stature. These characteristics help minimize maintenance and safety concerns. The most common plants are native to the Pacific Northwest, including rushes and broadleaf evergreen shrubs. Rushes are the dominant plant in the bottom of the facilities because they thrive in the variable moisture conditions and their stiff structure helps slow the passage of water. Some non-native plants were included, primarily to provide seasonal color accents.



The plants were installed approximately 8 inches apart, a density greater than required by the city’s Stormwater Management Manual. This was done to reduce maintenance requirements (weeding and watering) and to create an aesthetically appealing landscape quickly.

Plants include:

Scientific Name	Common Name
<i>Actostaphylos uva-ursi</i> ‘Vancouver Jade’	Vancouver jade kinnickinnick
<i>Mahonia repens</i>	Creeping Oregon grape
<i>Helictotrichon sempervirens</i>	Tall blue oat grass
<i>Juncus patens</i> *	California grey rush or grooved rush
* <i>Juncus patens</i> has a tendency to grow taller than the recommended 24-inch height and therefore requires pruning at least once per year.	

## PROJECT COST

The final project cost, excluding design, was \$11,946 for both curb extensions, including construction and project management.

- **Curb Extension Construction**

Construction cost \$9,626, or 81% of the total project cost. This included sawcutting and removal of existing asphalt, excavation, concrete curb installation, soil import and preparation, grading, and safety painting and reflectors on the curbs.

- **Landscape Construction**

Landscape construction cost \$2,320, or 19% of the total construction cost. This included check dam construction, fine grading, plant procurement, plant installation, and mulch cover.

## MAINTENANCE AND MONITORING

### Maintenance

Adjacent property owners allowed the city to use their outside hose bibs to help water the curb extensions during the 2-year plant establishment period. The city will continue long-term maintenance, including hand weeding (no chemical applications are allowed), plant trimming, plant replacement if needed, and removal of leaves, debris, and sediment. These activities will be performed approximately four times annually. (As is typical, more visits for irrigation were required during the plant establishment period). There is no permanent irrigation system, since irrigation is not needed once the plants are established.

### Monitoring

BES conducted a flow test in early 2006 to assess the hydraulic performance of the facilities. Results indicated an infiltration rate of 1.8 inches per hour. Monitoring results were instrumental in identifying necessary design modifications to improve the facilities' function. (See "Successes and Lessons Learned" below.)



Water entering the south facility during a flow test.

## SUCCESSES AND LESSONS LEARNED

- **Effectiveness:** The facilities are proving effective in reducing peak flows that can cause sewer backups and in retaining stormwater volumes to reduce combined sewer overflow events. (Visit the Sustainable Stormwater Management website for monitoring reports).

- **Check dams:** Given the minimal longitudinal slope of the street and results of the flow test, it was determined that the south curb extension needs only one check dam to retain runoff. Rather than adding to the effectiveness of the facility, the other two check dams were essentially minimizing storage capacity. The slope of the street determines the number of check dams needed.

Grade is very important when leveling check dams. If check dams are too high, runoff spills over the side of the facility into the street; if they are too low, stormwater is not sufficiently detained for infiltration.



- **Design Modifications:** Curb cuts on the sides of the facilities were filled in following construction. Because of the relatively flat grade of the street, a curb cut located just upstream of a check dam served more as an outlet for flow out of the facility than as an inlet. Curb cuts should be located just downstream of a check dam and above the normal ponding elevation. A small asphalt berm was placed adjacent to the first inlet to direct water into the facility.
- **Concrete Forebay:** A small, 2-inch concrete lip was originally placed behind the slab forebay of each facility to keep sediment from migrating into the landscaped area. Sediment is not desired in the planting area because it is difficult to remove and can reduce stormwater storage capacity. The concrete lip created ponding water, however. A row of *Juncus* proved to be an effective and less costly method to minimize sediment migration, while also allowing unencumbered stormwater flow. The concrete slab forebay at each inflow point (at the east end of each facility) works well for easy sediment removal.
- **Landscaping:** Planting the *Juncus patens* 8 inches apart proved to be too dense. This species tends to grow vigorously in this environment, reaching 24 inches or more and requiring trimming so it does not inhibit the growth of other plants and obscure the curb. This density did, however, minimize weeding during the first year. Cost savings could be obtained with less density and fewer plants. The city is researching alternative lower-growing *Juncus* species.



Vigorous growing *Juncus patens* (dark green plant).