

NE Fremont Street Green Street Project

NE Fremont Street between NE 131st and NE 132nd avenues Portland, Oregon

PROJECT SUMMARY

Project Type:	Stormwater retrofit of an existing residential collector street – demonstration project
Technology:	Stormwater curb extension
Major Benefits:	<ul style="list-style-type: none"> • The curb extension captures runoff from 4,500 square feet of paved surfaces. It treats and infiltrates most of the runoff it receives, providing volume and flow control and water quality benefits. • Runoff is managed onsite, instead of entering the storm sewer system. • The project includes a ramp that is ADA (Americans with Disabilities Act) compliant, providing for safe pedestrian crossing.
Cost:	The total project cost, including project management (but not design), was \$20,400. Of this, construction of the stormwater curb extension cost \$16,400, or \$3.64 per square foot of impervious area managed. The remaining \$4,000 was required for ancillary sidewalk repairs and construction of a new ADA ramp on the opposite side of the street. These costs are not necessarily typical of other Green Street projects.
Constructed:	July 2005
Maintenance	The City of Portland maintains the facility.



Before



After.

NE Fremont Stormwater Curb Extension

Features

- This project removed 300 square feet of paved street surface and transformed it into a vegetated system for stormwater management. The stormwater curb extension provides water quality treatment and maximizes infiltration of street runoff. It retains stormwater to a depth of about 6 inches.
- This is Portland's first Green Street project to integrate an ADA-compliant pedestrian crossing into the design of a stormwater curb extension facility.
- The project provides an attractive addition to the neighborhood and enhances the urban environment.



BACKGROUND

This was the first Green Street project jointly conceived and designed by the Portland Bureau of Environmental Services (BES) and the Portland Bureau of Transportation (BOT). BOT proposed a curb extension at the site to provide a safe pedestrian crossing that would accommodate school children in particular. BES suggested making it a vegetated facility that could also provide stormwater management, similar to stormwater curb extensions at NE Siskiyou Street and SE Ankeny Street.

SITE SELECTION CRITERIA

- **Traffic Impacts:** The project was not expected to have any traffic impacts.
- **Stormwater Catchment Area:** The 4,500 square foot catchment area is considered representative of catchment sizes in the surrounding neighborhood.
- **Loss of Parking Spaces:** The stormwater curb extension incorporates space that could accommodate parking for two cars.
- **Street Slope:** The moderate, 2% street slope was suitable for the project.
- **Soil Infiltration Rates:** Infiltration tests were not required at the site. (See "Geotechnical Evaluation" below.)
- **Available Space:** It was possible to locate the project between the existing residential water service meters to minimize utility conflicts.

STORMWATER CAPACITY AND SYSTEM CONFIGURATION

Stormwater Management Goal

The goal was to maximize the retention, treatment, and infiltration of street runoff, while providing improved pedestrian safety and a visual amenity for the neighborhood.

Geotechnical Evaluation

An infiltration test was not required before construction because adequate documentation already existed concerning how well Portland's east side soils drain. The Natural Resources Conservation Service soil survey for Multnomah County classifies the soils as 53B-Urban Land and well-drained Multnomah soils. The surface horizon typically is dark brown silt loam about 20 inches thick. Soil below this depth is gravelly silt loam and gravelly sand to a depth of approximately 60 inches.



Fremont stormwater curb extension during a rainstorm

System Configuration

Catchment Area (street, driveway, sidewalks):

- 4,500 square feet

Street Slope:

- Approximately 2%

Stormwater Curb Extension Dimensions:

- Length: 65 feet
- Width: 7 feet
- Total landscape area: 300 square feet
- Depth from sidewalk grade to finish grade of curb extension: 8 inches
- Maximum ponding depth: Approximately 6 inches
- Radius of curb taper: 10 feet

Internal Storage Volume:

- 150 cubic feet

Overflow:

- Overflow exits the facility through a 6-inch curb notch at the downhill end, draining to the separated sewer via an existing street inlet. No modifications were made to the inlet.

Additional Information:



Constructing the stormwater facility; forming the curbs.

- The curb extension was excavated to a depth of 18 inches below the sidewalk grade. The native soil was tilled before importing 12 inches of a three-way soil mix, consisting of sand, topsoil, and compost. No rock or sub-base material was added below the soil.
- The three-way soil mix was tilled into the native soil and spread to create a shallow parabolic cross section.
- The curb opening at the inflow point is 18 inches wide.
- A 12-inch-wide grated concrete trench conveys stormwater under the pedestrian ramp.

Landscaping

Plants were selected for their drought tolerance, evergreen foliage, and height. The typical mature height of the plants is less than 2 feet. These characteristics were a priority because they minimize maintenance and address safety concerns. Most of the plants are native to the Pacific Northwest; some non-native plants were included to provide seasonal color accents. Rushes are the dominant plant in the bottom of the facility because their stiff structure helps slow the passage of water and they survive well in the variable moist and dry soil conditions.



The plants were installed at a density greater than required by the city’s Stormwater Management Manual. This was done to reduce weeding and watering requirements and to quickly create an aesthetically appealing landscape.

Initial plantings included:

Scientific Name	Common Name
<i>Hebe</i> ‘Autumn Glory’	Hebe
<i>Lavandula angustifolia</i> ‘Hidcote Blue’	Dwarf English lavender
<i>Carex testacea</i>	New Zealand orange sedge
<i>Juncus patens</i>	California grey rush or grooved rush
<i>Gaultheria shallon</i>	Salal

(See “Successes and Lessons Learned” below for notes on plant survival.)

PROJECT COSTS

The final project cost was \$20,400, including project and construction management, curb extension and landscape construction, and ancillary construction activities. The cost does not include design.

- **Project and Construction Management**
Project and construction management cost \$3,465, or 17% of the total cost.

- **Curb Extension Construction**

The core curb extension construction activities cost \$11,704, or 57% of the total cost. This included sawcutting and removing existing hardscape, excavation, concrete curb installation, ADA ramp construction, curb cuts and ornamental grate installation, soil import and preparation, and final grading.



- **Landscape Construction**

The landscape construction activities cost \$1,230, or 6% of the total cost. This included fine grading, plant procurement, plant material, and mulching.

- **Ancillary Construction Activities**

Miscellaneous street and sidewalk repair activities cost \$4,000, or 20% of the total. This included installing a new concrete ADA ramp on the north side of Fremont, opposite the new curb extension, as well as additional sidewalk repair.

MAINTENANCE AND MONITORING

Maintenance

Maintenance includes hand weeding (no chemical applications are allowed), plant trimming, plant replacement, and sediment and debris removal.

Portland Parks and Recreation maintained the curb extension during the 2-year plant establishment period. The city will continue long-term maintenance an average of four times per year. There is no permanent irrigation system.



Monitoring

BES will visually monitor the curb extension for maintenance requirements and plant success.

SUCSESSES AND LESSONS LEARNED

- This street retrofit project is an attractive demonstration of how to integrate vegetated stormwater management systems into the urban streetscape to provide direct environmental benefits and a sense of neighborhood identity.
- The project is Portland's first example of a stormwater curb extension that integrates an ADA-compliant pedestrian ramp into the design without compromising the function of the facility.

- All of the plants, with the exception of *Gaultheria shallon* (salal), grew vigorously during the first year. As a result, little weeding is required. Some plants appeared to suffer from cold east winds in the winter, evidenced by some browning of leaves. Most species of the salal died during the establishment period, probably as a result of cold winds and intense solar exposure at this location. The salal was replaced with more hebe plants.
- In the first year, little sediment accumulated in the forebay. This may be because of a lack of contributing elements, such as street trees. Because there is little sediment input, city staff removes the sediment an average of twice per year, using a shovel and rake.