2007 Department of Ecology
Low Impact Development Stormwater Grant Program

CITY OF ISSAQUAH – RAINIER BOULEVARD STREET LID IMPROVEMENT PROJECT

Smoothing of pervious asphalt species

Project description

The Rainier Boulevard Street Improvement Project used low impact development (LID) in a road reconstruction and sidewalk improvement project in Issaquah. The project is located in downtown Issaquah, on Rainier Boulevard between the bridge over East Fork Issaquah Creek and Dogwood Street. It is one of the largest regional projects to use pervious asphalt on a city arterial street.

Previously, runoff from this roadway drained directly to East Fork Issaquah Creek without detention or treatment. Issaquah Creek is home to threatened Chinook salmon and other sensitive aquatic life, and the site is located in a critical aquifer recharge area.

LID techniques, such as pervious asphalt pavement and rain gardens, will eliminate the threat of stormwater runoff to Issaquah Creek.

For this project, the city incorporated pervious asphalt pavement along a 560-foot long, 37-foot wide section of pavement. Construction specifics of the pervious asphalt included:

- 804 tons of asphalt.
- Sidewalk at 7 inches thickness.
- 1250 tons of crushed surfacing base course, 10 inches thick.
- HMA-Class 1 aggregate, modified as a penetration grade (mix design without fines to allow the free passage of water to the underlying base materials).

The city also constructed two rain gardens to collect runoff from the sidewalks along the street and from a neighboring 200-foot section of conventional asphalt roadway.

The new techniques equal an acre of treated drainage that includes:

- Half an acre of new pervious asphalt.
- Half an acre of existing asphalt roadway and sidewalk drained to rain gardens.

Lessons learned

In general, the response from the public to using pervious asphalt was well received. People see LID as a viable alternative to conventional construction methods. Several private development projects proposed LID projects because of the exposure of this LID project.

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While the city considers this project very successful, several internal issues arose that need to be addressed in subsequent LID projects on city streets. These issues generally fall under two categories: construction and operation and maintenance.

A fire hose demonstrates the pervious asphalt and rain garden in action.

Construction issues

Pervious asphalt compaction. Construction of the pervious asphalt proceeded without any significant issues. The contractor followed the specifications for base preparation, laying the asphalt, compaction, and cooling prior to opening to traffic. The entire 7-inch asphalt thickness was placed in a single lift. Normally, asphalt is placed using two lifts, which results in a smooth surface. The resulting final surface of the pervious asphalt was slightly wavy because compaction was not controlled as well. However, this is just a minor aesthetic concern.

Pervious asphalt suppliers. The pervious asphalt supplier could not confirm for delivery until the day before installation, due to preparation time involved with making the special aggregate mix. As pervious asphalt is used more frequently in development projects, availability will improve in response to demand.

Operation and maintenance issues

Snow and ice control. Although Public Works staff knew about the pervious asphalt issues that can come from sanding, staff sanded during the winter. Sand compromises the ability of pervious asphalt to infiltrate water. Because the city must maintain the existing level of service on city streets for snow and ice control, sanding often was the solution in the past. Alternatives to sanding that are equally effective are being evaluated to avoid sanding of the road in the future.

Long-Term effectiveness. The city will modify maintenance best management practices (BMPs) to maintain infiltration capacity over a long period (i.e., 20-30 years). BMPs, such as replacing conventional street sweeping with vacuum sweepers; modifying snow and ice control BMPs; and making sure local construction projects avoid tracking dirt onto the roadway, will help maintain infiltration. Maintaining appropriate management will take a long time before the void space in the pervious asphalt is filled.

Leaf litter alongside the rain garden could be a small maintenance issue.

Long-Term strength. While some minor unraveling of the aggregate can occur, primarily due to wheel turning, the pervious asphalt on Rainier Boulevard in Issaquah is holding up well. The city will continue monitoring the pervious asphalt to determine long-term durability.

Projected environmental benefits

Hydrology improvements already exist on Rainier Boulevard. While the visual evidence exists, the city is collecting quantitative flow data to help determine the LID technique's effectiveness. Results are expected soon. This project intends to meet the following environmental water quality goals:

1. Reduce stormwater runoff from the project site by 90 percent.
2. Reduce fecal coliform, sediment, and other pollutant loading from the site to the receiving waters, including East Fork Issaquah Creek and main stem Issaquah Creek. Before-and-after sampling will quantify reduction of pollutants, but at least a 90 percent reduction is anticipated.

3. Recharge an annual average of 3.6 acre-feet to the underlying groundwater aquifer that provides base flow to summer low flows in adjacent creeks.

Public education

The city of Issaquah hosted an on-site tour for interested stormwater managers and construction professionals during the pervious asphalt pour. At the project ribbon-cutting ceremony, the city used a fire hose to demonstrate the infiltration capabilities of the pervious surfaces. The city installed an informational sign next to the eastern rain garden and the city's website, http://www.ci.issaquah.wa.us/Page.asp?NavID=1568, provides additional information.

Project cost

Ecology awarded a $140,000 grant to the city of Issaquah to support LID construction elements, project management, education and outreach, and monitoring. The total project cost including engineering, administration, construction management, and utility undergrounding was $618,000, with local money coming from the city's general fund. The Ecology grant provided a financial incentive for the city to design and implement LID in this reconstruction project.

The grant budget that shows how the $140,000 grant award was used:

Task Items	Total Project Cost	Grant Award
Project Management	$1,000	$1,000
Design and Construction	$172,500	$130,600
Monitoring	$5,400	$5,400
Outreach and Education	$6,100	$6,100
Final Report	$1,000	$1,000
Non LID Project Costs	$477,888	$0
Total	**$617,888**	**$140,000**

It is not fair to compare the cost of this LID project to a conventional road design. However, the city can estimate the difference from different material quantities and unit costs for LID items directly related to the design. LID costs include increased depth of gravel base course, increased thickness and cost of pervious asphalt, and rain gardens. The city actually saved money on this project by avoiding the need for conventional stormwater conveyance, detention, and treatment systems that were required under local stormwater regulations. The following table shows a comparison of these additional costs and cost saving:

LID/Conventional Design Cost Comparison

LID Type	Cost Difference	Comments
Pervious Asphalt	+$10,000	Added cost of pervious asphalt ($10/ton).
Gravel Base Course	+$15,000	Added cost of gravel base course with pervious asphalt
Grading	+$15,000	Added cost of excavation for gravel base course with pervious asphalt
Rain Gardens	+$11,000	Added cost of rain gardens
Stormwater Conveyance	-$35,000	Savings for not needing conveyance system
Stormwater Detention and Treatment	-$40,000[a]	Savings for not needing detention and treatment.
Total	-$19,000	Net savings using LID, which equals about a 4 percent savings of the total construction costs.

The cost saving for stormwater detention and treatment is highly variable, depending on the stormwater requirements. Rainier Boulevard required water quality treatment only if the street was completely rebuilt. Much greater savings could be realized if costly stormwater detention facilities were also avoided, as shown in the table.

Data from this project show that LID techniques equal cost-effective savings for stormwater management and treatment. Although a pervious asphalt design is more costly than conventional asphalt, this is offset by a large cost savings created by smaller stormwater conveyance, detention, and treatment facilities. Depending on the local conditions and requirements for stormwater management, the savings can be substantial.

Partnerships

As with any project that seeks to go beyond "old school" and achieve environmental sustainability goals, recognition is due to all those people involved that made this project a success. Ecology acknowledges, but does not endorse or recommend the contractors who helped make this project a success:

- Construction by Dennis R. Craig Construction
- Pervious asphalt by Lakeside Industries

Ecology and the state legislature deserve credit for providing the funding that made this project possible. The financial incentive that the grant program provided is the reason why this LID project became a reality. Other proposed projects in the area are a direct result of this demonstration project.

For more information

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