

WSDOT Stormwater Retrofit

PROTECTING SPECIES, HABITAT AND HUMAN HEALTH FROM STORMWATER IMPACTS BY IMPROVING WATER QUALITY AND REDUCING EFFECTS OF STORMWATER RUNOFF INCLUDING 6PPD-QUINONE

What is stormwater and 6PPD-quinone?

Stormwater is precipitation and snowmelt runoff from pervious and impervious surfaces, often carrying a complex mixture of pollutants from the built environment and atmosphere. WSDOT is committed to mitigating harmful effects of stormwater, including [a new pollutant identified in December 2020 as 6PPD-quinone \(6PPD-q\)¹](#), a byproduct of the tire additive 6PPD. 6PPD is a chemical that prevents tire rubber from cracking, improving safety and longevity. As 6PPD interacts with oxygen, ozone and temperature fluctuations, it transforms into 6PPD-q, a recently identified cause of urban runoff mortality syndrome resulting in harm or death of fish, particularly in their early life stages. Early studies show that 6PPD-q is most deadly to coho salmon, and emerging science indicates harmful effects to other species including rainbow trout and brook trout. There are many unknowns regarding 6PPD-q and its effects on fish, wildlife, plants, habitat and human health and more research is needed to better understand the issue.

UNDERSTANDING PERVIOUS AND IMPERVIOUS SURFACES: Pervious surfaces are porous, allowing water to pass through and seep into the ground. Impervious surfaces are hardened surfaces that repel water, blocking it from soaking into soils and becoming groundwater. Impervious surfaces are mainly from the built environment, like paved areas and buildings. Compacted soils can also deflect water. Impervious surfaces act like a rain coat for soil.

This illustrates the harm caused by 6PPD-quinone for coho and other fish species in some locations.



¹ Tian et al., Science 371, 185–189. 2021. A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon.

What is WSDOT doing to advance research?

WSDOT is participating in, and closely tracking and supporting efforts to gather critical information on this topic, while continuing to implement stormwater treatment, including potential treatment for 6PPD-q on projects throughout Washington.

WSDOT conducts and contributes to research to improve understanding and best practices around stormwater and solutions to address the problem. WSDOT has a stormwater research and monitoring program focused on improving stormwater treatment and a program to inventory and document existing stormwater features within our right of way. WSDOT contributed funding to the University of Washington Tacoma study that identified 6PPD-q. We will continue to update our stormwater management approach based on best available science and technology.

What is WSDOT doing to mitigate stormwater impacts including 6PPD-quinone?

WSDOT's [values](#) and regulatory obligations drive us to protect and improve water quality by minimizing and mitigating the effects of stormwater runoff on the environment. WSDOT, along with many other governments, tribes, non-governmental organizations (NGOs), scientists and partners, recognizes the connections between stormwater management, salmon recovery and the overall health of our state. Our projects already include stormwater treatment for previously known pollutants such as metals and sediment, which may also be effective in treating for 6PPD-q ([Ecology 2022](#)²).

Each WSDOT project treats stormwater when adding new pavement or resurfacing roads to meet current stormwater treatment standards and regulations. WSDOT's stormwater retrofit program addresses stormwater impacts from existing transportation infrastructure through three main approaches:

- **Project-triggered retrofits** - add treatment for existing impervious surfaces as a part of transportation improvement projects and as required by regulations.
- **Opportunity-based retrofits** - add treatment for existing impervious surfaces as a part of transportation projects when it makes sense and is cost-effective, even when not required by

² (Ecology 2022) Washington State Department of Ecology. 2022. 6PPD in Road Runoff Assessment and Mitigation Strategies. Publication 22-03-020. Olympia, Washington.



Compost amended vegetated filter strip



Media filter drain



Compost amended biofiltration swale

regulation. WSDOT specifically looks for these retrofit opportunities with every fish passage project, so fish return to higher quality habitat after a barrier is removed.

- **Stand-alone retrofits** - add treatment for existing impervious surfaces at prioritized locations where the project's sole purpose is stormwater treatment and reducing stormwater impacts.

Increased funding over the next 16 years will allow us to spend significantly more money compared to current levels for stand-alone retrofit.

WSDOT regularly inspects and maintains catch basins and existing stormwater treatment facilities to ensure they are functioning properly. WSDOT's street sweeping activities remove pollutants before they enter downstream waters. These activities also help reduce the effects of stormwater.

What treatment options are we initially focusing on to address 6PPD-quinone?

The pollutant 6PPD-q is generated primarily from vehicle use on the transportation system. The source of the pollution will not be removed until safe alternatives are studied and implemented and tires containing 6PPD reach the end of their service life. While we wait for science to broaden our understanding and the source of the pollutant to be removed from tires, WSDOT is moving ahead with already established best management practices that reduce or eliminate other pollutants and may have the same effect on 6PPD-q. Current thinking indicates 6PPD/6PPD-q binds to soils and solids as opposed to staying dissolved in

water. This suggests approaches that either filter and settle sediment and pollutants or allow water to seep into soils are the best potential treatment options for 6PPD-q ([Ecology 2022](#)). Plants, soils, and compost are often components of these types of best management practices, which are commonly referred to as green stormwater infrastructure or low impact development.

Stormwater Retrofit and Move Ahead Washington

The 2022 Washington State Legislature authorized \$500 million over 16 years beginning in 2023 for WSDOT stormwater retrofit as part of the Move Ahead Washington funding package to enhance stormwater treatment from existing roads and infrastructure, with an emphasis on green infrastructure retrofits. The Legislature directs WSDOT to prioritize projects that focus on benefits to salmon recovery and ecosystem health, reducing toxic pollution, addressing health disparities and cost effectiveness. Of the stormwater retrofit funding \$6 million is dedicated to the I-5 Ship Canal Bridge Pilot Project in Seattle.

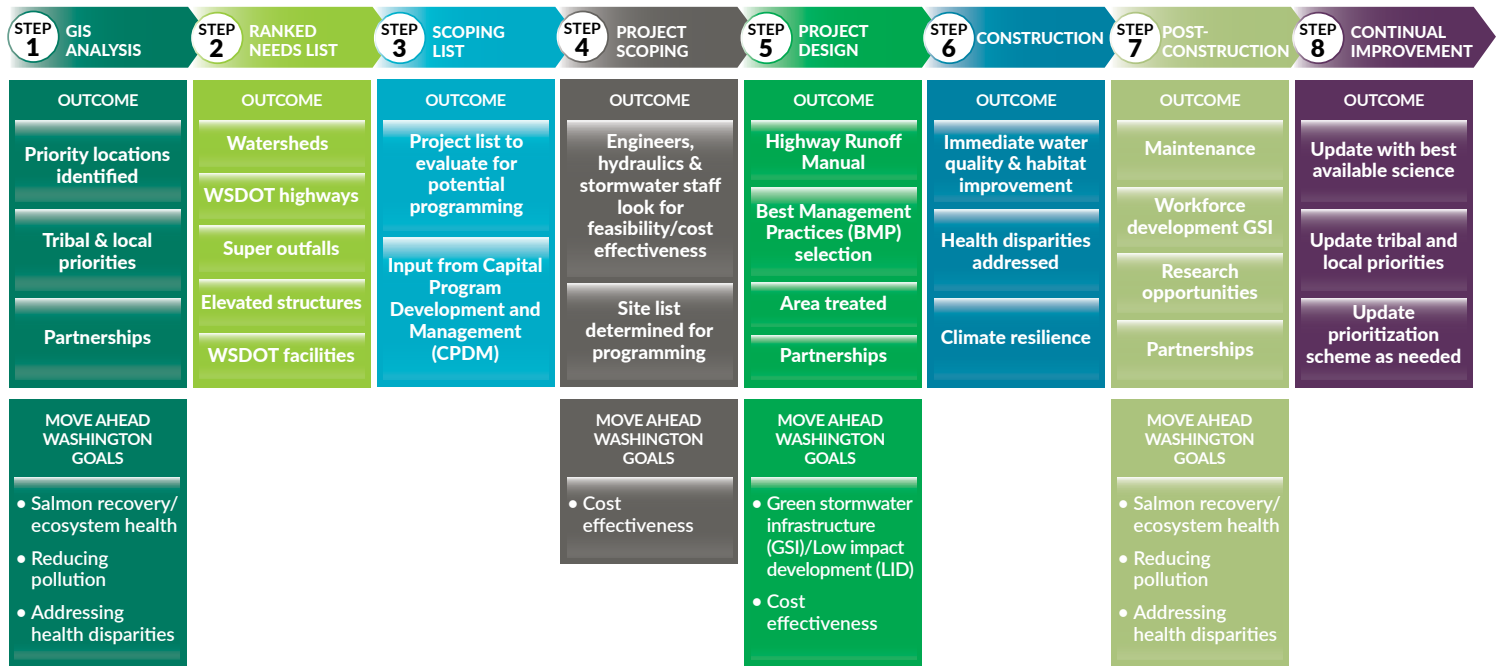
Where will Move Ahead Washington stormwater retrofit projects occur?

WSDOT is seeking input from federal, state, and local governments, tribes, NGOs, scientists and other interested parties to update priority locations along the state highway system. This will help inform how the new Move Ahead Washington funding for stormwater treatment can be directed to address the funding priorities and collective needs.

Improvement to water quality, human health, and ecosystems occurs when best management practices are added to treat stormwater.



This graphic shows WSDOT’s process for delivering stormwater retrofit projects and how Move Ahead Washington priorities are incorporated.



Delivering the Move Ahead Washington stormwater retrofit program requires projects entering early design phases in the 2023-2025 biennium as well as longer-range planning, which includes updating WSDOT’s stormwater retrofit prioritization in a thoughtful, inclusive and science-based manner. Consistent with the state’s [Healthy Environment for All Act](#), WSDOT’s goal is that 40% of stormwater retrofit improvement investments across the state will be directed to eliminate or reduce health disparities for vulnerable populations and overburdened communities.

The Washington State Department of Ecology shared data showing where urban runoff mortality syndrome has been documented or vulnerable habitat is suspected and intersects with transportation infrastructure. These are potential stormwater retrofit project locations to deliver early in the program. Some of the locations are also within planned fish passage projects.

The stormwater retrofit prioritization update is underway. The result will be a GIS analysis, indicating high and medium priority locations, pulling from weighted data, to address the Move Ahead Washington priority focus areas. The prioritization will consider preferred locations of tribes, cities and counties and

other interested parties as identified through outreach. It will take time to ensure inclusive outreach, input and coordination has occurred to represent a diversity of interests and considerations, including tribal treaty rights. WSDOT will continue to update treatment methods and priority retrofit locations as new science emerges and the agency gathers input through continuing assessments of statewide stormwater features and outreach efforts.

Partnerships

WSDOT is not alone in focusing on the importance and urgency of treating stormwater – this is an issue that brings many groups together to work towards a common goal. WSDOT is partnering with federal, state, and local governments, tribes, NGOs, research teams and other partners in these efforts. These partnerships help inform WSDOT’s stormwater retrofit prioritization update, develop stormwater treatment solutions, further scientific research, gather and incorporate community input, and develop green infrastructure with community co-benefits. Strong partnerships will be key to successful delivery of the program.

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