

Mitigating Tire Wear Toxicants & Other Contaminants from stormwater With Green Stormwater Infrastructure

Water Data & Dialogue – RDN DWWP Event

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**BRITISH COLUMBIA
CONSERVATION FOUNDATION**

Tire Wear Toxicants & Stormwater Pollutants

Pesticides

Oil & Grease



Fertilizers

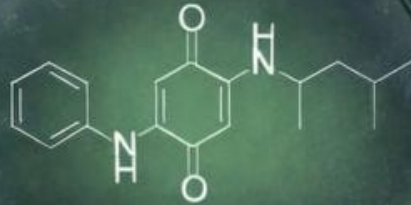


Trash

Heavy Metals

Microplastics

Tire Wear Toxicants



6PPD-quinone



Impacted Species

LC₅₀ = lethal concentration to 50% of a population



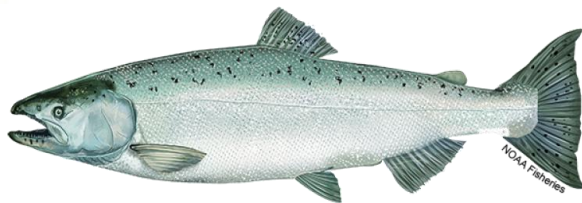
Coho salmon



Coastal cutthroat trout



Rainbow trout/
steelhead



Chinook salmon

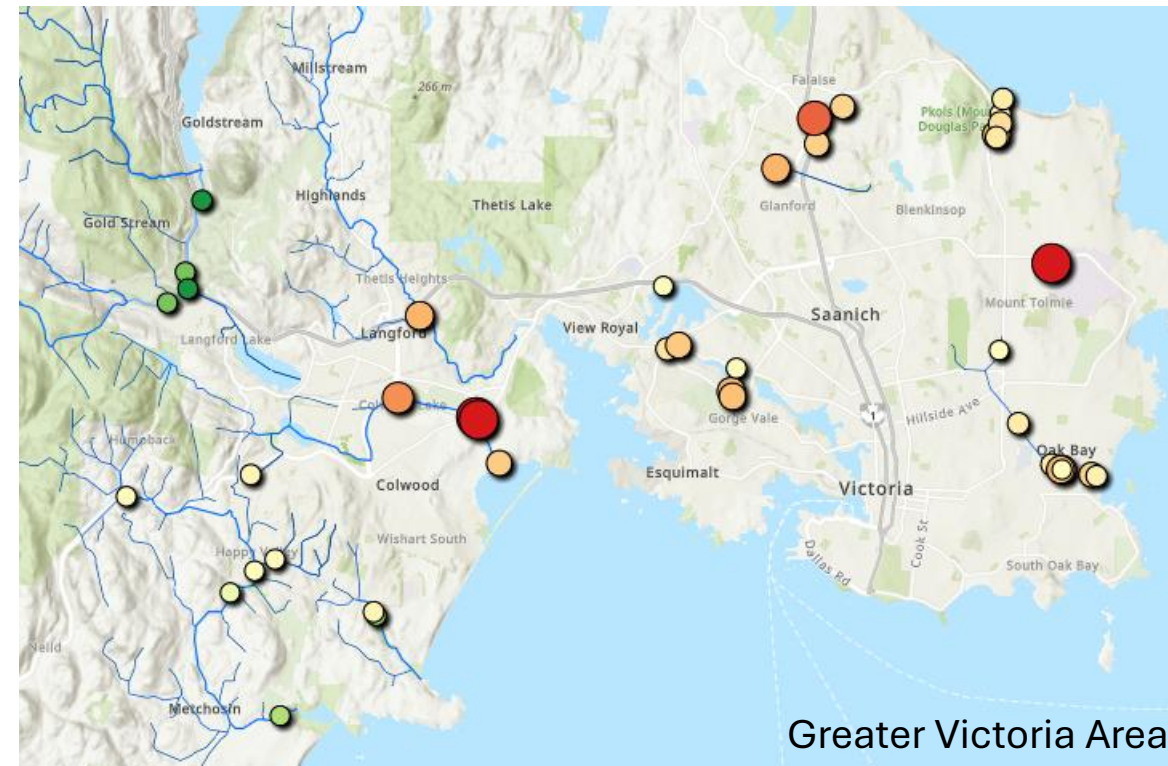
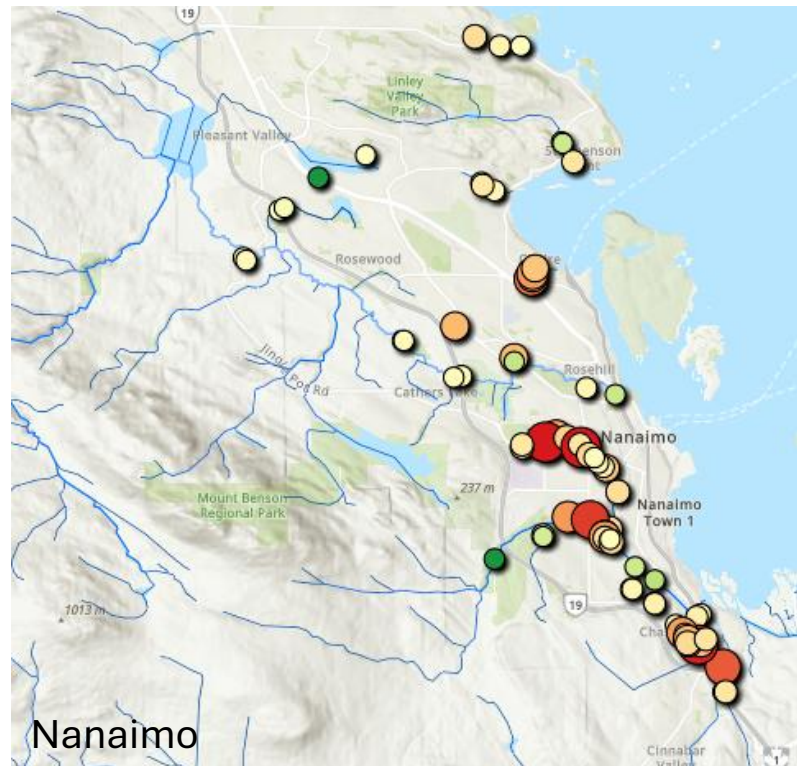
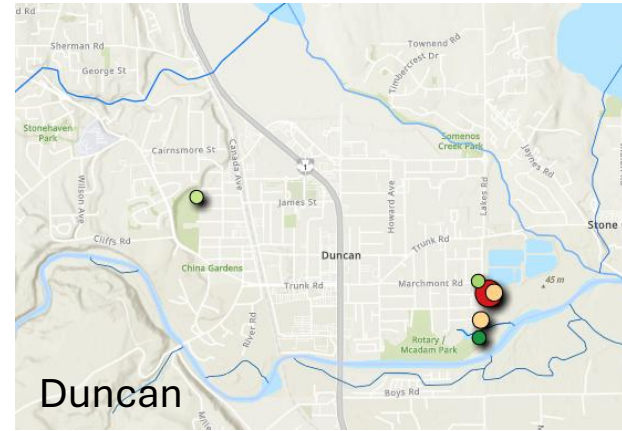
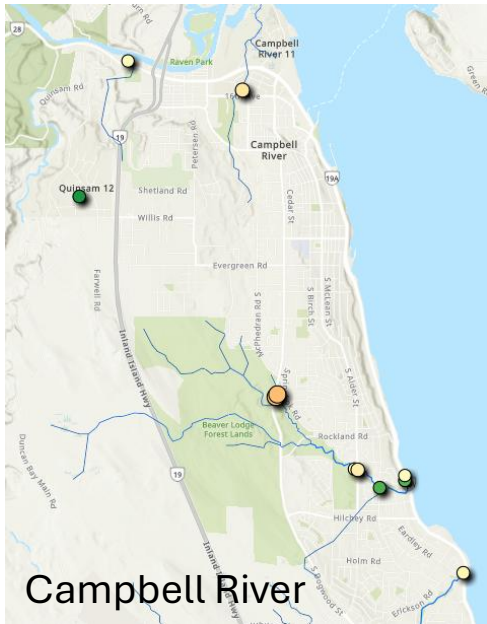
| Species | LC ₅₀ |
|-------------------------|------------------|
| Coho salmon | 41 - 95 ng/L |
| Coastal cutthroat trout | 39 - 185 ng/L |
| Rainbow trout | 470 ng/L |
| Lake trout | 500 ng/L |
| Brook trout | 590 ng/L |
| White sturgeon | > 12,000 ng/L |
| Chinook salmon | > 67,000 ng/L |

Major sources of TWTs on Vancouver Island



Data Dashboard

>7,000 samples collected across ECVI since Sept 2023 by 37 engaged groups



Streams that appear most impacted:

- Urban streams
- Smaller streams
- Large impervious surface/multiple stormwater inputs

Green Infrastructure (GSI)

GSI has shown to be very effective at treating stormwater runoff.

There are many types of GSI (not all have been tested for 6PPDQ treatment):

- Rain gardens
- Bioswales
- Permeable pavement
- Box-of-rain & other end-of-pipe solutions
- Constructed wetlands



Image: Stewardship Partnership (Washington)



Image: Stormwater Partners (SW Wash)

Rain Gardens

Smart landscaping for cleaner water and healthier communities

A rain garden is a shallow, planted depression that captures and filters rainwater runoff.

ITS FUNCTIONS & BENEFITS



POLLUTION FILTRATION

Plants and soil trap sediment, oil, heavy metals, and other pollutants from parking lot runoff.



REDUCED FLOODING

Captures and absorbs rainwater where it falls, reducing runoff, puddles, and stormwater overflow into drains and waterways.



STORE CARBON

Plants and soil naturally store carbon, helping to reduce greenhouse gases and build healthier soil.



INCREASE BIODIVERSITY

Provides habitat and food for pollinators, birds, and beneficial insects.



RECHARGE GROUNDWATER

Filtered water soaks into the ground, replenishing local aquifers and supporting healthy ecosystems.



COOLER COMMUNITIES

Plants provide shade and release moisture, helping to reduce urban heat and create more comfortable spaces.

CAPTURES RUNOFF

Rainwater from parking lots and pavement flows into the rain garden instead of going directly to storm drains.

FILTERS POLLUTANTS

Plants and soil trap and break down pollutants as water moves through the garden.

ABSORBS & STORES WATER

Water is absorbed into the soil and stored for plant use or slowly released over time.

CLEANER WATER, HEALTHIER COMMUNITY

Clean, filtered water either soaks into the ground or flows to waterways—supporting healthier rivers, lakes, and streams.



BEAUTIFUL. FUNCTIONAL. SUSTAINABLE.

Rain gardens turn everyday rain into an opportunity to protect our water, wildlife, and future.

A UBC study found that rain gardens are able to effectively mitigate >90% of 6PPDQ loadings under typical storm conditions (< 2 year rain event).



THIS RAIN GARDEN WORKS FOR YOU!



Clean water



Less flooding



Healthier wildlife



Stronger communities

Thank you for protecting our water!

Bioswales

No studies found specific to 6PPDQ removal

RAIN GARDENS vs. BIOSWALES

Both help soak up rain, reduce pollution, and protect our waterways!

| | | |
|---|--------------------------|--|
| Shallow, bowl-shaped depression | SHAPE | Long, narrow channel |
| Usually in yards or open spaces | LOCATION | Typically along roads, sidewalks, or parking lots |
| Planted with flowers, shrubs, and sometimes trees | VEGETATION | Planted with grasses, sedges, and other hardy plants |
| Captures and soaks in rain where it falls | WATER FLOW | Moves rainwater along the swale and soaks it in |
| Great for pollinators and wildlife | WILDLIFE BENEFITS | Provides habitat and helps filter pollution |

BEST FOR: Capturing rain from rooftops, driveways, and small areas. Adds beauty and habitat!

BEST FOR: Managing runoff from streets, parking lots, and large areas. Improves water quality!

DIFFERENT LOOKS, SAME GOAL: Cleaner water. Healthier communities. A greener future!



Image: USEPA

Permeable Pavement

Retained >96% of deposited tire particle mass & 68% of leachable 6PPDQ

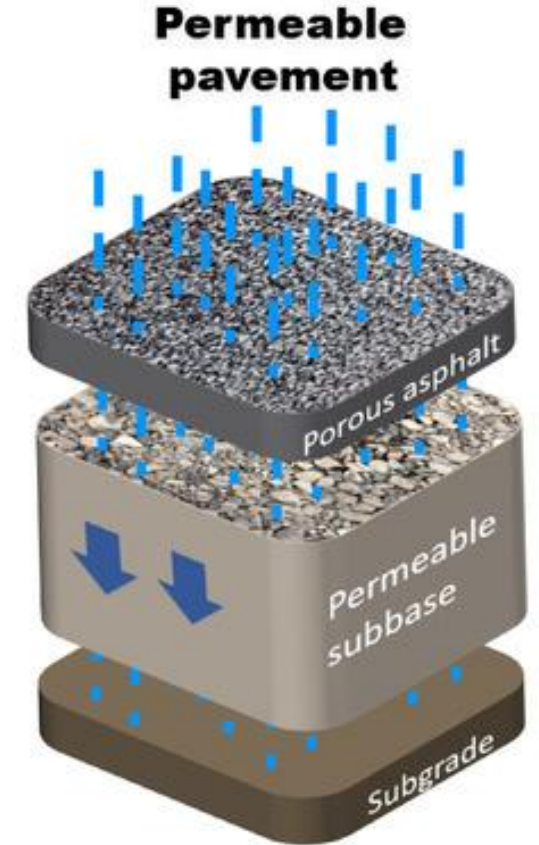
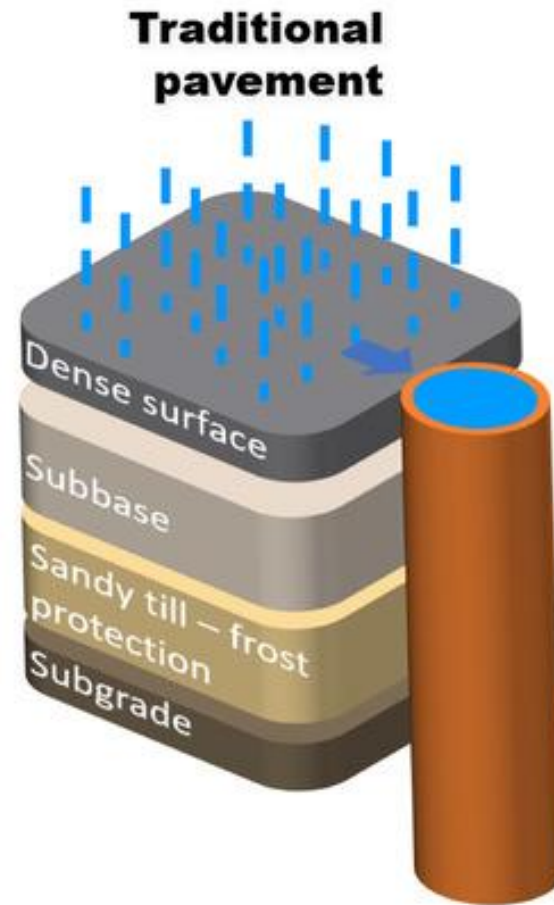


Image: Muttuvelu, Wyke & Vollertsen (2022)

'Box-of-Rain' or Downspout Planters

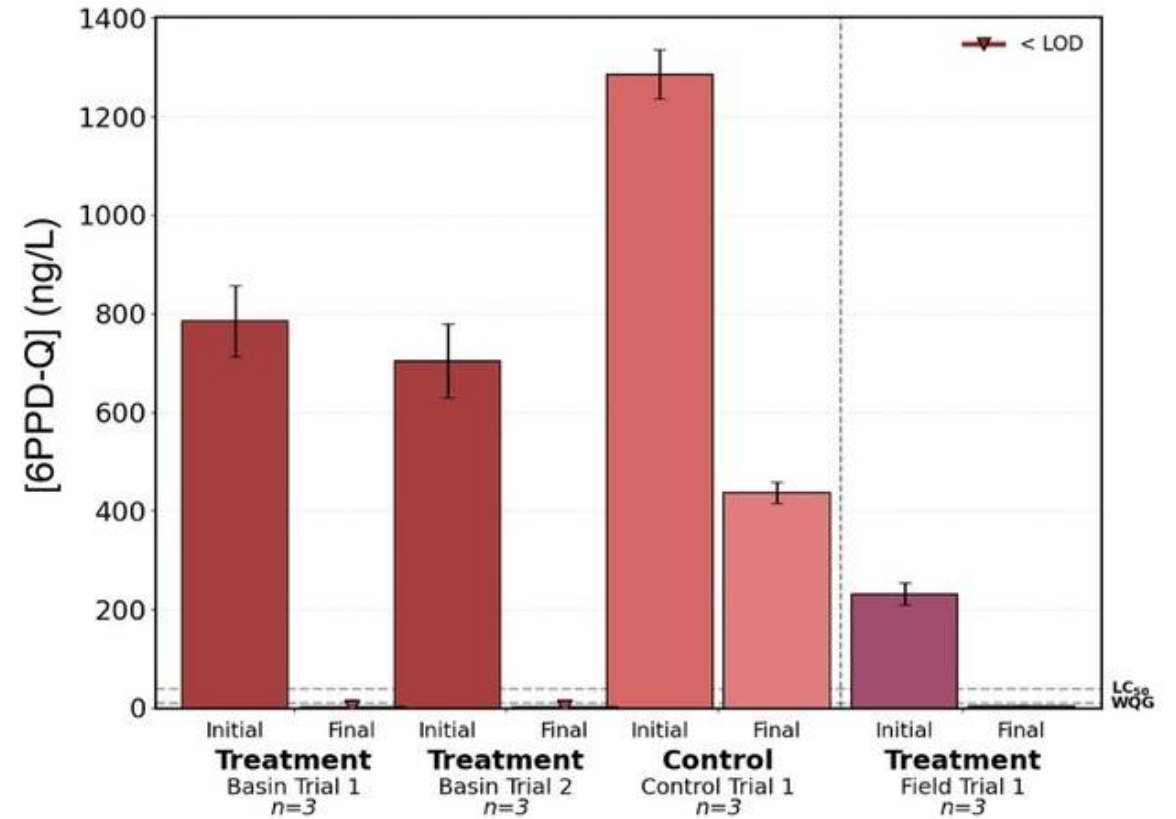
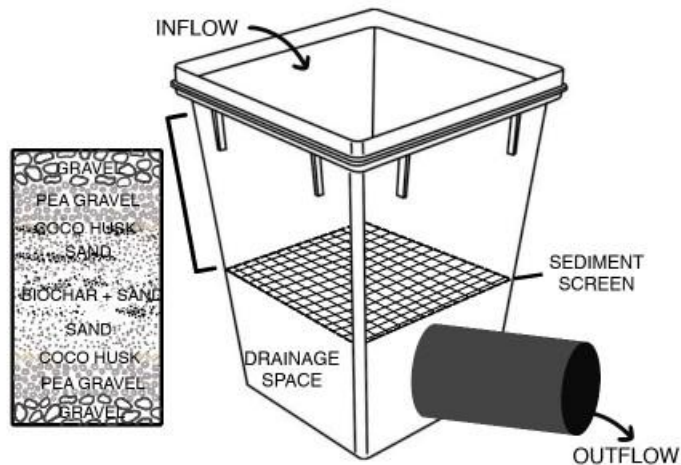
**~75% removal of
6PPDQ
dependent on
media type**

Image: Stewardship Partnership (Washington)



Image: Port of Vancouver USA

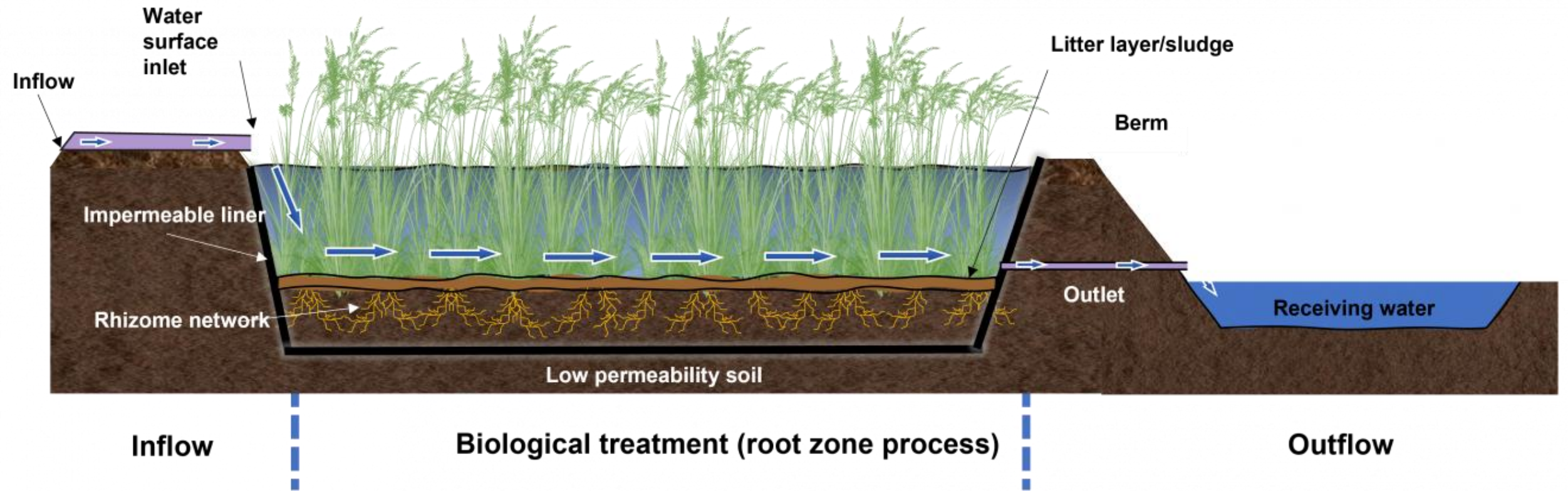
Other End-of-Pipe Solutions



Constructed Wetlands

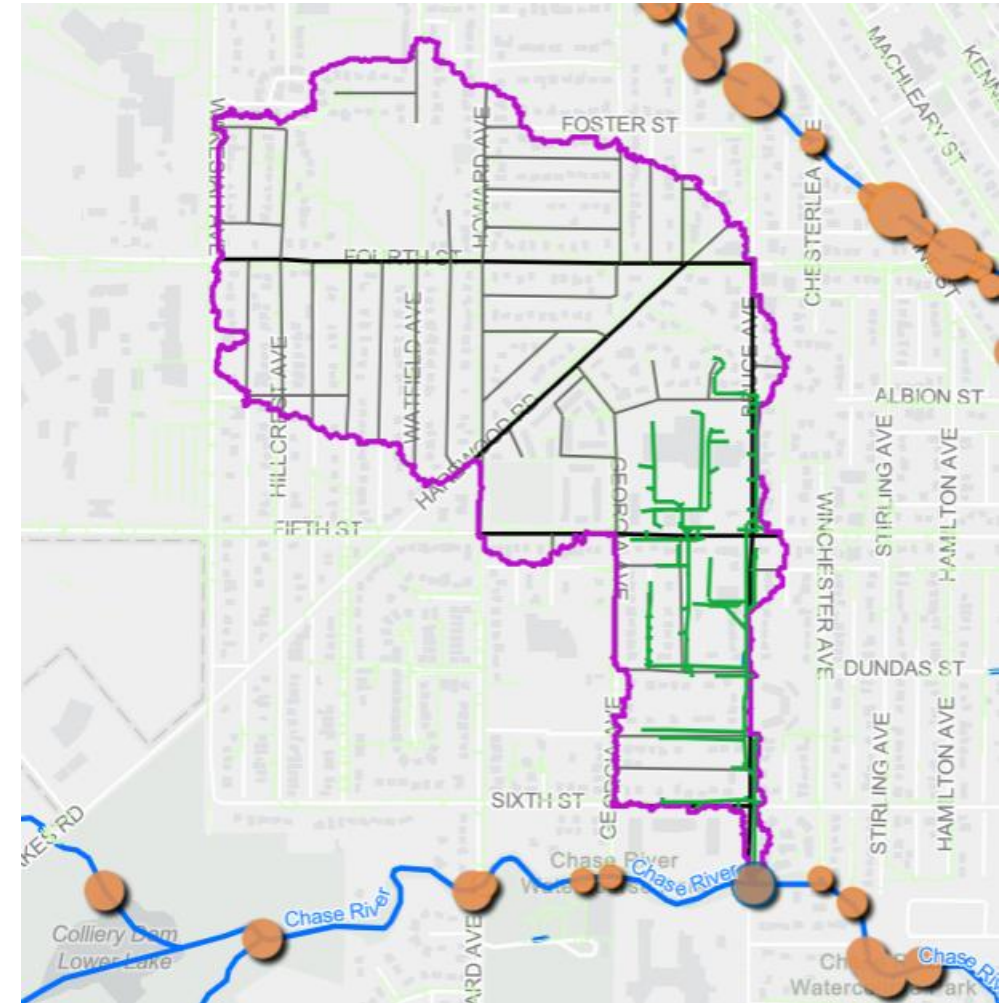
Wetlands operate closer to a pond than a bioretention system with regards to 6PPDQ; no known testing on constructed wetlands.

Reeds or other aquatic macrophytes
/ Wetlands: Plants



Identifying Potential Locations for GSI Locally

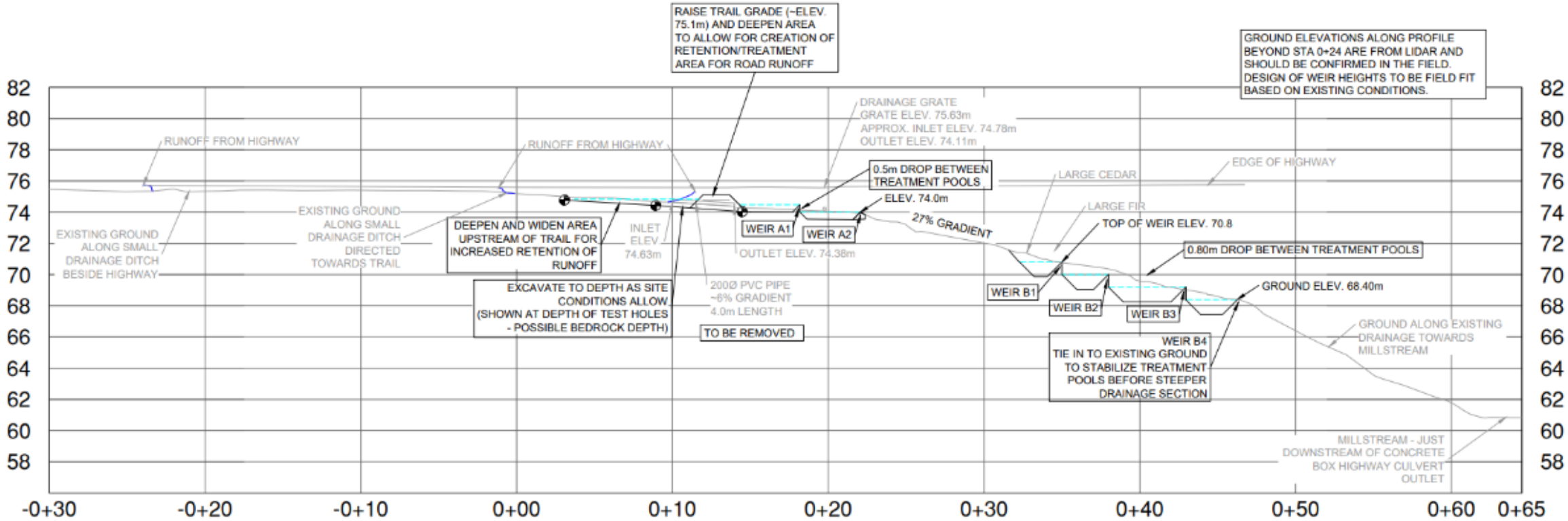
- Reviewed point source data & stormwater infrastructure
- Identified the highest point sources and associated stormwater infrastructure ‘watersheds’ in each major municipality
- Met with stakeholders in Campbell River, Courtenay, Parksville, Nanaimo, Duncan, and Victoria to discuss potential GSI locations
- Generated a short list of locations & began contacting property owners to begin approval process



Projects To Date – Millstream at Highway 1



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Current Sites of Consideration in the RDN – Beck Creek Constructed Wetland



Current Sites of Consideration in the RDN – Georgia Avenue Elementary School



Preliminary Lessons Learned

- GSI needs to be site specific to be most effective.
- Utilizing biochar and other high efficiency sorbents is recommended.
- Further sampling/testing is required to determine efficiency of recent and previously constructed sites.
- When finding sites, having strong partnerships and undertaking longer-term planning is key, as approvals take months to years.



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Canada
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Agence de l'eau
du Canada



PACIFIC SALMON
FOUNDATION



City of
Courtenay



REGIONAL
DISTRICT
OF NANAIMO



City of
Parksville



DEPARTURE CREEK STREAMKEEPERS