

Standard Operating Procedures:
6PPD-Quinone Online GIS Database

Version 1

May 2024



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OVERVIEW

This standard operating procedure (SOP) is to guide the use of the online GIS interactive database, which will be used to view and analyze results of 6-PPDQ testing conducted by the network of local First Nations, stewardship groups, BC Conservation Foundation's Applied Research and Restoration Centre (BCCF ARRC), and Vancouver Island University's Applied Environmental Research Lab (VIU AERL). All sample results displayed were analyzed and produced by VIU AERL.

This SOP is intended for use by staff, contractors, and volunteers associated with the 6-PPDQ monitoring project. All data is for research purposes only, should be considered preliminary, and must be verified if important. The project team does not warrant in any way that the data will meet end user's requirements, or that the data will be complete, uninterrupted, or error free. In the event you wish to use any of this data for research or publishing purposes, we ask you that you contact the project team. Contact information can be found on the [project website](#).

The interactive database was constructed by Campbell Geospatial Consultants under the direction of the BCCF ARRC/VIU AERL project team.

OPENING THE DATABASE

The online GIS interactive database can be accessed either via the [project webpage](#) or by following this link: <https://experience.arcgis.com/experience/597c33d27da84f1789bc41a36e37253d/page/Tire-Wear-Toxins/>.

Please review the disclaimer that appears as a splash screen on the database webpage. To move past the disclaimer screen, click the box beside 'I agree to the above terms and conditions' and select 'OK'

NAVIGATING THE DATABASE

Tire Wear Toxins Tab

The main screen that pops up will be showing the **maximum concentrations** measured at each of the sampling sites. You can also toggle back and forth between the maximum and mean 6-PPDQ concentrations for all sites by clicking between the two different tabs as indicated by the yellow box in Figure 1.

There is a legend on the left side of the screen (identified by red arrow in Figure 1) that shows the colour gradient used to depict 6-PPDQ concentration values on the map. The darker red colour and larger symbol size indicates higher concentrations, compared to smaller, green circles. You are able to zoom in and out on the map to see the entire sampling range. Sites are selected by clicking the circle that depicts the sample location of interest. As means to help navigate to the waterway of interest, there is a drop down in the top right corner of the screen where the waterway can be selected; once selected the map will zoom into that waterway and show all existing sample locations.

When the user selects a site, the 6-PPDQ concentration for every sample collected at that site will be listed in the top left portion of the screen; each listed date is colour coded in the same manner as the colour gradient shown below it. Additionally, all samples where 6-PPDQ was not detected are shaded grey.

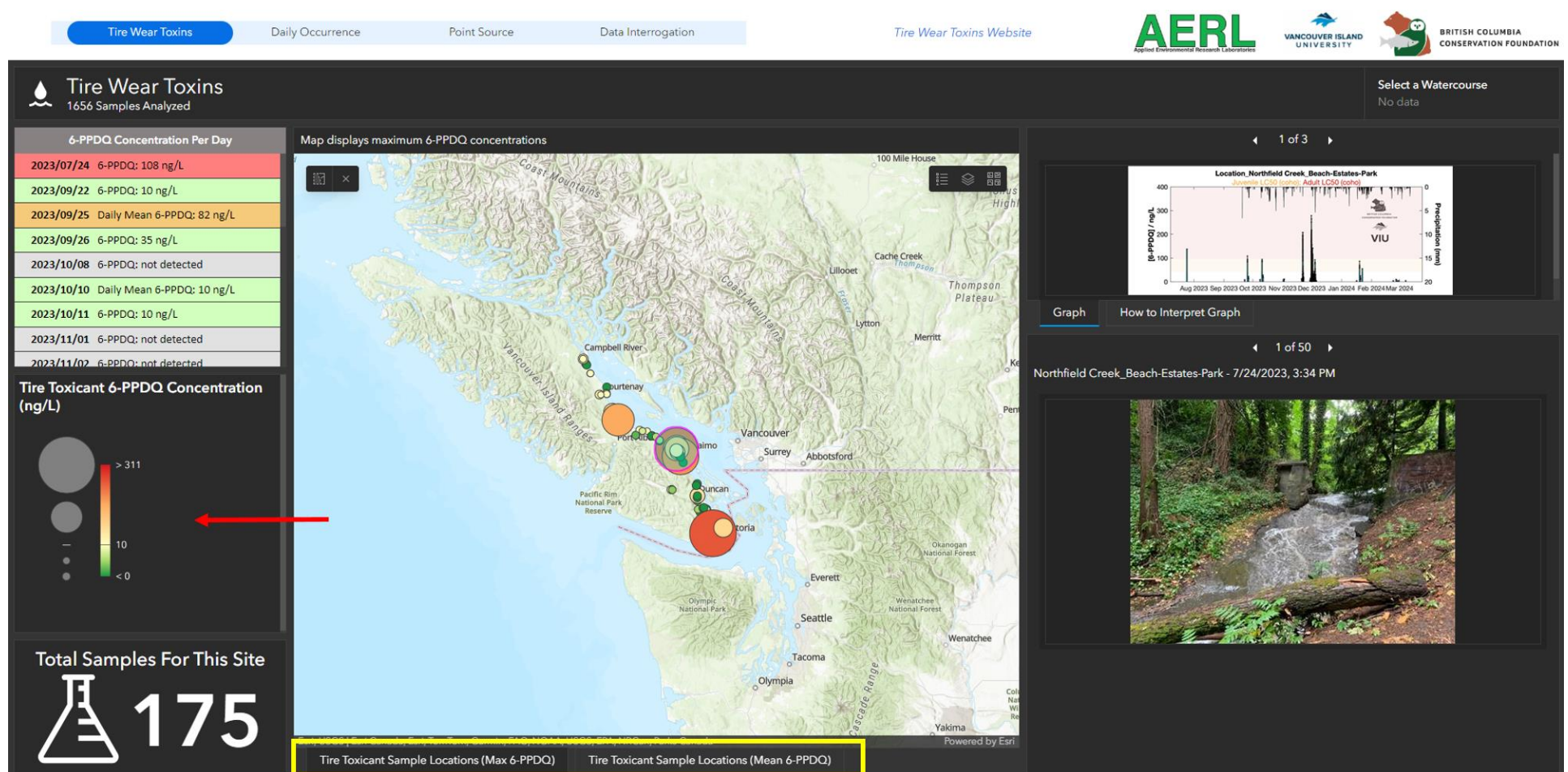


Figure 1. Tire Wear Toxins tab and main page of the Tire Wear Toxin Database. Location of the 6-PPDQ concentration legend is indicated by the red arrow. Location to toggle between maximum and mean 6PPDQ concentrations is indicated by the yellow box.

Additionally, when the user selects a site, a graph appears in the top right corner of the screen. The user can click on the graph and it will expand into full screen to more easily interpret the results. Further, all photos taken at the sample location are shown in the bottom right corner of the screen.

Daily Occurrence Tab

The purpose of the daily occurrence tab is to better see how concentrations at each location change throughout the season. In the top right corner of the screen (Figure 2) is a list of sample dates. Each date listed has its background shaded in white to blue tones; these colours indicate the amount of precipitation on a given sampling day, with darker shades of blue indicating greater precipitation and white indicating no precipitation. When the user clicks through each of the dates listed, the sample locations and their respective concentrations will change throughout the sampling season. The 6-PPDQ concentration legend is in the top left corner of the screen. Similar throughout the database, the darker red tones and the larger sized circles indicate higher concentrations.

If a user is interested in looking at a specific site to see how it changes over the season, they can zoom in to their selected site, click it, and a graph will appear along the bottom of the screen. There is a sliding bar along the top of the graph allowing the user to zoom in to a specific section of time to get a closer look at the displayed data. All pink bars in the graph depict 6-PPDQ concentrations detected at the site. Precipitation is displayed on the graph as blue bars. Precipitation is displayed as negative values, simply to avoid confusion with overlapping bars, align the timelines, and preventing overlap of precipitation values and the smaller quantities of 6-PPDQ detected.

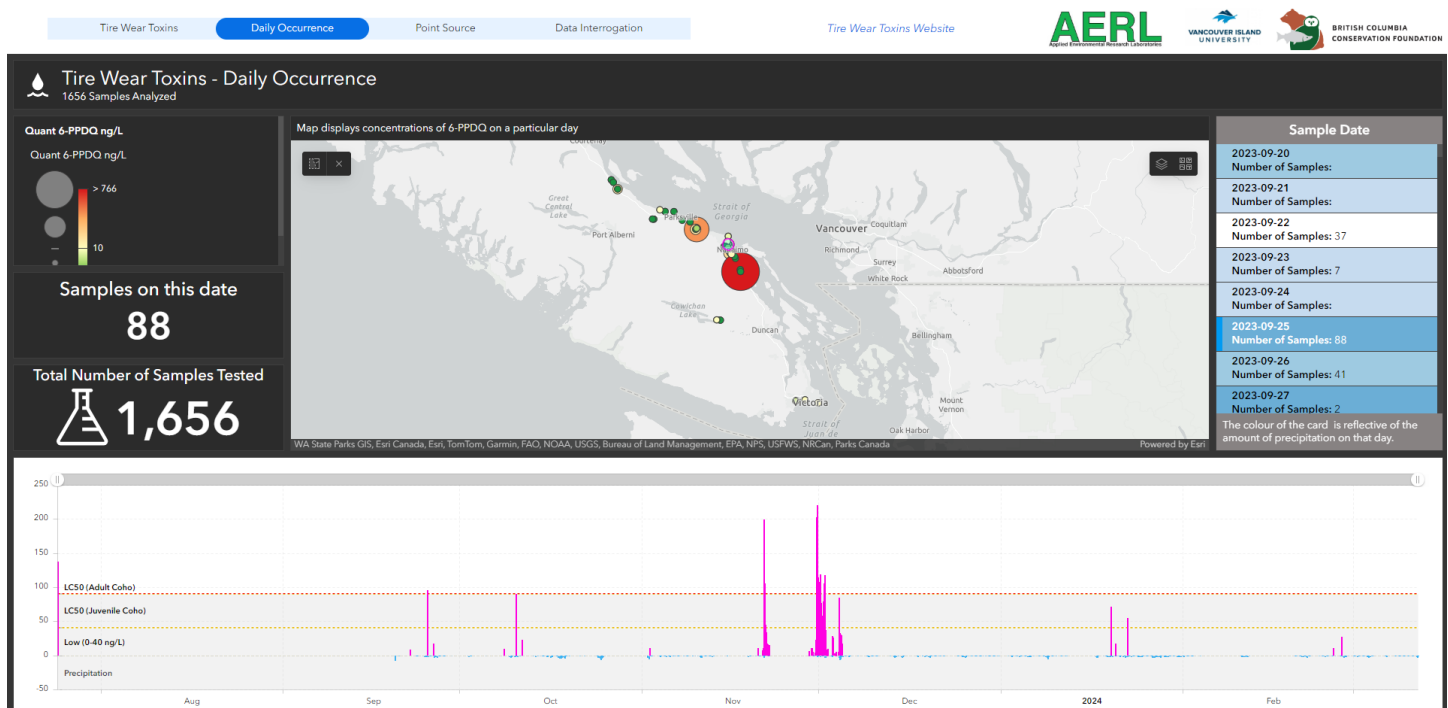


Figure 2. Daily occurrence tab in the tire wear toxins database.

Point Source Tab

The point source tab is built the same as the *Tire Wear Toxins* tab, with the listed concentrations for a selected site in the top left, the colour gradient below it, and the images that were taken of the selected point source in the bottom right. Point source locations are depicted as triangles, rather than circles; however, the same display techniques are used as in the other tabs: the more red and larger the triangle, the higher the concentrations.

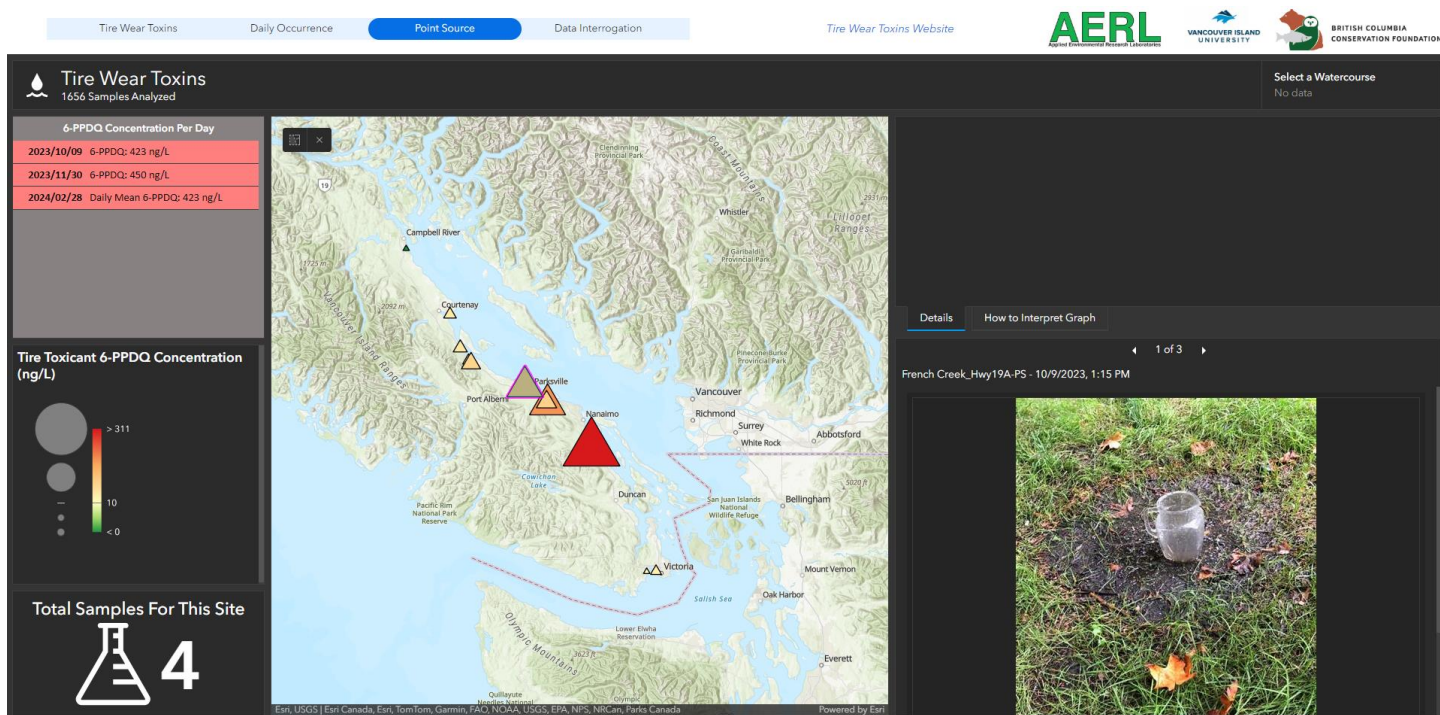


Figure 3. Point source sample tab in the tire wear toxins database.

Data Interrogation Tab

The final tab, *Data Interrogation*, is meant to allow the user the opportunity to view multiple sample locations at one time and compare results. When the page first loads, all sample locations are depicted as small black dots. The user will need to select the waterway(s) they are interested in viewing. The waterway(s) can be selected from the dropdown in the top right corner of the screen (Figure 4). The user is able to select as many waterways as they would like.

Once selected, all sample locations associated with the waterway(s) selected will appear above each of the graph boxes. When hovering over the sample locations (below the graph box title), a small circle will appear in the top corner, as depicted in the yellow box in Figure 4. Once selected, the box will expand and show the full list of all sample locations associated with the waterway(s) that were originally selected. The user should click the site they are interested in and reduce the size of the box by selecting the circle in the top right corner of the pop-up. The graph for the selected sample location should have appeared in the graph box. The user can do the same steps for the other three boxes; a total of four graphs can be viewed at one time.

Each of the graphs that appears has the sliders along the top, similar to the *Daily Occurrence* tab. These sliders can be used to view and compare a specific sample event or timeframe.

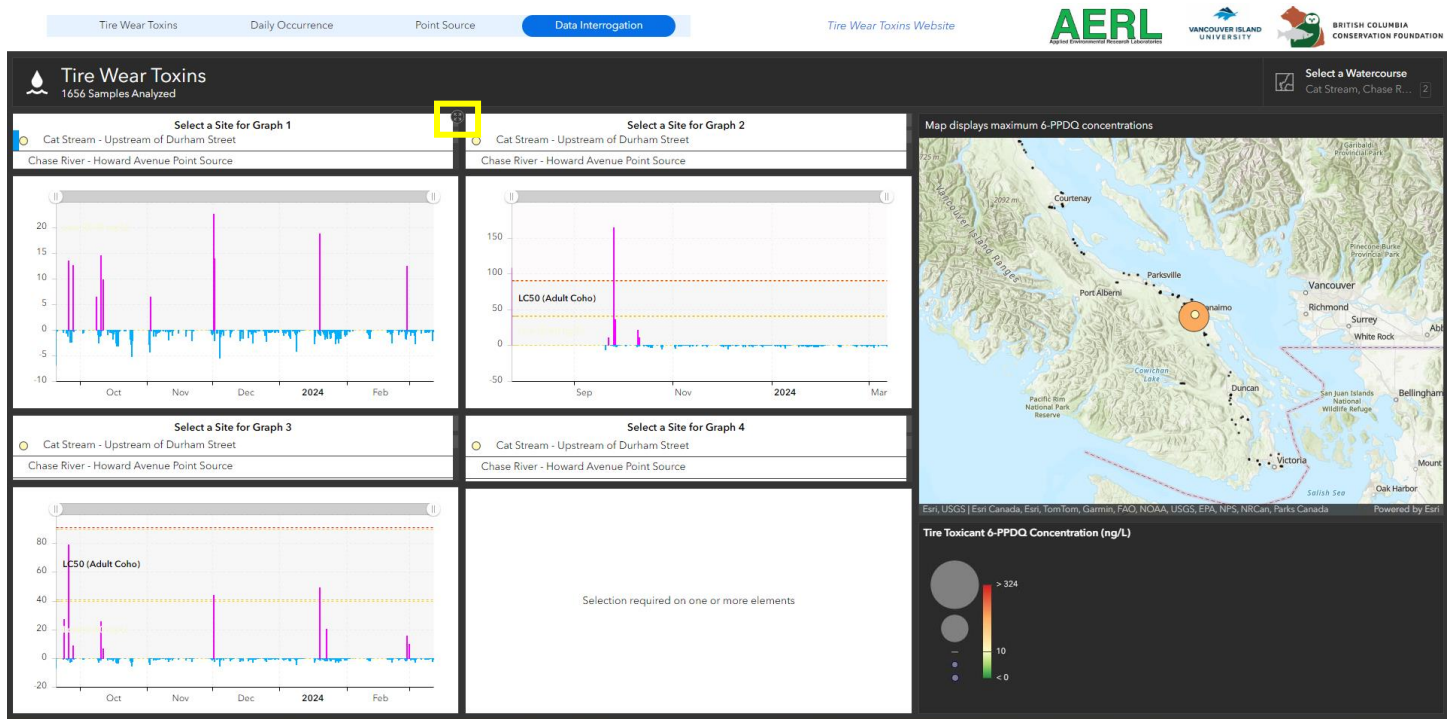


Figure 4. Data interrogation tab in the tire wear toxins database. The yellow box depicts where the user should click to expand the list of sample locations to select those they would like to view.

INTERPRETING THE DATA

There is a lot of information included in this database. For that reason, the project team wanted to provide an overview of some of the information that exists to help make sense of it, along with some definitions of terms utilized throughout the program.

Definitions

Not Detected: This refers to concentrations below the analysis method's limit of detection, which typically ranges from 1 – 10 ng/L of 6PPDQ depending on which instrument was employed for a given analysis. All instruments used are able to measure all known lethal concentrations of 6-PPDQ.

Low concentrations: These values are defined as those below 40 ng/L of 6-PPDQ, which is below the lowest estimated lethal concentration for juvenile coho.

Medium concentrations: These values range from 40 – 90 ng/L, which are between the published lethal concentrations for juvenile coho (alevin, ~3 week swim up).

High concentrations: High concentrations are defined as those above the lethal concentration of juvenile coho (parr/smolt, ~1 year old).

Table 1. Lethal 6PPDQ concentration, exposure time required to cause urban runoff mortality syndrome and mortality rates in local fish species.

Fish Species	6-PPDQ LC₅₀* (ng/L)	Life Stage	Exposure Time	Mortality Rates
Coho salmon ⁴	41	Juvenile (~3 weeks)	24 hours	92%
Coho salmon ^{3,2}	80	Juvenile (1+ years)	1 – 8 hours	92% – 100%
Rainbow trout ¹	1,000	Juvenile (2+ years)	7 – 60 hours	Not stated
Chinook Salmon ⁴	> 67,306	Juvenile (~3 weeks)	24 hours	
Chinook Salmon ²	Not stated	Juvenile (<1 year)	2 – 72 hours	0% – 13%
Steelhead ¹	Not stated	Juvenile (1+ years)	24 – 72 hours	4% – 42%
Sockeye salmon ²	Not stated	Juvenile (<1 year)	24 hours	0%
Chum salmon ²	> 320,000,000	Juvenile (1+ years)	24 hours	0%
Brown trout ⁸	Not stated	Alevins	48 hours	0%

¹ Brinkmann *et al.* 2022

² French *et al.* 2022

³ McIntyre *et al.* 2021

⁴ Lo *et al.* 2023

REFERENCES

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