POLYCHLORINATED BIPHENYL (PCB) IN PRECIPITATION, SNOWPACK, BASEFLOW AND STORMWATER IN THE UPPER AND MIDDLE RIO GRANDE WATERSHED

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The samples were collected within the last 3 - 5 years (2005 – 2010)

All data analyzed using EPA Method 1668A

All data has been blank corrected





Polychlorinated biphenyls (**PCB**s) are composed of two Benzene rings forming a biphenyl with 1 to 10 chlorine atoms attached.

209 theoretical combinations (congeners)

PCB homologues are groups of PCB congeners containing the same number of chlorine atoms (1 - 10) Homologue patterns can be used to identify unique mixtures due to different source terms



Student's t Test: Upper Rio Grande and Tributaries ambient are statistically similar (p = 0.628) Precipitation and Snowpack are close to Upper Rio Grande Ambient but not statistically similar (p = 0.03) Upper Rio Grande and Ephemeral Tributaries stormwater are statistically similar (p = 0.80) Middle Rio Grande and LANL watersheds stormwater are statistically similar (p = .10) LANL Watersheds and LANL SWMUs are not statistically similar (p=0.000001)

Normalizing Total PCB in Water as an Assessment Tool

Normalize total PCB in water by dividing by suspended sediment concentration (SSC) using the equation below:

Total PCB in water (pg/L)/ SSC (g/L) = Total PCB in suspended sediments (pg/g)

This results in a calculated value for total PCB in the suspended sediments

This value is used to evaluate if you have elevated levels of PCBs in the suspended sediments - indicating a potential source term

or

The watershed has low or baseline levels of PCB but excessive levels of suspended sediments in stormwater

Total PCB in Suspended Sediments in Stormwater



Student's t test: Upper Rio Grande and Ephemeral Tributary are close (p = 0.026) but not statistically similar at 95% LA County Urban Runoff and RG @ Alameda are statistically similar (p = 0.115) at 95% LA County Urban Runoff and LANL watersheds are statistically similar (p=0.063) at 95% Rio Grande at Alameda and LANL Watersheds are statistically similar (p=0.437) at 95% LANL Watersheds and Stormwater below LANL SWMUs are close (p = 0.0133) but not statistically similar at 95%



Precipitation demonstrates a bimodal distribution with peaks in the Di-CL and Te-CL homologue groups while snowpack demonstrates a shift toward higher chlorinated PCBs

Volatilization of lower chlorinated congeners in snowpack? Increased dust loading on snowpack – source of higher chlorinated congeners?



Upper Rio Grande and Chama River stormwater exhibits a bimodal homologue distribution with peaks in the Tri-CL and Hx-CL homologue groups

Percent of Total PCB



Ephemeral tributary stormwater (**red**) does not have the same bimodal pattern as Rio Grande stormwater and there is a slight shift towards larger levels of higher chlorinated congeners



Los Alamos County urban runoff (**purple**) displays smaller levels of the lower chlorinated congeners and a shift towards higher chlorinated congeners



Rio Grande above Alameda stormwater (teal)shows a continued reduction of lower chlorinated congeners and the highest levels of Hx-CL and Hp-CL congeners



Middle Los Alamos Canyon (**black**) homologue pattern is similar to what we see in the Rio Grande above Alameda



Aroclor 1254 was used as a cutting oil which was discharged into a septic tank which drained into small ephemeral drainage in Los Alamos Canyon.

LA-SMA-2 is the monitoring point for that drainage and the homologue pattern is unique to that drainage

Summary

Baseline flows in the upper Rio Grande and tributaries, snowpack and precipitation are nearly always below the Human Health criteria

Upper Rio Grande and ephemeral tributary stormwater often exceed the Human Health criteria and occasionally exceed the Wildlife Habitat criteria

Los Alamos County urban runoff, Rio Grande above Alameda and LANL watersheds nearly always exceed the Human Health criteria and usually exceed the Wildlife Habitat criteria

Stormwater below LANL SWMUs nearly always exceeds the Wildlife Habitat criteria and exceeds the Aquatic Life Acute criteria in twenty-five percent of the samples collected

Normalizing total PCB in water data to SSC can be used to evaluate between baseline levels of PCBs and those impacted by potentially contaminated sources

PCB homologue signatures can be used to differentiate between different source terms

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