# Applied Research of Adsorptive Media: Troubleshooting the Impact of Hidden Organic Material

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**Background/Objectives:** After two years and 50 million gallons of full-time operation of a pump and treat system for a VOC and 1,4-dioxane plume, a significant decline in adsorptive capacity was observed for the adsorptive media component of the treatment train. The decline was particularly measurable for 1,4-dioxane which was the target compound most subject to leakage in the treatment system. Because the absorptive material in the system was synthetic media, not activated carbon, hysteresis should not be the cause of the loss of adsorption, prompting an evaluation that focused on characteristics of the influent water, and the cause of the adsorptive loss.

A deep dive into the root cause of the adsorptive loss was initiated, looking at the overall influent chemistry, as well as detailed analyses of the media surface were performed. This paper presents the results of the testing used to determine the cause of the observed decline in capacity and the analyses and conclusions regarding the specific nature of the foulant.

**Approach/Activities:** Chemical and biological analyses were used to assess the properties of water entering and leaving the media and for direct testing of the media. Media core testing demonstrated that the media retained the same overall chemical characteristics and chemical composition of the original material, but the bulk density had increased significantly. Electron microscopy demonstrated that there was significant non-target materials adhering to the media. Subsequent pyrolysis analyses indicated natural organic material (NOM), including lignin and humic acid.

**Results/Lessons Learned:** The presentation will include an overview of the evaluation including: electronic microscopy, bulk density, and pyrolysis testing and comparing results of the affected media versus virgin media. The ubiquitous nature of the foulant (NOM) is likely a phenomenon that plays a major role in decreased capacity of adsorptive media at a significant number of remediation sites, and has potential broad ranging implications.