

May 5, 2022

To the Town of Moreau,

My name is Tristan Brown, J.D., Ph.D. I am Director off the Bioeconomy Development Institute and Associate Professor in the Sustainable Resources Management department at the SUNY College of Environmental Science & Forestry in Syracuse, NY. My Ph.D. was in Biorenewable Resources & Technology. I am writing this letter in support of the Saratoga Biochar Solutions project and to provide an important scientific perspective on the project as it relates to PFAS mitigation.

The Saratoga Biochar Solutions project will employ the thermochemical processing pathway pyrolysis to convert biosolids from water resource recovery facilities (WRRF) such as wastewater treatment plants to biochar. Biochar is a solid product this is produced when biomass is decomposed via high temperatures in an oxygen-free environment. The pyrolysis process drives off the biomass's hydrogen and oxygen content to yield carbon-rich biochar. Importantly, pyrolysis is not an incineration process, as combustion cannot occur in the pathway's oxygen-free environment.

The pyrolysis of biomass feedstocks provides multiple critical benefits, including the removal of carbon dioxide from the atmosphere (so long as the biochar produced is not combusted), the building of below-ground carbon (when soils are amended with biochar), and the production of fossil-free fertilizer. These benefits all align closely with the goals that New York has established under the Climate Leadership and Community Protection Act (CLCPA), and biochar is explicitly referred to as an important component of the CLCPA's implementation in the draft Scoping Plan that was released by the Climate Action Council in December 2021.¹

The Saratoga Biochar Solutions project offers an additional benefit to those listed above in the form of per- and polyfluoroalkyl substance (PFAS) mitigation. These so-called "forever chemicals" accumulate in animals and enter the human food chain, ultimately ending up in human sewage. (PFASs can also be taken up by plants, although natural plant exposure is limited.) The biosolids that are produced by WRRFs are frequently applied to cropland as a fertilizer. While these biosolids are treated to neutralize pathogens, their PFAS content is not normally removed, and cropland that is amended with biosolids in this way can produce food crops that in turn contain PFASs.²

The conversion of biosolids to biochar, as the Saratoga Biochar Solutions project will do, greatly reduces the contamination of cropland by PFAS. It does this in two ways. First, the pyrolysis

¹ New York State Climate Action Council (2021). "New York State Climate Action Council Draft Scoping Plan," December 30. Available on the Web at: <https://climate.ny.gov/-/media/Project/Climate/Files/Draft-Scoping-Plan.pdf> (accessed May 5, 2022).

² Ghisi, R., T. Vamerali, and S. Manzetti (2019). "Accumulation of perfluorinated alkyl substances (PFAS) in agricultural plants: A review," *Environmental Research* 169: 326-341, February. Available on the Web at: <https://www.sciencedirect.com/science/article/abs/pii/S0013935118305577> (accessed May 5, 2022).

pathway operates at very high temperatures (up to 1000 degrees Fahrenheit or greater) and destroys the PFASs in the biosolids being pyrolyzed. Recent tests have found up to 96% of the biosolids' PFAS content to be destroyed during the pyrolysis process.³ Second, whereas biosolids that are applied to cropland are capable of being absorbed by plants, allowing the former's PFAS content to be accumulated in the latter, biochar is inert and strongly resistant to microbial degradation for periods of up to thousands of years,⁴ meaning that any PFASs that survive the pyrolysis process will not find their way into the human food chain in the same manner as those from non-pyrolyzed biosolids do.

The Saratoga Biochar Solutions project therefore provides an important human health benefit in addition to its pronounced climate benefits. Biosolids contain PFASs, and those PFASs will continue to enter the human food chain so long as they are landfilled or applied to cropland. By instead destroying and otherwise mitigating the biosolids' PFAS content while converting the biosolids into a safer form of fossil-free fertilizer, the Saratoga Biochar Solutions project will greatly contribute to efforts to prevent the contamination of New York State's food supply by PFASs.

Regards,



Tristan R. Brown, J.D., Ph.D.
Director of the Bioeconomy Development Institute
Associate Professor
Department of Sustainable Resources Management
SUNY College of Environmental Science & Forestry
Syracuse, NY
Trbro100@esf.edu

³ Williams, T.O., et al. (2021). "Removal and transformation of PFAS from biosolids in a high temperature pyrolysis system – A bench scale evaluation." *WEF Residuals and Biosolids Conference 2021*.

⁴ Rawat, J., J. Saxena, and P. Sanwel (2019). "Biochar: A sustainable approach for improving plant growth and soil properties," in *Biochar – An Imperative Amendment for Soil and the Environment*. Available on the Web at: <https://www.intechopen.com/chapters/65070> (accessed May 5, 2022).