## Makarow, Irina (ECY)

**From:** Doris Cellarius <dorisc@cellarius.org>
**Sent:** Friday, November 6, 2020 12:32 PM
**To:** ECY RE CHEM ACTION PLANS (HWTR)
**Subject:** Comments on Draft WA State PFAS Plan
**Attachments:** Venkatesan_Halden_PFCs_HazMat.pdf; NIHMS464002-supplement-1.docx; Paper-and-Pulp-Mills-SIC-2600-from-ECHO-5-20-18.pdf



Comments on PFAS Chemical Action Plan

Overall the plan provides lots of information about other states where a great deal of information has been developed. Many Washington state "data gaps" are listed and it is good there are plans to address them.

With all the interesting studies done on PFAS in fish - some contaminated with PFAs at levels that do not protect the most vulnerable - it is disappointing that Fish Consumption Advisories have not been developed.

It is also disappointing to see this plan assigns much of the blame to consumer products when it is known that many industries , though not intentionally producing PFAS, release PFAS used in their chemical processes to air and water. The plan lists many industries known to use PFAS. Papermaking is an example of an industry with many facilities in Washington. https://www.dnb.com/business-directory/company-information.pulp-paper-mills.us.washington.html. Serious concerns about releases from papermills have been discussed by the Environmental Defense Fund which provided the attached ECHO database. "Paper mills as a significant source of PFAS contamination, but who's watching?" http://blogs.edf.org/health/2018/05/21/pfas-paper-mills/

More could be done than just investigating what industries may release PFAS in their wastewater. Industries could be directly asked to report on tis and then eliminate or reduce releases, as is happening in Michigan. Michigan used the NPDES process to get industries to reduce or stop PFA releases. This has already significantly decreased the amount of PFAS in sewage needing treatment.

My greatest disappointment is that Washington state has done little actual testing of biosolids, so I conclude with comments on Appendix 8 (Biosolids)

Other states have found that biosolids can be major contributors to PFAS pollution, but the Washington PFAS Plan goes on for pages explaining why PFAS contamination from biosolids use is nothing to worry about. It admits it has done little to study Washington biosolids contamination. Page 407 of the Plan says " there is no accredited data on PFAS contamination in WA biosolids". They cite a comprehensive national sewage sludge study of PFAS in Biosolids and say the study did not include a Washington state sample.

"National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA National Sewage Sludge Survey" https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3776589/ (Attached, along with supplement listing sites tested) .

This however is not true. This Venkatesan and Halden paper lists the Wyandotte plant in Renton as one of the sources of sludge they retested. Their report says "Ten out of thirteen PFAS analyzed were consistently detected in all biosolids samples." This means that Washington state biosolids were tested and contained PFAS chemicals.

> "National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA National Sewage Sludge Survey", Arjun K. Venkatesan and Rudolf Halden, https://doi.org/10.1016/j.jhazmat.2013.03.016Get rights and content
>
> Highlights
>
> First study to report nationwide occurrence and concentrations of perfluoroalkyl substances (PFAS) in U.S. biosolids.
> Ten out of thirteen PFAS analyzed were consistently detected in all biosolids samples.
> PFOS was the most abundant PFAS in biosolids, followed by PFOA.
> Mean load of ∑PFASs in U.S. biosolids was estimated at 2749–3450 kg/year.
> PFASs in biosolids show no significant difference between pre- and post-phase out period.

It is a small error. No problem. It is encouraging to see that biosolids will be tested in the future for PFAs. Other states have done this. At the military bases where drinking water is contaminated with PFAS it is likely that their sewage effluent and biosolids – contain PFAS. The state could make the military pay for testing of sewage residuals at military bases such as Whidbey Island where the concerned citizen group in Coupeville reports that wastewater and biosolids are applied near Penn Cove oyster beds.

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**National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA national sewage sludge survey**

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**Highlights**

- First study to report nationwide occurrence and concentrations of perfluoroalkyl substances (PFAS) in U.S. biosolids
- Ten out of thirteen PFAS analyzed were consistently detected in all biosolids samples
- PFOS was the most abundant PFAS in biosolids, followed by PFOA
- Mean load of ∑PFASs in U.S. biosolids was estimated at 2,749-3,450 kg/year
- PFASs in biosolids show no significant difference between pre- and post-phase out period.

**Abstract**

Using liquid chromatography tandem mass spectrometry, we determined the first nationwide inventories of 13 perfluoroalkyl substances (PFASs) in U.S. biosolids via analysis of samples collected by the U.S. Environmental Protection Agency in the 2001 National Sewage Sludge Survey. Perfluorooctane sulfonate [PFOS; 403±127 ng/g dry weight (dw)] was the most abundant PFAS detected in biosolids composites representing 32 U.S. states and the District of Columbia, followed by perfluorooctanoate [PFOA; 34±22 ng/g dw] and perfluorodecanoate [PFDA; 26±20 ng/g dw]. Mean concentrations in U.S. biosolids of the remaining ten PFASs ranged between 2 to 21 ng/g dw. Interestingly, concentrations of PFOS determined here in biosolids collected prior to the phase-out period (2002) were similar to levels reported in the literature for recent years. The mean load of ∑PFASs in U.S. biosolids was estimated at 2,749-3,450 kg/year, of which about 1,375-2,070 kg is applied on agricultural land and 467-587 kg goes to landfills as an alternative disposal route. This study informs the risk assessment of PFASs by furnishing national inventories of PFASs occurrence and environmental release via biosolids application on land.

**Keywords.** Perfluorochemicals; Biosolids; National Inventory; Land application; Emerging Contaminants; Risk Assessment.

## 1. Introduction.

Perfluoroalkyl substances (PFASs) are anthropogenic chemicals that have been widely used in commercial products since the 1950s [1]. Due to their unique properties of repelling both water and oil, PFASs are extensively used in the manufacture of surfactants, lubricants, polishes, textile coatings, and fire-retarding foams [1]. As a result PFASs are released into the environment at significant quantities and have been detected in surface water, fish, birds, mammals, and humans worldwide [2-6]. Although the production of two major PFASs, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), has been phased out in several major U.S. companies, continued environmental contamination of PFASs results from the use of precursors such as fluorotelomer alcohols and polyfluoroalkyl phosphates [7]. PFASs are emerging contaminants of increasing interest to the scientific community, due to their widespread occurrence in the environment and evidence of potential or known adverse human health effects. PFASs have been shown to persist in the environment, to bioaccumulate in animals and to occur at significant levels even in remote regions like the Arctic [3, 5, 8, 9]. PFOS is the predominant PFAS detected in all wildlife species worldwide [7]. One study reported bioaccumulation of PFOS in polar bears at concentrations even greater than polychlorinated biphenyls (PCBs) [10]. Results from animal studies have associated PFOS and PFOA with developmental and reproductive toxicity [11, 12], as well as cancer [13]. In humans, both PFOS and PFOA are shown to cross the placenta readily [14, 15], and epidemiological studies on fetal exposure have associated high levels of PFOS with reduced growth metrics of newborns [16]. Additionally, both PFASs have been associated with elevated total cholesterol levels in humans [17].

PFASs are considered to be highly resistant to biodegradation due to their extremely strong carbon-fluorine bonds [18]. They are not efficiently removed in municipal wastewater treatment plants (WWTPs), and the presence of PFASs in wastewater effluents and biosolids is of increasing concern [19]. Concentrations of PFOS and PFOA have been reported of up to 990 and 241 ng per g of biosolids, respectively [20-22]. Studies have also shown that several PFASs increase in concentration during the WWTP process train, suggesting the presence of precursor compounds that degrade and release persistent perfluorinated carboxylic acids and sulfonates (PFCAs and PFSAs) [20, 23]. Land application of biosolids contaminated with PFASs was shown to contaminate soil, groundwater, and surface waters [19, 22]. Soil concentrations of PFOS as high as 483 ng/g were reported at a land reclamation site in Illinois after 32 years of consecutive applications of biosolids at the rate of 69 Mg biosolids $ha^{-1}$ $yr^{-1}$ [22]. In Decatur, Alabama, about 22% of samples collected from surface and well water near fields with a history of PFASs contaminated biosolids application exceeded the health advisory level of the U.S. Environmental Protection Agency (U.S. EPA) of 400 ng/L for PFOA [19]. Multiple studies have shown that PFASs of shorter chain length tend to become mobilized from soil readily to contribute to contamination of surface water and groundwater [19, 22]. The widespread occurrence of PFASs at significant concentrations in the environment necessitates a better understanding of environmental occurrence and transport processes in order to inform both human health risk assessments and regulatory requirements for these recalcitrant, mobile chemicals.

The U.S. EPA has performed several national sewage sludge surveys (NSSS) to evaluate the need for regulating trace contaminants [24]. The present study was performed to extend this

effort to other emerging contaminants that were excluded from past U.S. EPA studies. In a research collaboration, unused samples from EPA's 2001 survey were acquired and are being archived in the Biodesign Institute at Arizona State University as part of the U.S. National Biosolids Repository maintained there. The approach of analyzing archived composite biosolids had been validated previously in studies of pharmaceuticals and personal care products (PPCPs) and alkylphenol surfactants performed to evaluate their nationwide occurrence in biosolids [25-27]. The present work employed a similar methodology to analyze for PFASs to enable risk assessment and to determine baseline concentrations and national inventory for these chemicals in treated municipal sludge fit for land application.

## 2. Materials and Methods.

**2.1. Sample description.** Biosolids samples, originally collected by the EPA from 94 WWTPs in 32 states and the District of Columbia as part of the 2001 National Sewage Sludge Survey by U.S. EPA, were retrieved from the U.S. National Biosolids Repository at the Biodesign Institute at Arizona State University. Information on sampling locations is available in supplementary material. The facilities were selected by the U.S. EPA to obtain unbiased national estimates of chemical contaminants in U.S. sewage sludges that are disposed of primarily by land application. The samples were collected between February and March 2001 according to an established protocol, only from facilities that included secondary treatment [28, 29]. All samples were collected in 500 mL glass or polyethylene jars, and to the best of our knowledge no teflon containing tools were used during sampling of sludge; thus eliminating possible contamination during sampling of sludge samples by PFASs [29]. Samples were collected from only processed sewage sludges intended for disposal. The biosolids composites analyzed in this study constitute

a representative sample (94 facilities) of the more than 16,000 U.S. WWTPs. The purpose of EPA's survey was to estimate levels of dioxins, dibenzofurans, and coplanar polychlorinated biphenyls in biosolids. After completion of 2001 NSSS, the samples were acquired by our laboratory and stored in amber glass jars (500 mL) at -20$^{o}$C for further analysis. Samples were stored initially at Johns Hopkins University, and later transferred to Arizona State University for long-term maintenance. Of the 94 WWTPs, 89 had single system (either aerobic or anaerobic digestion) and five of them had two systems for sludge treatment (both aerobic and anaerobic digestion). Samples were collected from each treatment systems amounting to a total of 113 biosolids samples. Three of these samples were excluded from analysis due to broken containers. The rest of the 110 biosolids samples were randomly grouped into five composite samples, each containing solids from between 21 and 24 individual samples. Sampling procedure and preparation of composites are described in detail elsewhere [27]. A duplicate of composite sample #1 was prepared to serve as a blind duplicate. Composite samples were prepared to establish national baseline levels for these compounds; the validity of the present approach has been demonstrated previously [25-27].

**2.2. Sample analysis.** Biosolids composites were analyzed for PFASs by a commercial lab (AXYS Analytical Services Ltd., Sydney, British Columbia, Canada) that developed EPA Method 1694 for pharmaceuticals and personal care products, and that specializes in the analysis of traditional and emerging contaminants. AXYS is a nationally accredited commercial lab in Canada and also is accredited by the National Environmental Laboratory Accreditation Program (NELAC) in Florida and New Jersey for PFAS analysis. The analytical method used had been employed previously in peer-reviewed studies on the level of PFASs in various environmental

matrices [30, 31]. Analyte concentrations were determined using the isotope dilution technique for all compounds. About 5 g of dried homogenized (<4 mm) biosolids samples were spiked with isotope-labeled surrogates and analytes were extracted once with dilute acetic acid solution and then twice with a mixture of 0.3% ammonium hydroxide and 99% methanol solution, each time by shaking the slurries and collecting the supernatants. Supernatants were combined and treated with ultra pure carbon powder. The resulting solution was diluted with water and cleaned up by solid phase extraction (SPE; Oasis WAX, Waters, Milford, MA, USA). The eluate was then spiked with recovery standards prior to analysis. Sample extracts were separated by high performance liquid chromatography using a reversed-phase column (X terra $C_{18}$ 3.5 µm, 2.1 mm × 100 mm; Waters, Milford, MA) as described previously [30, 31]. Analyses were performed using a Micromass Quattro Ultima triple quadrupole tandem mass spectrometer (Waters, Milford, MA) in Selected Reaction Monitoring (SRM) mode (Table 1).

Quality assurance and quality control procedures included method blanks and matrix spikes to evaluate recovery rates in percent. Analysis of duplicate samples was performed by the lab for each batch with greater than six samples. Positive identification of target analytes, surrogate standard and recovery standards required the compound retention time to fall within 0.4 minutes of the predicted retention times from the mean determined from the initial calibration. Native compounds with labeled surrogate standards had to elute within 0.1 minutes of the associated labeled surrogates. All concentrations are reported on a dry weight (dw) basis. Precision between samples and duplicates was expressed as relative percent difference (RPD), which was calculated using the following expression,

$$RPD[\%] = \frac{|C_{sample} - C_{duplicate}| * 100}{\frac{C_{sample} + C_{duplicate}}{2}} \quad (1)$$

Where, $C_{sample}$ and $C_{duplicate}$ are the concentration detected in the original sample and in its duplicate, respectively.

**2.3. Estimation of annual loading of PFASs to agricultural soil.** The annual loading of PFASs in biosolids was calculated based on the annual biosolids production of 5.1-6.4 million metric dry tonnes (5.6-7 million dry U.S. tons) in the U.S. [32-34].

Annual load in biosolids = [minimum/ maximum PFAS concentration detected in composites (µg/kg)]*($10^{-9}$ kg/µg)*(5.1-6.4× $10^{9}$ kg of biosolids/year) (2)

The estimated percentage of total biosolids use and disposal (50-60% to land application; 17% to landfills; 20% to incineration) were used to calculate the load of PFASs to the various end use components from equation 2.

**3. Results and Discussion.**

**3.1. Method performance.** The method detection limits (MDL) for the various PFASs ranged between 0.03 to 0.14 ng/g dry weight (dw) of biosolids. Recoveries from matrix spike experiments for the various analytes ranged between 75 and 110% in biosolids (Table 2). Analysis precision, expressed as relative percent difference (RPD), was within 20% for most of the analytes in blinded duplicates for biosolids analysis except for PFBA (52%), PFPeA (24%), and PFBS (21%). The RPD for non-blinded duplicates of biosolids was within 9% for all analytes. No laboratory contamination was observed in method blanks.

**3.2. Study limitations.** A large number of biosolids samples were combined to form five composites in this study in order to reduce the number of samples to be analyzed and still

provide with a defensible mean baseline concentration for the analytes. However, the mixing of samples is not well suited to capture the variation in concentrations of the individual analytes as a function of geographic location, treatment processes, population served etc. It is also possible for minor contaminants to become diluted during mixing. Hence the reported PFASs concentrations and detection frequencies are conservative. While this approach cannot determine the variability of concentrations between the large numbers of WWTPs studied, it is suitable for identifying major PFASs contaminants and determining their average concentrations in U.S. biosolids. Extrapolation of these average concentrations to total sewage sludge production in the U.S. carries potential risks. For example, if the plants selected by the U.S. EPA are not representative of all plants across the nation, estimates for the annual load or each PFAS could be skewed. However, the national sewage sludge survey conducted by U.S. EPA is by far the most comprehensive survey on U.S. sewage sludges, as it contains 94 samples from 32 U.S. States and the District of Columbia. Given the large number of samples analyzed and their selection by the government agency on the basis of providing good representation of the more than 16,000 WWTPs in the U.S. nationwide, the obtained estimates are expected to carry only a small and acceptable level of uncertainty. The fact that a survey of these compounds has never taken place before at this scale in the U.S. or any other country in the world, makes the analytical results and loading estimates reported here a valuable contribution to the current understanding of the occurrence and fate of PFASs in the built environment of the United States.

**3.3. Nationwide occurrence of PFASs in U.S. biosolids.** Ten out of thirteen PFASs analyzed were consistently detected in all composite biosolids samples except for PFBA, PFHpA, and PFBS (Table 2). The most abundant PFAS in biosolids was PFOS, detected at a concentration of

403±127 ng/g dw, followed by PFOA (34±22 ng/g dw). The remaining eleven PFASs ranged between 2 and 26 ng/g dw (Table 2) and the mean total concentration of PFASs (∑PFAS) detected in the five composite samples was 539±224 ng/g dw. The levels detected in U.S. biosolids is more than an order of magnitude higher than levels detected in sewage sludge samples collected from Spain and Germany [35]. For comparison purposes, the national baseline levels of PFASs detected in this study were plotted with levels reported in other studies for sludge samples collected from U.S. WWTPs (Figure 1). It must be noted that the concentrations reported in the present study represent samples collected at 94 WWTPs from across the U.S., whereas previously reported values were limited to specific study locations and a maximum of 11 WWTPs. The levels of PFASs from other studies plotted in Figure 1 are for sludge samples collected in the U.S. between 2004 and 2007 (except for one in 1998). Whereas, the biosolids samples analyzed in this study were collected by U.S.EPA between February and March 2001, which was during the phase out period of PFOS and perfluorooctanesulfonyl fluoride (POSF) related products by the 3M Company between 2000 and 2002. PFAS emission during manufacturing process has reduced since then in the U.S. [36] and hence their current concentrations in biosolids are expected to be lower. However, interestingly the mean concentration of PFASs detected in this study were not significantly different ($p > 0.05$) to concentrations reported in sludge samples collected between 2004 and 2007 (except for one collected in 1998) in U.S., years after 3M discontinued its industrial production of PFOS and related compounds. A similar observation was also reported for PFAS levels in human serum samples during the 2003-2004 NHANES survey [2]. The survey reported the prevalence of PFASs in more than 98% of the people analyzed even after the phase-out in production by 3M.

Even though the current producers are committed to reducing emissions of PFASs, it is suggested that there still exist other direct and indirect sources of PFASs in the U.S. [2].

**3.4. Annual loading of PFASs to U.S. biosolids and agricultural land.** Based on the estimated biosolids production of 5.1-6.4 million metric tonnes (5.6-7 million U.S. tons) in the year 2001 [32-34], the nationwide annual loading rates to biosolids for various PFASs were calculated (Table 2). The estimated mean loading rate of ∑PFAS was 2,749-3,450 kg/year, with the most abundant compound being PFOS with a rate of 2,052-2,575 kg/year, followed by PFOA and PFDA at 172-215 and 133-167 kg/year, respectively. However, these loadings are significantly lower when compared to other major contaminants in biosolids, such as antimicrobials (triclocarban and triclosan) and non-ionic surfactants (nonylphenol and their ethoxylates), whose loading in biosolids had been determined in previous studies [25, 27] (Figure 2). The higher loading for the antimicrobials and surfactants may be explained by their high production volumes of greater than 1 million pounds per year in the U.S. and their disposal, which differs from ∑PFAS in that, they are almost exclusively discharged into wastewater by design.

Based on the estimated percentage of total biosolids applied on land (50-60%) [32-34], the mean loading rate of ∑PFAS to agricultural soil was found to be 1,375-2,070 kg/year. A significant amount of ∑PFAS (467-587 kg/year) was also estimated to go to landfills as an alternative disposal route for unwanted biosolids (Table 2). As shown in the previous section, there is no significant change in PFASs levels in biosolids samples collected in the year 2001 and years 2004 through 2007. Hence one can expect a similar annual loading to soils in the following years, resulting in a net accumulation of these compounds in U.S. soils. These numbers should

be viewed as conservative estimates, since only a selected number of PFASs were included in this study.

## 4. Conclusion.

The nationwide concentrations of PFASs in U.S. biosolids provided in this study serves to inform both human exposure risk assessments and regulatory requirements for these recalcitrant chemicals. Although there were efforts in phasing out PFOS and related compounds from production beginning in the year 2002, a comparison of concentrations detected in samples collected in 2001 (this study) and in years 2004 through 2007 showed no noticeable differences. This suggests that the U.S. may have to consider regulations similar to those instituted in European countries, where PFOS and related compounds were banned from several uses. The significant loading to U.S. soils estimated in the present study further increases concern about groundwater and surface water contamination, as reported in previous investigations by others [19, 22]. This study further demonstrated the use of mega composite samples for determining national and regional mean concentrations of major contaminants in sewage sludge in a scientifically sounds, yet economically attractive fashion.

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**Table 1.** PFASs target analytes and their respective detection and quantification parameters.

| Target Analyte | Retention Time (min) | Precursor Ion m/z | Product Ion m/z | Quantified Against |
|---|---|---|---|---|
| Perfluorobutanoate (PFBA) | 5 | 213 | 169 | $^{13}C_4$-PFBA |
| Perfluoropentanoate (PFPeA) | 5.8 | 263 | 219 | $^{13}C_2$-PFHxA |
| Perfluorohexanoate (PFHxA) | 6.2 | 313 | 269 | $^{13}C_2$-PFHxA |
| Perfluoroheptanoate (PFHpA) | 6.6 | 363 | 319 | $^{13}C_2$-PFHxA |
| Perfluorooctanoate (PFOA) | 7 | 413 | 369 (169)[a] | $^{13}C_2$-PFOA |
| Perfluorononanoate (PFNA) | 7.4 | 463 | 419 | $^{13}C_5$-PFNA |
| Perfluorodecanoate (PFDA) | 7.9 | 513 | 469 | $^{13}C_2$-PFDA |
| Perfluoroundecanoate (PFUnDA) | 8.5 | 563 | 519 | $^{13}C_2$-PFDA |
| Perfluorododecanoate (PFDoDA) | 9 | 613 | 569 | $^{13}C_2$-PFDoA |
| Perfluorobutane sulfonate (PFBS) | 6.3 | 299 | 80 (99)[a] | $^{18}O_2$-PFHxS |
| Perfluorohexane sulphonate (PFHxS) | 7.2 | 399 | 80 (99/119)[a] | $^{18}O_2$-PFHxS |
| Perfluorooctane sulfonate (PFOS) | 8.2 | 499 | 80 | $^{13}C_4$-PFOS |
| Perfluorooctane sulfonamide (PFOSA) | 9.9 | 498 | 78 | $^{13}C_4$-PFOS |
| **Surrogate Standard** | | | | |
| $^{13}C_4$-PFBA | 5.0 | 217 | 172 | $^{13}C_2$-PFOUEA |
| $^{13}C_2$-PFHxA | 6.2 | 315 | 270 | $^{13}C_2$-PFOUEA |
| $^{13}C_2$-PFOA | 7.0 | 415 | 370 | $^{13}C_4$-PFOA |
| $^{13}C_5$-PFNA | 7.4 | 468 | 423 | $^{13}C_2$-PFOUEA |
| $^{13}C_2$-PFDA | 7.9 | 515 | 470 | $^{13}C_2$-PFOUEA |
| $^{13}C_2$-PFDoDA | 9.0 | 615 | 570 | $^{13}C_2$-PFOUEA |
| $^{18}O_2$-PFHxS | 7.2 | 403 | 84 (103)[a] | $^{13}C_2$-PFOUEA |
| $^{13}C_4$-PFOS | 8.2 | 503 | 80 (99)[a] | $^{13}C_2$-PFOUEA |
| **Recovery Standard** | | | | |
| $^{13}C_2$-$^{2}$H-Perfluoro-2-decenoic acid (PFOUEA) | 7.3 | 459 | 394 | - |
| $^{13}C_4$-Perfluorooctanoic acid | 6.9 | 417 | 372 | - |

[a] Alternate transition were used if necessary to avoid interference.

**Table 2.** Concentrations and estimated annual loads of perfluoroalkyl substances in biosolids collected in 2001.

| Compounds | CAS # | Matrix Spike Recovery (%) | Biosolids Concentration (ng/g) Avg. (Min, Max) | RPD (%) | | Frequency Detected (%) | Estimated Annual PFCs Load (kg/year) (Min-Max)[a] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Blind Duplicates | Non-blinded Duplicates | | Biosolids | To Land Application | To Landfills | To Incineration |
| Perfluorobutanoate (PFBA) | 375-22-4 | 99.7 | 2 (1.2, 3.2) | 51.6 | - | 80 | 10-12.5 | 5-7.5 | 1.7-2.1 | 2-2.5 |
| Perfluoropentanoate (PFPeA) | 2706-90-3 | 99.1 | 3.5 (1.8, 6.7) | 23.6 | 2.3 | 100 | 17.7-22.2 | 8.8-13.3 | 3-3.8 | 3.5-4.4 |
| Perfluorohexanoate (PFHxA) | 307-24-4 | 107 | 6.2 (2.5, 11.7) | 4.2 | 16.7 | 100 | 31.8-39.9 | 15.9-23.9 | 5.4-6.8 | 6.4-8 |
| Perfluoroheptanoate (PFHpA) | 375-85-9 | 104 | 3.4 (1.2, 5.4) | 8.3 | - | 80 | 17.4-21.8 | 8.7-13.1 | 3-3.7 | 3.5-4.4 |
| Perfluorooctanoate (PFOA) | 335-67-1 | 103 | 34 (11.8, 70.3) | 13.4 | 12.2 | 100 | 172-215 | 85.8-129 | 29.3-36.6 | 34.3-43.1 |
| Perfluorononanoate (PFNA) | 375-95-1 | 92.4 | 9.2 (3.2, 21.1) | 7.9 | 14.3 | 100 | 47.2-59.1 | 23.5-35.5 | 8-10 | 9.4-11.8 |
| Perfluorodecanoate (PFDA) | 335-76-2 | 98.9 | 26.1 (6.9, 59.1) | 6.6 | 12.6 | 100 | 133 -167 | 66.6-100 | 22.7-28.4 | 26.7-33.4 |
| Perfluoroundecanoate (PFUnDA) | 2058-94-8 | 74.6 | 11.7 (2.8, 38.7) | 6.6 | 2.4 | 100 | 59.9-69.7 | 29.9-45.1 | 10.2-12.8 | 12-15 |
| Perfluorododecanoate (PFDoDA) | 307-55-1 | 95.4 | 10.9 (4.5, 26) | 6.7 | 6.4 | 100 | 55.6-69.7 | 27.8-41.8 | 9.4-11.9 | 11.1-13.9 |
| Perfluorobutanesulfonate (PFBS) | 45187-15-3 | 110 | 3.4 (2.5, 4.8) | 20.8 | - | 60 | 17.6-22 | 8.8-13.2 | 3-3.7 | 3.5-4.4 |
| Perfluorohexanesulfonate (PFHxS) | 108427-53-8 | 97.8 | 5.9 (5.3, 6.6) | 7.4 | 5.4 | 100 | 29.9-37.5 | 15-22.5 | 5.1-6.4 | 6-7.5 |
| Perfluorooctanesulfonate (PFOS) | 45298-90-6 | 96.9 | 403 (308, 618) | 11.9 | 15.7 | 100 | 2052-2575 | 1026-1545 | 349-438 | 410-515 |
| Perfluorooctane sulfonamide (PFOSA) | 754-91-6 | 75.3 | 20.7 (2.2, 68.1) | 19.2 | 20.2 | 100 | 105-132 | 52.7-79.3 | 17.9-22.5 | 21.1-26.4 |

- Represent non-detects in samples;

[a]These values were calculated based on the estimated percentage of total biosolids use and disposal (50-60% to land application; 17% to landfills; 20% to incineration) [32-34]

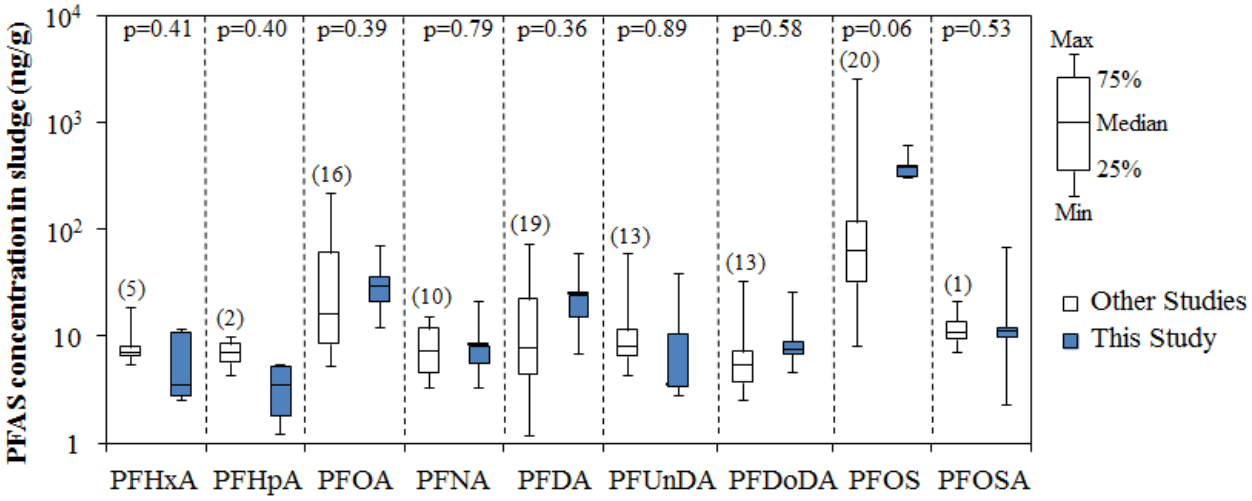


**Figure 1.** Comparison of PFASs concentrations in U.S. sludge reported in other studies with levels detected in the present work. Values in parentheses represent the total number of wastewater treatment plants sampled for the particular analyte in other studies [20-22, 37, 38]. The *p*-values indicate lack of statistically significant differences between the paired datasets evaluated.

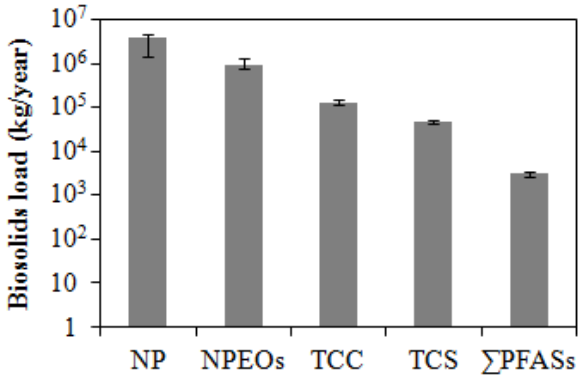


**Figure 2.** Comparison of 2001 annual loads of emerging contaminants in U.S. biosolids. NP- nonylphenol; NPEOs- nonylphenol mono- and di-ethoxylates; TCC- triclocarban; TCS - triclosan; ∑PFASs - total perfluoroalkyl substances detected in this study. Error bars represent minima and maxima.

**Supplementary Materials**

# National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA national sewage sludge survey

Arjun K. Venkatesan and Rolf U. Halden

Supplemental Tables (1)

**Table S1.** Facilities sampled in the 2001 national sewage sludge survey

| Facility name | City | State | Facility name | City | State |
|---|---|---|---|---|---|
| Sacramento Regional WWTP | Elk Grove | CA | Metropolitan Council – Metro | Saint Paul | MN |
| Fallbrook Public Utility District | Fallbrook | CA | Crocker WWTP | Crocker | MO |
| Manteca WQCF | Manteca | CA | Mason Farm WTP | Carrboro | NC |
| Central Contra Costa Sanitary District | Martinez | CA | Whiteville WWTP | Whiteville | NC |
| Fairfield Suisun Sewer District | Suisun city | CA | Burwell WWTF | Burwell | NE |
| Boulder – 75th St WWTP | Boulder | CO | Middletown Sewerage Authority | Belford | NJ |
| Steamboat Springs | Steamboat Springs | CO | Joint Meeting Sewage Treatment | Elizabeth | NJ |
| Rocky Hill WPCP | Hartford | CT | Passaic Valley Sewerage Commision | Newark | NJ |
| Waterbury WPCF | Waterbury | CT | Bowery Bay WPC | Corona Queens | NY |
| DC WASA (Blue Plains) | Washington | DC | Hunt's Point WPC | Corona Queens | NY |
| Mulberry STP | Mulberry | FL | Cayuga Heights WWTP | Ithaca | NY |
| Escambia County – Main Street WTP | Pensacola | FL | Brewster WWTP | Mahopac | NY |
| St. Petersburg SW Treatment Plant | St. Petersburg | FL | NEORSD – Southerly | Cleveland | OH |
| Sunrise Sweage Treatment Plant No. 1 | Sunrise | FL | Brentwood Estates STP #24 | Cuyahoga Falls | OH |
| R.M. Clayton WPCP | Atlanta | GA | Delphos | Delphos | OH |
| Buford Westside WPCP | Buford | GA | Massillon | Massillon | OH |
| Cartersville WPCP | Cartersville | GA | North Olmsted | North Olmsted | OH |
| Dekalb Co – Snapfinger Cr WPCP | Decatur | GA | Port Clinton | Port Clinton | OH |
| Garden City WPCP | Garden City | GA | Twin Lakes WWTP | Ravenna | OH |
| Gwinnett Co Jackson Cr | Lilburn | GA | Thornville | Thornville | OH |
| Ocmulgee WPCP | Warner Robins | GA | West Carrollton | West Carrollton | OH |
| Boise | Boise | ID | Blackwell | Blackwell | OK |

| | | | | | |
|---|---|---|---|---|---|
| Belleville STP #1 | Belleville | IL | Lebanon | Lebanon | OR |
| MWRDGC Stickney STP | Cicero | IL | Portland | Portland | OR |
| Jacksonville STP | Jacksonville | IL | Burnham STP | Burnham | PA |
| Morris STP | Morris | IL | Downingtown Area Regional Authority | Downingtown | PA |
| Tolono STP | Westville | IL | Girard Boro | Girard | PA |
| Evansville STP – Westside | Evansville | IN | Kiski Valley Water Pollution Control | Leechburg | PA |
| Frankton Municipal STP | Frankton | IN | Philadelphia Water Dept (SW) | Philadelphia | PA |
| Hammond Municipal STP | Hammond | IN | Philadelphia Water Dept (NE) | Philadelphia | PA |
| Muncie Sanitary District | Muncie | IN | Allengheny County Sanitary Authority | Pittsburgh | PA |
| Terre Haute Municipal STP | Terre Haute | IN | Narragansett Bay Commission – Bucklin | Providence | RI |
| Union city Municipal STP | Union City | IN | Florence – Pee Dee River Plant | Florence | SC |
| Oakland STP | Topeka | KS | WCRSA/Pelham WWTF | Greenville | SC |
| Shepherdsville STP | Shepherdsville | KY | Brooking | Brookings | SD |
| Billerica WWTP | Billerica | MA | Sioux Falls | Sioux Falls | SD |
| Fall River WWTF | Fall River | MA | Andrews STP | Andrews | TX |
| Medfield WWTP | Medfield | MA | Del Rio – San Felipe | Del Rio | TX |
| Pittsfield WWTP | Pittsfield | MA | Navasota, Grimes Co. STP | Navasota | TX |
| Patapsco WWTP | Baltimore | MD | Orange, Jackson St WWTP | Orange | TX |
| South Portland WPCF | South Portland | ME | Brazos River Authority (Waco) | Waco | TX |
| Dowagiac WWTP | Dowagiac | MI | Fredericksburg City STP | Fredericksburg | VA |
| Iron Mountain – Kingsford WWTP | Kingsford | MI | Augusta County Service Authority | Verona | VA |
| Genesee County – Ragnone WWTP | Montrose | MI | HRSD – James River STP | Virginia Beach | VA |
| Port Huron WWTP | Port Huron | MI | HRSD – Chesapeake/Elizabeth STP | Virginia Beach | VA |
| Wyandotte WWTP | Wyandotte | MI | Metropolitan King County | Renton | WA |
| Western Lake SSD | Duluth | MN | Greenbrier County PSD No 2 | Rainelle | WV |

**National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA national sewage sludge survey**

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Pages 3

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| Central Contra Costa Sanitary District | Martinez | CA | Whiteville WWTP | Whiteville | NC |
| Fairfield Suisun Sewer District | Suisun city | CA | Burwell WWTF | Burwell | NE |
| Boulder – 75th St WWTP | Boulder | CO | Middletown Sewerage Authority | Belford | NJ |
| Steamboat Springs | Steamboat Springs | CO | Joint Meeting Sewage Treatment | Elizabeth | NJ |
| Rocky Hill WPCP | Hartford | CT | Passaic Valley Sewerage Commision | Newark | NJ |
| Waterbury WPCF | Waterbury | CT | Bowery Bay WPC | Corona Queens | NY |
| DC WASA (Blue Plains) | Washington | DC | Hunt's Point WPC | Corona Queens | NY |
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| Buford Westside WPCP | Buford | GA | Massillon | Massillon | OH |
| Cartersville WPCP | Cartersville | GA | North Olmsted | North Olmsted | OH |
| Dekalb Co – Snapfinger Cr WPCP | Decatur | GA | Port Clinton | Port Clinton | OH |
| Garden City WPCP | Garden City | GA | Twin Lakes WWTP | Ravenna | OH |
| Gwinnett Co Jackson Cr | Lilburn | GA | Thornville | Thornville | OH |
| Ocmulgee WPCP | Warner Robins | GA | West Carrollton | West Carrollton | OH |
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| | | | | | |
|---|---|---|---|---|---|
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| MWRDGC Stickney STP | Cicero | IL | Portland | Portland | OR |
| Jacksonville STP | Jacksonville | IL | Burnham STP | Burnham | PA |
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| Tolono STP | Westville | IL | Girard Boro | Girard | PA |
| Evansville STP – Westside | Evansville | IN | Kiski Valley Water Pollution Control | Leechburg | PA |
| Frankton Municipal STP | Frankton | IN | Philadelphia Water Dept (SW) | Philadelphia | PA |
| Hammond Municipal STP | Hammond | IN | Philadelphia Water Dept (NE) | Philadelphia | PA |
| Muncie Sanitary District | Muncie | IN | Allengheny County Sanitary Authority | Pittsburgh | PA |
| Terre Haute Municipal STP | Terre Haute | IN | Narragansett Bay Commission – Bucklin | Providence | RI |
| Union city Municipal STP | Union City | IN | Florence – Pee Dee River Plant | Florence | SC |
| Oakland STP | Topeka | KS | WCRSA/Pelham WWTF | Greenville | SC |
| Shepherdsville STP | Shepherdsville | KY | Brooking | Brookings | SD |
| Billerica WWTP | Billerica | MA | Sioux Falls | Sioux Falls | SD |
| Fall River WWTF | Fall River | MA | Andrews STP | Andrews | TX |
| Medfield WWTP | Medfield | MA | Del Rio – San Felipe | Del Rio | TX |
| Pittsfield WWTP | Pittsfield | MA | Navasota, Grimes Co. STP | Navasota | TX |
| Patapsco WWTP | Baltimore | MD | Orange, Jackson St WWTP | Orange | TX |
| South Portland WPCF | South Portland | ME | Brazos River Authority (Waco) | Waco | TX |
| Dowagiac WWTP | Dowagiac | MI | Fredericksburg City STP | Fredericksburg | VA |
| Iron Mountain – Kingsford WWTP | Kingsford | MI | Augusta County Service Authority | Verona | VA |
| Genesee County – Ragnone WWTP | Montrose | MI | HRSD – James River STP | Virginia Beach | VA |
| Port Huron WWTP | Port Huron | MI | HRSD – Chesapeake/Elizabeth STP | Virginia Beach | VA |
| Wyandotte WWTP | Wyandotte | MI | Metropolitan King County | Renton | WA |
| Western Lake SSD | Duluth | MN | Greenbrier County PSD No 2 | Rainelle | WV |

**EPA Enforcement and Compliance History Online (ECHO)**

https://echo.epa.gov/trends/loading-tool/water-pollution-search/

**ECHO Search Criteria: Year = 2018; Limit to Industrial Point Sources (non-POTWs) ; PSC code = 430 - Pulp, paper and paperboard**

https://echo.epa.gov/trends/loading-tool/water-pollution-search/results/?s=6aef9dc44be15cafafccf8790c4ab16de0365f47

| NPDES Permit Number | Facility Name | City | County | State | HUC 12 Code | Watershed Name | SIC Code | Average Daily Flow (MGD) |
|---|---|---|---|---|---|---|---|---|
| MD0001422 | VERSO CORPORATION D,B,A LUKE PAPER COMPANY | LUKE | ALLEGANY COUNTY | MD | 20700020207 | Piney Swamp Run-North Branch Potomac River | 2621 | 914 |
| NHG360001 | MONADNOCK PAPER MILLS INC | BENNINGTON | HILLSBOROUGH | NH | 10700030108 | Great Brook-Contoocook River | 2621 | 172 |
| GA0001201 | GEORGIA PACIFIC CEDAR SPRINGS LLC | CEDAR SPRINGS | EARLY | GA | 31300040710 | Town of Jakin-Chattahoochee River | 2621 | 113 |
| WI0037991 | STORA ENSO NORTH AMERICA WATER QUALITY CENTER | WISCONSIN RAPIDS | WOOD | WI | 70700030701 | City of Wisconsin Rapids-Wisconsin River | 2611 | 110 |
| LA0005258 | GEORGIA-PACIFIC CONSUMER OPERATIONAS, LLC- PORT HUDSON OPERATIONS | ZACHARY | EAST BATON ROUGE | LA | 80702010401 | Cypress Bayou-Bayou Baton Rouge | 2621 | 87 |
| TX0000167 | INTERNATIONAL PAPER TEXARKANA MILL | QUEEN CITY | CASS | TX | 1.11403E+11 | Cypress Creek-Sulphur River | 2621 | 68 |
| AL0003301 | GEORGIA-PACIFIC CONSUMER PRODUCTS LP | PENNINGTON | CHOCTAW | AL | 31602010506 | Mill Creek-Tuckabum Creek | 2621 | 67 |
| MN0001643 | BOISE WHITE PAPER LLC | INTERNATIONAL FALLS | KOOCHICHING | MN | 90300080501 | City of International Falls-Rainy River | 2611 | 64 |
| AL0025968 | ALABAMA RIVER NEWSPRINT CO | PERDUE HILL | MONROE COUNTY | AL | 31502040206 | Bradley Mill Creek | 2621 | 62 |
| NHG360002 | MONADNOCK PAPER MILLS,INC. | BENNINGTON | HILLS | NH | 10700030108 | Great Brook-Contoocook River | 2621 | 58 |
| AR0002968 | DOMTAR AW LLC ASHDOWN MILL | ASHDOWN | LITTLE RIVER | AR | 1.11401E+11 | Haney Creek-Red River | 2611 | 55 |
| AR0001210 | GEORGIA PACIFIC CROSSETT LLC - PAPER OPERATIONS | CROSSETT | ASHLEY | AR | 80402020403 | Coffee Creek-Ouachita River | 2621 | 53 |
| VA0004162 | INTERNATIONAL PAPER FRANKLIN MILL | FRANKLIN | FRANKLIN | VA | 30102020505 | Union Camp Holding Pond-Blackwater River | 2611 | 52 |
| GA0003620 | RAYONIER PERFORMANCE FIBERS JESUP MILL | JESUP | WAYNE | GA | 30701060405 | Penholoway Swamp-Altamaha River | 2611 | 52 |
| TX0003891 | MEADWESTVACO TEXAS | EVADALE | JASPER | TX | 1.202E+11 | Bunns Canal-Neches River | 2631 | 46 |
| AL0002682 | GEORGIA-PACIFIC BREWTON LLC | BREWTON | ESCAMBIA | AL | 31403040506 | Lindsey Creek | 2611 | 44 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AL0003018 | INTERNATIONAL PAPER - RIVERDALE MILL | SELMA | DALLAS | AL | 31502011204 | Gardiner Island-Alabama River | 2611 | 43 |
| FL0000876 | BUCKEYE FLORIDA LP | PERRY | TAYLOR | FL | 31101020203 | Carlton Springs | 2611 | 40 |
| NC0000680 | DOMTAR PAPER COMPANY, LLC | PLYMOUTH | WASHINGTON | NC | 30101070903 | Town of Plymouth-Roanoke River | 2621 | 38 |
| TN0002356 | RESOLUTE FP US INC | CALHOUN | MCMINN | TN | 60200021406 | Hiwassee River-Dry Valley | 2621 | 36 |
| AL0003115 | INTERNATIONAL PAPER | PRATTVILLE | AUTAUGA | AL | 31502010501 | Savanna Swamp | 2631 | 35 |
| OR0000795 | GEORGIA PACIFIC WAUNA MILL | CLATSKANIE | CLATSOP | OR | 1.708E+11 | Lower Columbia-Clatskanie | 2611 | 34 |
| AL0002828 | WESTROCK MILL COMPANY, LLC | DEMOPOLIS | MARENGO | AL | 31602010402 | Spring Creek-Tombigbee River | 2631 | 34 |
| SC0038121 | INTERNATIONAL PAPER-EASTOVER MILL | EASTOVER | RICHLAND | SC | 30501040407 | Beech Creek-Wateree River | 2621 | 34 |
| LA0007927 | BOISE PACKAGING & NEWSPRINT PAPER MILL | DERIDDER | BEAUREGARD | LA | 1.201E+11 | Cypress Creek-Anacoco Creek | 2621 | 33 |
| AL0003158 | RESOLUTE FP US INC COOSA PINES OPERATIONS | CHILDERSBURG | TALLADEGA | AL | 31501060810 | Spring Creek-Coosa River | 2611 | 33 |
| NC0003298 | INTERNATIONAL PAPER COMPANY | RIEGELWOOD | COLUMBUS | NC | 30300050405 | Mitchell Landing-Cape Fear River | 2611 | 31 |
| VA0003646 | MEADWESTVACO OF VIRGINIA COVINGTON OPERATIONS | COVINGTON | COVINGTON CITY | VA | 20802010503 | Indian Draft-Jackson River | 2631 | 31 |
| SC0000868 | INTERNATIONAL PAPER GEORGETOWN MILL | GEORGETOWN | GEORGETOWN | SC | 30402070106 | Lower Sampit River | 2631 | 31 |
| LA0056651 | INTERNATIONAL PAPER CO - MANSFIELD MILL | MANSFIELD | DE SOTO | LA | 1.11402E+11 | Bayou Pierre Lake | 2611 | 30 |
| FL0002763 | GEORGIA-PACIFIC CONSUMER OPERATIONS LLC | PALATKA | PUTNAM | FL | 30801030604 | Rice Creek | 2621 | 30 |
| MS0031704 | LEAF RIVER CELLULOSE, LLC | NEW AUGUSTA | PERRY | MS | 31700050604 | Gum Branch-Leaf River | 2611 | 30 |
| SC0001759 | KAPSTONE PAPER AND PACKAGING | CHARLESTON | CHARLESTON | SC | 30502010707 | Lower Cooper River | 2631 | 30 |
| TN0002232 | PACKAGING CORP. OF AMERICA | COUNCE | HARDIN | TN | 60400010504 | Tennessee River-Mud Creek | 2631 | 29 |
| NC0000272 | BLUE RIDGE PAPER PRODUCTS INC (DBA EVERGREEN PACKAGING) | CANTON | HAYWOOD | NC | 60101060105 | Beaverdam Creek-Pigeon River | 2621 | 28 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| GA0003654 | GP CELLULOSE | BRUNSWICK | GLYNN | GA | 30702030201 | Turtle River-South Brunswick River | 2611 | 28 |
| ID0001163 | CLEARWATER PAPER CORPORATION | LEWISTON | NEZ PERCE | ID | 1.70601E+11 | Dry Creek-Snake River | 2611 | 28 |
| FL0002526 | INTERNATIONAL PAPER PENSACOLA MILL | CANTONMENT | ESCAMBIA | FL | 31401070101 | Elevenmile Creek | 2611 | 27 |
| TX0003158 | INLAND PAPERBOARD AND PACKAGING | ORANGE | ORANGE | TX | 1.201E+11 | Black Bayou-Sabine River | 2611 | 27 |
| OK0000744 | INTERNATIONAL PAPER CO. - VALLIANT | VALLIANT | MCCURTAIN | OK | 1.11401E+11 | Clear Creek | 2631 | 27 |
| GA0002801 | INTERNATIONAL PAPER AUGUSTA MILL | AUGUSTA | RICHMOND | GA | 30601060607 | Beaverdam Ditch-Savannah River | 2611 | 27 |
| AL0002755 | BOISE WHITE PAPER MILL | JACKSON | CLARKE | AL | 31602030901 | Stave Creek | 2621 | 25 |
| MI0042170 | VERSO QUINNESEC | QUINNESEC | DICKINSON | MI | 40301080706 | Sturgeon Dam-Menominee River | 2611 | 24 |
| AL0002674 | INTERNATIONAL PAPER - PINE HILL MILL | PINE HILL | WILCOX | AL | 31502030805 | Dunns Creek | 2631 | 23 |
| AL0000817 | MEADWESTVACO COATED BOARD, LLC | PHENIX CITY | RUSSELL | AL | 31300030804 | Hatchechubbee Creek-Chattahoochee River | 2631 | 22 |
| WI0003671 | EXPERA SPECIALTY SOLUTIONS LLC - MOSINEE MILL | MOSINEE | MARATHON | WI | 70700021807 | Lake Dubay-Wisconsin River | 2611 | 22 |
| LA0003468 | HOOD CONTAINER OF LOUISIANA LLC - SAINT FRANCISVILLE MILL | ST. FRANCISVILLE | WEST FELICIANA | LA | 80702010308 | Sandy Creek-Thompson Creek | 2611 | 22 |
| GA0001988 | INTERNATIONAL PAPER COMPANY (SAVANNAH) | SAVANNAH | CHATHAM | GA | 30601090307 | Outlet Savannah River | 2621 | 21 |
| SC0001015 | RESOLUTE FOREST PRODUCTS CATAWBA OPERATIONS | CATAWBA | YORK | SC | 30501030604 | Sixmile Creek-Catawba River | 2611 | 21 |
| LA0007901 | INTERNATIONAL PAPER - BOGALUSA MILL | BOGALUSA | WASHINGTON | LA | 31800040607 | Chinquapin Creek-Pearl River | 2621 | 20 |
| LA0007617 | GRAPHIC PACKAGING INTERNATIONAL INC. | WEST MONROE | OUACHITA | LA | 80902030201 | Morrison Canal | 2631 | 20 |
| NC0000752 | KAPSTONE KRAFT CORPORATION | ROANOKE RAPIDS | HALIFAX | NC | 30101070101 | City of Roanoke Rapids-Roanoke River | 2621 | 20 |
| AR0035823 | CLEARWATER PAPER CORPORATION (CYPRESS BEND) | ARKANSAS CITY | DESHA | AR | 80500020203 | Canal No. 43-Clay Bayou | 2611 | 20 |
| GA0001104 | INTERNATIONAL PAPER | ROME | FLOYD | GA | 31501050205 | Morton Bend | 2611 | 20 |

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| KY0001716 | DOMTAR PAPER CO LLC HAWESVILLE MILL | HAWESVILLE | HANCOCK | KY | 51402010205 | Indian Creek-Ohio River | 2611 | 19 |
| LA0007684 | ROCKTENN CP LLC | HODGE | JACKSON | LA | 80403030306 | Iron Branch-Dugdemona River | 2621 | 19 |
| LA0020800 | INTERNATIONAL PAPER RED RIVER MILL | CAMPTI | NATCHITOCHES | LA | 1.11402E+11 | Sims Bayou | 2631 | 19 |
| WI0003026 | WAUSAU PAPER MILLS LLC | RHINELANDER | ONEIDA | WI | 70700011302 | Cresent Creek-Wisconsin River | 2611 | 19 |
| MD0021687 | UPPER POTOMAC RIVER COMM STP | WESTERNPORT | ALLEGANY | MD | 20700020402 | Limestone Run-North Branch Potomac River | 2621 | 18 |
| MI0001171 | PACKAGING CORP OF AMERICA | FILER CITY | MANISTEE | MI | 40601030705 | Manistee River | 2631 | 18 |
| VA0003115 | WESTROCK CP LLC - WEST POINT MILL | WEST POINT | KING WILLIAM COUNTY | VA | 20801061102 | Mill Creek-Pamunkey River | 2611 | 18 |
| SC0042188 | DOMTAR PAPER CO LLC | BENNETTSVILLE | MARLBORO | SC | 30402010510 | Beaverdam Creek-Great Pee Dee River | 2621 | 18 |
| WI0000825 | EXPERA SPECIALTY SOLUTIONS LLC KAUKAUNA | KAUKAUNA | OUTAGAMIE COUNTY | WI | 40302040205 | Garners Creek-Fox River | 2611 | 18 |
| MS0036412 | WEYERHAEUSER COMPANY, COLUMBUS PULP AND PAPER | COLUMBUS | LOWNDES | MS | 31601060303 | Cedar Creek | 2611 | 17 |
| FL0001104 | WESTROCK CP, LLC | FERNANDINA BEACH | NASSAU | FL | 30702040906 | Amelia River | 2631 | 17 |
| WI0003620 | DOMTAR - NEKOOSA | NEKOOSA | WOOD | WI | 70700030704 | Fivemile Creek-Wisconsin River | 2611 | 17 |
| GA0002798 | WEYERHAEUSER PORT WENTWORTH | SAVANNAH | CHATHAM | GA | 30601090307 | Outlet Savannah River | 2611 | 17 |
| NY0005525 | FINCH PRUYN LAND REC LANDFILL | GLENS FALLS | WARREN | NY | 20200030506 | Glens Falls Feeder Canal-Hudson River | 2611 | 17 |
| GA0003590 | INTERSTATE PAPER LLC | RICEBORO | LIBERTY | GA | 30602040401 | Upper North Newport River | 2611 | 17 |
| NY0004413 | INTERNATIONAL PAPER | TICONDEROGA | ESSEX | NY | 41504080304 | McKenzie Brook-Lake Champlain | 2611 | 16 |
| NC0003191 | WEYERHAEUSER NR CO | VANCEBORO | CRAVEN | NC | 30202020607 | Hog Island-Neuse River | 2611 | 15 |
| FL0000701 | RAYONIER PERFORMANCE FIBERS LLC | FERNANDINA BEACH | NASSAU | FL | 30702040906 | Amelia River | 2611 | 15 |
| WI0002810 | PACKAGING CORP OF AMERICA | LINCOLN COUNTY | LINCOLN | WI | 70700011306 | Lake Mohawksin-Wisconsin River | 2611 | 14 |

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| PA0002143 | DOMTAR - JOHNSONBURG MILL | JOHNSONBURG | ELK | PA | 50100050601 | Little Mill Creek-Clarion River | 2611 | 14 |
| AL0002801 | KIMBERLY- CLARK CORPORATION | MOBILE | MOBILE | AL | 31602040505 | Tensaw River-Apalachee River | 2621 | 13 |
| WI0026042 | DOMTAR CORP | ROTHSCHILD | MARATHON COUNTY | WI | 70700021803 | Mosinee Flowage-Wisconsin River | 2621 | 13 |
| OR0000515 | INTERNATIONAL PAPER | SPRINGFIELD | LANE | OR | 1.709E+11 | Walterville Canal-McKenzie River | 2611 | 13 |
| VA0003026 | GEORGIA PACIFIC CORP - BIG ISLAND MILL | BIG ISLAND | BEDFORD | VA | 20802030103 | Thomas Mill Creek-James River | 2631 | 12 |
| OR0001341 | TOLEDO PAPER MILL | TOLEDO | LINCOLN | OR | 1.71002E+11 | Poole Slough-Yaquina River | 2611 | 12 |
| NY0001562 | U S GYPSUM CO OAKFIELD PLANT | OAKFIELD | GENESEE | NY | 41300010402 | Brinningstool Creek-Oak Orchard Creek | 2631 | 12 |
| FL0000281 | PACKAGING CORPORATION OF AMERICA | CLYATTVILLE | LOWNDES | GA | 31102030902 | Lake Alcyone-Withlacoochee River | 2631 | 12 |
| TN0001643 | DOMTAR PAPER KINGSPORT MILL | KINGSPORT | SULLIVAN | TN | 60101020704 | Kendrick Creek-South Fork Holston River | 2621 | 11 |
| SC0000876 | ROCK-TENN CP, LLC - FLORENCE MILL | FLORENCE | FLORENCE | SC | 30402011003 | Bachelor Creek-Great Pee Dee River | 2631 | 11 |
| WI0037389 | SCA TISSUE MENASHA PAPER MILL | MENASHA | WINNEBAGO | WI | 40302040201 | Little Lake Butte des Mortes | 2621 | 10 |
| AR0001601 | GRAPHIC FLEXIBLE PACKAGING | PINE BLUFF | JEFFERSON | AR | 1.11102E+11 | Caney Creek-Arkansas River | 2621 | 10 |
| GA0049336 | WEYERHAEUSER NR COMPANY - FLINT RIVER OPERATIONS | OGLETHORPE | MACON COUNTY | GA | 31300070705 | Deer Creek-Muckalee Creek | 2611 | 10 |
| GA0032620 | SP NEWSPRINT CO LLC | DUBLIN | LAURENS | GA | 30701020906 | Shaddock Creek-Oconee River | 2621 | 10 |
| OR0001074 | CASCADE PACIFIC PULP HALSEY PULP MILL | HALSEY | LINN | OR | 1.709E+11 | Fischor Island-Muddy Creek | 2611 | 10 |
| AR0001970 | EVERGREEN PACKAGING PINE BLUFF CHIP MILL | PINE BLUFF | JEFFERSON | AR | 1.11102E+11 | Plum Bayou-Arkansas River | 2611 | 10 |
| SC0000582 | KIMBERLY CLARK CORPORATION | BEECH ISLAND | AIKEN | SC | 30601060607 | Beaverdam Ditch-Savannah River | 2621 | 9 |
| AR0001830 | GREEN BAY PACKAGING/ARK KRAFT | MORRILTON | CONWAY | AR | 1.11102E+11 | Portland Bottoms-Arkansas River | 2631 | 9 |
| CT0000434 | AHLSTROM NONWOVENS | WINDSOR LOCKS | HARTFORD | CT | 10802050105 | Freshwater Brook-Connecticut River | 2621 | 9 |

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| WI0003468 | WATER RENEWAL CENTER | STEVENS POINT | PORTAGE | WI | 70700030304 | Village of Plover-Wisconsin River | 2621 | 9 |
| KY0094463 | TEMPLE-INLAND | MAYSVILLE | MASON | KY | 50902010605 | Lawrence Creek-Ohio River | 2631 | 8 |
| AL0022314 | WESTROCK STEVENSON MILL | STEVENSON | JACKSON | AL | 60300010205 | Marshall Branch-Tennessee River | 2631 | 8 |
| NY0002755 | OMNIAFILTRA LLC | BEAVER FALLS | LEWIS | NY | 41501011105 | Black Creek-Beaver River | 2621 | 8 |
| PA0008885 | THE PROCTER & GAMBLE PAPER PRODUCTS CO | MEHOOPANY | WYOMING | PA | 20501061405 | Little Mehoopany Creek-Lower Susquehanna River | 2621 | 8 |
| WI0000990 | APPLETON COATED L.L.C. LOCKS MILL | COMBINED LOCKS | OUTAGAMIE | WI | 40302040205 | Garners Creek-Fox River | 2611 | 8 |
| WI0001031 | PROCTER & GAMBLE PAPER PRODUCTS - FOX RIVER PLANT | GREEN BAY | BROWN | WI | 40302040405 | City of Green Bay-Fox River | 2621 | 8 |
| VA0006408 | GREIF PACKAGING CONTAINERBOARD MILL | AMHERST | AMHERST | VA | 20802030405 | Allens Creek-James River | 2631 | 7 |
| AL0074667 | ESSITY PROFESSIONAL HYGIENE NORTH AMERICA LLC BARTON OPERATIONS | CHEROKEE | COLBERT | AL | 60300051002 | Colbert Creek-Pickwick Lake | 2621 | 6 |
| SC0003042 | SONOCO PRODUCTS COMPANY | HARTSVILLE | DARLINGTON | SC | 30402010704 | Everlasting Branch-Black Creek | 2631 | 6 |
| NY0003344 | INTERFACE PERFORMANCE MATERIALS | FULTON | OSWEGO | NY | 41402030204 | Oswego River | 2621 | 6 |
| NH0000655 | GORHAM PAPER & TISSUE | GORHAM | COOS | NH | 10400010606 | Horne Brook-Androscoggin River | 2611 | 5 |
| FL0000400 | WESTROCK CP LLC | JACKSONVILLE | DUVAL | FL | 30801031601 | Broward River | 2621 | 5 |
| WI0003212 | FLAMBEAU RIVER PAPERS, LLC | PARK FALLS | PRICE | WI | 70500020503 | Bosner Creek-Flambeau River | 2621 | 5 |
| MS0043222 | BOWATER NEWSPRINT SOUTH INC. | GRENADA | GRENADA | MS | 80302050602 | McSwine Creek-Yalobusha River | 2621 | 5 |
| PA0008265 | APPVION INC | ROARING SPRING | BLAIR | PA | 20503020106 | Oldtown Run-Frankstown Branch Juniata River | 2611 | 5 |
| TN0002763 | HOOD CONTAINER | WAVERLY | HUMPHREYS | TN | 60400050405 | Tennessee River-Harman Creek | 2631 | 5 |
| OH0105228 | WAUSAU PAPER TOWEL & TISSUE LLC | MIDDLETOWN | BUTLER | OH | 50800020702 | Browns Run-Great Miami River | 2621 | 4 |
| KY0095192 | KIMBERLY-CLARK CORP OWENSBORO OPERATIONS | OWENSBORO | DAVIESS | KY | 51402011203 | Cowhide Slough-Ohio River | 2621 | 4 |

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| VA0004642 | ROCKTENN CP LLC | HOPEWELL | HOPEWELL | VA | 20802060201 | Bailey Creek-James River | 2631 | 4 |
| WI0001261 | GEORGIA PACIFIC CONSUMER PRODUCTS LP | GREEN BAY | BROWN | WI | 40302040405 | City of Green Bay-Fox River | 2621 | 4 |
| GA0003581 | GRAPHIC PACKAGING MACON MILL | MACON | BIBB | GA | 30701031605 | Stone Creek-Ocmulgee River | 2631 | 3 |
| CT0026476 | ALGONQUIN POWER COGENERATION FACILITY | WINDSOR LOCKS | HARTFORD | CT | 10802050105 | Freshwater Brook-Connecticut River | 2621 | 3 |
| MA0000671 | CRANE WASTEWATER TREATEMENT PLANT | DALTON | BERKSHIRE | MA | 11000050103 | East Branch Housatonic River | 2621 | 3 |
| SC0049115 | SHAW INDUSTRIES GROUP INC PLANT 8N | ANDERSON | ANDERSON | SC | 30601030401 | Upper Big Generostee Creek | 2621 | 3 |
| NC0000078 | DAVIDSON RIVER VILLAGE | PISGAH FOREST | TRANSYLVANIA | NC | 60101050206 | Lyday Creek-French Broad River | 2621 | 3 |
| NY0006807 | HOLLINGSWORTH & VOSE-EASTON MILL | GREENWICH | WASHINGTON | NY | 20200030303 | Batten Kill | 2621 | 3 |
| MI0053601 | FIBREK | MENOMINEE | MENOMINEE | MI | 40301090502 | Beattie Creek-Frontal Green Bay | 2611 | 3 |
| WV0110434 | FIBREK RECYCLING U.S. INC.- FAIRMONT DIVISION | FAIRMONT | MARION COUNTY | WV | 50200030305 | Little Creek-Monongahela River | 2611 | 2 |
| MO0044121 | THE PROCTER & GAMBLE PAPER PRODUCTS CO | JACKSON | CAPE GIRARDEAU | MO | 71401050501 | Little Indian Creek-Indian Creek | 2621 | 2 |
| WI0001341 | LITTLE RAPIDS CORP - SHAWANO SPECIALTY PAPERS | SHAWANO | SHAWANO | WI | 40302020901 | School Section Creek-Wolf River | 2621 | 2 |
| WI0003611 | NEENAH PAPER - WHITING MILL | STEVENS POINT | PORTAGE | WI | 70700030104 | McDill Pond-Plover River | 2611 | 2 |
| OR0033405 | GEORGIA-PACIFIC HALSEY MILL | HALSEY | LINN | OR | 1.709E+11 | Lake Creek-Willamette River | 2621 | 2 |
| NY0007226 | SCA TISSUE NORTH AMERICA, LLC (FORMERLY ENCORE PAPER CO) | SOUTH GLENS FALLS | SARATOGA | NY | 20200030506 | Glens Falls Feeder Canal-Hudson River | 2621 | 2 |
| MA0004561 | HOLLINGSWORTH & VOSE ADVANCED MATERIALS | GROTON | MIDDLESEX | MA | 10700040302 | Witch Brook-Squannacook River | 2621 | 2 |
| AL0000396 | COURTLAND | COURTLAND | LAWRENCE | AL | 60300021205 | Page Branch-Tennessee River | 2621 | 2 |
| CA0004821 | PACTIV LLC | RED BLUFF | TEHAMA | CA | 1.80202E+11 | Sevenmile Creek-Sacramento River | 2679 | 2 |
| IN0003409 | SONOCO FLEXIBLE PACKAGING | EDINBURGH | JOHNSON | IN | 51202040705 | Herriotts Creek-Sugar Creek | 2671 | 2 |

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| OH0031046 | UNITED STATES GYPSUM CO. | GYPSUM | OTTAWA | OH | 41000111405 | North Side Sandusky Bay Frontal | 2631 | 2 |
| IN0036447 | INTERNATIONAL PAPER | CAYUGA | VERMILLION | IN | 51201081602 | Dry Branch-Wabash River | 2631 | 2 |
| NY0000191 | DUNN PAPER - NATURAL DAM | GOUVERNEUR | ST. LAWRENCE | NY | 41503020802 | Malterna Creek-Oswegatchie River | 2621 | 1 |
| WI0037842 | NEENAH PAPER INC | NEENAH | WINNEBAGO | WI | 40302040201 | Little Lake Butte des Mortes | 2621 | 1 |
| NY0103390 | POTSDAM SPECIALTY PAPER INC | POTSDAM | ST LAWRENCE | NY | 41503050703 | Village of Potsdam-Raquette River | 2621 | 1 |
| MI0000060 | MENOMINEE ACQUISITION CORPORATION | MENOMINEE | MENOMINEE | MI | 40301080913 | Menominee River | 2621 | 1 |
| NY0002372 | BURROWS PAPER CORP | LYONS FALLS | LEWIS | NY | 41501010602 | Pine Creek-Moose River | 2621 | 1 |
| WI0003204 | CELLU TISSUE - CITYFOREST LLC | LADYSMITH | RUSK | WI | 70500020703 | Thornapple Dam-Flambeau River | 2611 | 1 |
| MS0001309 | MISSISSIPPI RIVER PULP, LLC | NATCHEZ | ADAMS | MS | 80601000502 | Glasscock Cutoff-Mississippi River | 2611 | 1 |
| WI0000680 | CELLU TISSUE NEENAH | MENASHA | WINNEBAGO | WI | 40302040201 | Little Lake Butte des Mortes | 2621 | 1 |
| KYR003292 | AHLSTROM FILTRATION LLC | MADISONVILLE | HOPKINS | KY | 51402050202 | Greasy Creek-Clear Creek | 2621 | 1 |
| MS0000795 | BURROWS PAPER CORPORATION | PICKENS | HOLMES | MS | 80602010904 | Tacketts Creek-Big Black River | 2621 | 1 |
| WI0000531 | OCONTO FALLS TISSUE INCORPORATED | OCONTO FALLS | OCONTO | WI | 40301040505 | Machicknee Flowage-Oconto River | 2611 | 1 |
| MA0001848 | ONYX SPECIALTY PAPERS INC - WILLOW MILL | LEE | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2621 | 1 |
| NY0006912 | MOHAWK PAPER MILLS - COHOES MILL | COHOES | ALBANY | NY | 20200041110 | Shakers Creek-Mohawk River | 2621 | 1 |
| MA0000469 | SEAMAN PAPER OF MASSACHUSETTS | TEMPLETON (OTTER | WORCESTER | MA | 10802020201 | Otter River | 2621 | 1 |
| WI0000540 | KIMBERLY CLARK CORP | MARINETTE | MARINETTE | WI | 40301080913 | Menominee River | 2621 | 1 |
| WI0000973 | GREEN BAY PACKAGING INC - GB MILL DIV | GREEN BAY | BROWN | WI | 40302040405 | City of Green Bay-Fox River | 2611 | 1 |
| NY0257826 | INTERFACE SOLUTIONS | BEAVER FALLS | LEWIS COUNTY | NY | 41501011105 | Black Creek-Beaver River | 2631 | 1 |

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| NY0000957 | KNOWLTON TECHNOLOGIES LLC | WATERTOWN | JEFFERSON | NY | 41501011404 | Kelsey Creek-Black River | 2621 | 1 |
| NY0006050 | IRVING TISSUE INC FT EDWARD OPERATIONS | FORT EDWARD | WASHINGTON | NY | 20200030506 | Glens Falls Feeder Canal-Hudson River | 2621 | 1 |
| WI0026999 | COVERIS FLEXIBLES US LLC | MENASHA | WINNEBAGO | WI | 40302040201 | Little Lake Butte des Mortes | 2671 | 1 |
| OR0000558 | WESTROCK NORTHWEST MILL AND COGENERATION FACILITY | NEWBERG | YAMHILL | OR | 1.709E+11 | Hess Creek-Willamette River | 2621 | 1 |
| WI0003077 | POPE & TALBOT WIS INC ASH MONOFILL | EAU CLAIRE | EAU CLAIRE | WI | 70500050502 | Beaver Creek-Chippewa River | 2611 | 1 |
| AL0003930 | NGC INDS INC | OXFORD | CALHOUN | AL | 31501060507 | Tuskehadky Branch-Choccolocco Creek | 2631 | 1 |
| ARG160040 | GRAPHIC FLEXIBLE PACKAGING | PINE BLUFF | JEFFERSON | AR | 1.11102E+11 | Caney Creek-Caney Bayou | 2621 | 1 |
| GA0046426 | HOLLINGSWORTH & VOSE CO | HAWKINSVILLE | PULASKI | GA | 30701040303 | Town Creek-Ocmulgee River | 2621 | 1 |
| NY0001902 | HUHTAMAKI INC | FULTON | OSWEGO | NY | 41402030103 | Waterhouse Creek-Oswego River | 2653 | 1 |
| OH0009717 | SORG PAPER CO. | MIDDLETOWN | BUTLER | OH | 50800020702 | Browns Run-Great Miami River | 2621 | 0 |
| IN0054810 | PAPERWORKS INDUSTRIES, INC. | WABASH | WABASH | IN | 51201011405 | Kentner Creek | 2611 | 0 |
| MA0001716 | MEADWESTVACO CUSTOM PAPERS LAUREL MILL | LEE | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2621 | 0 |
| NY0006491 | INTERFACE PERFORMANCE MATERIALS | HOOSICK FALLS | RENSSELAER | NY | 20200030804 | Browns Brook-Hoosic River | 2621 | 0 |
| OH0141275 | WEIDMANN ELECTRICAL TECHNOLOGY, INC. | URBANA | CHAMPAIGN | OH | 50800011602 | Dugan Run | 2621 | 0 |
| NY0007161 | COTTRELL PAPER CO INC | ROCK CITY FALLS | SARATOGA | NY | 20200030403 | Middle Kayaderasseras Creek | 2631 | 0 |
| CT0002127 | CLEARWATER PAPER | EAST HARTFORD | HARTFORD | CT | 10802050402 | Lower Hockanum River | 2679 | 0 |
| NY0006157 | SCHWEITZER-MAUDUIT | ANCRAM | COLUMBIA COUNTY | NY | 20200061003 | Punch Brook-Roeliff Jansen Kill | 2621 | 0 |
| NY0000515 | FELIX SCHOELLER TECHNICAL PAPERS | PULASKI | OSWEGO | NY | 41401020705 | Salmon River | 2672 | 0 |
| TX0007056 | UNITED STATES GYPSUM | GALENA PARK | HARRIS | TX | 1.20401E+11 | Vince Bayou-Buffalo Bayou | 2631 | 0 |

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| OR0002119 | WEYERHAEUSER NORTH BEND CONTAINERBOARD MILL | NORTH BEND | COOS | OR | 1.71003E+11 | North Cove-Pacific Ocean | 2611 | 0 |
| NY0006785 | HOLLINGSWORTH & VOSE GREENWICH MILL | GREENWICH | WASHINGTON | NY | 20200030303 | Batten Kill | 2621 | 0 |
| OR0000787 | WEST LINN PAPER MILL | WEST LINN | CLACKAMAS | OR | 1.709E+11 | Tanner Creek-Willamette River | 2611 | 0 |
| PA0008591 | NGC IND/MILTON PLT | NEW COLUMBIA | UNION | PA | 20502061205 | Muddy Run-Lower West Branch Susquehanna River | 2631 | 0 |
| KY0002623 | DIXIE CONSUMER PRODUCTS LLC | LEXINGTON | FAYETTE | KY | 51002050902 | Town Branch | 2656 | 0 |
| KYR004155 | INTERNATIONAL PAPER COMPANY | BOWLING GREEN | WARREN | KY | 51100020902 | Jennings Creek | 2653 | 0 |
| TN0003735 | SONOCO PRODUCTS COMPANY | NEWPORT | COCKE | TN | 60101060403 | Pigeon River-English Creek | 2631 | 0 |
| OH0140635 | FIBERCORR MILLS LLC | MASSILLON | STARK | OH | 50400010309 | West Sippo Creek-Tuscarawas River | 2631 | 0 |
| GA0001911 | CARAUSTAR MILL GROUP INC AUSTE LL BOXBOARD MILLS | AUSTELL | COBB | GA | 31300050104 | Murphy Creek-Flint River | 2631 | 0 |
| WV0005517 | OX PAPERBOARD LLC | HARPERS FERRY | JEFFERSON | WV | 20700070304 | Flowing Springs Run-Shenandoah River | 2631 | 0 |
| OH0004961 | NEWARK GROUP INDUS DBA OHIO PAPERBOARD CORP | BALTIMORE | FAIRFIELD | OH | 50600011701 | Pawpaw Creek | 2631 | 0 |
| KY0099414 | BEMIS PACKINGING INC | SHELBYVILLE | SHELBY | KY | 51401020403 | Lower Clear Creek | 2671 | 0 |
| OH0011738 | VALLEY CONVERTING CO. INC. | TORONTO | JEFFERSON | OH | 50301011106 | Hardin Run-Ohio River | 2631 | 0 |
| PA0013081 | KIMBERLY-CLARK PENNSYLVANIA L LC | CHESTER | DELAWARE | PA | 20402020607 | Repaupo Creek-Delaware River | 2621 | 0 |
| KYR003134 | AEP INDUSTRIES INC | BOWLING GREEN | WARREN | KY | 51100020903 | Rays Branch-Barren River | 2671 | 0 |
| KYR004124 | KAPSTONE CONTAINERS CORP | SOMERSET | PULASKI | KY | 51301030204 | Lower Pitman Creek | 2653 | 0 |
| KYR003262 | KAPSTONE PAPER AND PACKAGING | BOWLING GREEN | WARREN | KY | 51100020902 | Jennings Creek | 2653 | 0 |
| WI0003034 | MULE-HIDE MANUFACTURING CO INC | CORNELL | CHIPPEWA | WI | 70500050104 | French Creek-Chippewa River | 2631 | 0 |
| KY0000086 | WICKLIFFE PAPER COMPANY | WICKLIFFE | BALLARD | KY | 80102010305 | Shelton Creek-Mayfield Creek | 2621 | 0 |

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| OH0094552 | MILL CREEK LANDFILL (CLOSED) | COSHOCTON | COSHOCTON | OH | 50400030907 | Spoon Creek-Mill Creek | 2631 | 0 |
| KYR003261 | INTERNATIONAL PAPER | LEXINGTON | FAYETTE | KY | 51002050801 | Headwaters North Elkhorn Creek | 2653 | 0 |
| NJG031372 | GEORGIA PACIFIC CORRUGATED III | MILFORD | HUNTERDON | NJ | | | 2679 | 0 |
| KYR003247 | INTERNATIONAL PAPER COMPANY | LOUISVILLE | JEFFERSON | KY | 51401010901 | South Fork Beargrass Creek | 2653 | 0 |
| AR0001791 | DIXIE CONSUMER PRODUCTS LLC | FORT SMITH | SEBASTIAN COUNTY | AR | 1.11101E+11 | City of Fort Smith-Arkansas River | 2656 | 0 |
| NC0072664 | SHURTAPE TECHNOLOGIES INCORPORATED | STONY POINT | ALEXANDER | NC | 30401020301 | Headwaters Third Creek | 2672 | 0 |
| KYR003192 | GULF STATES PAPER CO. | NICHOLASVILLE | JESSAMINE | KY | 51002050701 | Jessamine Creek | 2657 | 0 |
| LAG534082 | LIGHTHOUSE FOR THE BLIND | BATON ROUGE | EAST BATON ROUGE | LA | 80702020901 | Jones Creek-Amite River | 2679 | 0 |
| ALG110223 | GATE PRECAST COMPANY | MONROEVILLE | MONROE | AL | 31502040303 | Vanity Fair Lake | 2672 | 0 |
| ALG141038 | WESTROCK CP, LLC | STEVENSON | JACKSON COUNTY | AL | 60300010205 | Marshall Branch-Tennessee River | 2631 | 0 |
| AR0052761 | SUN BIO PROJECT | ARKADELPHIA | CLARK | AR | 80401020603 | Casa Massa Creek-Ouachita River | 2611 | 0 |
| CA0059871 | PERMALITE REPROMEDIA CORP | GARDENA | LOS ANGELES | CA | 1.80701E+11 | Lower Dominguez Channel | 2672 | 0 |
| IN0003026 | INTERNATIONAL PAPER CO | TERRE HAUTE | VIGO | IN | 51201110605 | Izaak Walton Lake-Wabash River | 2631 | 0 |
| KYR003014 | DURO HILEX PLY LLC | FLORENCE | BOONE | KY | 51001011304 | Upper Banklick Creek | 2674 | 0 |
| KYR003050 | WESTROCK CP LLC | LEXINGTON | FAYETTE | KY | 51002050902 | Town Branch | 2653 | 0 |
| KYR004026 | PREMIER PACKAGING LLC | LOUISVILLE | JEFFERSON | KY | 51401021201 | Northern Ditch | 2653 | 0 |
| LA0003565 | INTERNATIONAL PAPER CO - PINEVILLE MILL | PINEVILLE | RAPIDES | LA | 80403010201 | Williams Lake-Red River | 2611 | 0 |
| LA0007561 | INTERNATIONAL PAPER LOUISIANA MILL | BASTROP | MOREHOUSE | LA | 80402051003 | Horse Bayou-Bayou Bartholomew | 2611 | 0 |
| NC0022934 | UCS MAIN PLANT | LINCOLNTON | LINCOLN | NC | 30501020504 | Sulphur Branch-South Fork Catawba River | 2655 | 0 |

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| NY0005061 | WALLOOMSAC RECYCLING | HOOSICK FALLS | RENSSELAER | NY | 20200030704 | Walloomsac River | 2631 | 0 |
| VA0004791 | BONTEX INC | BUENA VISTA | BUENA VISTA | VA | 20802020501 | Bennetts Run-Maury River | 2631 | 0 |
| AL0003603 | MOBILE PAPERBOARD CORP | MOBILE | MOBILE | AL | 31602040504 | Toulmins Spring Branch-Three Mile Creek | 2631 | 0 |
| MD0066974 | NEWSTECH MD LP | HAGERSTOWN | WASHINGTON | MD | 20700041009 | Sharmans Branch-Antietam Creek | 2611 | 0 |
| NY0001856 | NEWTON FALLS FINE PAPER COMPANY | NEWTON FALLS | SAINT LAWRENCE | NY | 41503020601 | Peavine Creek-Oswegatchie River | 2621 | 0 |
| OH0006718 | CARAUSTAR MILL GROUP, INC. | RITTMAN | WAYNE | OH | 50400010204 | River Styx | 2631 | 0 |
| OH0142654 | SOFIDEL AMERICA CORP CIRCLEVILLE | CIRCLEVILLE | PICKAWAY COUNTY | OH | | | 2621 | 0 |
| OR0000566 | BLUE HERON PAPER COMPANY | OREGON CITY | CLACKAMAS | OR | 1.709E+11 | Tanner Creek-Willamette River | 2611 | 0 |
| PA0008150 | MOUNT HOLLY SPRINGS SPEC PAPER INC/MT HOLLY SPRINGS | MOUNT HOLLY SPRINGS | CUMBERLAND | PA | 20503050503 | Mountain Creek | 2621 | 0 |
| IN0001350 | INDIGREEN, LLC | CARTHAGE | RUSH | IN | 51202040108 | Goose Creek-Big Blue River | 2631 | 0 |
| IN0045985 | CCL DESIGN | SCHERERVILLE | LAKE | IN | 71200030304 | Plum Creek-Hart Ditch | 2671 | 0 |
| KY0108529 | AMCOR PHARMACEUTICAL PACKAGING USA INC | SHELBYVILLE | SHELBY | KY | 51401020403 | Lower Clear Creek | 2671 | 0 |
| KYR003667 | HUHTAMAKI INC | HOPKINSVILLE | CHRISTIAN | KY | 51302050502 | Lower South Fork Little River | 2657 | 0 |
| MS0033057 | DUNN PAPER, WIGGINS, LLC | WIGGINS | STONE | MS | 31700070306 | Chaney Creek-Red Creek | 2621 | 0 |
| SCG250180 | INTERTAPE POLYMER GROUP | COLUMBIA | RICHLAND | SC | 30501100203 | Lower Gills Creek-Congaree River | 2672 | 0 |
| LAG481058 | BATON ROUGE POLYMERS TERMINAL LLC | BATON ROUGE | EAST BATON ROUGE | LA | 80702010402 | Devils Swamp-Bayou Baton Rouge | 2671 | 0 |
| MO0136263 | UNITED STATES GYPSUM COMPANY | NORTH KANSAS CITY | CLAY | MO | 1.03001E+11 | Buckeye Creek-Missouri River | 2621 | 0 |
| OK0000272 | PRYOR INDUSTRIAL CONSERVATION | PRYOR | MAYES | OK | 1.10702E+11 | Crutchfield Branch-Neosho River | 2611 | 0 |
| SCG250288 | CARAUSTAR IND/CAROTELL PAPEROA | TAYLORS | GREENVILLE | SC | 30501080101 | Headwaters Enoree River | 2631 | 0 |

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| KYR003013 | DURO DESIGNER CO | WALTON | BOONE | KY | 51001011304 | Upper Banklick Creek | 2674 | 0 |
| KYR003864 | INTERNATIONAL PAPER COMPANY | HENDERSON | HENDERSON | KY | 51402020405 | Wilson Creek-Canoe Creek | 2631 | 0 |
| ALG060177 | UNION CAMP CORP | DECATUR | MORGAN | AL | 60300021102 | Bakers Creek-Tennessee River | 2653 | |
| ALG060302 | GEORGIA-PACIFIC CORRUGATED, LLC | HUNTSVILLE | MADISON | AL | 60300020403 | Upper Flint River-Acuff Spring | 2653 | |
| ALG060346 | INTERNATIONAL PAPER COMPANY | BAY MINETTE | BALDWIN | AL | 31401060501 | Headwaters Styx River | 2653 | |
| ALG060469 | WESTROCK ATHENS SHEETFEEDER PLANT | ATHENS | LIMESTONE | AL | 60300021101 | Swan Creek | 2653 | |
| ALG060474 | WESTROCK CULLMAN SHEET PLANT | CULLMAN | CULLMAN | AL | 31601090106 | Broglen River | 2653 | |
| ALG060479 | HUHTAMAKI, INC. | ANDALUSIA | COVINGTON | AL | 31401030203 | Five Runs Creek | 2657 | |
| IDR053113 | CLEARWATER PAPER CORPORATION | LEWISTON | NEZ PERCE | ID | 1.70603E+11 | Catholic Creek-Clearwater River | 2631 | |
| MAR053088 | WESTROCK CP, LLC | WAKEFIELD | MIDDLESEX | MA | 10900010401 | Headwaters Saugus River | 2653 | |
| MS0000191 | INTERNATIONAL PAPER - VICKSBUR G MILL | REDWOOD | WARREN | MS | 80302080102 | Ballground Creek | 2631 | |
| NJ0002674 | MARCAL MANUFACTURING | ELMWOOD PARK | BERGEN | NJ | 20301030803 | Weasel Brook-Passaic River | 2621 | |
| PA0051896 | DIXIE CONSUMER PRODUCTS LLC | EASTON | NORTHAMPTON | PA | 20401050303 | Lower Bushkill Creek | 2656 | |
| PAR144804 | PKG RESOURCES INC | MOUNT CARMEL | NORTHUMBERLAND | PA | 20503010101 | Shamokin Creek-City of Shamokin | 2653 | |
| ALG060123 | GEORGIA-PACIFIC CONSUMER PRODUCTS LP | PENNINGTON | CHOCTAW | AL | 31602010408 | Tompkins Bluff-Tombigbee River | 2631 | |
| ALG060445 | MARYLAND PAPER PRODUCTS | TUSCALOOSA | TUSCALOOSA | AL | 31601130202 | Jay Creek-Big Creek | 2671 | |
| ALG060467 | WESTROCK EUTAW FOLDING | EUTAW | GREENE | AL | 31601130606 | Minter Creek | 2657 | |
| ALG060506 | WESTROCK CP, LLC | STEVENSON | JACKSON COUNTY | AL | 60300010205 | Marshall Branch-Tennessee River | 2631 | |
| ALG060521 | WESTROCK MILL COMPANY, LLC | DEMOPOLIS | MARENGO | AL | | | 2611 | |

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| MAR053382 | ONYX SPECIALTY PAPERS, INC. - LAUREL MILL | SOUTH LEE | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2621 |
| PAR140013 | GRAPHIC PKG INTL INC/PHOENIXVILLE | PHOENIXVILLE | CHESTER | PA | 20402031006 | Mingo Creek-Schuylkill River | 2657 |
| PAR140022 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | BUCKS | PA | 20401050701 | Upper Tohickon Creek | 2672 |
| PAR142204 | MACTAC INC/SCRANTON FAC | SCRANTON | LACKAWANNA | PA | 20501070108 | Spring Brook | 2672 |
| PRR053215 | PAPELERA PUERTORRIQUENA, INC. | UTUADO | UTUADO | PR | 2.101E+11 | Rio Vivi | 2674 |
| ALG060242 | INTERNATIONAL PAPER | HUNTSVILLE | MADISON | AL | 60300020906 | Matney Branch-Tennessee River | 2653 |
| MAR053085 | SOUTHWORTH CO. TFM | TURNERS FALLS | FRANKLIN | MA | 10802010503 | Dry Brook-Connecticut River | 2621 |
| MAR053399 | HUB FOLDING BOX COMPANY | MANSFIELD | BRISTOL | MA | 10900040301 | Wading River | 2657 |
| MAR053499 | FITCHBURG PAPERBOARD | FITCHBURG | WORCESTER | MA | 10700040101 | Whitman River | 2631 |
| PAR142210 | TIN INC | HAZLETON | LUZERNE | PA | 20501070402 | Black Creek | 2653 |
| ALG060248 | TEKPAK, INC. | MARION | PERRY | AL | 31502030102 | Headwaters Bouge Chitto Creek | 2655 |
| MAR053171 | HAZEN PAPER CO | HOLYOKE | HAMPDEN | MA | 10802010702 | Stony Brook-Connecticut River | 2671 |
| MAR053218 | ONYX SPECIALTY PAPERS INC - WILLOW MILL | LEE | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2621 |
| MAR053513 | HAMPDEN PAPERS INC | HOLYOKE | HAMPDEN | MA | 10802010702 | Stony Brook-Connecticut River | 2672 |
| NYR00C490 | WESTROCK SOLVAY MILL | SYRACUSE | ONONDAGA | NY | 41402011503 | Geddes Brook-Ninemile Creek | 2631 |
| PRR053226 | RONDO PAK, INC. | SAN JUAN | SAN JUAN | PR | 2.101E+11 | Rio Canas | 2657 |
| ALG060244 | ROCKTENN MONTGOMERY | MONTGOMERY | MONTGOMERY | AL | 31502010310 | Caney Branch | 2653 |
| MAR053165 | HOLLINGSWORTH & VOSE ADVANCED MATERIALS | GROTON | MIDDLESEX | MA | 10700040302 | Witch Brook-Squannacook River | 2621 |
| WVG610729 | MONDI BAGS USA, LLC | WELLSBURG | BROOKE | WV | 50301061202 | Salt Run-Ohio River | 2674 |

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| MAR053090 | HAZEN PAPER COMPANY | HOUSATONIC | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2671 |
| MAR053214 | HOLLINGSWORTH & VOSE | EAST WALPOLE | NORFOLK | MA | 10900010801 | Headwaters Neponset River | 2621 |
| MAR054035 | NEENAH PAPER FR LLC | GREAT BARRINGTON | BERKSHIRE | MA | 11000050107 | Konkapot Brook-Housatonic River | 2671 |
| PRR053170 | ESSENTRA | GUAYNABO | GUAYNABO | PR | 2.101E+11 | Rio Guaynabo | 2657 |
| NHR053012 | NASHUA COATED PAPER PRODUCTS PLANT | MERRIMACK | HILLS | NH | 10700061002 | Nesenkeag Brook-Merrimack River | 2672 |