

PCBs in State Purchased Products: Janitorial Supplies 2017 Results

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Abstract

In 2017, the Washington State Department of Ecology (Ecology) conducted a study to assess polychlorinated biphenyls (PCBs) in products available through state contracts. PCBs are a family of synthetic chemicals used in hundreds of industrial and commercial applications due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties. PCBs are identified as persistent, bioaccumulative, and toxic chemicals.

Washington State law (RCW 39.26.280 and RCW 39.26.290) requires state agencies to limit purchases of products and packaging that contain PCBs. The State Department of Enterprise Services (DES) implements the law. This study was carried out to assist state agencies in identifying where PCBs may be present in janitorial supplies, a subgroup of products available from DES statewide contracts.

Ecology evaluated 31 janitorial supply products used by state entities in 2017. The products may contain dyes and pigments or use chlorinated compounds from manufacturing processes. Once used, products could be disposed of by discharge to drains and/or into the landfill. Sampled products included gloves, paper, personal care products, cleaners, and other supplies.

All results showed detectable levels of total PCBs (tPCBs). The tPCB concentration results, as estimates, ranged from 0.003 J parts per billion (ppb) to 24.17 J ppb. Twelve had tPCB levels below 0.5 ppb, 15 had levels ranging from 1 to 10 ppb, four had levels between 10 and 100 ppb, and there were none at a level above 100ppb. The results were all below the permissible Toxic Substances Control Act (TSCA) limits of 25 ppm average and 50 ppm maximum.

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Background

PCBs

Polychlorinated biphenyls (PCBs) are a family of synthetic chemicals consisting of two benzene rings joined together (a biphenyl molecule) and containing one to 10 chlorine atoms attached to the benzene rings (ATSDR 2000). Figure 1 shows the basic structure of PCBs, where the numbers 2-6 and 2'-6' represent possible substitution locations for chlorine. There are 209 possible configurations of chlorine positions around the biphenyl molecule. These individual PCB compounds are known as congeners and designated by a number 1 through 209 (EPA 2022).

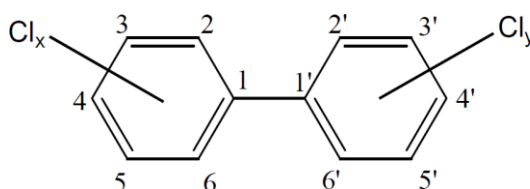


Figure 1. The general chemical structure of chlorinated biphenyls.

PCBs were manufactured as chemical mixtures made up of a variety of congeners. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications. PCBs are identified as persistent, bioaccumulative, and toxic (PBT) chemicals. They are persistent in the environment, build up in the food chain, and can cause adverse health effects, including cancer and harm to the immune, nervous, and reproductive systems in humans and wildlife (Ecology and Health 2015).

The manufacture of PCBs for intentional use in products was restricted in the U.S. more than 40 years ago. Products may still contain PCBs at an annual average of less than 25 parts per million (ppm) with a 50 ppm maximum, per the U.S. Toxic Substances Control Act (TSCA; EPA 1979).

PCBs continue to be generated as inadvertent byproducts in manufacturing processes and are referred to as inadvertent PCBs (Panero et al. 2005). Processes that may result in the creation of inadvertent PCBs involve carbon, chlorine, and high temperatures, such as the production of pigments, dyes, and chlorinated chemicals. Inadvertent PCBs may be released from products during their use and eventual disposal. PCB-11 is an example of an inadvertent PCB.

PCBs in Janitorial Supplies

In 2017, Washington State Department of Ecology (Ecology) conducted a study to assess the levels of PCBs in products available from state contracts. Washington State law (Revised Code of Washington (RCW) 39.26.280 and RCW 39.26.290) requires state agencies to limit the purchase of products and packaging containing PCBs. The state Department of Enterprise Services (DES) leads the implementation of the law. There is no restriction level for PCB

concentrations in products under the law. Instead, it specifies that no agency may knowingly purchase products or products in packaging containing PCBs above the practical quantification limit except when it is not cost-effective or technically feasible to do so (RCW 39.26.280). The DES purchasing preference policy (DES 2019) outlines this approach, along with guidelines to incentivize suppliers to provide products and product packaging that do not contain PCBs.

This study was carried out to identify where PCBs may be present in janitorial supplies, a subgroup of state purchased products from state contracts. Non-point releases, such as from consumer products, are becoming increasingly important to control and reduce overall PCB delivery to humans and the environment (Ecology and Health 2015). Highly consumable materials purchased by state agencies and disposed of in landfills and/or by discharge to drains could contain dyes and pigments or use chlorinated compounds in the manufacturing process. These could release PCBs into the environment.

At the time, state agencies could contract with DES to purchase and use a wide range of janitorial supply products such as gloves, paper and personal care products, cleaners, etc. This study examined whether PCBs were present in some of these types of product samples. Ecology acquired 31 samples of various janitorial supply products in 2017, and all were analyzed for PCBs.

Methods

Product Collection and Sample Processing

Ecology acquired multiple janitorial supply samples that were available from various state agencies (Department of Corrections (DOC), Department of Ecology (ECY), etc.), or purchased directly from a vendor (Waxie) from March 16th, 2017, to May 22nd, 2017 (Table A-1). Each sample was labeled with a unique Ecology identification number (Component ID). For example, component sample DOC-1-1-1 corresponds to: Department of Corrections for DOC, the first number, “1” indicates that it is the first time Ecology acquired samples from DOC, the second number, “1” refers to a unique sample from DOC, and the last number, “1” indicates it was the first component sample from that specific sample.

Samples were processed to an appropriate lab analysis size and logged into the database per Ecology Standard Operating Procedure (SOP) PTP001 and PTP002, respectively (both SOPs were per version 1.0 at the time). After samples were made ready by Ecology, they were sent out for contract lab analysis. Table A-1 includes the sample Component ID, Product Description, and Component Material.

All samples were received in good condition by the contract lab. All component samples except for DOC-4-1-1 were received by the contract lab at ambient temperature instead of at reduced temperature as specified by the Quality Assurance Project Plan and addendum (QAPP; Sekerak 2016; Trumbull 2017a, 2017b). Data were not qualified on this basis, and the deviation is not considered to have adversely impacted the study data quality since janitorial supplies may be regularly stored at ambient temperatures.

Laboratory Analysis and Data Quality

Contract lab analysis for PCBs was performed by ALS Life Sciences – Environmental Division (ALS) in Burlington, Ontario, Canada. Samples were sent to ALS via Ecology and followed the quality assurance (QA) system in place at that time. ALS extracted component samples using EPA Method 1668C. The sample extracts were analyzed for all 209 PCB congeners by high-resolution gas chromatography mass spectrometry following EPA Method 1668C (EPA 2010).

Ecology's QA Coordinator at MEL performed a stage 4 validation following the QAPP, EPA Method 1668C, and applicable criteria from the National Functional Guidelines for Organic Superfund Methods Data Review (EPA 2009, 2017, 2020). Some of the data points were qualified using the reviewer's professional judgment. The data were verified to have been generated following the analytical method with no omissions or errors. The project manager also reviewed all the data points. All validated data were found acceptable and usable for all purposes.

PCB congener concentrations below the limit of quantitation (LOQ) and above the estimated detection limit (EDL) were qualified "J". The "J" qualifier indicates that the analyte was positively identified, and the associated value is an estimate. PCB congener concentrations at levels less than five times the concentrations found in the associated lab method blank were qualified as non-detects: either "UJ" when concentrations were reported below the LOQ or "U" when concentrations were reported above the LOQ. PCB congeners that were tentatively identified ("NJ") by the lab and were also detected in the blank at concentrations less than 5 times the blank value were qualified "NUJ" as non-detects at the EDL.

Measurement quality objectives (MQOs) for laboratory control standards, laboratory duplicates, and internal recovery standards were found acceptable as validated at the time. MQOs were met with the following exceptions:

- Samples DOC-6-2-1, WX-1-1-1 to WX-1-10-1, WX-1-13-1 to WX-1-15-1
 - The recoveries for extraction standards 13C12-PCB-001 (1%), 13C12-PCB-003 (1%), 13C12-PCB-004 (2%), 13C12-PCB-015 (8%), 13C12-PCB-019 (6%), and 13C12-PCB-054 (9%) were extremely low and indicated a possible high bias in the associated results. Sample results were qualified based on their respective extraction standard recoveries.
 - There was a pattern of localized suppression of the lock-mass check signal occurring at the retention time of 13C12-PCB-189. However, the response of this standard did not seem to be suppressed in all analyses. Data were not qualified on this basis.
 - The recoveries for native target PCB-105 and PCB-123 were marginally below the control limits (74% and 71%, respectively). The sample runs for these two analytes were found acceptable; data were not qualified on this basis.
- Samples WX-1-11-1 and WX-1-12-1
 - The recoveries for the early labelled extraction standards were below the method control limit for the laboratory control sample (LCS). However, the

recoveries for the native targets were all within limits and no additional qualification was required.

- There were low levels of selected targets detected in the method blank that were within the reference method control limits. Low level sample data may be elevated.
- The recovery of the labelled extraction standard 13C12-PCB-209 was marginally above the method control limit. However, the native target recovery was within control. No bias to native target data is expected.
- During the post-run mass resolution check, the resolutions of two masses were marginally below the reference method control limit. No negative impact to overall data quality is expected. All of the analyte responses for this run were acceptable, data were not qualified on this basis
- The recoveries for extraction standards 13C12-PCB-001 (1%), 13C12-PCB-003 (1%), 13C12-PCB-004 (2%), 13C12-PCB-015 (8%), 13C12-PCB-019 (6%) and 13C12-PCB-054 (9%) were low and indicated a possible high bias in the associated results. Sample results were qualified based on their respective extraction standard recoveries.
- All of the Continuing Calibration Verification (CCV) analyzed met the technical acceptance criteria except for:
 - ECY-1-1-1, ECY-2-4-1, and ECY-2-5-1
 - Instrument response drift may have affected results and were qualified
 - WX-2-1-1, WX-2-3-1 to WX-2-9-1
 - Due to the uncertainties of the CCV and mass resolution associated with the respective sequences, associated sample results were qualified
- All duplicate results were similar with relative percent difference (RPD) less than 50% for detections greater than or equal to method reporting limit (MRL) with the following exceptions:
 - WX-2-3-1
 - PCB-001 (55%), PCB-002 (63%), PCB-003 (54%), PCB-041/071/040 (62%), PCB-083/099 (56%), PCB-109/119/086/097/125/087 (76%), PCB-113/090/101 (98%), PCB-132 (117%), PCB-138/163/129 (98%), PCB-147/149 (119%), PCB-158 (56%), PCB-168/153 (114%), PCB-180/193 (131%), PCB-187 (110%), PCB-194 (71%), PCB-209 (63%), tMonoCB (63%), tPentaCB (65%), tHexaCB (105%), tHeptaCB (161%), tOctaCB (87%), DecaCB (63%)
 - WX-2-4-1
 - PCB-011 (171%), PCB-020/028 (54%), PCB-052 (77%), PCb-061/070/074/076 (108%), tDiCB (155%), tTriCB (57%), tTetraCB (75%), tPentaCB (58%), tPCB (81%)

For both samples, the results were already previously qualified due to reporting limits and/or method blank contamination. No additional qualification was required, data were not qualified on the basis of duplicate analysis.

- Method 1668C control limits for the labeled PCB congener standards 13C12-PCB-001, 13C12-PCB-003, 13C12-PCB-004, 13C12-PCB-015, 13C12-PCB-019, 13C12-PCB-028, 13C12-PCB-037 and 13C12-PCB-054 ranged from 5-145%, while the control limits for the remaining labeled standards ranged from 10% to 145%. Since the target analyte concentrations are adjusted for their corresponding labeled standard recoveries, low labeled standard recoveries (< 10%) may indicate potential high bias in the detected results (qualified estimated, “J”) and possible false negatives on the undetected results, which were qualified estimated, “UJ”. The recoveries of the labeled injection and clean-up standards met the laboratory established acceptance criteria with exceptions listed in Table A-2.

Total PCB concentrations, calculated by the project manager as the sum of PCB congeners in the sample, include only detected congener results that were either unqualified or were qualified “J,” as estimates. Data qualified as “NJ” (indicating that the analyte was tentatively identified, and the associated value represents its approximate concentration) were not included in the tPCB sums. Total PCB calculations were qualified “J” when 10% or more of the detected congener concentration results in the sample were qualified “J,” as estimates.

All PCB concentrations are reported on an as-received wet weight basis by the lab in picogram per gram (pg/g), or pg/l (respective for the liquid component samples) and have been converted to nanogram per gram (ng/g, or ppb) for reporting purposes. PCB data are available from Ecology’s Consumer Product Database.

Results

ALS analyzed the 31 component samples for all 209 PCB congeners and tPCB concentrations were calculated according to the procedure outlined in the Data Quality section above. Per the QAPP, the estimated lab reporting limit and range of PCB congener results expected were approximately < 1.0 ppb to 2.3 ppm. Results found within this study are within the expected range (including < 1.0 ppb). Table A-1 displays selected results from the component samples. For assessing data in this study, select results (as qualified) are identified in the tables for discussion purposes and do not represent any regulatory level.

PCB Congener Results

The number of PCB congeners detected at a concentration of approximately 0.5 ppb or higher in the component samples is listed in Table A-1. Sample ECY-2-5-1 (paper towels) had the highest number of PCB congener detections with 12. DOC-6-2-1 (corrugated board) and WX-1-10-1 (toilet paper) had 11 and 5 detections at or above 0.5 ppb, respectively. DOC-4-1-1 (green nitrile gloves) had 3 detections at or above 0.5 ppb. Two of the component samples (WX-1-14-1 and DOC-4-5-1) had only two detections at or above 0.5 ppb, and one of the detections for DOC-4-5-1 (yellow latex gloves) was at 22.20 ppb (PCB-11). Seven samples had only one PCB congener detection at or above 0.5 ppb each (ECY-1-1-1, ECY-2-4-1, ECY-1-2-1, WX-1-4-1, WX-1-5-1, WX-1-6-1, and WX-1-7-1). The remaining 18 samples did not have any PCB congener detections at or above 0.5ppb, as qualified.

The PCB congener observed at the highest concentration overall was PCB-11 at approximately 22.20 ppb in sample DOC-4-5-1. PCB-11 was detected as unqualified or J in 25 of the component samples. The remaining six component samples were qualified U or UJ for PCB-11 results. The concentration of PCB-11 in the samples ranged from 0.003 J ppb to 22.20 ppb, with the greatest concentration detected in sample DOC-4-5-1 (yellow latex gloves). Samples ECY-2-5-1 and DOC-6-2-1 had the next highest concentrations of PCB-11 at 2.55 ppb and 2.47 ppb, respectively. These samples did not present with a specific color within the sample material; however, both were paper-based products (paper towel and corrugated board). All other sample concentrations of PCB-11 were below 2 ppb. PCB-11 is considered a key indicator of inadvertent PCBs, as it is primarily associated with color pigments, especially yellow (Hu and Hornbuckle 2010).

There are 12 of the 209 PCB congeners that have a spatial and electronic structure similar to polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). PCDD and PCDF congeners (numbers 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169 and 189) are known as dioxin-like PCBs. These are considered highly toxic (EPA 2025). Samples DOC-4-5-1, DOC-6-2-1, ECY-2-4-1, ECY-2-5-1, WX-1-6-1, WX-1-10-1, WX-1-13-1, and WX-1-14-1 had detections of at least one of these PCBs at or above 0.05 ppb (as qualified). Sample DOC-6-2-1 had the highest number of detections of these PCBs with 5, and the highest dioxin detection at 0.62 ppb (PCB-118). PCB-118 was the most frequently detected dioxin within the samples, with 7 detections at or above 0.05 ppb (DOC-6-2-1, ECY-2-4-1, ECY-2-5-1, WX-1-6-1, WX-1-10-1, WX-1-13-1, and WX-1-14-1). All other samples did not have any detections of at least one of these dioxin PCBs at or above 0.05 ppb (as qualified). Dioxins and dioxin-like furans have no known commercial or natural use, and they can be produced during the bleaching processes used in pulp and paper mills (ATSDR 2008).

PCB Congener Patterns

Principal Components Analysis (PCA) was used to explore similarities and differences in PCB congener patterns among the samples. PCA is a statistical tool that groups a large number of variables (e.g., the PCB congeners) into “principal components” (PCs). The first two PCs often explain much of the variability in the dataset and are a common comparison. Plotting the sample data on an ordinate graph (the first two PCs as the X and Y axes; Figure 2) was used for interpreting similarities and differences in the dataset. Points on the plot that are more closely clustered together are more similar to each other than points that are further away.

PCB congener values for each sample were first normalized to the tPCB concentration of the sample by dividing the two values: [PCB Congener]/[tPCB]. This was done to reduce total PCB concentration bias on the PCA results. PCA performed on normalized PCB congener composition showed separation of samples on the first two principal components (axes), which cumulatively represented approximately 83% of the total variance in the dataset.

Separation was greatest among three samples (WX-2-1-1, WX-2-2-1, and WX-2-9-1), with WX-2-1-1 having the greatest overall separation. These samples are FaciliPro Concentrated Mile Foam Hand Soap - Yellow Soap, Quik Tank Extra-Strength Cleaner Concentrate - Cleaning Liquid, and Dial Basics Liquid Hand Soap - Hand Soap, respectively. The other component samples indicated minimal separation and were not as significant as the other three samples.

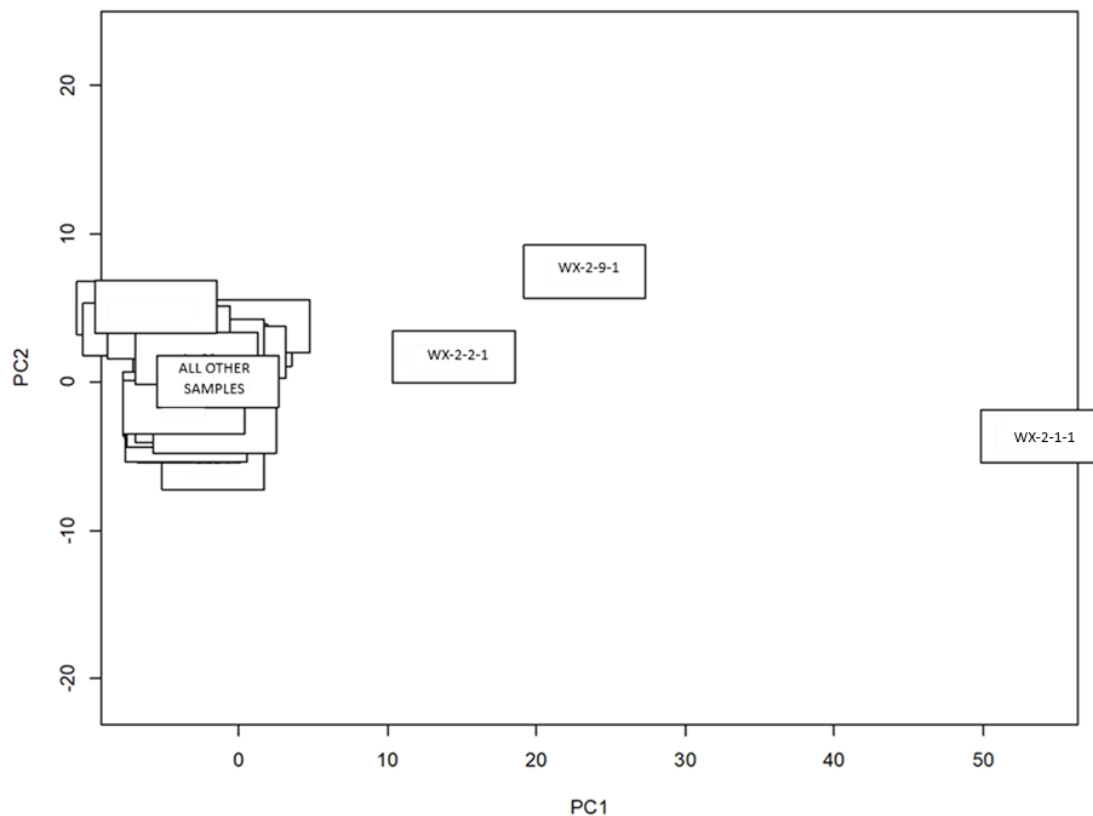


Figure 2. Principal Components Analysis (PCA) ordination plot showing principal components (PC) 1 and 2 of normalized total PCB congener composition along the X and Y axes.

PCB Homolog Results

Homologs are subcategories of PCB congeners that have equal numbers of chlorine substituents. For example, Dichlorobiphenyls (DiCBs) are all PCB congeners with exactly two chlorine substituents that can be in any arrangement (EPA 2022). These include the sum of PCB congeners PCB-4 through PCB-15 and can be summed as a total (tDiCBs). Overall, DiCBs represented the largest concentration of PCB homolog groups in the samples, followed by Tetrachlorobiphenyls (TetraCBs) and Trichlorobiphenyls (TriCBs).

PCB-11 is a dichlorobiphenyl. The PCB-11 levels found in the component samples also correlate to having high concentrations of DiCBs (ex: component sample DOC-4-5-1 had the highest DiCB result at 22.60 J ppb and the highest PCB-11 result at 22.20 J ppb). Figure 3 shows homolog concentrations (as qualified, ppb), with corresponding sample component ID. Component sample results for tDiCBs can be found in Table A-1.

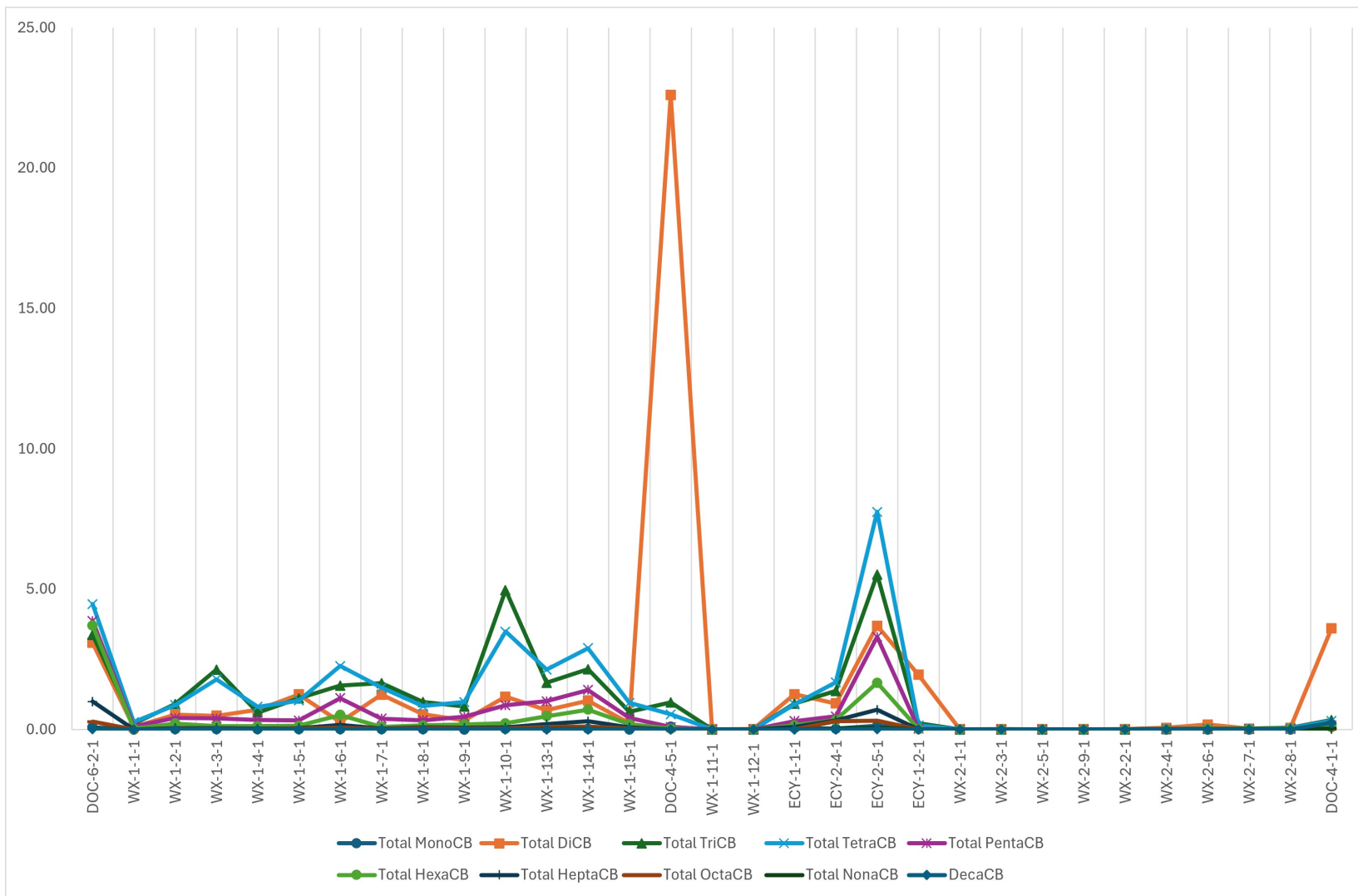


Figure 3. Sample component ID vs. total homolog concentration (ppb).

tPCB Results

All samples had detectable levels of tPCBs, ranging from 0.003 J ppb to 24.17 J ppb. All of the sample tPCB results were qualified J. The samples with the highest tPCB level were DOC-4-5-1, ECY-2-5-1, and DOC-6-2-1 at 24.17 J ppb, 22.52 J ppb, and 19.70 J ppb, respectively. The samples with the lowest tPCB level were WX-2-1-1, WX-2-9-1, and WX-1-11-1 at 0.003 J ppb, 0.01 J ppb, and 0.01 J ppb, respectively.

Component Material Category Type

The largest number of component material category types within this study consisted of paper products (16 component samples), personal care products (6 component samples), and cleaners (5 component samples). Within these categories, paper products had the highest number of component samples with tPCBs at or above 0.5 ppb (15). Samples ECY-2-5-1 (paper towels) and WX-1-10-1 (toilet paper) were both above 10 J ppb tPCBs (22.52 J ppb and 10.82 J ppb, respectively). Historically, paper products made with post-consumer recycled paper contained PCBs where carbonless copy paper was included in recycling streams. PCBs could be released via the encapsulated dyes used in the carbonless duplicating paper (ATSDR, 2000). However, PCB concentrations have decreased over time as the volume of unrecycled carbonless copy paper has reduced (Versar 1977).

The lowest concentrations of tPCBs from the categories were from the personal care products category, with WX-2-1-1 and WX-2-9-1 (both liquid hand soaps) at 0.003 J ppb and 0.01 J ppb, respectively. Figure 4 shows tPCB results grouped by component material category type.

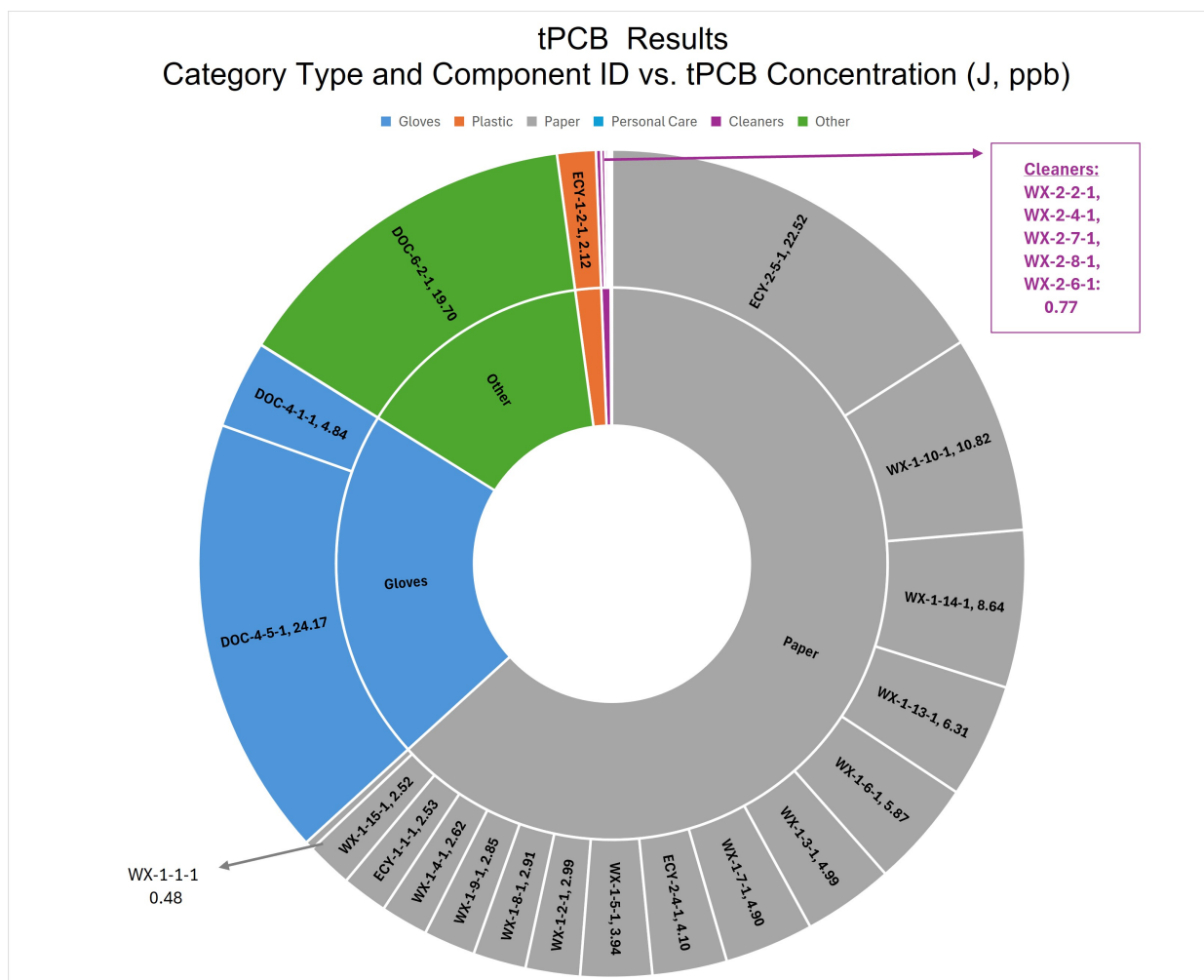


Figure 4. Circle graph of total PCB concentrations (J, ppb) detected in sample components, grouped by component category types.

Conclusions

All 31 component samples tested had detectable levels of tPCBs, ranging from 0.003 J ppb to 24.17 J ppb. Nineteen of the component samples had tPCB levels above 1.0 J ppb. The results were all below the TSCA 25 ppm average and 50 ppm maximum limits. Table 1 displays the distribution of tPCB results by concentration range.

Table 1. Total PCB results (ppb, J) by concentration range.

Number of Evaluations	< 0.50	0.50 to < 1	1 to < 10	10 to < 100	≥ 100
31	12	0	15	4	0

J = analyte was positively identified and the associated value is an estimate

The exact source of PCBs in the samples is unknown. Pigments and dyes are known sources of inadvertent PCBs in products and have previously been detected in pigment-printed and dyed materials (Guo et al. 2014; Stone 2016). It is not possible to conclude from this 2017 study that the PCBs detected in the samples are only from the pigments or dyes.

Ultimately, PCBs detected in the samples may be due to several sources:

- Product content.
- Manufacturing process: pigments, dyes, and/or additional chemicals used.
- Environmental contamination from manufacturing: equipment, environment, etc.
- Packaging, handling, and/or the storage of the materials prior to use in the production of the final product.

No conclusions can be drawn from a single sample of a single product because of the variability in results observed for the same product across other product types with different manufacturing dates/lots.

Recommendations

- Purchasing preference for state contracts can be applied to the products or product packaging items if the test results for the specified products or packaging confirm they do not contain PCBs within the limits of the test and are tested by EPA method 1668C (DES-280-00). Since there are no established standardized practical quantitation limits (PQL) for PCBs in janitorial supplies, further work could include PQL method development.
- Ranges and variability among different types and batches of products available by state contracts (including those in-use by state entities) could be further assessed. A mass balance study approach that accounts for all inputs and outputs could be performed.

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Appendix A.

Table A-1. Component sample information and select results.

Component ID	Component Description	Component Material	tPCB Concentration (ppb)	Number of PCB Congeners Detected (as Qualified) > = Approximately 0.5 ppb	PCB-11 Concentration (ppb)	PCB Homolog Total Dichlorobiphenyl (tDiCB) Result (ppb)
DOC-4-1-1	Green Nitri-Solve Gloves	Green Glove Material	4.84 J	3	0.90	3.61 J
DOC-4-5-1	Household latex Gloves	Yellow Glove Material	24.17 J	2	22.20	22.60 J
DOC-6-2-1	8"X10" Corrugated Board	Cardboard	19.70 J	11	2.47	3.09 J
ECY-1-1-1	Waxie Half-fold Seat Covers	Seat Cover	2.53 J	1	1.09 U	1.26 UJ
ECY-1-2-1	Waxie Garbage Can Liners	Black Plastic	2.12 J	1	1.84	1.95 J
ECY-2-4-1	Eco Soft Toilette Paper	Toilet Paper	4.10 J	1	0.56 U	0.93 UJ
ECY-2-5-1	Georgia Pacific Envision Paper Towels	Paper Towel	22.52 J	12	2.55	3.69 J
WX-1-1-1	Bigfold EPA Compliant Premium Paper Towels	Paper Towels	0.48 J	0	0.06 U	0.09 UJ
WX-1-2-1	Kleenex Multi-Fold Towels	Paper Towels	2.99 J	0	0.35	0.53 J
WX-1-3-1	GP White Multifold Towels	Paper Towels	4.99 J	0	0.11	0.49 J
WX-1-4-1	Scott Bathroom Tissue	Toilet Paper	2.62 J	1	0.59	0.70 J
WX-1-5-1	Envision White 2-Ply Jumbo SR Bathroom Tissue	Toilet Paper	3.94 J	1	1.03	1.25 J
WX-1-6-1	BW Ecosoft Universal Tissue 2-Ply	Toilet Paper	5.87 J	1	0.09 U	0.27 J

Component ID	Component Description	Component Material	tPCB Concentration (ppb)	Number of PCB Congeners Detected (as Qualified) > = Approximately 0.5 ppb	PCB-11 Concentration (ppb)	PCB Homolog Total Dichlorobiphenyl (tDiCB) Result (ppb)
WX-1-7-1	Waxie Green White 1-Ply Bath Tissue	White Toilet Paper	4.90 J	1	0.95	1.24 J
WX-1-8-1	Compact Coreless Hi-Cap 2-Ply Bath Tissue	Toilet Paper	2.91 J	0	0.38	0.54 J
WX-1-9-1	BW Ecosoft Green Seal Facial Tissue	Tissue Paper	2.85 J	0	0.19	0.33 J
WX-1-10-1	Preference White 2-Ply Embossed Bathroom Tissue	Toilet Paper	10.82 J	5	0.39	1.17 J
WX-1-11-1	Purell 8 oz Green Certified Instant Hand Sanitizer	Hand Sanitizer Liquid	0.01 J	0	0.005	0.01 J
WX-1-12-1	GOJO Green Certified Foam Hand Cleaner	Hand Cleaner Liquid	0.02 J	0	0.003 J	0.02 J
WX-1-13-1	Enmotion Brown Eco Logo Hi Cap Roll Towel	Paper Towels	6.31 J	0	0.36	0.70 J
WX-1-14-1	Cormatic Brown Roll Towel	Paper Towels	8.64 J	2	0.63	1.03 J
WX-1-15-1	Bay West Dublnature Towel	Paper Towels	2.52 J	0	0.15	0.22 J
WX-2-1-1	FaciliPro Concentrated Mile Foam Hand Soap	Yellow Soap	0.003 J	0	0.006 U	0.009 UJ
WX-2-2-1	Quik Tank Extra-Strength Cleaner Concentrate	Cleaning Liquid	0.02 J	0	0.007	0.02 J
WX-2-3-1	Waxi-Green Lotionized Hand Soap	Green Soap	0.04 J	0	0.007	0.02 J
WX-2-4-1	FaciliPro Concentrated Acid Bathroom Cleaner	Pink Cleaner	0.10 J	0	0.06 J	0.06 J
WX-2-5-1	Waxie Foaming Luxury Hand Soap	Pink Soap	0.02 J	0	0.006	0.01 UJ

Component ID	Component Description	Component Material	tPCB Concentration (ppb)	Number of PCB Congeners Detected (as Qualified) > = Approximately 0.5 ppb	PCB-11 Concentration (ppb)	PCB Homolog Total Dichlorobiphenyl (tDiCB) Result (ppb)
WX-2-6-1	Alpha-HP Multi-Surface Cleaner	Cleaner	0.29 J	0	0.12	0.18 J
WX-2-7-1	Glance NA Glass & Multi-Surface Cleaner	Non- Ammoniated Blue Cleaner	0.15 J	0	0.02	0.03 J
WX-2-8-1	GS Neutral Cleaner Concentrate	Cleaner Concentrate	0.21 J	0	0.04	0.06 J
WX-2-9-1	Dial Basics Liquid Hand Soap	Soap	0.01 J	0	0.004 UJ	0.01 J

ppb = parts per billion

tDiCB = total dichlorobiphenyl

J = analyte was positively identified, and the associated value is an estimate.

UJ = non-detect due to the result at less than five times the concentration found in the associated lab method blank and below the LOQ (limit of quantitation).

Table A-2. Recoveries of labeled injection and clean-up standards for select component samples.

Component ID	Labeled Standard	Recovery (%)	Validation Qualifier: Detects	Validation Qualifier: Non-Detects
WX-2-2-1	¹³ C ₁₂ -PCB-003	10	J	UJ
WX-2-2-1	¹³ C ₁₂ -PCB-004	10	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-81	9	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-104	9	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-105	8	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-114	8	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-118	8	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-123	8	J	UJ
WX-2-3-1	¹³ C ₁₂ -PCB-126	8	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-001	8	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-003	10	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-105	9	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-114	10	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-118	10	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-123	10	J	UJ
WX-2-4-1	¹³ C ₁₂ -PCB-126	10	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-001	7	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-003	9	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-015	9	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-105	9	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-114	9	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-118	9	J	UJ

Component ID	Labeled Standard	Recovery (%)	Validation Qualifier: Detects	Validation Qualifier: Non-Detects
WX-2-6-1	¹³ C ₁₂ -PCB-123	9	J	UJ
WX-2-6-1	¹³ C ₁₂ -PCB-126	9	J	UJ
WX-2-7-1	¹³ C ₁₂ -PCB-001	8	J	UJ
WX-2-7-1	¹³ C ₁₂ -PCB-003	7	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-004	10	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-019	8	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-054	8	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-104	8	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-155	10	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-156/157	10	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-163	10	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-169	10	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-188	8	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-202	9	J	UJ
WX-2-8-1	¹³ C ₁₂ -PCB-206	9	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-105	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-114	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-118	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-123	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-126	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-188	9	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-205	8	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-206	8	J	UJ

Component ID	Labeled Standard	Recovery (%)	Validation Qualifier: Detects	Validation Qualifier: Non-Detects
WX-2-9-1	¹³ C ₁₂ -PCB-208	7	J	UJ
WX-2-9-1	¹³ C ₁₂ -PCB-209	6	J	UJ

J = estimate, may indicate potential high bias in the detected results.

UJ = non-detect due to possible false negatives.