PCBs in State Purchased Products – Vehicle and Ferry Lubricants 2017

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Abstract

In 2017, the Washington State Department of Ecology (Ecology) conducted a study to assess the levels of PCBs in products available from state contracts. Washington State law (RCW 39.26.280 and RCW 39.26.290) requires state agencies to limit the purchase of products and packaging containing PCBs. The Washington State Department of Enterprise Services (DES) leads the implementation of the law. This study was carried out to assist state agencies in identifying where PCBs may be present in a subgroup of state purchased products from state contracts.

The study investigated the potential for PCBs to be present in some vehicle and ferry lubricants available from Washington state contracts. Ecology collected 11 vehicle lubricant samples currently in use by the City of Seattle and seven ferry lubricant samples currently for purchase from the contract vendor, Maxum Petroleum, at the time of this study in 2017. The 18 samples were analyzed for PCBs. These samples consisted of a variety of product types categorized as engine oil (diesel and gasoline), hydraulic oil, automotive gear oil, automatic transmission fluid, and grease.

All 18 lubricant samples tested had detectable levels of total PCBs. Total PCB concentrations ranged from 0.00580 J, as an estimate, to 14.0 J, as an estimate, part per billion (ppb) in the samples from a variety of lubricant types. Three of the 18 samples had total PCBs above 1 ppb.

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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 1 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. The 209 individual PCB compounds are known as congeners and designated by a congener number 1 through 209 (EPA 2022).

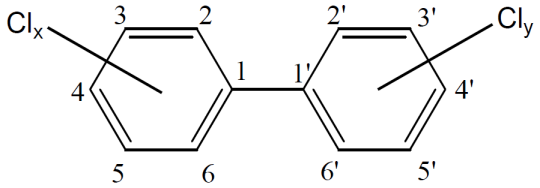

Figure 1. The general chemical structure of chlorinated biphenyls (ATSDR 2000).

PCBs were manufactured as chemical mixtures made up of a variety of the different congeners. The most common commercial PCB mixtures in the U.S. are known by their industrial trade name Aroclor (EPA 2022). Aroclors are identified by number (e.g., 1254), with the last two digits representing the percent content of chlorine; higher Aroclor numbers reflect higher chlorine content (ATSDR 2000). Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications (Ecology and Health, 2015). PCBs are identified as persistent, bioaccumulative, and toxic chemicals (PBTs). They are persistent in the environment, build up in the food chain, and can cause adverse health effects in humans and wildlife including cancer and harm to immune, nervous, and reproductive systems (Ecology and Health, 2015).

The manufacture of PCBs, such as Aroclors, for intentional use in products was restricted in the U.S. more than 30 years ago. Products may still contain PCBs at an annual average of less than 25 parts per million (ppm) with a 50 ppm maximum, under the U.S. Toxic Substances Control Act (TSCA; EPA 1979). PCBs continue to be generated as inadvertent byproducts in manufacturing processes, 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. When present, inadvertent PCBs may be released from products during their use and eventual disposal.

PCBs in Lubricants

In 2017, the 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 Washington State Department of Enterprise Services (DES) leads the implementation of the law. This study was carried out to assist state agencies in identifying where PCBs may be present in a subgroup of state purchased products from state contracts.

DES oversees Washington state master contracts of vendors supplying goods and services to state agencies, local and tribal governments, public school districts and colleges, and nonprofit organizations (DES 2020). Lubricants used for vehicles and ferries are available for purchase from Washington state contracts. This study investigated the potential for PCBs to be present in some vehicle and ferry lubricants from state contracts. Ecology collected 11 vehicle lubricant samples currently in use by the City of Seattle and seven ferry lubricant samples currently for purchase from the contract vendor, Maxum Petroleum, at the time of this 2017 study. All 18 lubricant samples were analyzed for PCBs. The samples consisted of a variety of product types categorized as engine oil (diesel and gasoline), hydraulic oil, automotive gear oil, automatic transmission fluid, and grease.

Methods

Sample Collection

The project plans for this study are:

- PCBs in State Purchased Products – 2017: Addendum to Quality Assurance Project Plan: Product Testing Program, Version 1.0 (Trumbull, 2017a)
- Addendum 1 to PCBs in State Purchased Products – 2017: Addendum to Quality Assurance Project Plan: Product Testing Program, Version 1.0 (Trumbull, 2017b)

Samples were not stored at reduced temperature but instead at ambient temperatures after collection and during shipment to the contract lab, a deviation from the project plan. This deviation is considered to not have adversely impacted the reported study data quality.

Ecology collected 11 vehicle lubricant samples from the City of Seattle on March 28, 2017, and seven ferry lubricant samples from Maxum Petroleum in Seattle, WA on April 10, 2017. An employee at the business location dispensed each donated sample of lubricant from an automatic pump with a hose connected to a drum (for vehicle lubricants) or large tank (for ferry lubricants) into a certified clean 8-ounce glass sample jar. Jars were filled at least about one-third full of lubricant. Samples of unused lubricants were collected and tested for this study. Photographs were taken documenting the product label on the drum or label identifying the bulk product dispensed from the pump. One of the seven lubricant samples collected from Maxum Petroleum was an opened tube of a grease lubricant currently in use; the entire tube with the remaining unused grease (about one-half full) was collected and tested.

Lubricant samples were labeled with a unique Ecology identification number (ECY ID). For example, the ECY ID lubricant sample CS-1-1-1 corresponds to: CS for the City of Seattle (or MP for Maxum Petroleum), the first 1 indicates the first time Ecology collected samples from CS, the second 1 refers to a unique lubricant product at the location, and the third 1 indicates the first sample from the product.

Laboratory Analysis and Data Quality

ALS Life Sciences – Environmental Division (ALS) in Burlington, Ontario, Canada – extracted the lubricant samples with hexane using modification of EPA Method 1668C. The sample extracts were analyzed for all 209 PCB congeners by high-resolution gas chromatography mass spectrometry in accordance with EPA Method 1668C (EPA 2010).

Ecology's Manchester Environmental Laboratory Quality Assurance Coordinator performed a stage 4 validation to verify that the data were generated following the analytical method with no omissions or errors (EPA 2009, EPA 2020). The project manager also reviewed all the data. Data were deemed usable as qualified.

PCB congener concentrations below the limit of quantitation (LOQ) and above the estimated detection limit (EDL) were qualified "J" (indicating 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.

Measurement quality objectives (MQOs) were met with the following exceptions:

- The sample result of an analyte above the LOQ (CS-1-3-1 for PCB-11) was qualified "J," as an estimate, because the lab duplicate did not meet the MQO for the relative percent difference.
- The non-detected result in a sample for an analyte with low surrogate recovery (MP-1-1-1 for PCB-155 with less than 10% recovery) was qualified "REJ," as rejected, due to deficiencies in the ability to analyze the sample and meet quality control criteria.
- Eight analytes in three samples had high surrogate recovery (above 145%). Two of these analytes (CS-1-4-1 for PCB-105 and PCB-118) were detected below the LOQ and already qualified "J," as estimates, while the other six analytes were not detected above the EDL and not further qualified:
  - CS-1-2-1 for PCB-126.
  - CS-1-3-1 for PCB-209.
  - CS-1-4-1 for PCB-81, PCB-105, PCB-114, PCB-118, PCB-123, and PCB-126.
- Broad regions of suppressed lock-mass signal near the retention time of some PCB congeners were observed in three samples (CS-1-2-1, CS-1-3-1, and CS-1-4-1).
  - The reported values for CS-1-2-1 for PCB-21/33 and PCB-44/47/65 may be biased low.
    - PCB-21/33 was positively identified below the reported LOQ, and PCB-44/47/65 was tentatively identified in the sample.
    - Both were qualified "UJ" due to PCBs in the associated lab method blank.
  - For CS-1-3-1, no PCB was detected in the affected region.
  - The reported values for CS-1-4-1 for PCB-61/70/74/76 and PCB-66 may be biased low.
    - Both were tentatively identified in the sample, and PCB-61/70/74/76 was qualified "UJ" due to PCBs in the associated lab method blank.

Total PCB (tPCB) 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 has been 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 were qualified "J," as estimates.

All PCB concentrations are reported on an as-received (wet weight) basis in picogram per gram (pg/g) and have been converted to nanogram per gram (ng/g) for reporting in Table 1. PCB data

are available for download in Ecology's product testing database[1] by searching *PCBs in State Purchased Products – Vehicle and Ferry Lubricants 2017.*

Results for Total PCBs

ALS analyzed 18 lubricant samples for all 209 PCB congeners. Total PCB (tPCB) concentrations were calculated according to the procedure outlined in the previous Data Quality section. Table 1 reports the results for tPCBs in the 18 lubricant samples. The tPCBs levels above 1 part per billion (ppb, equivalent to ng/g) in the table are highlighted in green. For assessing data in this study, results above 1 ppb tPCBs are identified in the discussion and tables. The value of 1 ppb was selected for discussion purposes and does not represent a regulatory level.

Results by Lubricant Product Type

The product type for each sample of lubricant was either described on the product label (if available), product safety data sheet (SDS), product data sheet, and/or product website (see Table 1).

Many lubricants are classified according to their viscosity, which is the measure of a fluid's resistance to flow (shear stress) under certain conditions, and are numbered using industry-standard scales. The International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are the two most common industry scales; they use different scales to measure viscosity (Oil Viscosity 2014).

- Engine oils are measured on an SAE crankcase scale.
- Gear oils are measured on their own SAE gear scale.
- Hydraulic fluids are measured on an ISO viscosity grade (VG) scale.

Both SAE scales measure kinematic viscosity at 100 degrees Fahrenheit, while the ISO scale measures kinematic viscosity at 40 degrees Celsius (Oil Viscosity 2014). Oils from the different systems may have the same viscosity but are numbered on a different number scale. In general, the higher the number, the greater its viscosity (e.g., ISO 46 has greater viscosity than ISO 32).

SAE has both single grade (also called monograde) and multigrade scales for both engine oils and gear oils (Oil Grades 2017, Gear Oil 2019). Multigrade oils are designed to have two different flows, one when it is cold and one when an engine is warm (Oil Grades 2017). They have two numbers separated by a W, which stands for "winter". For example, SAE 15W-40, with the number preceding the W indicates the viscosity of the oil when cold, and the number after the W indicates its viscosity when hot (Oil Grades 2017).

[1] https://apps.ecology.wa.gov/ptdbreporting/

Table 1. Summary Results for PCBs in Lubricant Samples

Number	ECY ID	Lubricant Brand	Lubricant Product Name	tPCBs (ng/g or ppb)	Lubricant Type*	Lubricant Color*	PCB Congener(s) above 1 ppb (concentration in ppb)
1	CS-1-1-1	Phillips 66[#]	Firebird® Heavy Duty EC SAE 15W-40	0.209 J	engine oil (diesel)	amber	na
2	CS-1-2-1	Phillips 66[#]	Mercon® V ATF	0.00629 J	automatic transmission fluid	red	na
3	CS-1-3-1	Allison Transmission	TranSynd™ Synthetic Transmission Fluid	0.198 J	automatic transmission fluid	red	na
4	CS-1-4-1	Phillips 66[#]	Triton® Synthetic Gear Lubricant SAE 80W-140	0.472 J	automotive gear oil	amber	na
5	CS-1-5-1	Phillips 66[#]	Triton® Syngear FE SAE 75W-90	0.0444 J	automotive gear oil	amber	na
6	CS-1-6-1	Phillips 66[#]	76® Super Synthetic Blend Motor Oil SAE 5W-20	0.151 J	engine oil (gasoline)	amber	na
7	CS-1-7-1	Chevron	Clarity® Hydraulic Oil AW 46	0.154 J	hydraulic oil	colorless	na
8	CS-1-8-1	Chevron	Chevron 1000 THF	14.0 J	hydraulic oil[+]	orange	PCB-85/110/115/116/117^ (1.37) PCB-90/101/113^ (1.05) PCB-118 (1.07)
9	CS-1-9-1	Phillips 66[#]	Megaflow® AW Hydraulic Oil 32	0.670 J	hydraulic oil	colorless to yellow	na
10	CS-1-10-1	Phillips 66[#]	MP Gear Lube SAE 80W-90	0.572 J	automotive gear oil	amber	na
11	CS-1-11-1	Phillips 66[#]	Guardol QLT® SAE 15W-40	0.360 J	engine oil (diesel)	light brown	na
12	MP-1-1-1	Chevron	Ultra-Duty Grease EP	0.476 J	grease	red	na
13	MP-1-2-1	Chevron	Rando® HD ISO 32	0.336	hydraulic oil	colorless to yellow	na

Number	ECY ID	Lubricant Brand	Lubricant Product Name	tPCBs (ng/g or ppb)	Lubricant Type*	Lubricant Color*	PCB Congener(s) above 1 ppb (concentration in ppb)
14	MP-1-3-1	Chevron	Delo® 710 LE SAE 20W-40	0.522	engine oil (diesel)	brown	na
15	MP-1-4-1	Chevron	Rando® HD ISO 46	1.85	hydraulic oil	colorless to yellow	PCB-11 (1.78)
16	MP-1-5-1	Chevron	Delo® 100 Motor Oil SAE 40	5.19	engine oil (diesel)	amber	PCB-11 (4.90)
17	MP-1-6-1	Chevron	Delo® 400 SAE 40	0.00580 J	engine oil (diesel)	light brown	na
18	MP-1-7-1	Chevron	Delo® 400 LE SAE 15W-40	0.00683 J	engine oil (diesel)	brown	na

Green shaded results represent tPCB concentrations above 1 ppb.
J = tPCB calculations were qualified "J" when 10% or more of the detected congener concentration results were qualified "J" as estimates.
*Additional product information was collected from the product label, product safety data sheet, product data sheet, and or product website if available.
#Some of the Phillips 66 brand lubricants collected in 2017 were from products with labels still having the 76 Lubricants brand on the containers. The 76 Lubricants brand was consolidated into other Phillips 66 brands in 2016 and many products remain available under the Phillips 66 brand (Phillips 66 Brand 2016).
+Chevron 1000 THF is categorized for this study as a hydraulic oil as on the Chevron product website, the product SDS lists this as a tractor hydraulic fluid & wet brake and on the product label as a transmission fluid.
^Co-elution of congeners quantified as a mixture of more than one congener during laboratory analysis (EPA 2010).
na = PCB congener(s) not above 1 ppb.

Seven of the 18 lubricant samples were engine oils: six were engine oils for diesel engines and one was an engine oil for gasoline engines. Diesel and gasoline engine oils have a similar composition. They are formulated from the blending of base oils and additives that enhances their properties to achieve a set of desired performance characteristics (Engine Oils 2020). Compared to gasoline engine oils, diesel engine oils typically have more additives per volume in the formulation and a higher viscosity. Diesel engine oils also use a higher engine anti-wear (AW) additive (Engine Oils 2020).

One of seven engine oil samples was above 1 ppb tPCBs. Chevron Delo® 100 Motor Oil SAE 40 (MP-1-5-1) had 5.19 ppb tPCBs. It is a diesel engine oil for use in two and four-stroke diesel engines in farm machinery and construction equipment, as well as in marine and other off-highway applications (Chevron Lubricants 2020a).

Six of seven engine oil samples were below 1 ppb tPCBs. Five of these six samples were diesel engine oils:

- Chevron Delo® 710 LE SAE 20W-40 (MP-1-3-1).
- Phillips 66 Guardol QLT® SAE 15W-40 (CS-1-11-1).
- Phillips 66 Firebird® Heavy Duty EC SAE 15W-40 (CS-1-1-1).
- Chevron Delo® 400 LE SAE 15W-40 (MP-1-7-1).
- Chevron Delo® 400 SAE 40 (MP-1-6-1).

One of these six engine oil samples below 1 ppb tPCBs was a gasoline engine oil, Phillips 66 76® Super Synthetic Blend Motor Oil SAE 5W-20 (CS-1-6-1).

Five of the 18 lubricant samples are categorized as hydraulic oil. Hydraulic oil is used as the means by which power is transferred throughout the hydraulic system and also can act as a lubricant, coolant, and sealant within hydraulic machinery and equipment (Hydraulic Oil 2020).

Two of five hydraulic oil samples were above 1 ppb tPCBs:

- Chevron 1000 THF (CS-1-8-1) at 14.0 J ppb tPCBs.
- Chevron Rando® HD ISO 46 (MP-1-4-1) at 1.85 ppb tPCBs.

Chevron 1000 THF is described as a multifunctional tractor hydraulic fluid, specially formulated for use in transmissions, final drives, wet brakes, and hydraulic systems of tractors and other equipment using a common fluid reservoir (Chevron Lubricants 2020b). Chevron Rando® HD ISO 46 is described to be formulated with premium base oil technology to give robust protection to hydraulic pumps in mobile and stationary systems and recommended for vane, piston, or gear-type pumps, especially where pressures exceed 1000 pounds per square inch (psi), and lightly loaded reciprocating compressors (Chevron Lubricants 2020c).

Three of five hydraulic oil samples were below 1 ppb tPCBs:

- Phillips 66 Megaflow® AW Hydraulic Oil 32 (CS-1-9-1).
- Chevron Clarity® Hydraulic Oil AW 46 (CS-1-7-1).
- Chevron Rando® HD ISO 32 (MP-1-2-1).

The Chevron Rando® HD ISO 32 (MP-1-2-1) is described similar to the Chevron Rando® HD ISO 46 oil, with the main difference in the ISO viscosity grade, ISO 32 compared to ISO 46.

Three of 18 lubricant samples are automotive gear oil. Automotive gear oil is a lubricant made for transmissions, transfer cases, and differentials in vehicles. It is a high-viscosity lubricant,

and the additives usually contain sulfur compounds for extreme pressure and anti-wear (Wikipedia 2020a).

All three automotive gear oil samples were below 1 ppb tPCBs:

- Phillips 66 MP Gear Lube SAE 80W-90 (CS-1-10-1).
- Phillips 66 Triton® Synthetic Gear Lubricant SAE 80W-140 (CS-1-4-1).
- Phillips 66 Triton® Syngear FE SAE 75W-90 (CS-1-5-1).

Two of 18 lubricant samples are automatic transmission fluid. Automatic transmission fluid (ATF) is used in vehicles with self-shifting or automatic transmissions to lubricate the components and to act as a coolant (Wikipedia 2020b). It is typically red in color to distinguish it from other fluids in vehicles.

Both automatic transmission fluid samples were below 1 ppb tPCBs:

- Allison Transmission TranSynd™ Synthetic Transmission Fluid (CS-1-3-1).
- Phillips 66 Mercon® V ATF (CS-1-2-1).

The one grease sample was below 1 ppb tPCBs. Chevron Ultra-Duty Grease EP (MP-1-1-1) is described as a versatile, high-pressure grease with good adhesive properties designed for a wide variety of automotive and industrial applications (Chevron Lubricants 2020d).

In this study, the type of lubricant product by engine oil, hydraulic oil, automotive gear oil, automatic transmission fluid, and grease, did not indicate greater levels of tPCB or levels of tPCBs above 1 ppb. In 18 lubricant samples tested, three were above 1 ppb tPCBs: two categorized as hydraulic oils and one categorized as an engine oil (diesel).

Results for PCB Congeners

PCB congeners (individual or co-eluting) detected at a concentration greater than 1 ppb in each lubricant sample are listed in Table 1. In three of the 18 samples, at least one or more PCB congener was detected above 1 ppb.

PCB-11 was identified as the only congener detected above 1 ppb in two of 18 lubricant samples. PCB-11 was detected at the greatest concentration of a PCB congener at 4.90 ppb in the Chevron Delo® 100 Motor Oil SAE 40 lubricant (MP-1-5-1). The other sample was the Chevron Rando® HD ISO 46 lubricant (MP-1-4-1) at 1.78 ppb PCB-11. PCB-11 comprised the majority of the tPCB results greater than 90% in both lubricant samples. PCB-11 is not present in Aroclor mixtures of known PCB congener composition (ATSDR 2000).

Three individual or co-eluting PCB congeners were detected just above 1 ppb in the Chevron 1000 THF lubricant sample (CS-1-8-1): PCB-85/110/115/116/117 at 1.37 ppb, PCB-90/101/113 at 1.05 ppb, and PCB-118 at 1.07 ppb. Each comprised less than 10% of the tPCB result in this sample.

For co-eluting PCB-85/110/115/116/117, PCB-85 is found in some Aroclor mixtures at up to 2.5%, PCB-110 at up to 9.3%, PCB-115 at less than 0.5%, PCB-116 is not present, and PCB-117 at less than 0.5% if present of the total mixture by weight (ATSDR 2000). For co-eluting PCB-90/101/113, PCB-90 is found in some Aroclor mixtures at trace levels, PCB-101 at up to 8.0%, and PCB-113 at less than 0.5% if present of the total mixture by weight (ATSDR 2000). PCB-118 is found in some Aroclor mixtures at up to 13.6% of the total mixture by weight (ATSDR 2000).

Conclusions

All 18 lubricant samples tested had detectable levels of tPCBs in a variety of lubricant types. The tPCB concentrations ranged from 0.00580 J, as an estimate, to 14.0 J, as an estimate, ppb in the samples. These results were below the 50 ppm TSCA limit. Three of the 18 lubricant samples had tPCBs above the 1 ppb discussion level. Table 2 displays the distribution of tPCB results by concentration range in the lubricant samples.

Table 2. Total PCB Results (ppb) by Concentration Range

Lubricant Samples	< 0.50	0.50 to < 1	1 to < 10	10 to < 100	≥ 100
18	12	3	2	1	0

The exact source of PCBs in the lubricant samples is unknown. For the three samples with tPCBs over 1 ppb, the composition of the lubricant as listed on the SDS did not indicate a likelihood to contain PCBs. Only highly refined mineral oil (C15-C50) between 70% to 99% weight was listed on the SDS for these lubricants but was also listed on the SDS for many of the other lubricants that had tPCBs below 1 ppb in the sample.

Lubricants can contain additives which can make up to about 30% of the finished lubricant product depending on the application of the lubricant (Lubricant Additives 2020). Chemical additives mixed into the base oil, whether mineral-based or synthetic-based:

- enhance existing base oil properties with antioxidants, corrosion inhibitors, anti-foam agents, and demulsifying agents,
- suppress undesirable base oil properties with pour point depressants and viscosity index improvers,
- and impart new properties with extreme pressure additives, detergents, metal deactivators, and tackiness agents (Lubricant Additives 2020).

Dyes may also be added to give the lubricant a specific color, such as red, for some automatic transmission fluids (Oil Color 2020).

PCBs could also be introduced through sampling, even though routes to minimize contamination of the samples were taken (e.g., avoiding touching the nozzle to the sample jar). The samples were dispersed through a hose and nozzle which could potentially contribute to PCBs in the lubricant samples.

PCB-11 is considered a key indicator of inadvertent PCBs, as it is not typically found in Aroclor mixtures and is primarily associated with color pigments, especially yellow (Hu and Hornbuckle 2010). PCB-11 was the major PCB congener detected with tPCBs above 1 ppb in two of the three lubricant samples (MP-1-4-1 and MP-1-5-1). In the other sample (CS-1-8-1) with tPCBs above 1 ppb, several of the PCB congeners, as individual or co-eluting congeners, are found in Aroclor mixtures (ATSDR 2000). Although, PCB congeners found in Aroclor mixtures are not necessarily from Aroclors and may be inadvertently produced.

The City of Spokane tested lubricant samples in 2011 and 2014 (City of Spokane 2015). In 2011, five lubricant samples consisting of three motor oils and two automatic transmission fluids from off-the-shelf products were tested and reported to have tPCBs between 8.8 to 116 ppb. In 2014, five lubricant samples consisting of one bulk engine oil, one off-the-shelf engine

oil (the same product name sampled in 2011 with the greatest detected concentrations of PCBs), one gear oil, and two used samples of the bulk engine oil were tested by the city (City of Spokane 2015). The three samples of new, unused lubricants in 2014 had tPCB concentrations between 0.623 and 0.969 ppb and were more comparable to the results in this 2017 study. The two samples of the bulk engine oil after the oil was used in the vehicles had 0.502 ppb and 2.375 ppb tPCBs.

One of the products tested in this 2017 study was the same product name as a product tested in 2014, the Phillips 66 Firebird® Heavy Duty EC SAE 15W-30 bulk engine oil. The City of Spokane reported 0.856 ppb tPCBs in the engine oil, while this 2017 study detected 0.209 J ppb tPCBs.[2]

Washington State law states 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). However, no established standardized practical quantitation limits (PQLs) exist for PCBs in products. The law also states that DES "may request suppliers of products to provide testing data" documenting the level of PCBs in products and packaging but does not require testing every product procured (RCW 39.26.290). In 2019, DES Policy (DES-280-00, 2019) established the purchasing preference to incentivize the State's contract suppliers to provide products and product packaging that do not contain PCBs.

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[2] PCB congener results were evaluated at levels less than three times the concentrations found in the associated lab method blank for the 2014 City of Spokane data (City of Spokane 2015). For this 2017 study, PCB congener results were evaluated at levels less than five times the concentrations found in the associated lab method blank.

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