



DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

7 Dec 18

AFCEC/CIB
2261 Hughes Ave., Ste. 155
JBSA Lackland, TX 78236-9853

Ms. Teresa Seidel
Director, Water Resources Division
525 West Allegan Street
P.O. Box 30473
Lansing, MI 48909-7973

RE: Violation Notice No. VN-008900, Substantive Requirements Document (SRD) No.
MIU990034 Designated Name: USAF-Wurtsmith AFB, MI

Dear Ms. Seidel:

The Air Force (AF) acknowledges the receipt of Violation Notice No. VN-008900 (hereinafter "notice of violation" or "NOV") on October 24, 2018, for the former Wurtsmith Air Force Base, Michigan, and hereby provides responses to the concerns raised by the Michigan Department of Environmental Quality (MDEQ). Based on our review of the legal authority for the NOV as cited by MDEQ, the AF is hereby informing you that it will not be taking any new remedial actions at this time. However, the AF will evaluate Michigan's Rule 299.44 as a potential cleanup standard when it reaches the groundwater remedy selection phase under the federal cleanup law. A detailed discussion of the AF basis for this response is provided below.

The NOV addresses the same issues concerning the groundwater-surface water interface (GSI) that MDEQ raised when it invoked dispute under the Department of Defense and State Memorandum of Agreement (DSMOA) on December 14, 2017. MDEQ's dispute invocation claimed in part: "[A]dditional sampling is needed to evaluate compliance with Michigan's statewide criteria for GSI locations as set forth in Part 201. The AF must move more aggressively and more quickly to define and remove the ongoing threat to public health and the environment, starting with the USAF action to provide a long-term potable water supply to affected well users, and followed by response actions to remediate impacted ecosystems, including surface waters, groundwater, fish, birds and mammals." That dispute is ongoing. Therefore, it is inappropriate for MDEQ to issue a violation notice for the same issues that MDEQ is formally disputing with the AF. See Michigan's 1992 DSMOA, Section IV.B., which states: "It is the intention of the parties that all disputes shall be resolved in this manner. ... In the event that the Natural Resources Commission and the Service Secretary are unable to resolve a dispute, the State retains any enforcement authority it may have under State or Federal law." In other words, the DSMOA requires MDEQ to exhaust the dispute resolution process before resorting to issuing a violation notice.

In addition, MDEQ lacks the jurisdictional authority to enforce the NOV. The United States has not waived sovereign immunity with regard to the state regulation on which the NOV is premised. MDEQ's enforcement authority is limited to instances where the federal government has explicitly waived sovereign immunity within the context of an applicable federal statute.

States may impose regulatory authority over federal facilities only to the extent that such regulation is clearly authorized by Congress. Congressional authorizations are generally referred to as "waivers of sovereign immunity." Where no waiver of sovereign immunity exists, the Federal government is not subject to state regulation. *See Mayo v. United States*, 319 U.S. 441, 445 (1943); *see also Department of Energy v. Ohio*, 503 U.S. 607 (1992).

The NOV cites generally to Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), MCL 324.3101 et seq., the administrative rules at AACS R 323.2101 et seq., and the Substantive Requirements Document referenced above, as authority. The NOV further cites a failure to meet water quality standards per section 3109(a) of Part 31. Although the NOV is insufficient to put the AF on notice as to specifically what provisions of Part 31 were violated and exactly how the AF violated the provisions, we have assumed that the MDEQ is alleging a violation of the Clean Water Act (CWA) under Section 3109 NREPA, which pertains to direct and indirect discharges into waters of the United States. While Section 3109(a) NREPA categorizes discharges of "venting groundwater" in the same manner as point source discharges, the CWA does not. Point source discharges are defined as a "discernible, confined and discrete conveyances." 33 U.S.C. § 1362(14). The CWA does not recognize "venting groundwater" as a point source discharge. As such, the regulation of "venting groundwater" into waters of the United States is a construct of state regulation to which the AF has not waived sovereign immunity.

The CWA has four jurisdictional elements that must be met in order for the Act to apply. For the CWA to have jurisdiction there must be a discharge, of a pollutant, from a point source, to a water of the United States. *Nat'l Wildlife Fed'n v. Gorsuch*, 693 F.2d 156, 165 (D.C. Cir. 1982). If any one of those four elements are missing then the CWA has no legal jurisdiction.

"Venting groundwater" is not a point source discharge subject to CWA regulation. NREPA, MCL 324.3109a(3)(b) defines "venting groundwater" as groundwater that is entering a surface water of the state from a facility. The 6th Circuit United States Court of Appeals, which includes both the eastern and western districts of Michigan recently affirmed in two companion cases that groundwater venting to waters of the United States, also known as hydrological connection, does not constitute a point source discharge subject to CWA regulation. *See Tenn. Clean Water Network v. TVA*, 905 F.3d 436, 2018 U.S. App. LEXIS 27237, 2018 FED App. 0214P (6th Cir.), 48 ELR 20166, 86 ERC (BNA) 2677, 2018 WL 4559103. *See also Ky. Waterways All. v. Ky. Utils. Co.*, 905 F.3d 925, 2018 U.S. App. LEXIS 27238, 2018 FED App. 0213P (6th Cir.), 48 ELR 20167, 86 ERC (BNA) 2657, 2018 WL 4559315. Therefore, non-point source discharges of venting groundwater into Clark's Marsh is not subject to CWA jurisdiction. In this instance, the Federal government has waived sovereign immunity only for discharges that are subject to the jurisdiction of the CWA. Where no waiver of sovereign immunity exists, such as for venting groundwater, the AF is not subject to state regulation.

In addition to the CWA arguments set forth above, the AF is immune under 42 USC § 9620(a)(4) from MDEQ's attempts to enforce its venting groundwater standards.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §120(a)(4), codified at 42 USC § 9620(a)(4), only waives the federal government's sovereign immunity for state laws concerning "removal" and "remedial" actions at facilities that are not on the National Priorities List (NPL). (The former Wurtsmith AFB is not on the NPL.) In 42 USC § 9601(23) and (24), Congress defines "remove," "removal," "remedy" and "remedial action" to apply only to the release of "hazardous substances." CERCLA defines "hazardous substance" in 42 USC § 9601(14). That definition only includes substances identified within CERCLA's regulations or by such federal laws as the CWA and the Clean Air Act; the definition of "hazardous substance" does not include any substances identified as a hazardous substance solely under state laws. Because a state-listed hazardous substance does not qualify as a CERCLA "hazardous substance," the federal government waiver of sovereign immunity under 42 USC §9620(a)(4) does not extend to state attempts to enforce against the federal government state requirements concerning environmental contaminants that do not constitute CERCLA "hazardous substances."

Violation Notice No. VN-008900 uses the term "GSI" and cites MCLS § 324.3109a, which is part of Michigan's Part 31 statutes (Water Resources Protection). However, none of the Part 31 statutes (including § 324.3109a) or the Part 4 regulations (Water Quality Standards) use the term "groundwater surface water interface" or "GSI." Rather, those statutes and regulations only use the term "venting groundwater." As previously stated Section 324.3109a(3)(b) defines "venting groundwater" as follows: " 'Venting groundwater' means groundwater that is entering a surface water of the state from a facility, as defined in section 20101" [emphasis added]. (See an almost identical definition in MCLS § 324.20101(1)(ddd).) "Facility" is defined in MCLS § 324.20101(1)(s) as meaning "any area, place, parcel or parcels of property, or portion of a parcel of property where a hazardous substance in excess of the concentrations that satisfy the cleanup criteria for unrestricted residential use has been released, deposited, disposed of, or otherwise comes to be located ..." (emphasis added). The definition of "hazardous substance" in MCLS § 324.20101(1)(x) is more complicated:

"Hazardous substance" means 1 or more of the following, but does not include fruit, vegetable, or field crop residuals or processing by-products, or aquatic plants, that are applied to the land for an agricultural use or for use as an animal feed, if the use is consistent with generally accepted agricultural management practices at the time of the application or stamp sands:

- (i) Any substance that the department demonstrates, on a case by case basis, poses an unacceptable risk to the public health, safety, or welfare, or the environment, considering the fate of the material, dose-response, toxicity, or adverse impact on natural resources.
- (ii) Hazardous substance as defined in the comprehensive environmental response, compensation, and liability act, 42 USC 9601 to 9675.
- (iii) Hazardous waste as defined in part 111.
- (iv) Petroleum as described as a regulated substance in section 21303.

PFOS and PFOA do not qualify as CERCLA hazardous substances; they are CERCLA pollutants or contaminants under 42 USC § 9601(33). PFOS and PFOA also are not hazardous

wastes, and they obviously are not petroleum. Therefore, the only portion of the MCLS § 324.20101(1)(x) definition that PFOS, PFOA or other PFAS could possibly qualify under is (i). However, as explained above, the federal government is immune under 42 USC § 9620(a)(4) from a state enforcing its state laws for the release of anything other than CERCLA hazardous substances. Because Michigan's Part 31 statutes and Part 4 regulations only apply to venting groundwater and the definition of venting groundwater relies on a definition of hazardous substance from which the federal government is immune, MDEQ cannot enforce its Part 31 statutes or Part 4 regulations on the AF.

The second paragraph of the violation notice also makes a very general reference to Michigan's Part 201, Environmental Remediation. MCLS § 324.20120e(23)(c) (Response activity providing for venting groundwater; definitions), includes the following definition for GSI, but § 324.20120e(23) limits its use to § 324.20120e: " 'GSI' means groundwater-surface water interface, which is the location at which groundwater enters surface water." The term "GSI" is not used in any other Part 201 statute, although it does appear in the tables in Rules 299.44, 299.45, and 299.46, as well as in Rule 299.49 (Footnotes for generic cleanup criteria tables). However, the use of the term "GSI" has to be read in context of what the statute and regulations cover. Section 324.20120e only applies to response activities for "venting groundwater." This is stated plainly in subsections (1) and (3). In fact, subsection 324.20120e(3) clearly links venting groundwater to hazardous substances: "The pathway addressed by GSI criteria under subsection (1) shall be considered a relevant pathway when a remedial investigation or application of best professional judgment leads to the conclusion that a hazardous substance in groundwater is reasonably expected to vent to surface water in concentrations that exceed the generic GSI criteria. ..." As explained above in the discussion regarding the Part 31 statutes and Part 4 regulations, "venting groundwater" is tied to hazardous substances, and the federal government is immune under CERCLA from a state enforcing a requirement related to substances that are not CERCLA hazardous substances.

Although the AF is immune under 42 USC § 9620(a)(4) from Michigan's attempt to enforce its venting groundwater statutes and regulations, the AF will evaluate Michigan's Rule 299.44 when it reaches the groundwater remedy-selection phase of its CERCLA actions at the former Wurtsmith AFB.

Congress mandated in 42 USC § 9621(d)(1) the degree of cleanup that the federal government must achieve in its remedial actions and stated that federal agencies had to take remedial actions to address not only CERCLA hazardous substances but also pollutants and contaminants. In addition, 42 USC § 9621(d)(2)(a) requires that federal agencies conducting these remedial actions must comply with promulgated state environmental or facility siting laws that are more stringent than federal requirements that are either applicable or relevant and appropriate to the contaminants of concern at a site. Such applicable or relevant and appropriate requirements are known as "ARARs" in CERCLA cleanup documents.

In short, while the AF is immune under 42 USC § 9620(a)(4) from Michigan's attempt to enforce its venting groundwater statutes and regulations, the AF is bound by 42 USC § 9621(d)(1) to evaluate those same state statutes and regulations as potential ARARs when the AF is choosing remedial actions at Wurtsmith. MDEQ will have a chance during CERCLA's

Feasibility Study stage to identify all state statutes and regulations that it believes the AF should accept as ARARs. See 40 CFR § 300.400(g)(4).

Furthermore, the NOV alleges a violation of the Substantive Requirements Document without explaining how the requirements have been violated. The Substantive Requirements Document pertains to the discharge from the granular activated carbon (GAC) plant facility. It does not cover discharges from the groundwater plume, direct or otherwise. Because direct discharge from the GAC plant facility contains no PFAS compounds, the AF is not in violation of the terms of the Substantive Requirements Document.

Although the AF will not be taking any new actions in response to the NOV, we will continue to work with MDEQ to address many of the issues raised in the NOV. We describe this work in the following paragraphs.

The FT-02 pump and treat system (PTS) began operation in April 2015 and was built in collaboration with MDEQ as an interim action to mitigate the migration of PFOS and PFOA contaminated groundwater from the FT-02 source area to Clark's Marsh. The goal of the PTS is to capture and treat PFOS/PFOA groundwater contamination from FT-02. The AF designed the system to capture groundwater in the plume at concentrations which exceeded the 2009 USEPA drinking water provisional health advisories (PHAs) of 200 parts per trillion (ppt) for PFOS and 400 ppt for PFOA. However, the PTS has proven significantly more effective at capturing PFOS/PFOA.

As part of the AF's ongoing performance evaluation of the FT-02 PTS, annual groundwater samples are collected from 68 monitoring wells. In addition, the PTS influent and effluent is sampled on a monthly basis. Annual groundwater monitoring results and PTS data are provided to MDEQ in an annual remedial action operation (RA-O) report. Data is also uploaded to the state's MiWaters system on a monthly basis.

I am enclosing information that provides the effectiveness of the current PTS for FT-02 including recent 2018 data. Attachment 1 is a figure showing the layout of the FT-02 monitoring wells and PTS. Attachment 2 is a figure showing the progression of decreasing concentrations of PFOS from PTS startup in 2015 to 2018. The data represented in this figure validates the major reductions in PFOS/PFOA in the groundwater before reaching Clark's Marsh from FT-02. Also attached at Attachment 3 is a bar chart depicting concentration decreases from 2015 to 2017. Our calculations show an average decrease in PFOS concentrations of 90 percent from 2015 to 2018 in the wells identified in your NOV letter. The AF believes this demonstrates the FT-02 PTS system is more effective than the original design criteria in 2015. Groundwater monitoring analytical results and GAC treatment system influent/effluent data from 2015 to 2017 (Attachment 4) were provided to the MDEQ electronically on November 8, 2018, but are also attached for your convenience.

As part of the ongoing Supplemental Site Inspection (SSI), the AF has installed vertical aquifer sampling (VAS) wells at eight (8) locations to further delineate both the vertical and horizontal extent of PFOS/PFOA contamination in the area of FT-02. This data will be used to further refine the FT-02 conceptual site model and will also be utilized in modeling the capture

zone of the existing extraction well network. The data will also help determine what additional system expansion might be required as part of an evaluation of remedial options under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

CERCLA requires that on-site remedial actions attain or waive federal environmental Applicable or Relevant and Appropriate Requirements (ARARs), or more stringent state environmental ARARs, during selection of the remedial action. The 1990 National Oil and Hazardous Substances Pollution Contingency Plan (NCP) also requires compliance with ARARs during removal and remedial actions to the extent practicable. Once the CERCLA process has reached the feasibility study phase, an analysis of ARARs will be completed, and the AF will evaluate various remedial action alternatives for Site FT-02. Expansion of the FT-02 PTS may be one of the remedial alternatives evaluated.

Please call me at (210) 395-9428 to discuss the AF responses and current path forward with the FT-02 Compliance Plan. The AF is committed to working with the MDEQ to restore the environment and protect human health.

Sincerely,



STEPHEN G. TERMAATH, GS-15, DAF
Chief, BRAC Program Management Division
Installations Directorate

Attachments:

1. FT02 GAC System Layout
2. FT02 PFOS Comparison 2015 to 2018
3. FT02 Bar Chart Comparison of PFOS Data
4. FT02 PFOA PFOS 2017 Data

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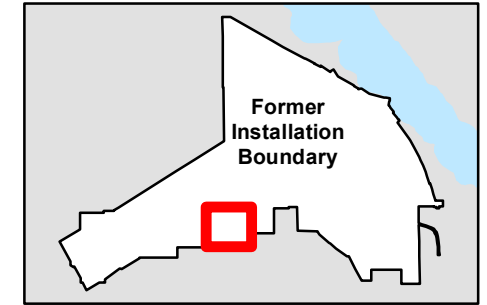


FORMER 50 FOOT IN-SITU
BIODEGRADATION
INFILTRATION TRENCH

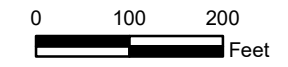
Figure 2-2

Remediation Systems and Monitoring Well Locations Site – FT-02

Wurtsmith BRAC



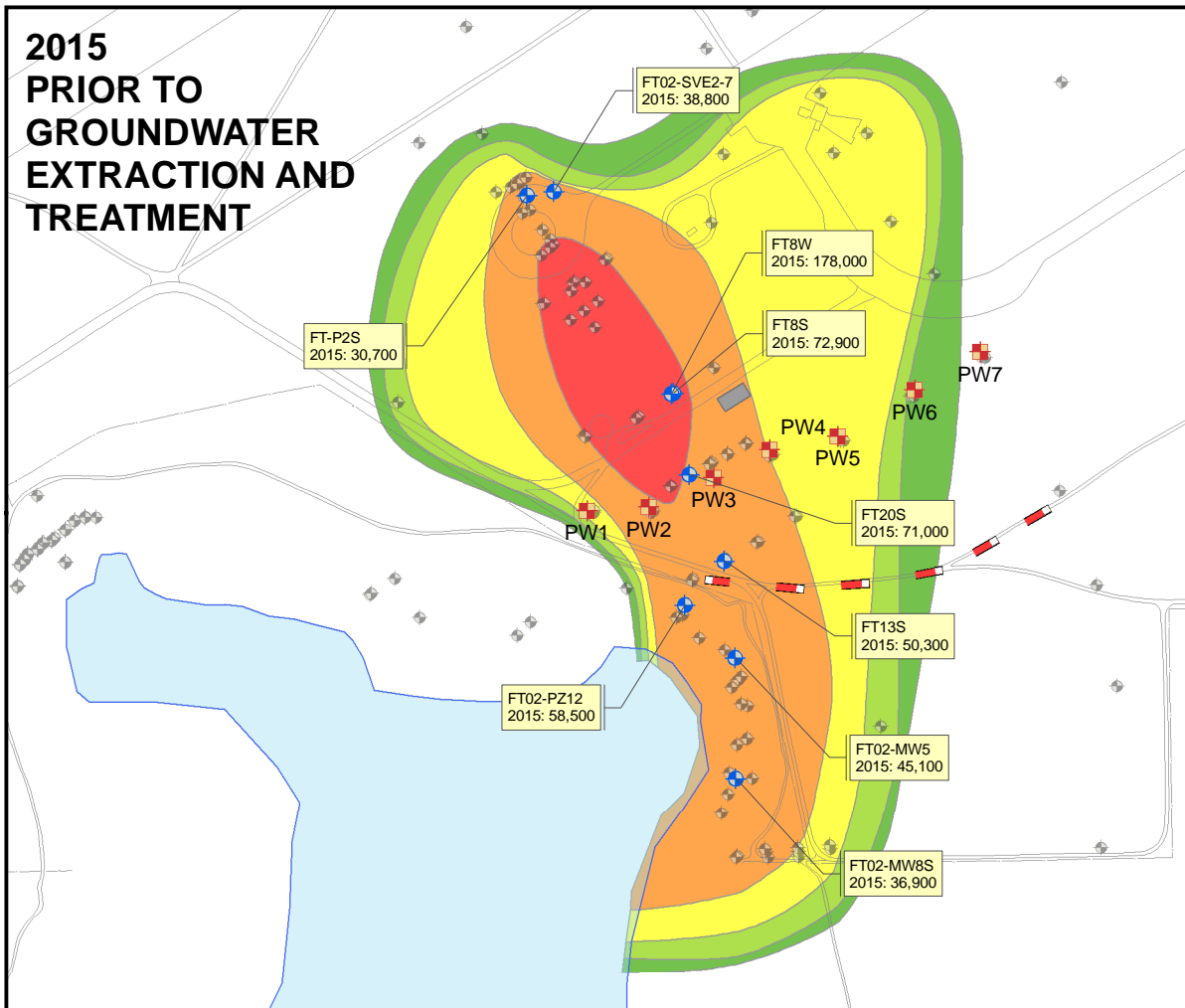
NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl



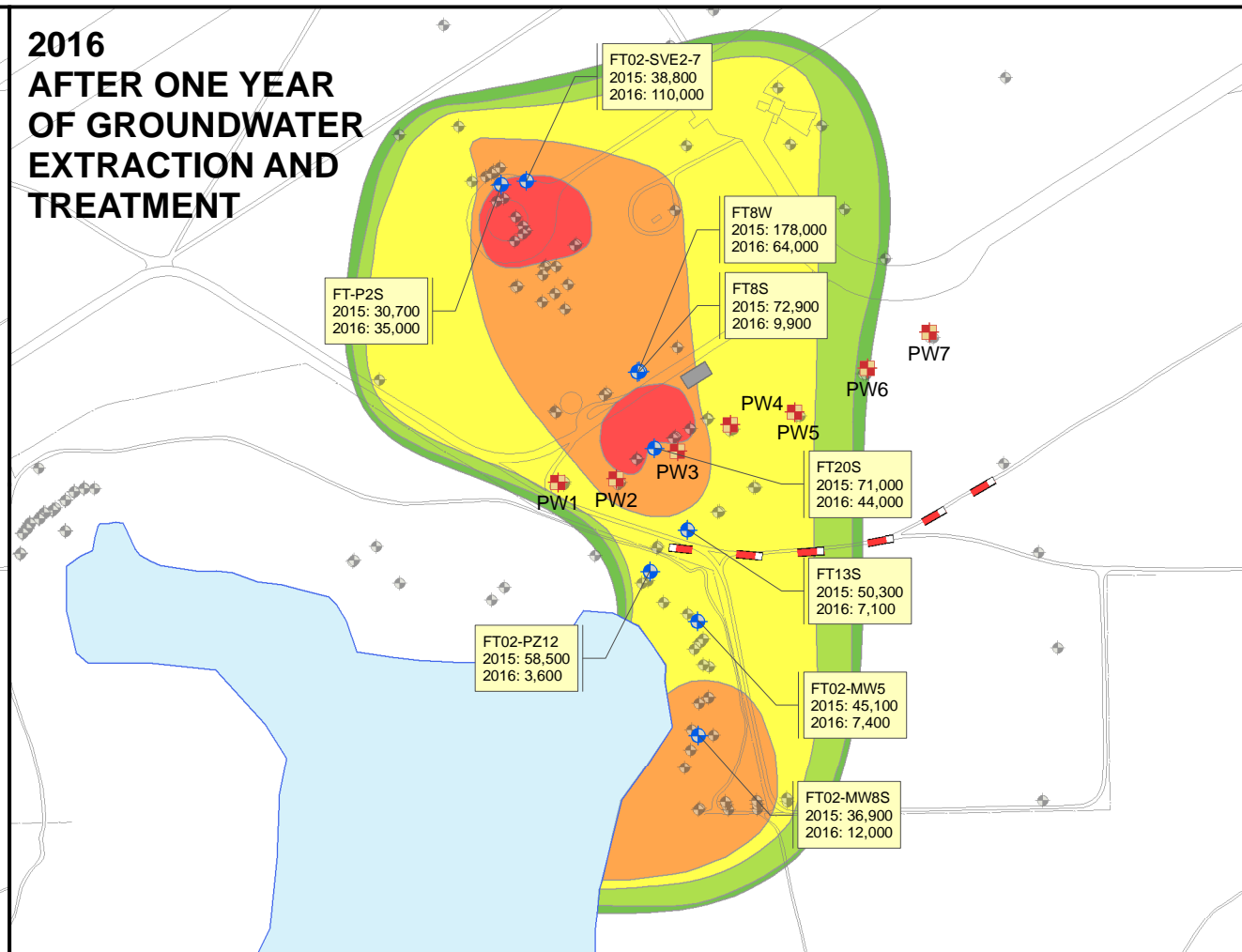
- Operating Purge Well
- Monitoring Well Sampled in 2017
- Monitoring Well/Piezometer
- Soil Vapor Extraction Well Sampled in 2017
- Soil Vapor Extraction Well
- Air Sparge Well (Curtain, 2012)
- Air Sparge Well (Source Area, 2010)
- Cleanout
- Infiltration Trench
- Infiltration Gallery Piping Trench Line
- Purge Well Piping Trench Line
- Former 50 Foot In-Situ Biodegradation Infiltration Trench
- Hanger 7 AFFF Containment Pond Sediment Disposal Pit
- Treatment System Building
- Surface Water Body



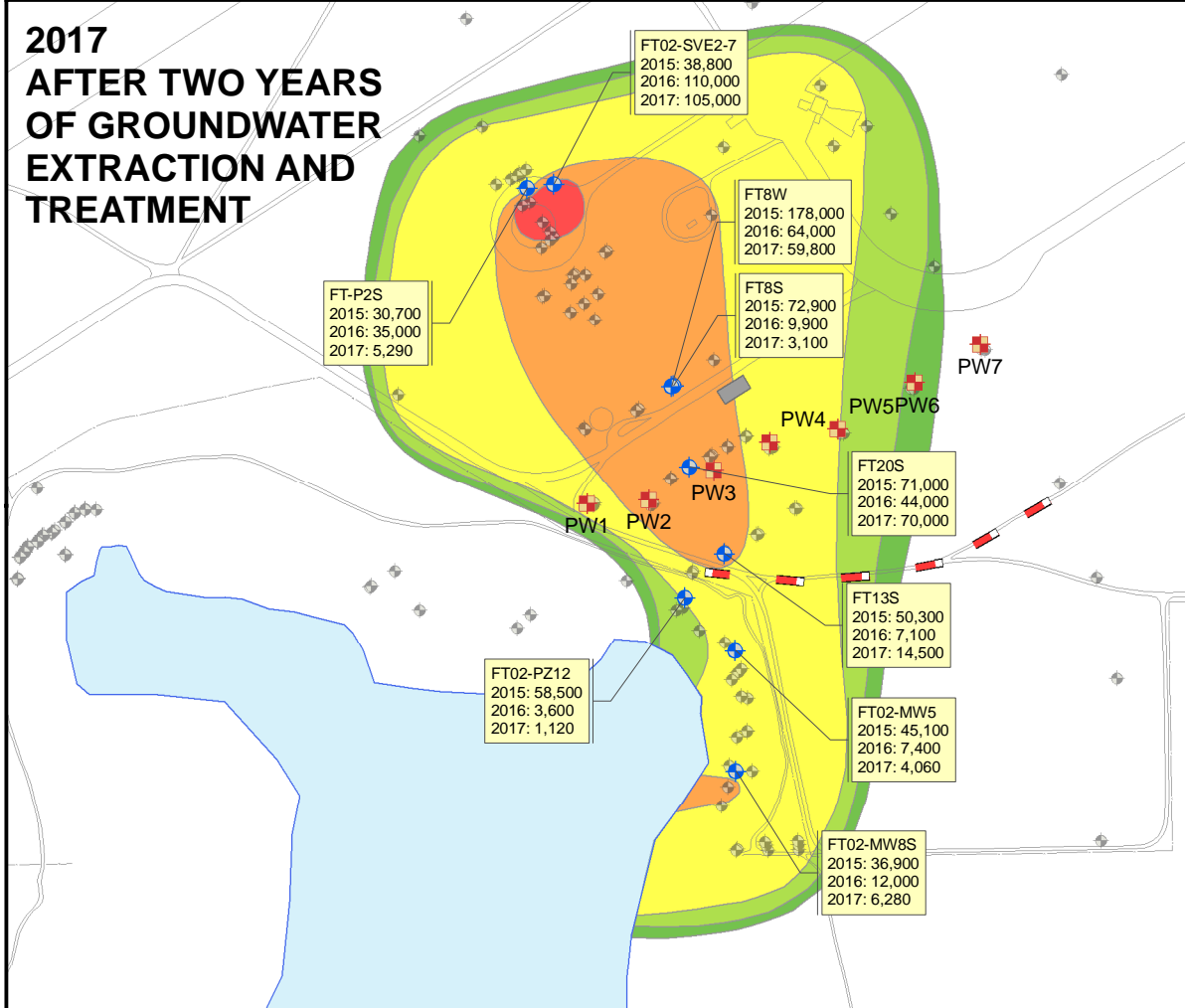
**2015
PRIOR TO
GROUNDWATER
EXTRACTION AND
TREATMENT**



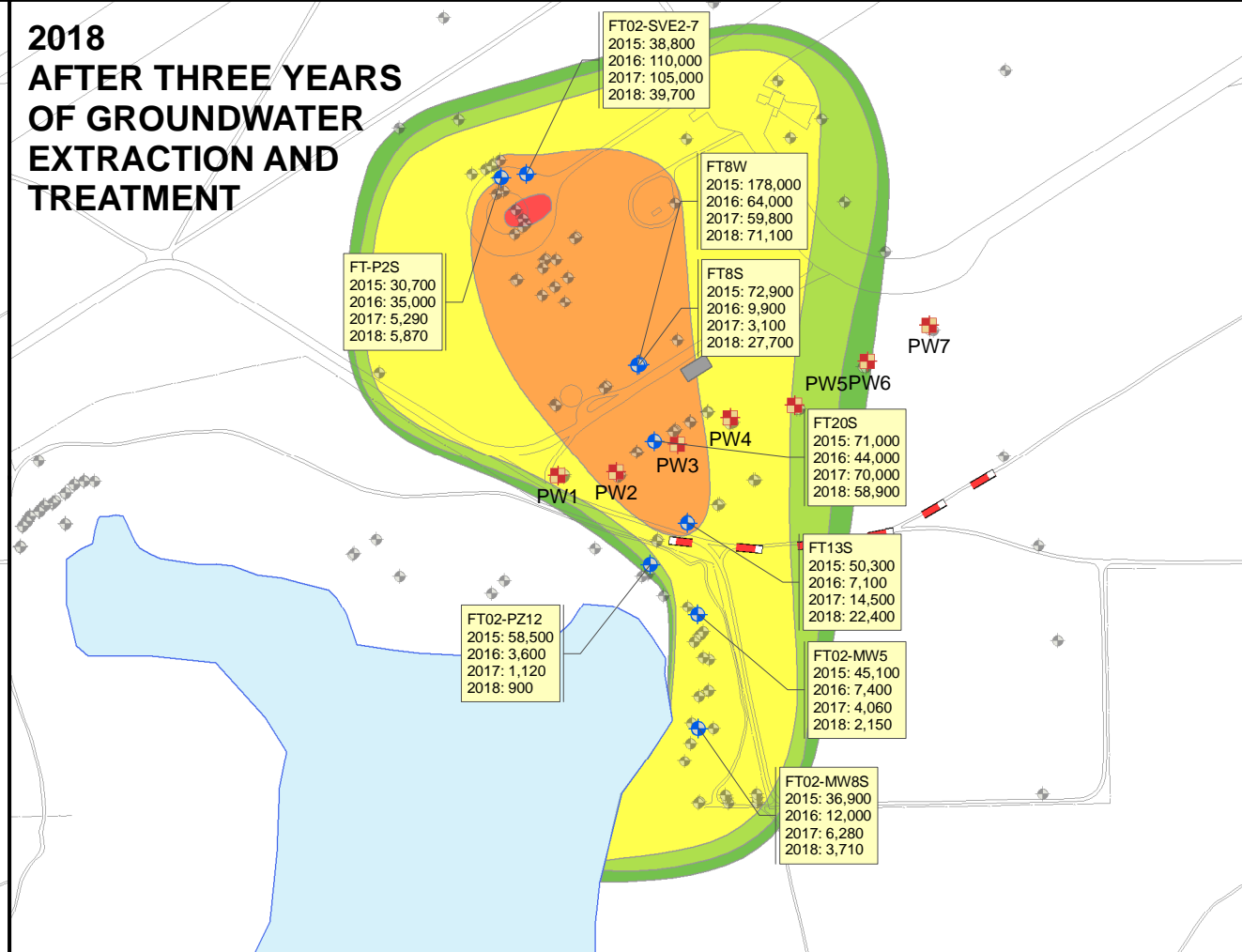
**2016
AFTER ONE YEAR
OF GROUNDWATER
EXTRACTION AND
TREATMENT**



**2017
AFTER TWO YEARS
OF GROUNDWATER
EXTRACTION AND
TREATMENT**



**2018
AFTER THREE YEARS
OF GROUNDWATER
EXTRACTION AND
TREATMENT**

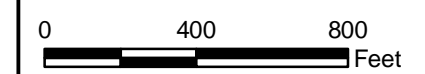
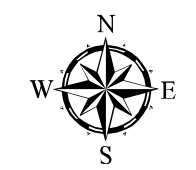


**PFOS Plume
Pre- and Post-Treatment
Comparison (2015 to 2018)
Site FT-02
Wurtsmith Air Force Base**

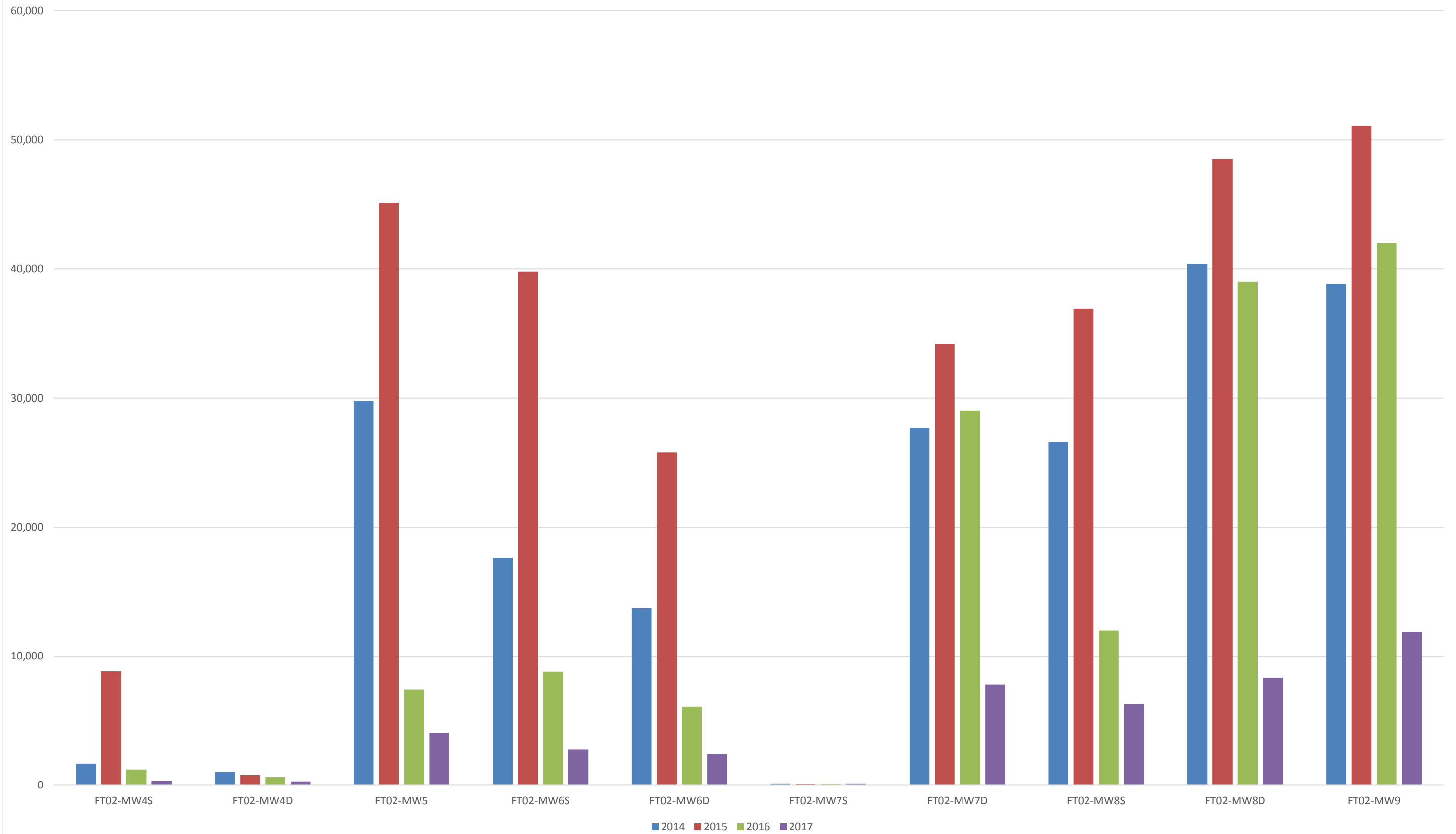
- Legend**
- Highlighted Monitoring Locations
 - Purge Well
 - Other Monitoring Locations
 - Infiltration Gallery
 - Treatment System Building

- PFOS Isoconcentration Contours (ng/L)**
- 200 - 400
 - 400 - 1,000
 - 1,000 - 10,000
 - 10,000 - 100,000
 - > 100,000

- Notes:**
- 1) Plume contours based on the 47 FT-02 wells monitored for PFOS with data from plume centerline well shown for comparison purposes.
 - 2) Not all monitoring well shown on map were analyzed for PFOS.



PFOS Concentration in ppt



PFOS+PFOA Concentration in ppt

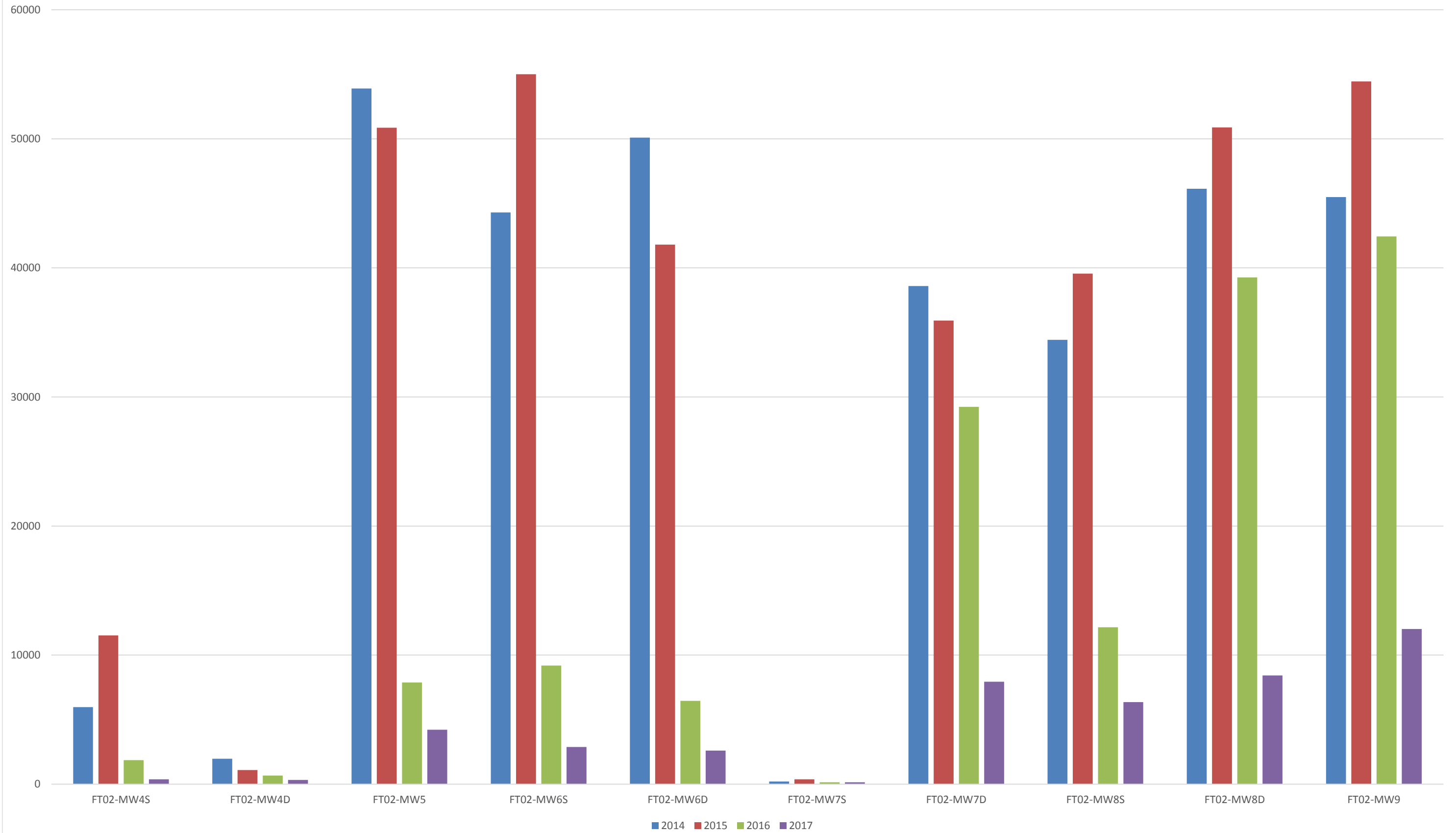


TABLE 1
 FT-02 PUMP AND TREAT SYSTEM SAMPLING RESULTS
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Sample Date	Influent				Intermediate				Effluent				SRD Effluent Limitations	
	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)
4/20/2015	5.61	0.44	115	17.1	<0.016	<0.032	<100	<10.0	<0.017	<0.033	<100	<10.0	0.02	0.04
4/21/2015	5.04	1.09	86.7	21.6	<0.015	<0.031	<100	8.76 F	<0.015	<0.031	<100	17.3	0.02	0.04
4/22/2015	4.45	1.00	10	21.5	<0.015	<0.031	<100	7.96	<0.015	<0.031	<100	13.5	0.02	0.04
4/23/2015	6.70	1.70	104	21.4	<0.017	<0.033	<100	11.1	<0.015	<0.031	<100	14.8	0.02	0.04
4/24/2015	6.15	1.49	92.9	17.6	<0.015	<0.031	<100	15.1	<0.017	<0.033	<100	13.3	0.02	0.04
5/1/2015	6.13	1.79	122	19.1	0.0507	<0.031	<100	19.1	<0.017	<0.033	<100	11.1	0.02	0.04
5/7/2015	7.55	1.74	102	14.2	0.119	0.031	<100	12.4	<0.015	<0.031	<100	11.3	0.02	0.04
5/12/2015	6.26	1.77	138	NA	0.00982	<0.031	<100	NA	<0.015	<0.031	<100	NA	0.02	0.04
5/20/2015	5.52	1.55	130	NA	0.0277	<0.033	<100	NA	<0.017 J	<0.033 J	<100	NA	0.02	0.04
5/28/2015	6.90	1.57	NA	NA	0.120	0.0564	NA	NA	<0.015	<0.031	NA	NA	0.02	0.04
6/2/2015	6.26	1.77	130	NA	0.133	0.0786	<100	NA	<0.015	<0.031	<100	NA	0.02	0.04
6/8/2015	8.14	1.58	115	NA	0.236	0.138	<100	NA	<0.015	<0.032	<100	NA	0.02	0.04
6/16/2015	7.74	1.22	NA	NA	0.225	0.136	NA	NA	<0.015	<0.031	NA	NA	0.02	0.04
6/22/2015	7.47	1.33	122	NA	0.287	0.166	<100	NA	<0.017	<0.033	<100	NA	0.02	0.04
7/1/2015	7.45	1.34	133	16.1	0.389	0.219	<100	<10.0	<0.015	<0.031	<100	<10.0	0.02	0.04
7/8/2015	7.96	1.53	106	NA	0.521	0.270	<100	NA	<0.015	<0.031	<100	NA	0.02	0.04
7/14/2015	6.02	1.30	133	NA	0.531	0.282	<100	NA	<0.015	<0.031	<100	NA	0.02	0.04
7/30/2015	7.23	1.42	NA	NA	0.712	0.393	NA	NA	0.0427	0.0257	NA	NA	0.02	0.04
8/12/2015	8.36	1.73	91.9	NA	1.14	0.539	<100	NA	0.0163	0.0192	<100	NA	0.02	0.04
8/26/2015	8.10	1.62	NA	NA	1.11	0.561	NA	NA	0.0131	0.0231	NA	NA	0.02	0.04
8/28/2015	LGAC Exchange													
8/31/2015	6.64	1.39	NA	NA	0.0505	0.064	NA	NA	<0.015	<0.031	NA	NA	0.02	0.04
9/16/2015	7.68	1.58	NA	NA	0.296	0.219	NA	NA	<0.015	<0.031	NA	NA	0.02	0.04
10/13/2015	9.04	1.88	110	NA	0.455	0.637	<100	NA	<0.015	<0.031	<100	NA	0.02	0.04
10/26/2015	8.18	1.66	NA	NA	0.892	0.549	NA	NA	<0.015	<0.031	NA	NA	0.02	0.04
11/12/2015	8.61	1.05	137	30.4	1.05	0.595	<100	<10.0	<0.017	<0.033	<100	<10.0	0.02	0.04
11/18/2015	9.41	1.81	89.6	33.3	1.22	0.617	<100	<10.0	<0.0096	<0.031	<100	<10.0	0.02	0.04
11/24/2015	8.60	1.68	NA	NA	1.54	0.749	NA	NA	<0.010	<0.032	NA	NA	0.02	0.04
12/2/2015	10.3	1.90	NA	NA	1.73	0.725	NA	NA	<0.0096	<0.031	NA	NA	0.02	0.04
12/9/2015	8.23	1.60	NA	NA	1.47	0.664	NA	NA	<0.010	0.0186	NA	NA	0.02	0.04
12/16/2015	8.28	1.70	NA	NA	1.84	0.796	NA	NA	<0.0096	0.0265	NA	NA	0.02	0.04
12/22/2015	9.01	1.72	NA	NA	1.86	0.760	NA	NA	<0.010	0.0345	NA	NA	0.02	0.04
12/29/2015	7.92	1.55	NA	NA	2.16	0.824	NA	NA	0.0119	0.0451	NA	NA	0.02	0.04
1/5/2016	8.23	1.59	NA	NA	1.92	0.752	NA	NA	0.0183	0.0582	NA	NA	0.02	0.04
1/14/2016	LGAC Exchange													
1/15/2016	6.13	1.34	NA	NA	0.0437	0.109	NA	NA	<0.0096	<0.031	NA	NA	0.02	0.04
1/19/2016	9.28	1.77	111	NA	0.1	0.172	<100	NA	<0.0096	<0.031	<100	NA	0.02	0.04
2/16/2016	6.84	1.23	102	NA	0.587	0.4	<100	NA	<0.0096	<0.031	<100	NA	0.02	0.04
3/16/2016	9.23	1.71	121	NA	1.2	0.518	<100	NA	0.018	0.0182	277	NA	0.02	0.04
3/30/2016	5.7	1.09	NA	NA	1.09	0.518	NA	NA	0.0209	0.0285	NA	NA	0.02	0.04
4/7/2016	7.47	2.85	NA	NA	1.41	0.58	NA	NA	0.0283	0.0552	NA	NA	0.02	0.04
4/13/2016	6.1	1.17	NA	NA	1.26	0.53	NA	NA	0.0351	0.0548	NA	NA	0.02	0.04
4/19/2016	LGAC Exchange													
4/21/2016	8.8	1.2	114	28.6	0.051	0.12	<100	<10.0	<0.0029	<0.0019	<100	30	0.02	0.04
5/16/2016	5.3	1	142	NA	0.6	0.32	<100	NA	<0.0027	0.00072	<100	NA	0.02	0.04
6/15/2016	7.7	1.4	109	NA	0.92	0.53	57.5F	NA	<0.0057	<0.0038	<100	NA	0.02	0.04
7/14/2016	LGAC Exchange													
7/18/2016	7.06	1.18	170	NA	0.218	0.146	<100	NA	<0.0015	<0.0015	<100	NA	0.02	0.04
8/8/2016	5.6	0.911	119	33.2	0.334	0.778	<100	<10.0	<0.0064	<0.0064	<100	NA	0.02	0.04
9/20/2016	5.2	0.96	95.6J	NA	1.3	0.37	<50.0	NA	0.013J	0.019J	<50.0	NA	0.02	0.04
10/13/2016	LGAC Exchange													
10/17/2016	3.1	0.52	133	NA	0.1	0.075	<50.0	NA	<0.0033	<0.0053	<50.0	NA	0.02	0.04
11/7/2016	4.1	0.6	123	NA	0.45	0.23	<50.0	NA	0.0037J	<0.0053	<50.0	NA	0.02	0.04
12/7/2016	4.9	0.64	111	NA	1	0.34	<50.0	NA	<0.0033	<0.0057J	<50.0	NA	0.02	0.04

TABLE 1
 FT-02 PUMP AND TREAT SYSTEM SAMPLING RESULTS
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Sample Date	Influent				Intermediate				Effluent				SRD Effluent Limitations	
	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Total Iron (µg/L)	Total Manganese (µg/L)	PFOS (µg/L)	PFOA (µg/L)
1/12/2017	LGAC Exchange													
1/16/2017	4.90	0.660	117	NA	0.180	0.160	<50	NA	<0.0033	<0.0053	<50	NA	0.02	0.04
2/6/2017	4.40	0.660	118	NA	0.630	0.310	<50	NA	<0.010	<0.014	<50	NA	0.02	0.04
3/7/2017	4.40	0.760	NA	NA	1.200	0.480	NA	NA	0.027	0.042	NA	NA	0.02	0.04
4/6/2017	LGAC Exchange													
4/10/2017	3.30	0.710	NA	NA	0.200	0.120	NA	NA	<0.004	<0.004	NA	NA	0.02	0.04
5/10/2017	3.04	0.862	NA	NA	1.040	0.461	NA	NA	<0.004	<0.004	NA	NA	0.02	0.04
6/9/2017	3.12	1.030	NA	NA	1.670	0.652	NA	NA	0.0237	0.0391	NA	NA	0.02	0.04
6/27/2017	LGAC Exchange													
7/5/2017	2.78	0.898	NA	NA	0.310	0.184	NA	NA	< 0.00351	< 0.00351	NA	NA	0.02	0.04
8/8/2017	2.81	0.671	NA	NA	1.110	0.348	NA	NA	< 0.00377	< 0.00377	NA	NA	0.02	0.04
9/6/2017	3.66	0.988	NA	NA	1.710	0.578	NA	NA	<0.00357	0.0104	NA	NA	0.02	0.04
10/5/2017	LGAC Exchange													
10/9/2017	7.47	1.05	NA	NA	0.092	0.0776	NA	NA	< 0.00357	< 0.00357	NA	NA	0.02	0.04
11/9/2017	3.02	1.55	NA	NA	1.89	0.555	NA	NA	< 0.00357	< 0.00357	NA	NA	0.02	0.04
12/5/2017	4.72	1.09	NA	NA	2.660	0.650	NA	NA	0.00526	0.0136	NA	NA	0.02	0.04
12/20/2017	LGAC Exchange													

Notes: NA - Not available Shaded cell indicates effluent concentration above SRD Effluent Limitations
 GAC - granular activated carbon

TABLE 2
 FT-02 PUMP AND TREAT SYSTEM TOTAL PFOA AND PFOS MASS REMOVAL SUMMARY
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Year	Average PFOS Influent Concentration (µg/L)	Average PFOS Effluent Concentration (µg/L)	Total Flow (gallons)	Mass of PFOS Removed from Liquid Stream (lbs)
2015	8.03	0.002	59,760,000	4.00
2016	6.51	0.008	109,131,323	5.92
2017	3.97	0.019	104,990,766	3.46
Cumulative Mass of PFOS Removed June 2015-December 2017				13.38

Year	Average PFOA Influent Concentration (µg/L)	Average PFOA Effluent Concentration (µg/L)	Total Flow (gallons)	Mass of PFOA Removed from Liquid Stream (lbs)
2015	1.56	0.009	59,760,000	0.77
2016	1.24	0.015	109,131,323	1.12
2017	0.91	0.026	104,990,766	0.77
Cumulative Mass of PFOA Removed June 2015-December 2017				2.67

Notes:

µg/L = micrograms per Liter

lbs = pounds

Non-detect sample results were not included in the data set used to calculate the average concentrations of PFOS and PFOA.

TABLE 3
 FT-02 PURGE WELL SAMPLING RESULTS
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Location:	MDEQ Part 201 Criteria µg/L (DW)	USEPA Health Advisory (µg/L)	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1	FT02-PW1
Date:	201		2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017
Unit:	µg/L (DW)	(µg/L)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)												
Total VOCs	-	-	7.25	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (Method SW6010B)												
Iron, Total	300 (E)	-	4030	88.0 J	87.5 J	88.0 J	90.5 J	116	82.6 J	72.1 J	114	247
Per- and Polyfluoroalkyl Substances (Method EPA 537)												
Perfluorooctanesulfonic acid (PFOS)	-	0.07	11.30	4.68	4.93	5.37	4.10	4.11	5.03	2.35	1.1	1.68 J
Perfluorooctanoic acid (PFOA)	-	0.07	0.594	0.204	0.201	0.186	0.159	0.151	0.188	0.095	0.07	0.15
Combined PFOS and PFOA	-	0.07	11.894	4.884	5.131	5.556	4.259	4.261	5.218	2.445	1.17	0.15

Location:	MDEQ Part 201 Criteria µg/L (DW)	USEPA Health Advisory (µg/L)	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2	FT02-PW2
Date:	201		2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017
Unit:	µg/L (DW)	(µg/L)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)												
Total VOCs	-	-	4.61	ND	ND	ND	ND	ND	2.96	0.790	1.70	8.21
Metals (Method SW6010B)												
Iron, Total	300 (E)	-	307	51.0 J	68.6 J	67.5 J	71.4 J	107	100	193.0	153	275
Per- and Polyfluoroalkyl Substances (Method EPA 537)												
Perfluorooctanesulfonic acid (PFOS)	-	0.07	45.40	21.2	25.9	33.6	47.0	17.1	26.3	26.20	26.0	25.3 J
Perfluorooctanoic acid (PFOA)	-	0.07	1.65	1.10	1.01	1.15	1.18	3.34	7.31	6.97	9.70	4.99
Combined PFOS and PFOA	-	0.07	47.050	22.300	26.910	34.750	48.180	20.440	33.610	33.170	35.70	4.99

Location:	MDEQ Part 201 Criteria µg/L (DW)	USEPA Health Advisory (µg/L)	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3	FT02-PW3
Date:	201		2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017
Unit:	µg/L (DW)	(µg/L)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)												
Total VOCs	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (Method SW6010B)												
Iron, Total	300 (E)	-	5360	289	216	185	192	171	126	180.0	216	161
Perfluoroalkyl Substances (Method EPA 537)												
Perfluorooctanesulfonic acid (PFOS)	-	0.07	1.05	1.10	11.50	16.20	14.10	9.58	16.70	14.40	9.9	9.26 J
Perfluorooctanoic acid (PFOA)	-	0.07	0.735	0.718	10.30	9.47	9.66	2.10	2.97	1.86 J	1.40	0.89
Combined PFOS and PFOA	-	0.07	1.785	1.818	21.800	25.670	23.760	11.680	19.670	14.400	11.30	0.89

Location:	MDEQ Part 201 Criteria µg/L (DW)	USEPA Health Advisory (µg/L)	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4	FT02-PW4
Date:	201		2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017
Unit:	µg/L (DW)	(µg/L)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)												
Total VOCs	-	-	32.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (Method SW6010B)												
Iron, Total	300 (E)	-	851	ND	64.7 J	68.1 J	66.2 J	94.7 J	75.5 J	78.0 J	103	103
Perfluoroalkyl Substances (Method EPA 537)												
Perfluorooctanesulfonic acid (PFOS)	-	0.07	5.07	2.85	3.06	4.97	4.32	5.38	5.20	5.19	3.6	3.31 J
Perfluorooctanoic acid (PFOA)	-	0.07	0.474	0.295	0.255	0.275	0.288	0.280	0.312	0.38	0.34	0.29
Combined PFOS and PFOA	-	0.07	5.544	3.145	3.315	5.245	4.608	5.660	5.512	5.574	3.94	0.29

TABLE 3
 FT-02 PURGE WELL SAMPLING RESULTS
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Location:	MDEQ Part	USEPA	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5	FT02-PW5
Date:	201 Criteria	Health	2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017	
Unit:	µg/L (DW)	Advisory	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)													
Total VOCs	-	-	43.8	ND	ND	ND	ND	ND	ND	0.204	0.26	ND	
Metals (Method SW6010B)													
Iron, Total	300 (E)	-	1000	85.7 J	106	94.8 J	108	134	120	126.0	118	116	
Perfluoroalkyl Substances (Method EPA 537)													
Perfluorooctanesulfonic acid (PFOS)	-	0.07	2.45	1.59	1.40	1.77	1.62	1.50	1.70	1.62	1.3	1.00 J	
Perfluorooctanoic acid (PFOA)	-	0.07	0.296	0.369	0.367	0.375	0.317	0.264	0.315	0.26	0.23	0.144	
Combined PFOS and PFOA	-	0.07	2.746	1.959	1.767	2.145	1.937	1.764	2.015	1.876	1.53	0.14	

Location:	MDEQ Part	USEPA	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6	FT02-PW6
Date:	201 Criteria	Health	2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017	
Unit:	µg/L (DW)	Advisory	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)													
Total VOCs	-	-	8.85	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Metals (Method SW6010B)													
Iron, Total	300 (E)	-	414	123	116	102	111	138	102	145.0	119	122	
Perfluoroalkyl Substances (Method EPA 537)													
Perfluorooctanesulfonic acid (PFOS)	-	0.07	0.893	0.380	0.335	0.321	0.294	0.270	0.317	0.28	0.2	0.302 J	
Perfluorooctanoic acid (PFOA)	-	0.07	0.191	0.109	0.091	0.089	0.084	0.071	0.086	0.08	0.07	0.0559	
Combined PFOS and PFOA	-	0.07	1.084	0.489	0.426	0.410	0.378	0.341	0.403	0.354	0.27	0.06	

Location:	MDEQ Part	USEPA	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7	FT02-PW7
Date:	201 Criteria	Health	2/3/2015	4/20/2015	5/1/2015	5/7/2015	5/12/2015	7/14/2015	10/13/2015	1/19/2016	4/21/2016	9/6/2017	
Unit:	µg/L (DW)	Advisory	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Volatiles Organic Compounds (Method SW846 8260B)													
Total VOCs	-	-	2.07	0.451	0.373	0.336	0.420	ND	ND	ND	ND	ND	
Metals (Method SW6010B)													
Iron, Total	300 (E)	-	526	93.3 J	107	113	109	141	88.7 J	60.4 J	<100	64.6 J	
Perfluoroalkyl Substances (Method EPA 537)													
Perfluorooctanesulfonic acid (PFOS)	-	0.07	0.342	0.161	0.174	0.184	0.159	0.185	0.178	0.14	0.067	0.0982 J	
Perfluorooctanoic acid (PFOA)	-	0.07	0.126	0.056	0.056	0.064	0.051	0.052	0.052	0.05	0.033	0.0358	
Combined PFOS and PFOA	-	0.07	0.468	0.217	0.230	0.248	0.210	0.237	0.230	0.188	0.10	0.04	

Notes:

Shaded cell indicates concentration exceeds a cleanup criterion or health advisory value for drinking water

ND - Non-detect

J - The analyte was positively identified, but the quantitation is an estimate.

E - Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). A notice of aesthetic impact may be employed as an institutional control mechanism if groundwater concentration exceed the aesthetic drinking water criterion, but do not exceed the applicable health-based drinking water value provided in the Footnotes table.

2/3/2015 samples were collected at the well head prior to system start up, all other samples collected in the plant with wells operational

* Prior to issuing the combined health advisory for PFOS/PFOA in May 2016, PFOS and PFOA had Provisional Health Advisories of 0.20 and 0.40.

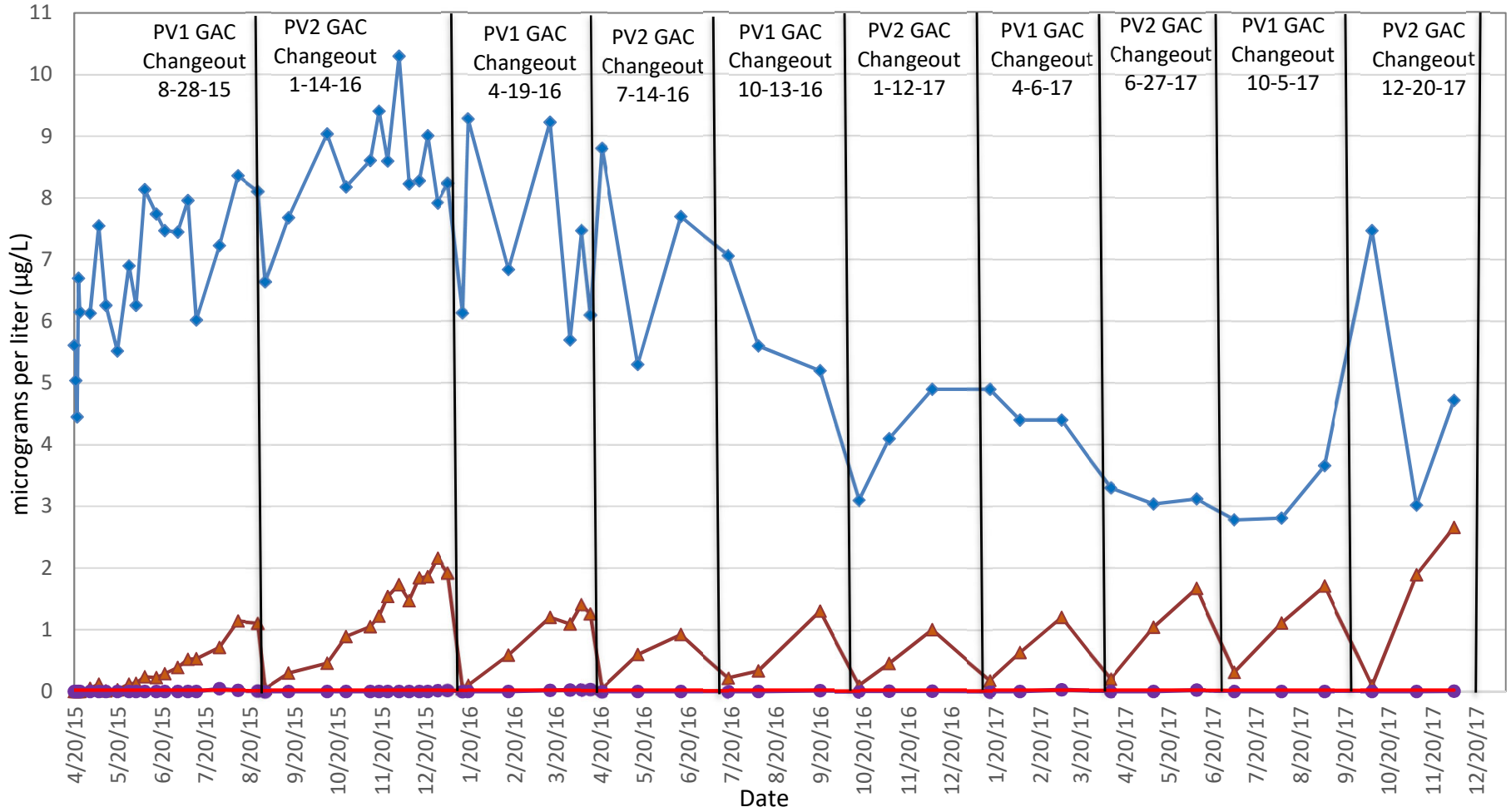
TABLE 4
 FT-02 SUMMARY OF GROUNDWATER DETECTIONS OF PFOA and PFOS
 2017 ANNUAL RAO REPORT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

Units µg/L		Compound		Total
Well	Date	PFOA	PFOS	PFOA + PFOS
Criteria	EPA Provisional Health Advisory Values	0.07	0.07	0.07
FT1	7/31/2017	2.64	3.93	6.57
FT2	8/1/2017	84.6	161	245.60
FT3	7/31/2017	13.3	33.6	46.90
FT4D	7/31/2017	< 0.00385	< 0.00385	ND
FT4S	7/31/2017	7.27	26.7	33.97
FT8S	7/26/2017	1.30	3.10	4.40
FT8W	7/31/2017	9.15	59.8	68.95
FT13S	8/23/2017	0.472	14.5 J	14.97
FT16S	8/23/2017	< 0.0714	2.65	2.65
FT18S	8/23/2017	0.0787 J	6.98	7.06
FT19D	8/9/2017	27.6	48.5	76.10
FT19S	8/9/2017	1.67	34.7	36.37
FT20D	8/9/2017	9.10	16.4	25.50
FT20S	8/9/2017	8.63	70.0	78.63
FT21D	8/9/2017	< 0.00392	0.0163	0.0163
FT21M	8/9/2017	3.48	27.1	30.58
FT21S	8/9/2017	0.597 J	53.8	54.40
FT22D	8/9/2017	1.06	14.0	15.06
FT22S	8/9/2017	0.625 J	75.8	76.43
FT23D	8/10/2017	0.240	7.06	7.30
FT23S	8/10/2017	0.162 J	5.49	5.65
FT02-FTP1D	7/27/2017	0.355	0.366	0.72
FT02-FTP1S	7/27/2017	12.0	1.99 J	13.99
FT02-FTP2D	7/27/2017	0.536 J	0.388	0.92
FT02-FTP2S	7/27/2017	12.7	5.29	17.99
FT02-FTP3	7/27/2017	10.3	1.44 J	11.74
FT02-FTP4	7/27/2017	6.72	5.58	12.30
FT02-FTP5	7/31/2017	0.177	1.00	1.18
FT02-FTP6D	7/27/2017	0.0157	0.0273	0.0430
FT02-FTP7D	8/1/2017	0.00716 J	< 0.00400	0.00716
FT02-FTP8	8/1/2017	119	112	231.00
FT02-FTP9	8/1/2017	161	186	347.00
FT02-FTP11D	7/24/2017	< 0.0800	< 0.0800	ND
FT02-FTP11M	7/24/2017	0.0113	0.00277 J	0.01
FT02-FTP11S	7/24/2017	0.330	3.53	3.86
FT02-FTP12D	7/25/2017	0.170 J	0.109	0.28
FT02-FTP12M	7/25/2017	0.00450 J	0.0138	0.02
FT02-FTP12S	7/25/2017	33.1	79.7	112.80
FT02-FTP13D	7/25/2017	< 0.0800	0.0406 J	0.0406
FT02-FTP13M	7/25/2017	0.00183 J	0.0129	0.0147
FT02-FTP13S	7/25/2017	4.16	10.6	14.76
FT02-FTP14D	7/25/2017	< 0.0800	< 0.0800	ND
FT02-FTP14M	7/25/2017	< 0.00400	0.00375 J	0.00375
FT02-FTP14S	7/25/2017	0.473	10.8	11.27
FT02-MW3	8/23/2017	0.0159	0.146	0.16
FT02-MW4D	8/25/2017	0.0387	0.289	0.33
FT02-MW4M	8/25/2017	0.0949 J	3.01	3.10
FT02-MW4S	8/25/2017	0.0387	0.335	0.37
FT02-MW5	8/25/2017	0.165 J	4.06	4.23
FT02-MW6D	8/25/2017	0.166 J	2.44	2.61
FT02-MW6S	8/25/2017	0.110 J	2.77	2.88
FT02-MW7D	8/28/2017	0.155 J	7.78	7.94
FT02-MW7M	8/28/2017	0.0616 J	3.97	4.03
FT02-MW7S	8/28/2017	0.0491	0.101	0.15
FT02-MW8D	8/28/2017	0.0879 J	8.34	8.43
FT02-MW8S	8/28/2017	0.0731 J	6.28	6.35
FT02-MW9	8/28/2017	0.119 J	11.9	12.02
FT02-MW10	8/28/2017	0.109 J	8.00	8.11
FT02-MW11	8/23/2017	0.00210 J	0.0639	0.07
FT02-PZ12	8/25/2017	< 0.0800	1.12	1.12
FT02-PZ19	8/25/2017	0.0388 J	0.666	0.70
FT02-SVE1-2	7/31/2017	13.3	19.1	32.40
FT02-SVE1-2-1	7/27/2017	3.51	1.00	4.51
FT02-SVE2-7	8/1/2017	21.3	105	126.30
FT02-SVE2-8	7/31/2017	149	124	273.00

Notes:
 Exceed EPA Provisional Health Advisory Value
 J - Indicates an estimated value
 GCAL preformed all analysis for the Annual Sampling event July - August 2017, using method EPA 537m.

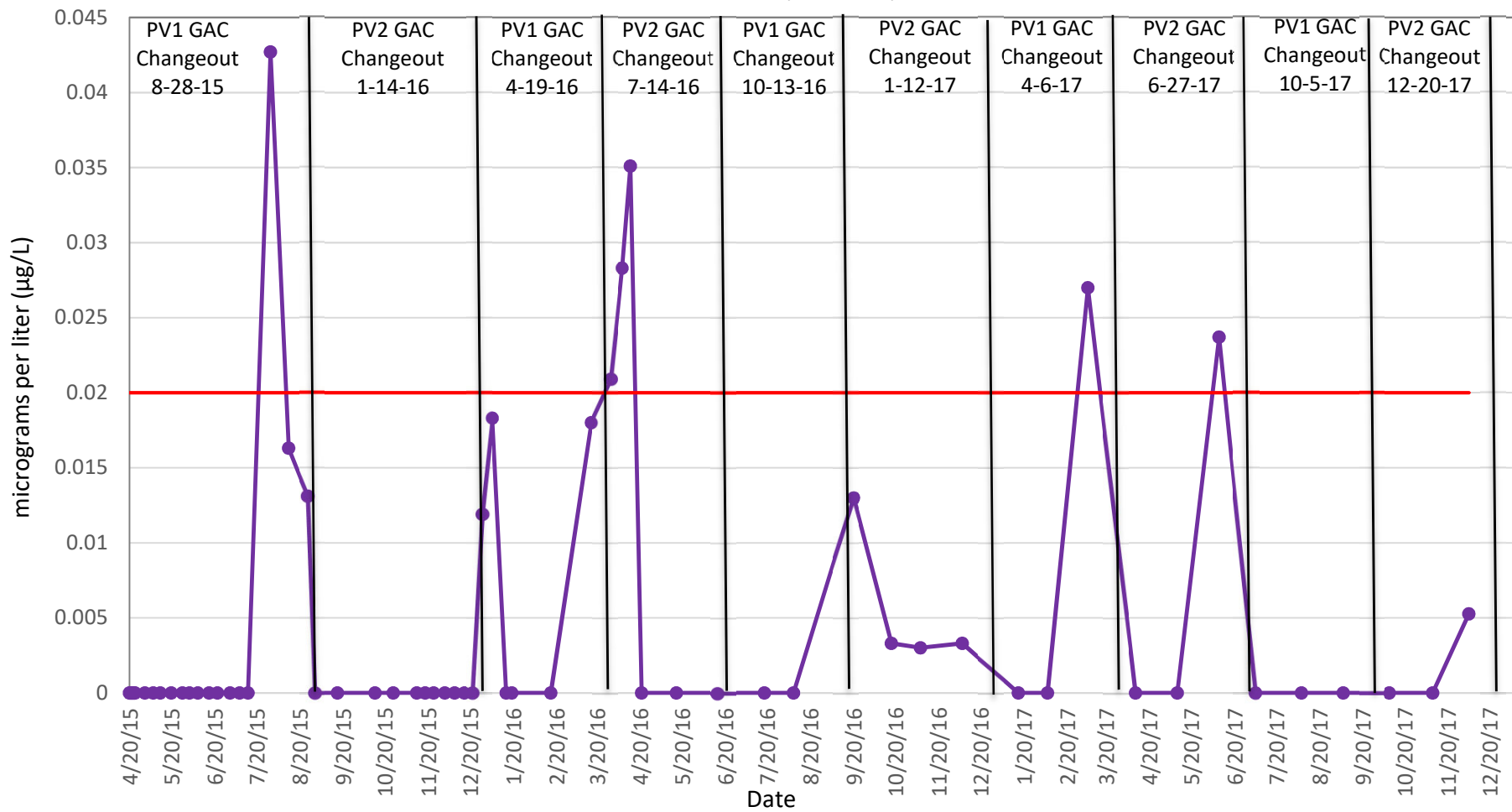
GRAPH 1
 FT-02 PUMP AND TREAT SYSTEM
 PFOS CONCENTRATIONS AT TREATMENT PLANT
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

- ◆ Influent
- ▲ Intermediate
- Effluent
- SRD Effluent Limitations



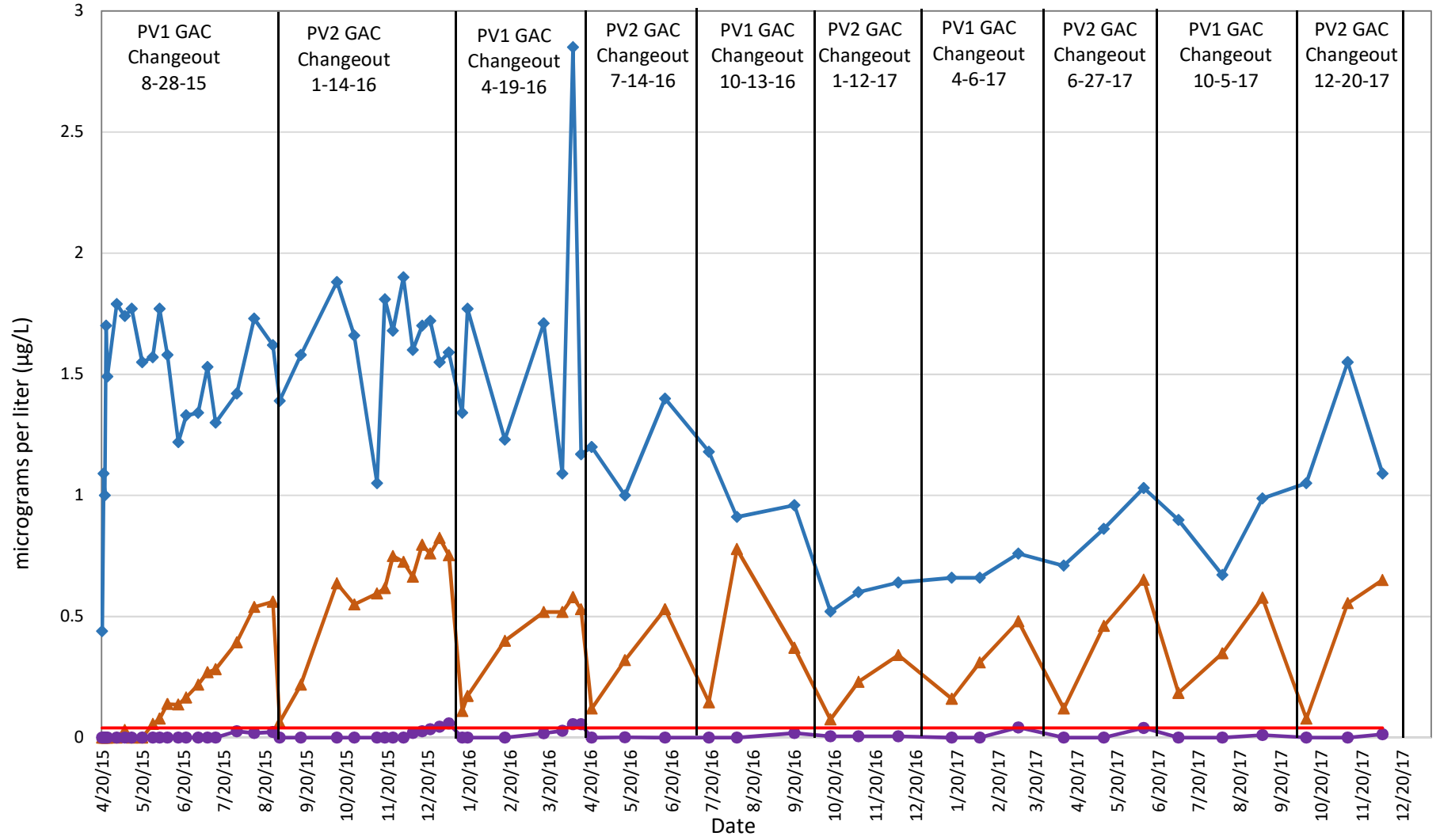
GRAPH 2
 FT-02 PUMP AND TREAT SYSTEM
 PFOS EFFLUENT CONCENTRATIONS
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

● Effluent — SRD Effluent Limitations



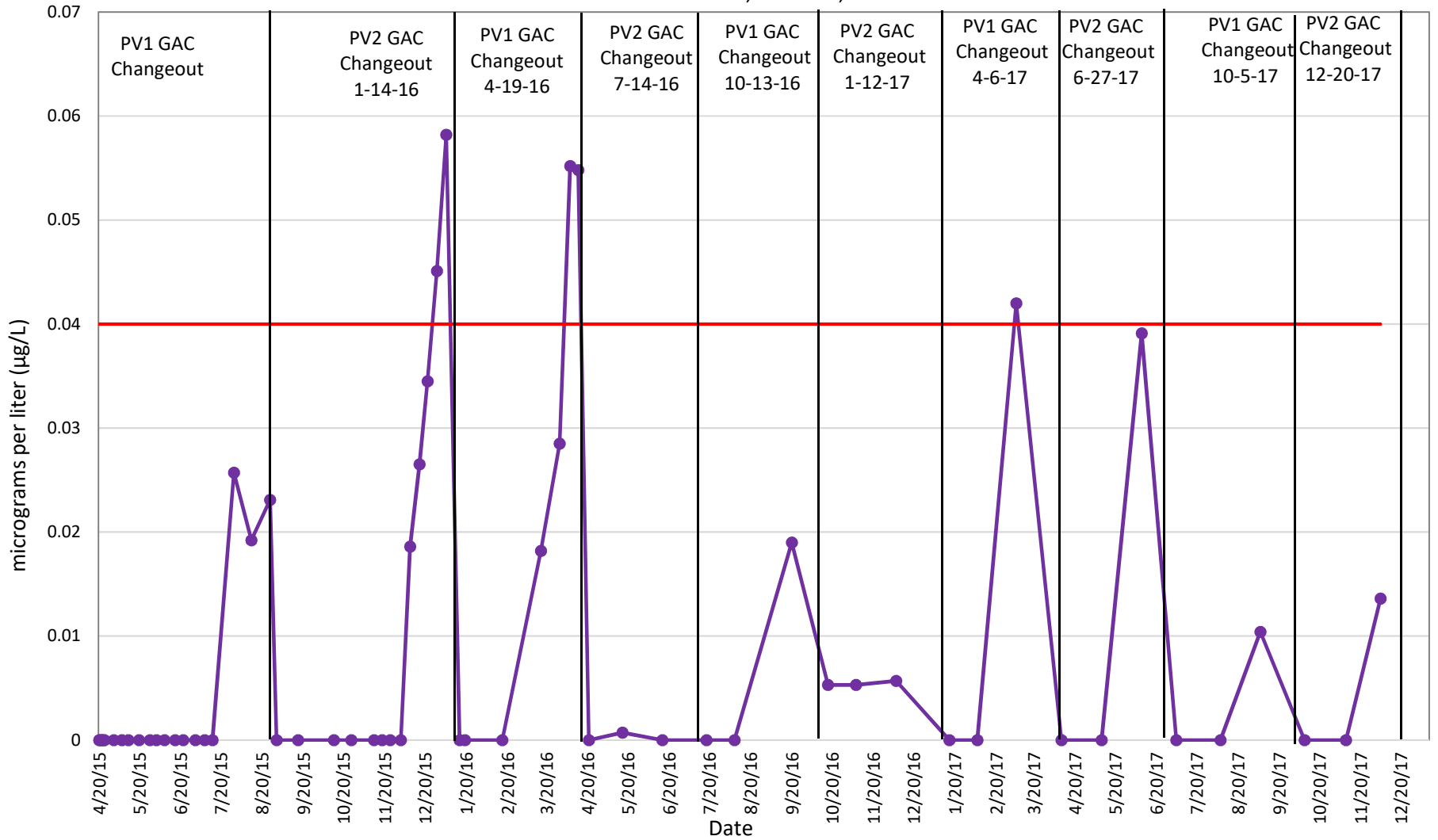
GRAPH 3
FT-02 PUMP AND TREAT SYSTEM
PFOA CONCENTRATIONS AT TREATMENT PLANT
WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

- ◆ Influent
- ▲ Intermediate
- Effluent
- SRD Effluent Limitations



GRAPH 4
 FT-02 PUMP AND TREAT SYSTEM
 PFOA EFFLUENT CONCENTRATIONS
 WURTSMITH AIR FORCE BASE, OSCODA, MICHIGAN

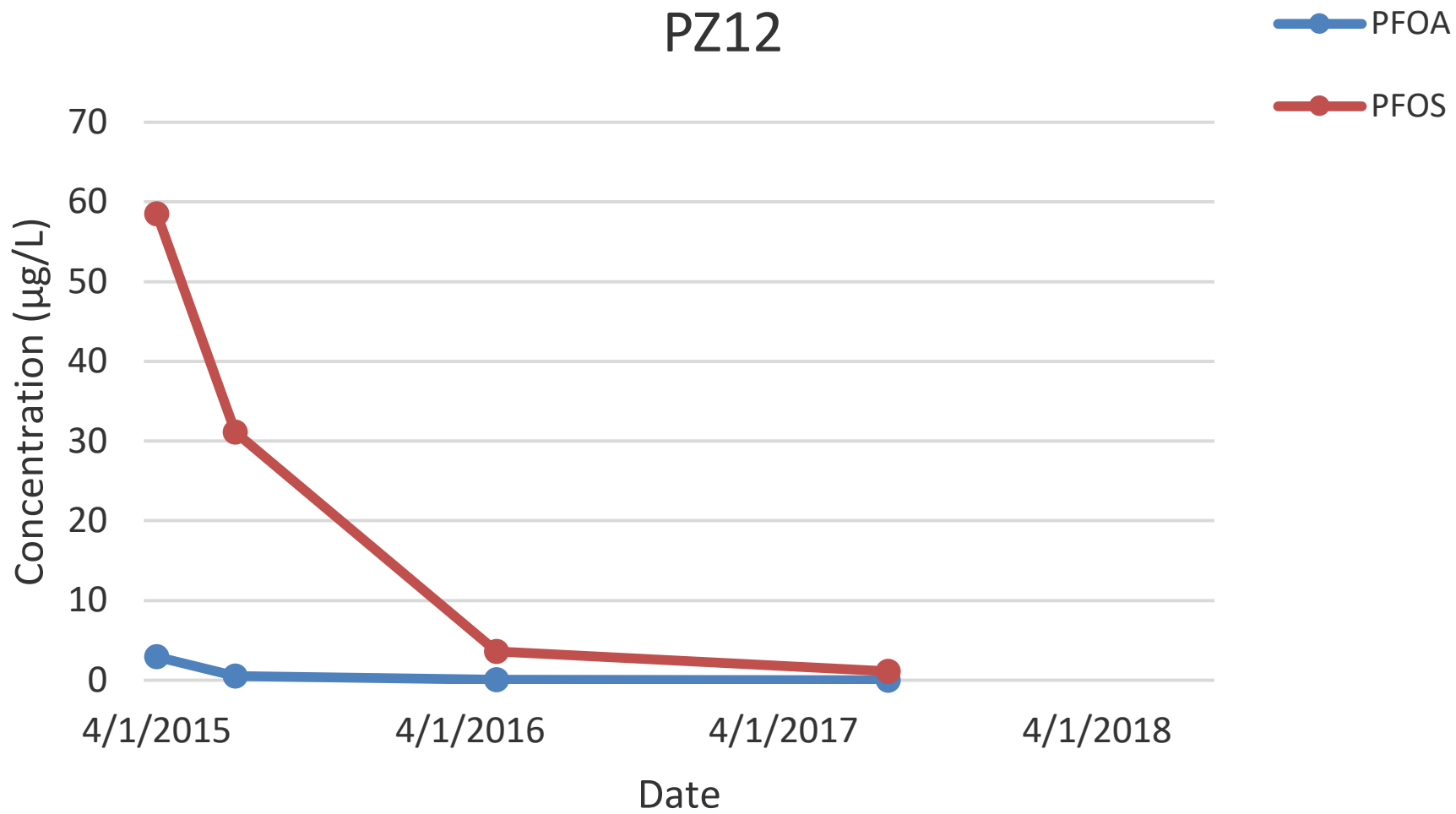
● Effluent — SRD Effluent Limitations



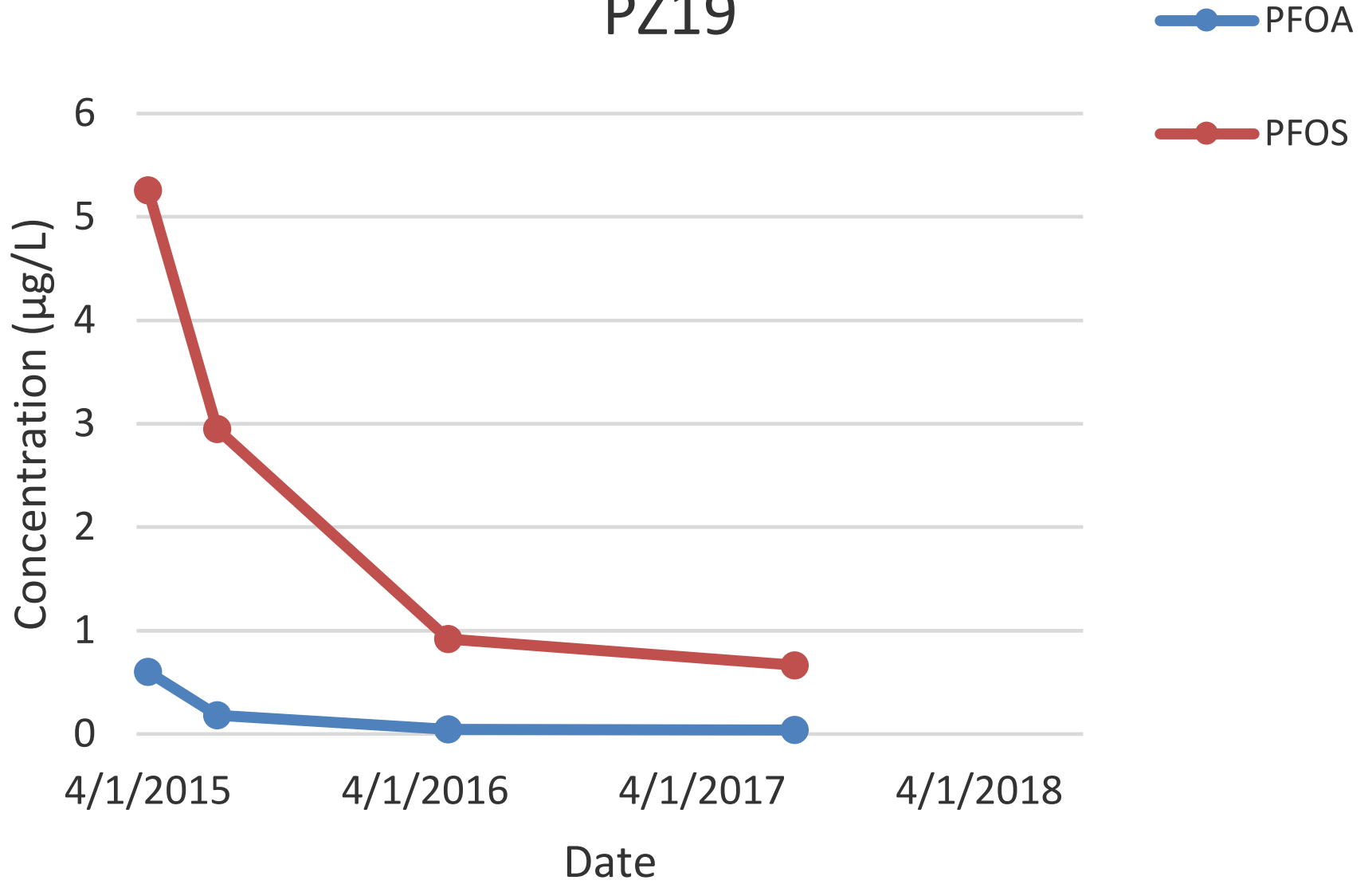
Trend Graphs

(Trend graphs are only provided for wells sampled in 2017 where detectable concentrations of PFOA and/or PFOS have been observed. Only detected analytes are included in the trend graphs.)

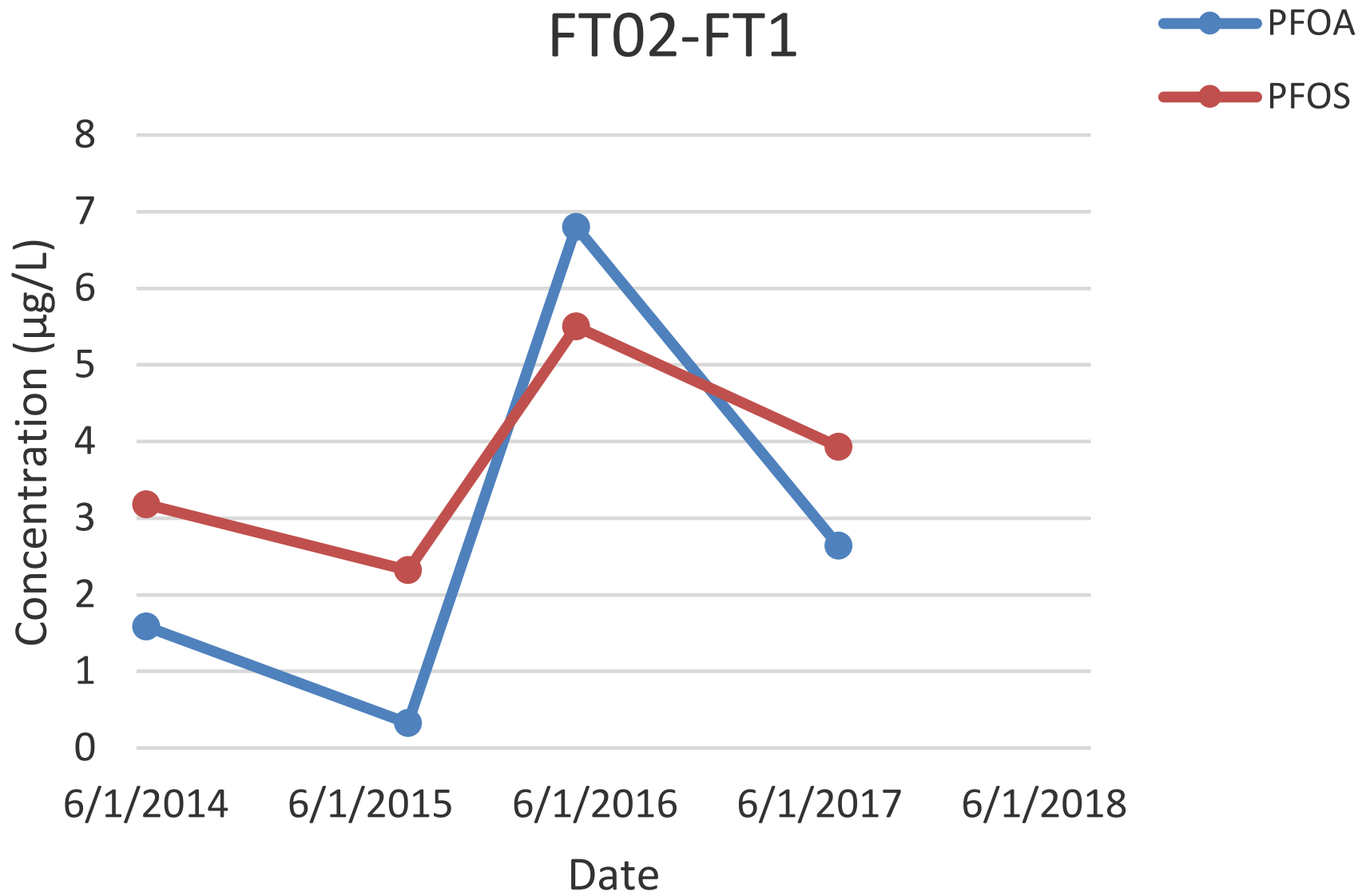
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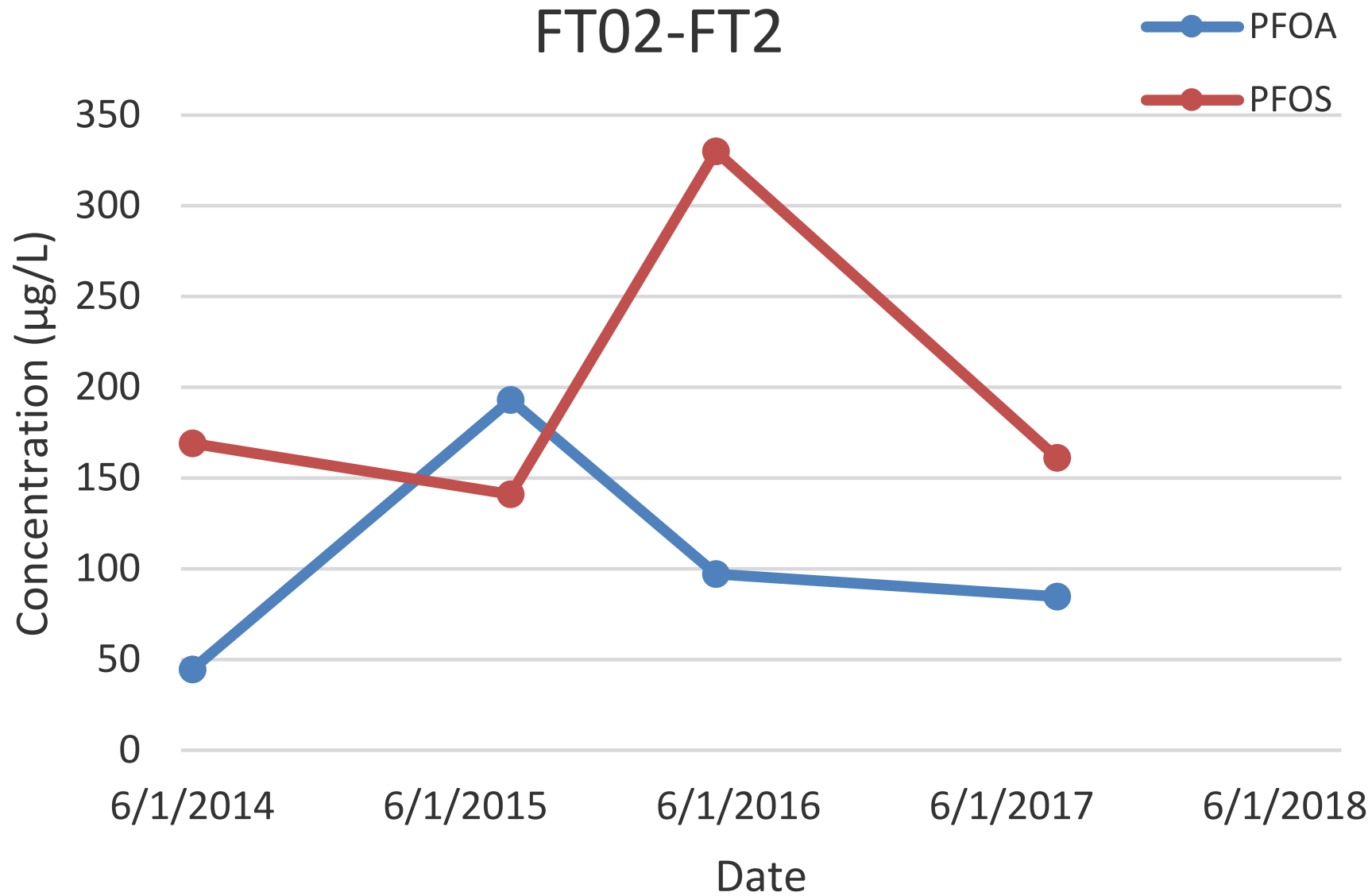
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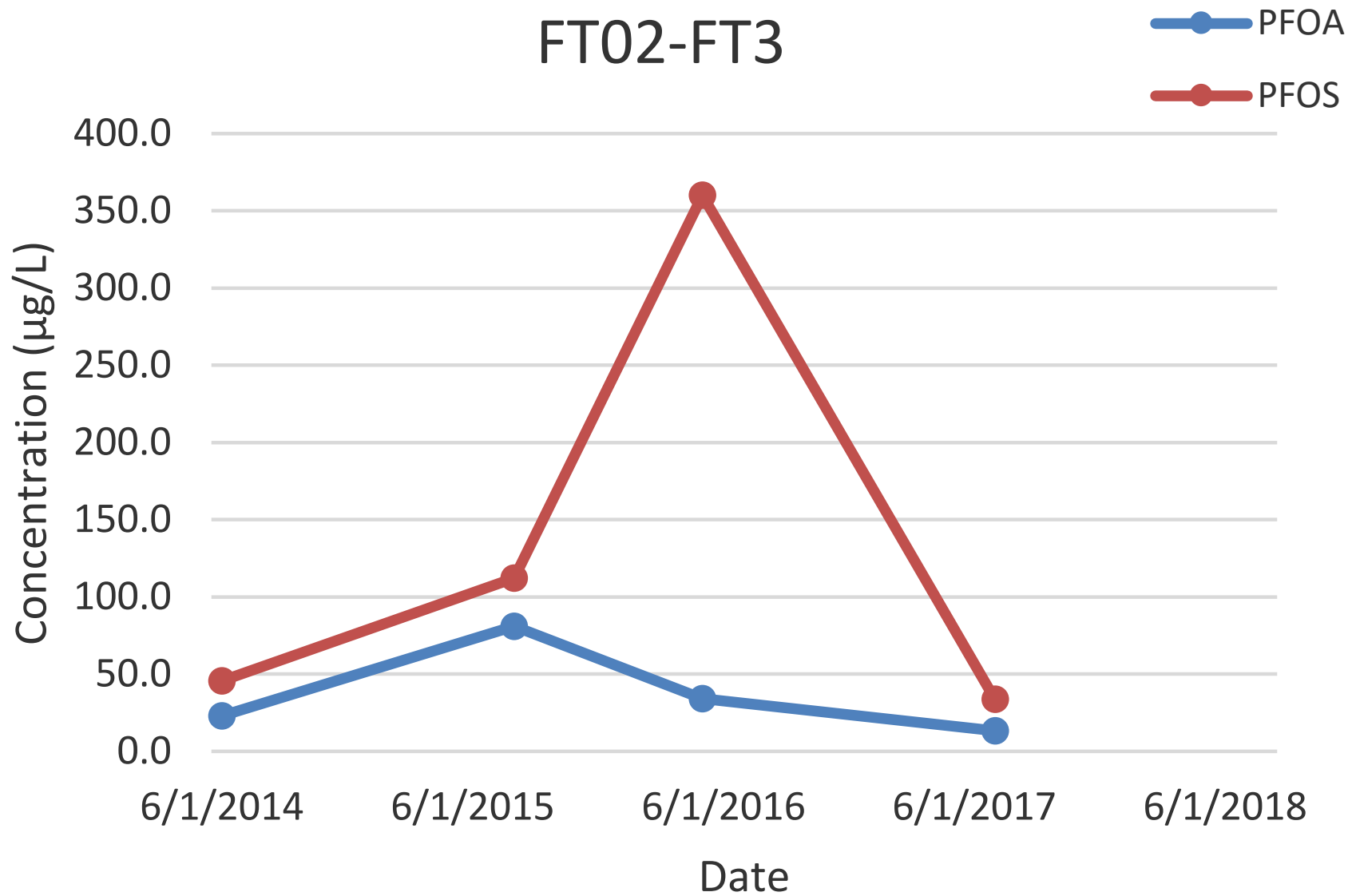
FT02-FT1



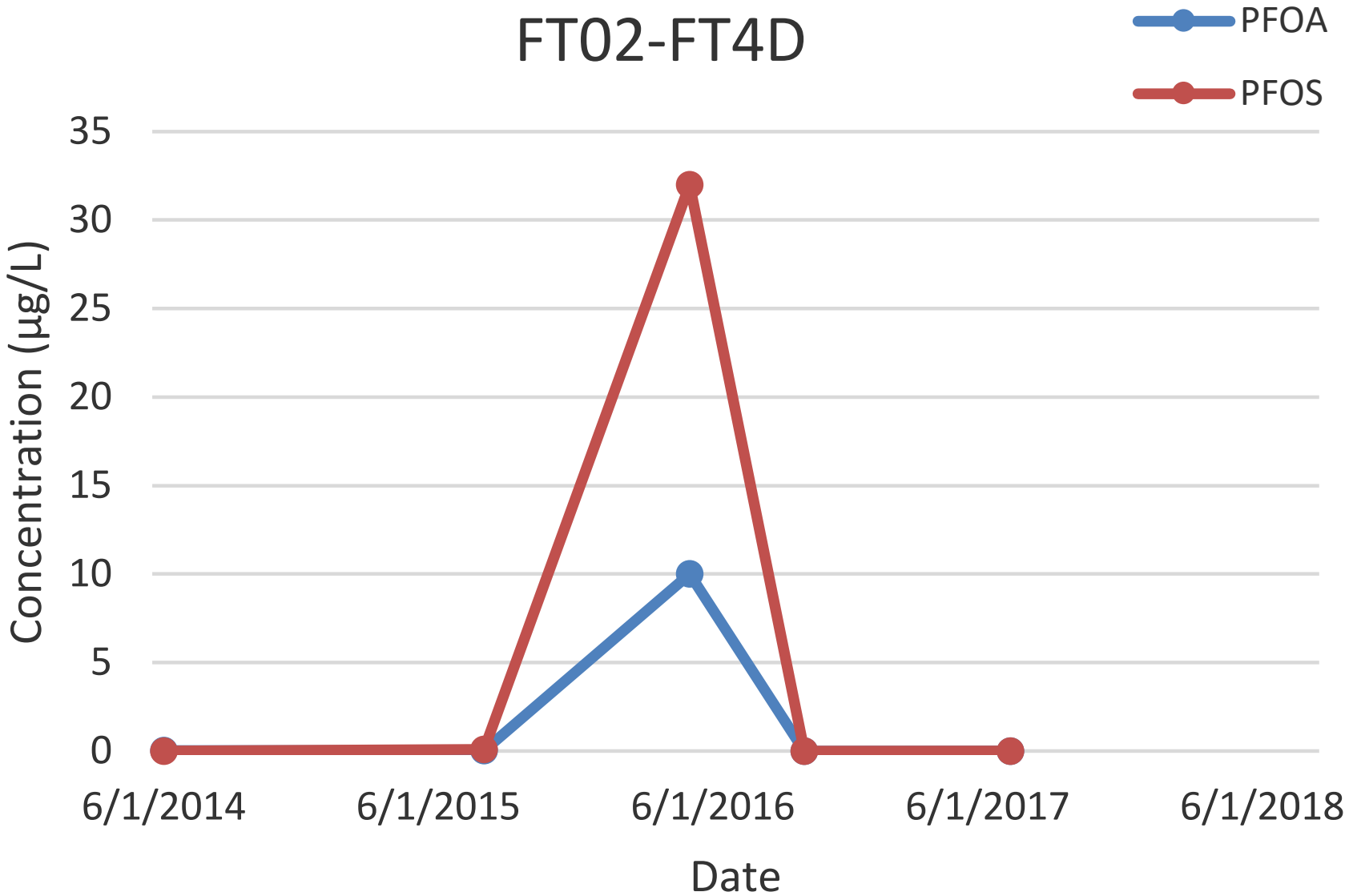
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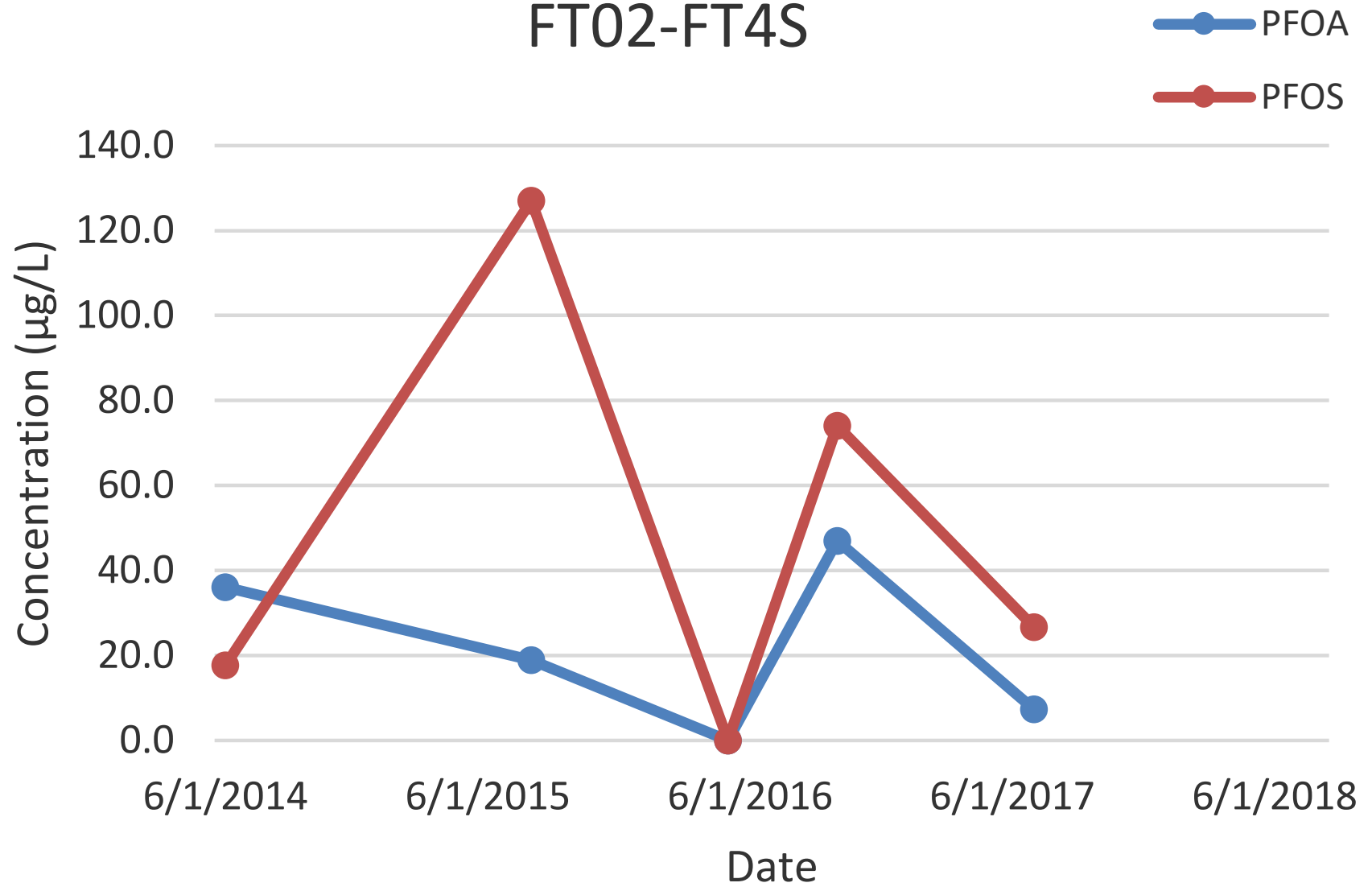
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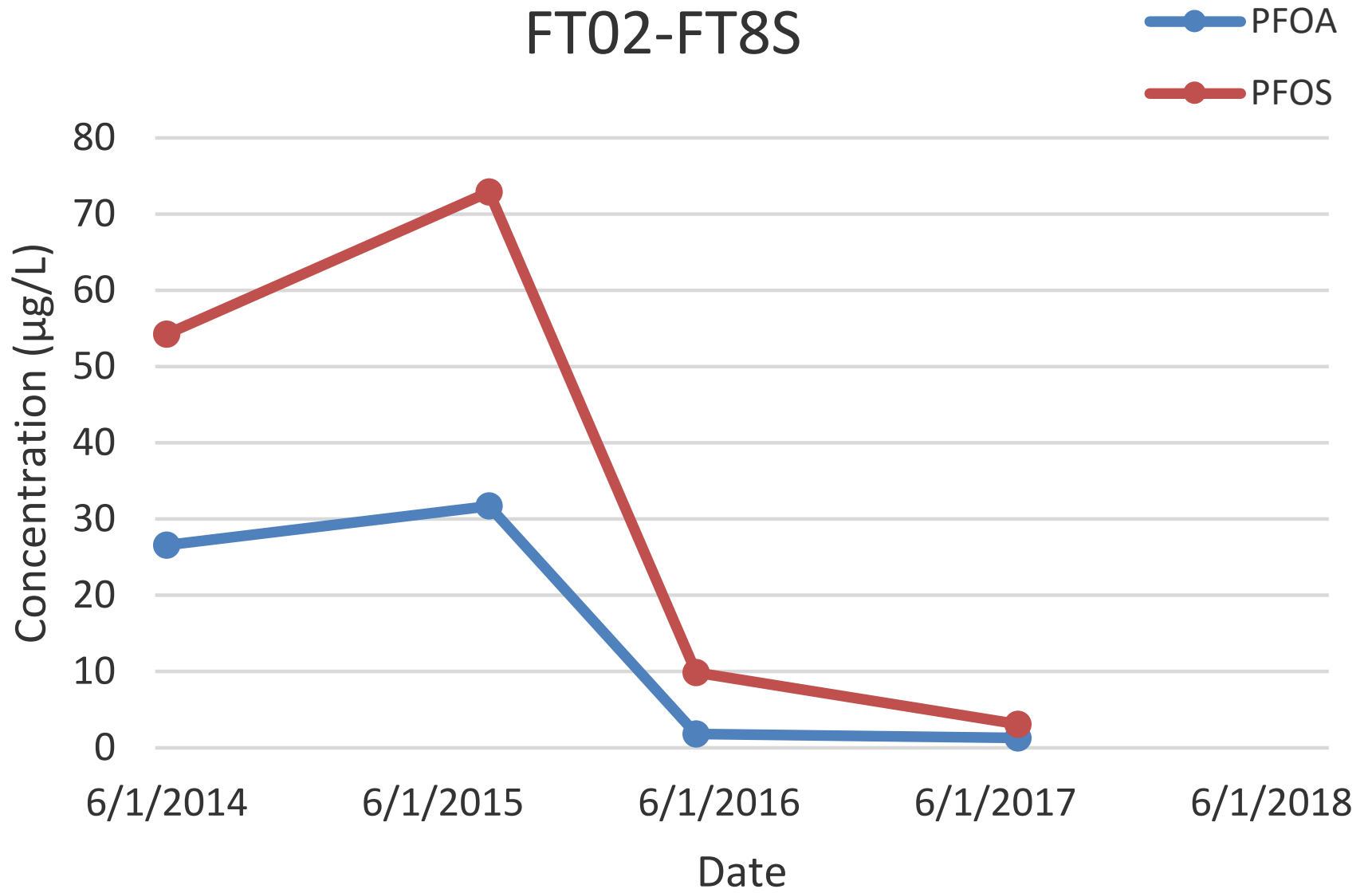
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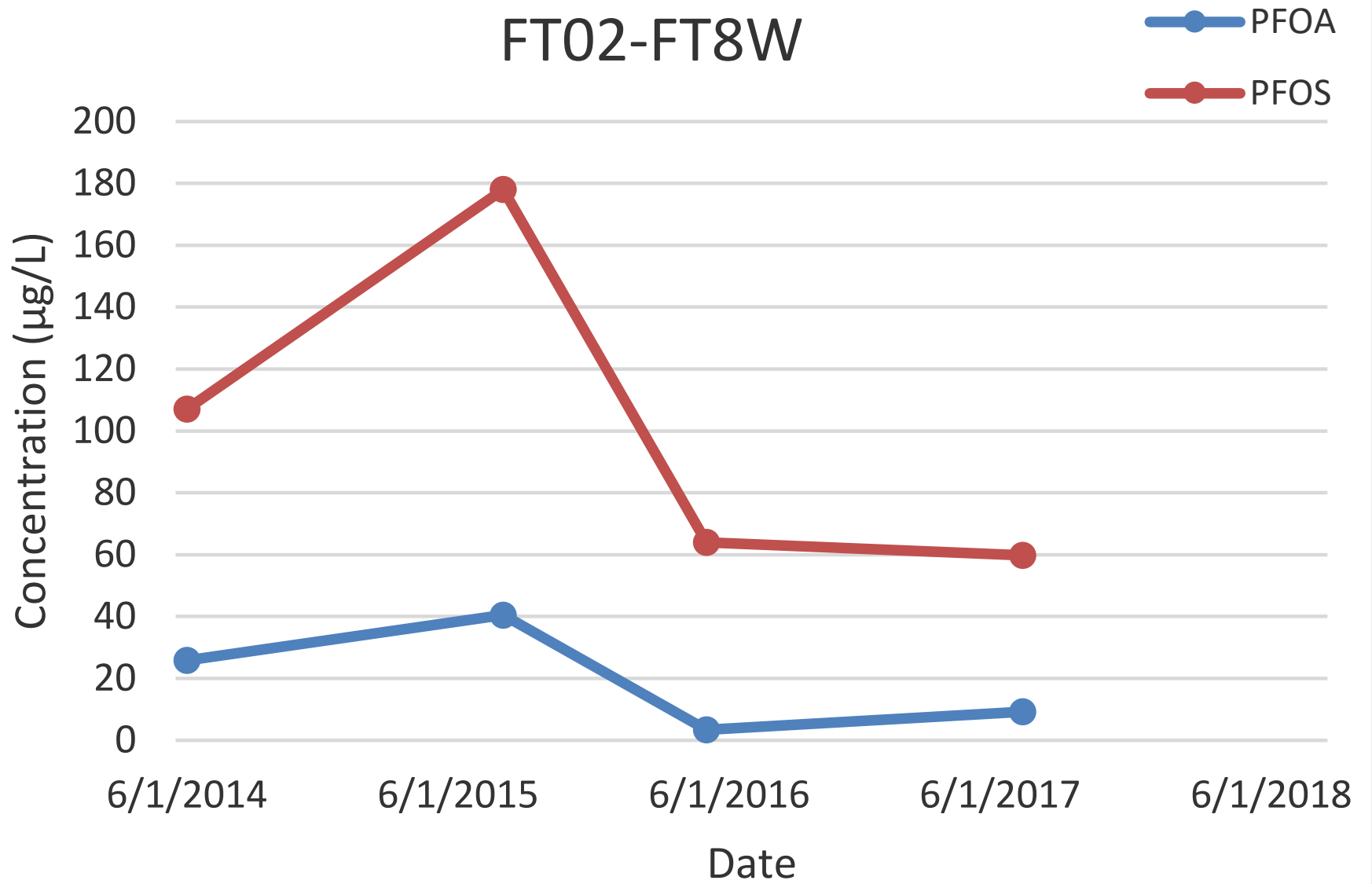
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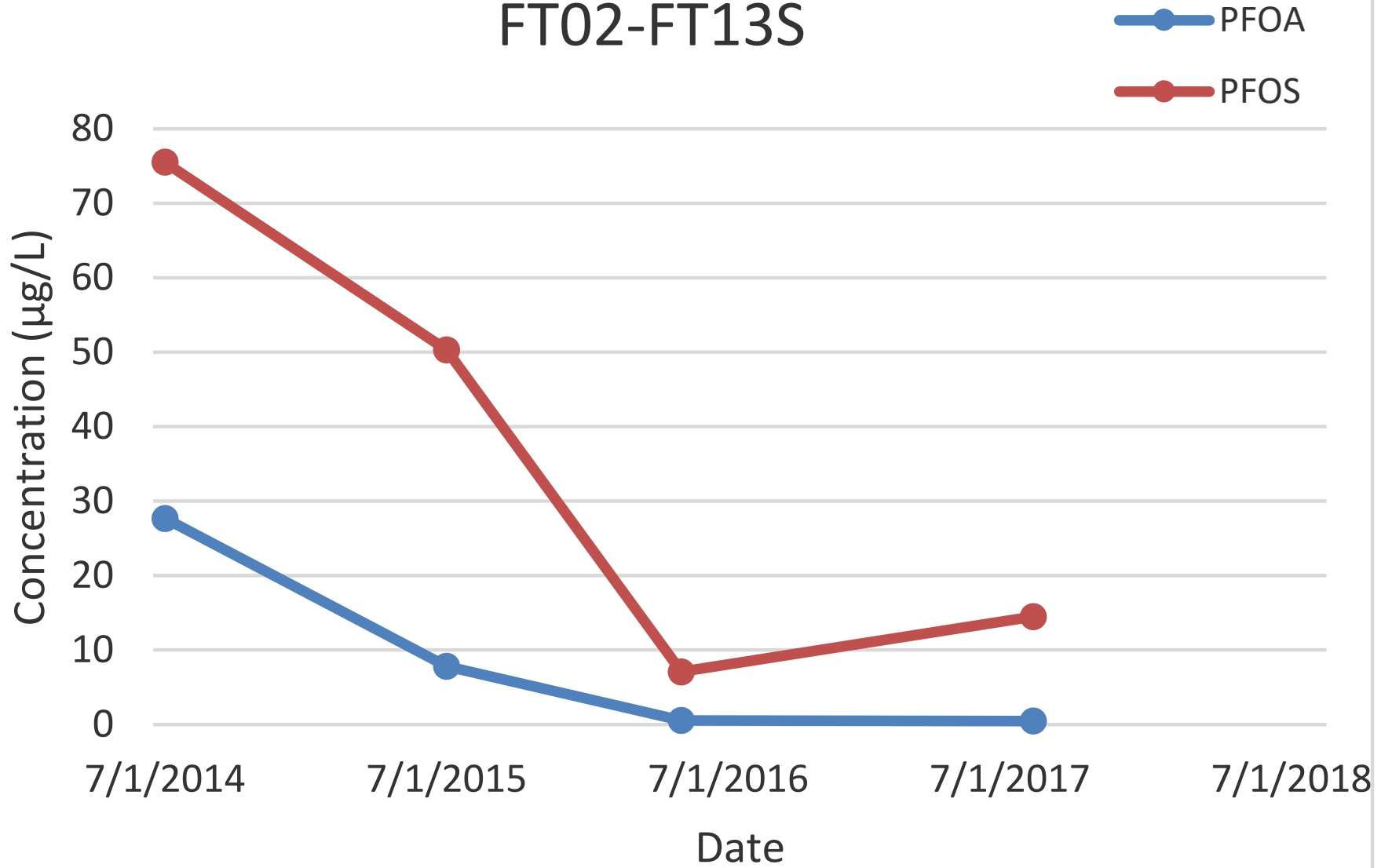
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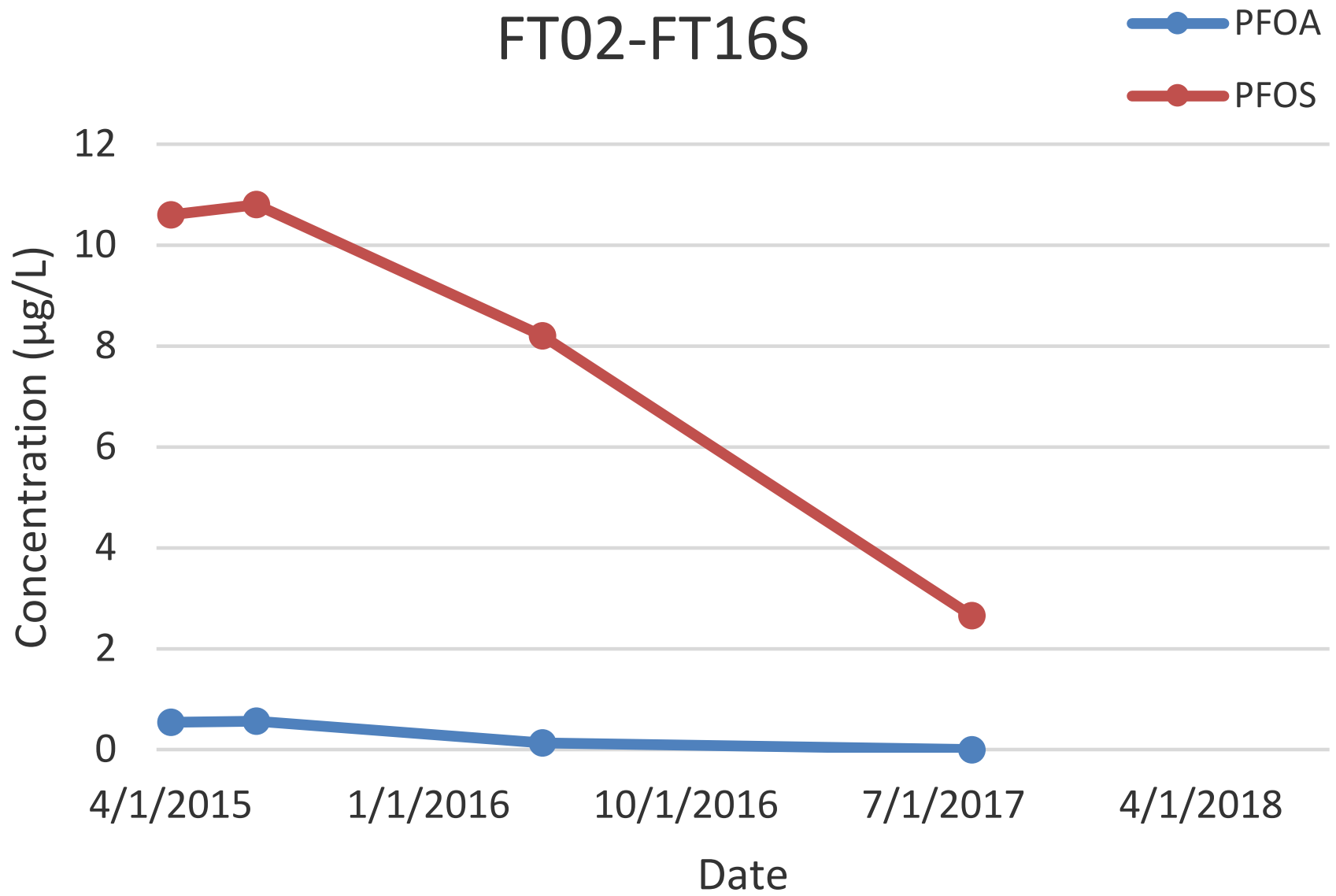
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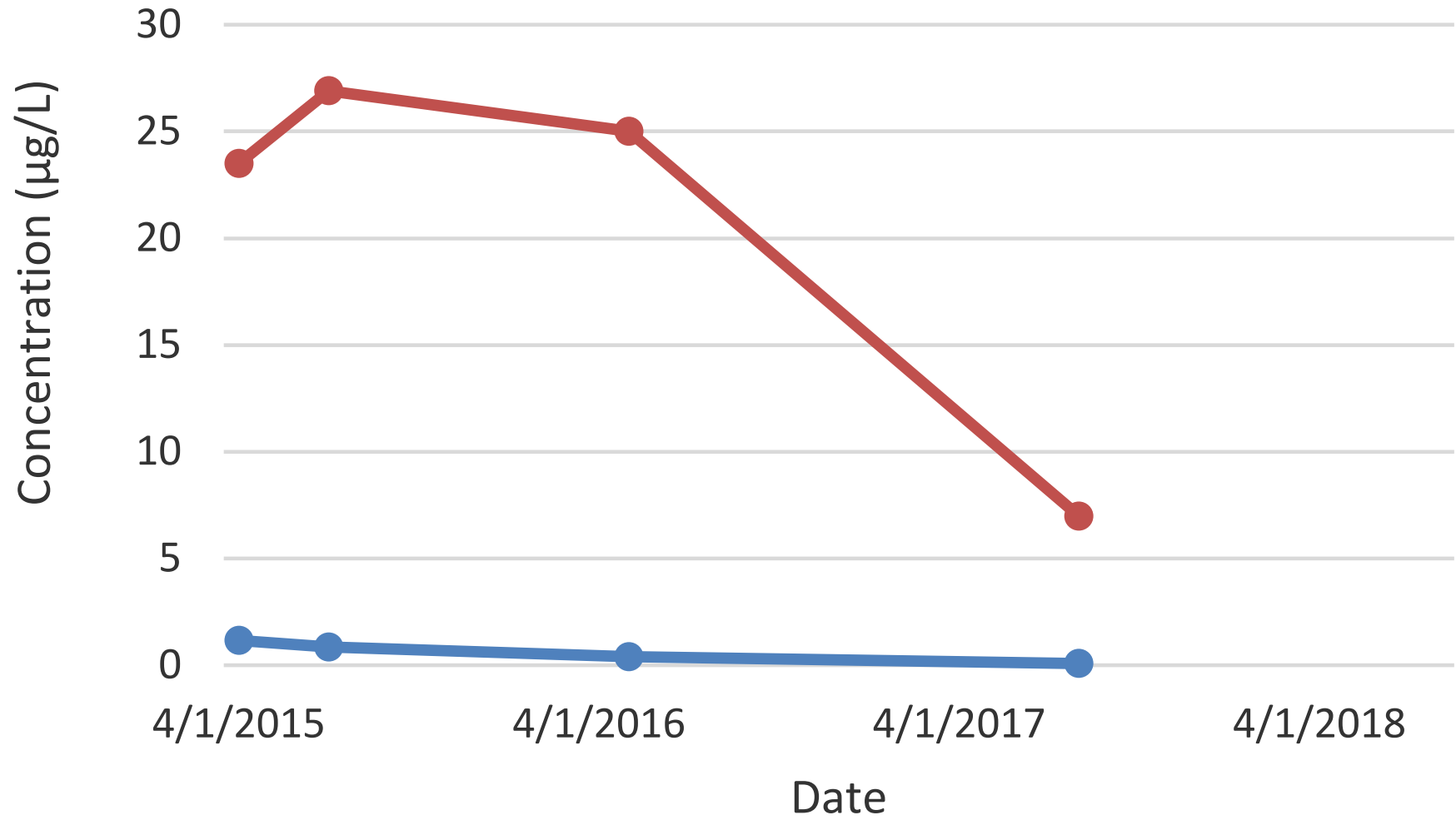


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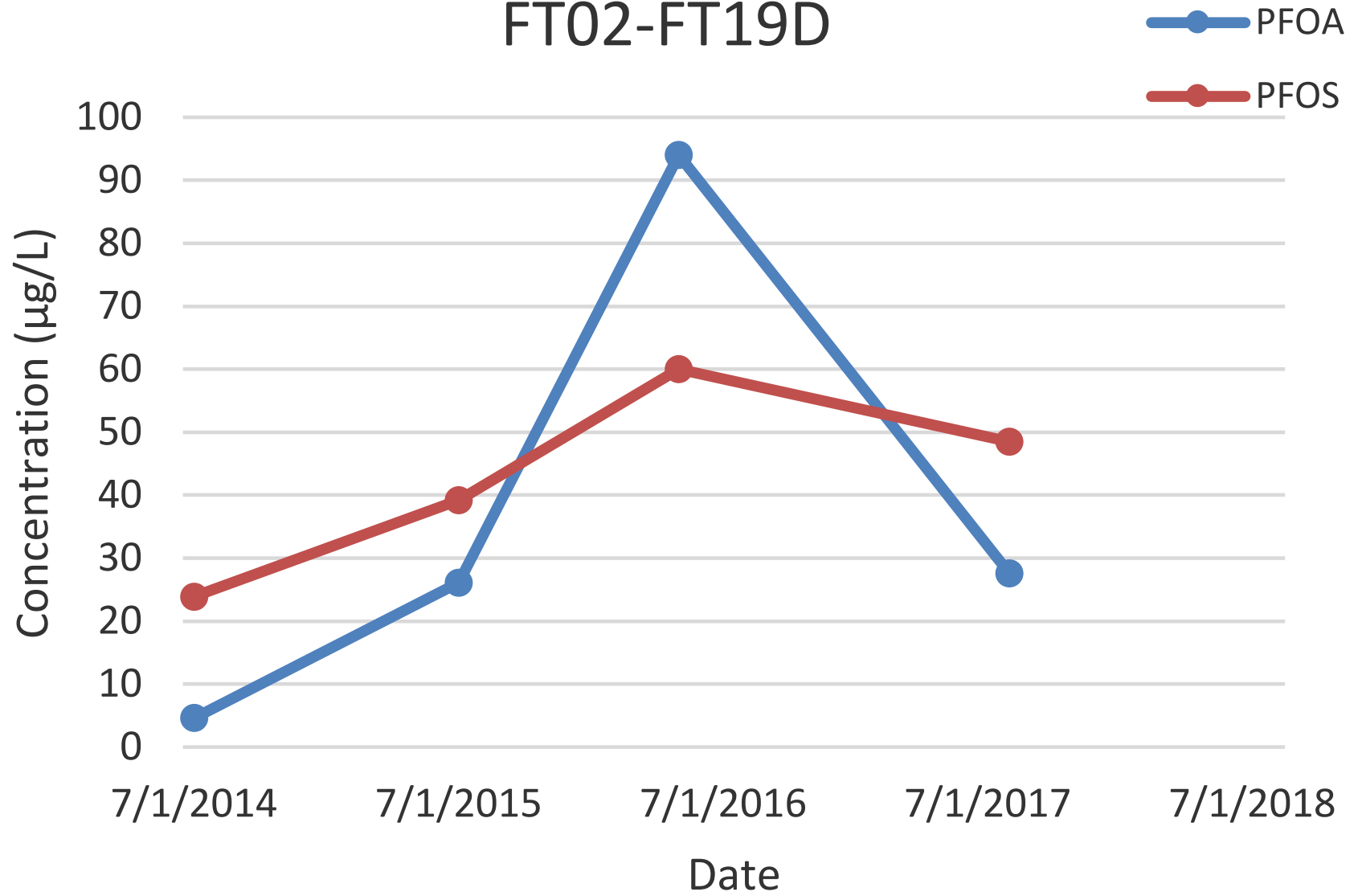


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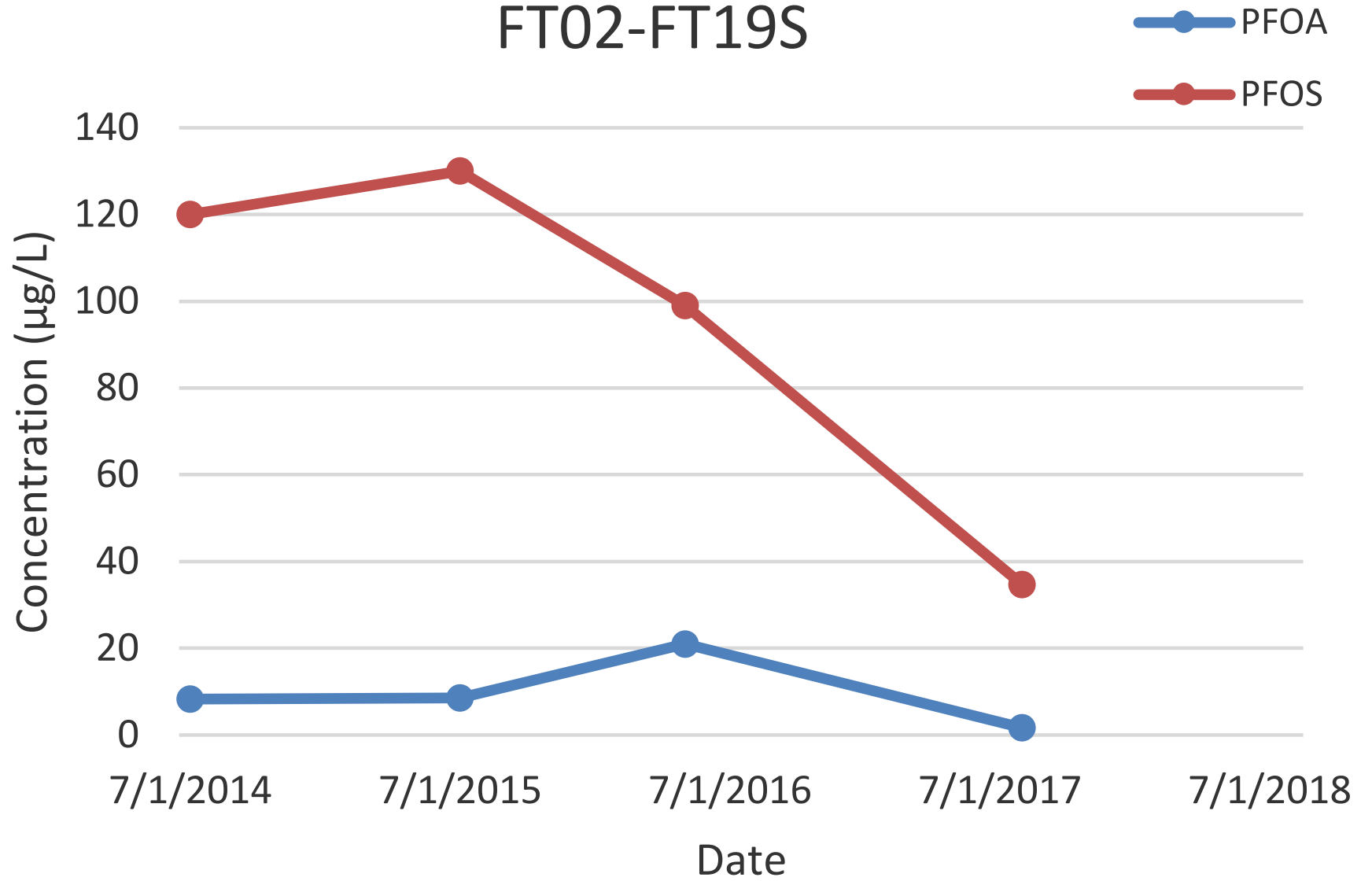
PFOA
PFOS



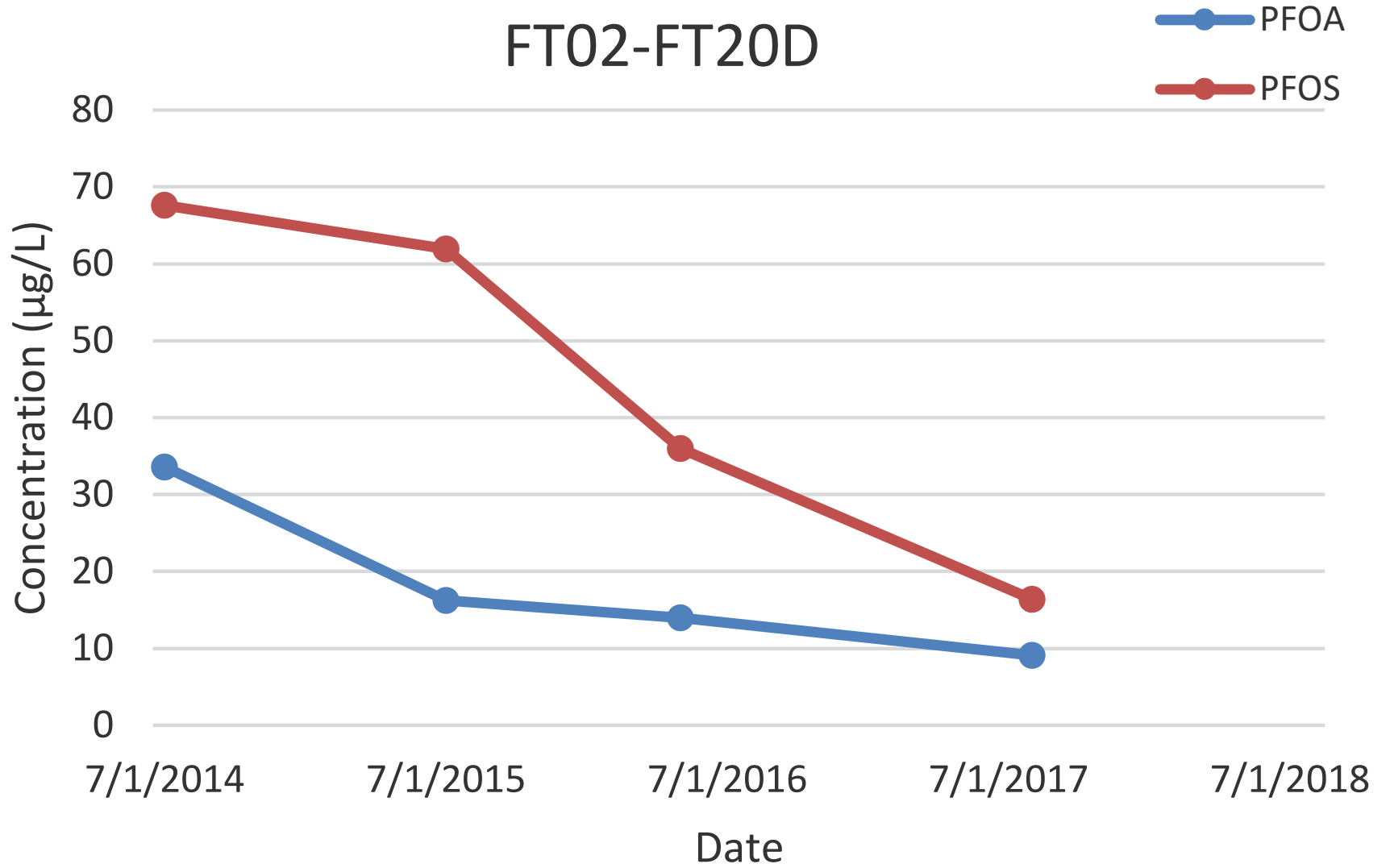
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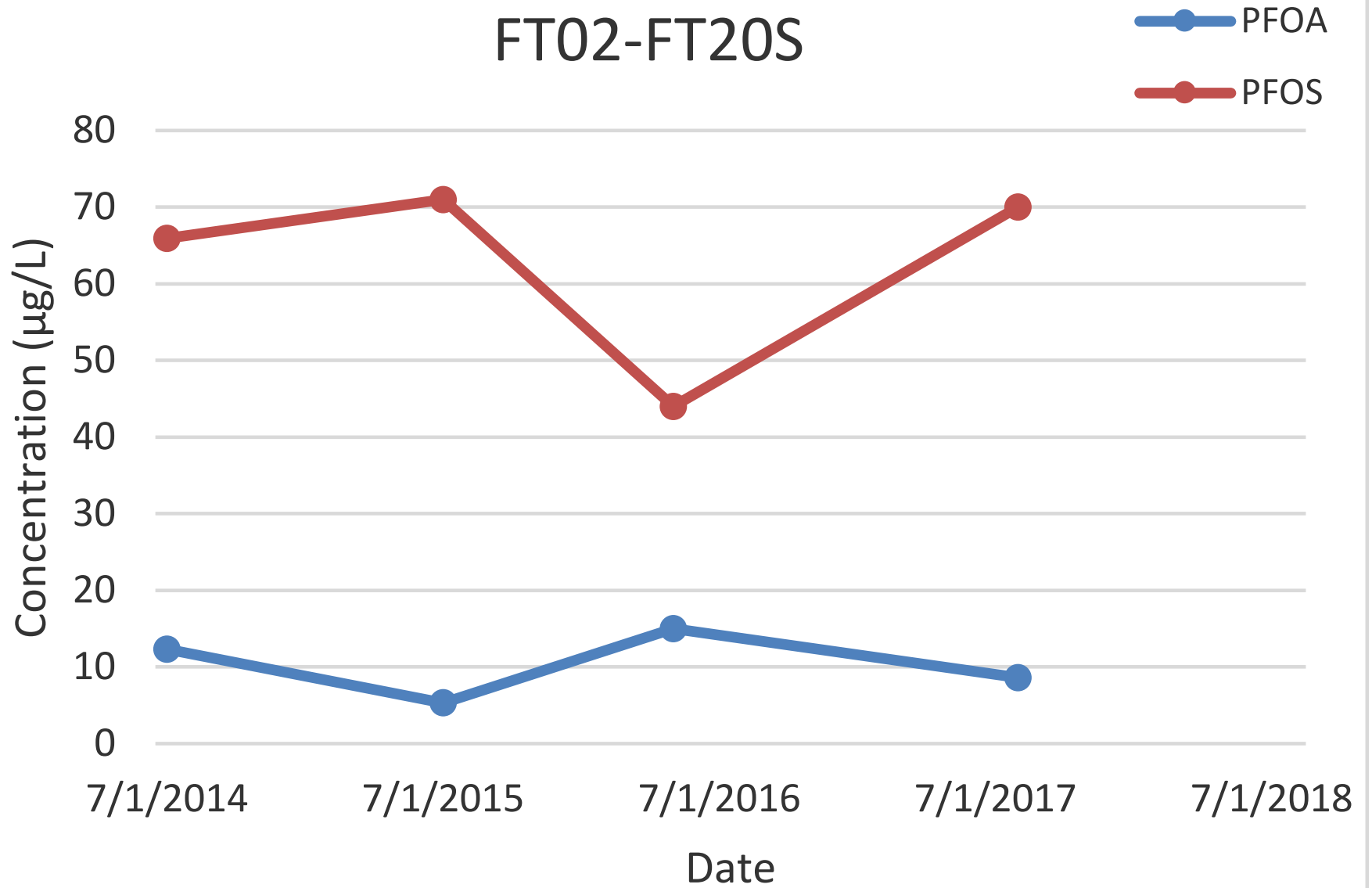
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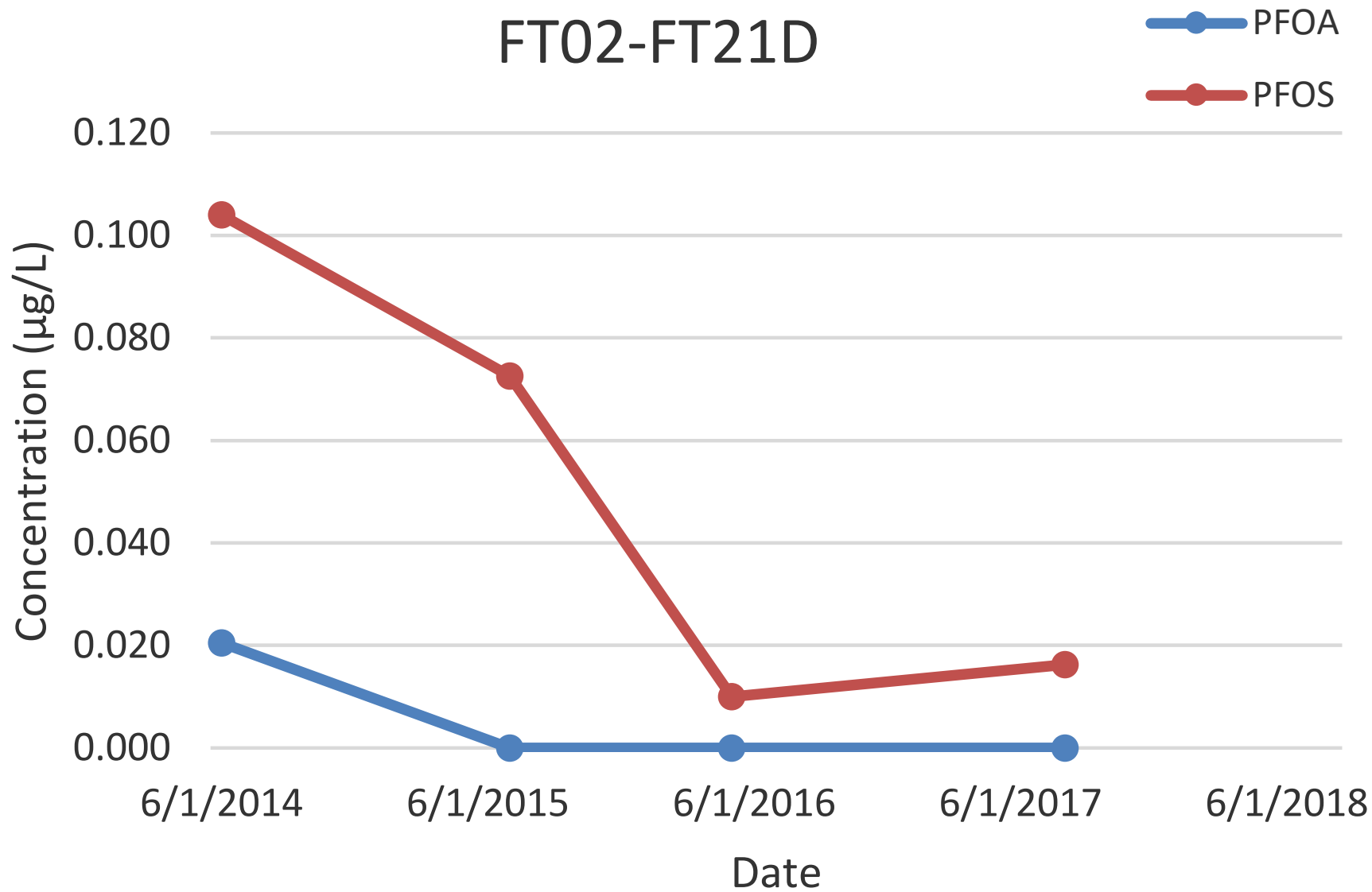
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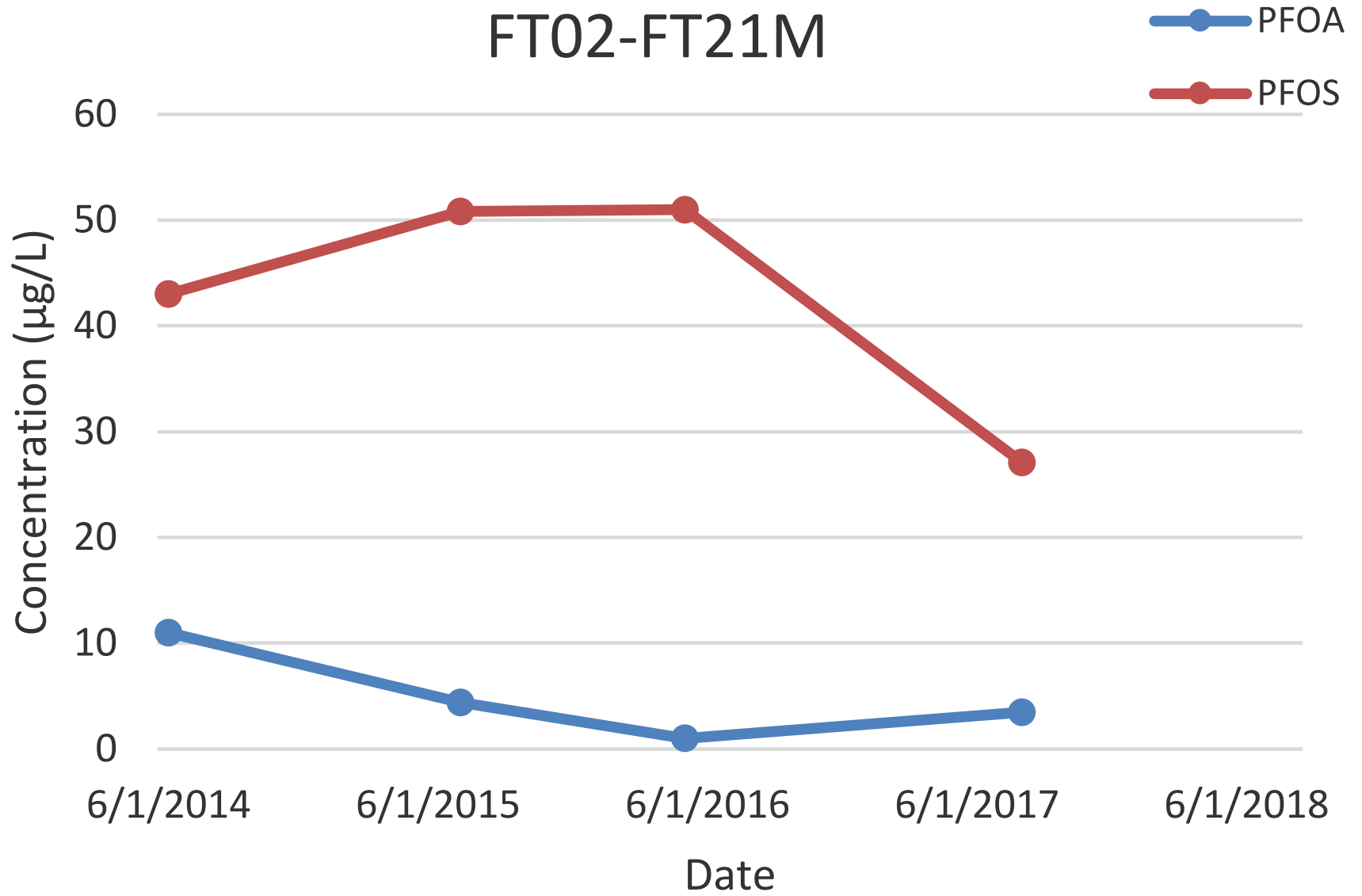
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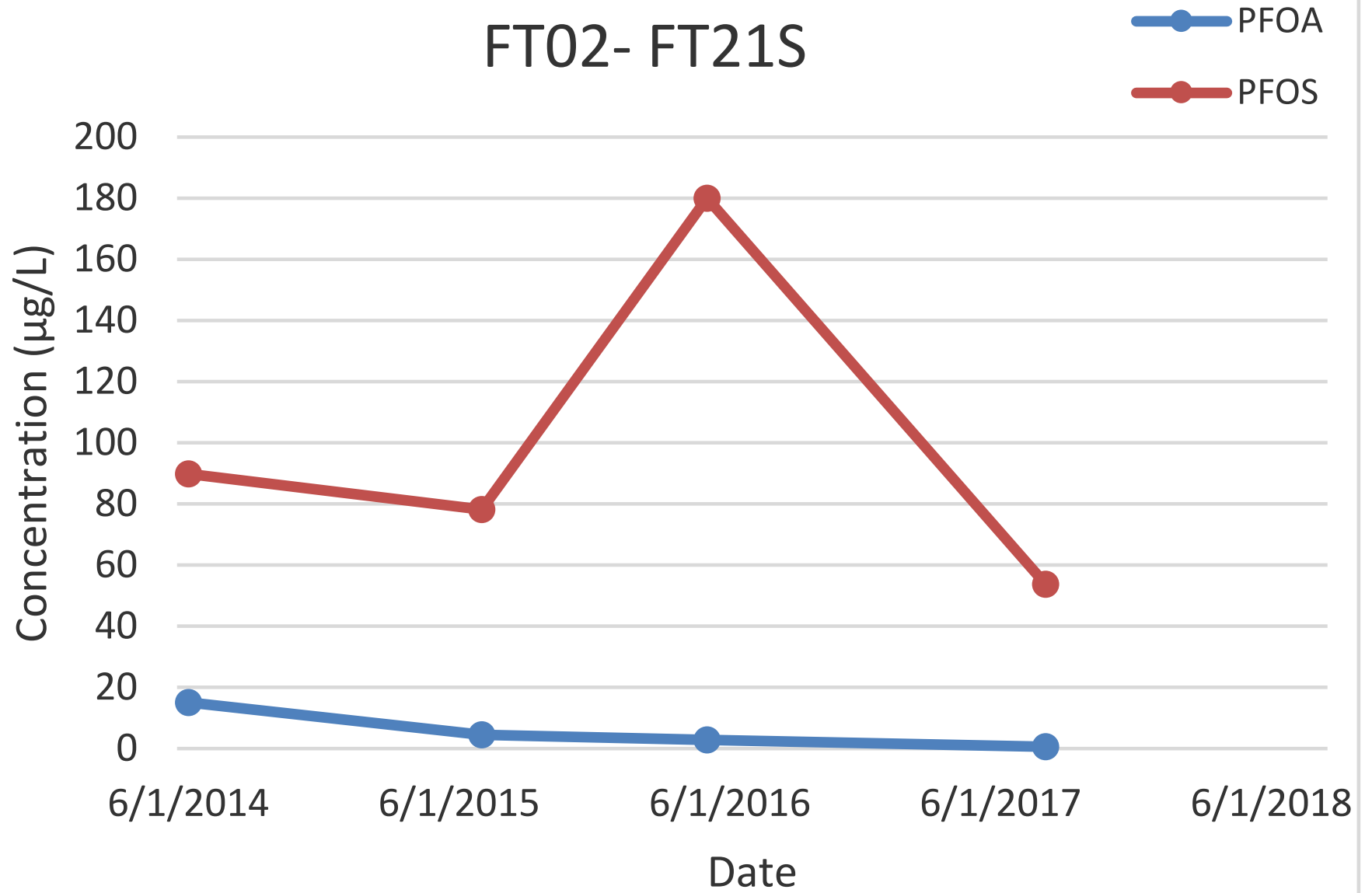
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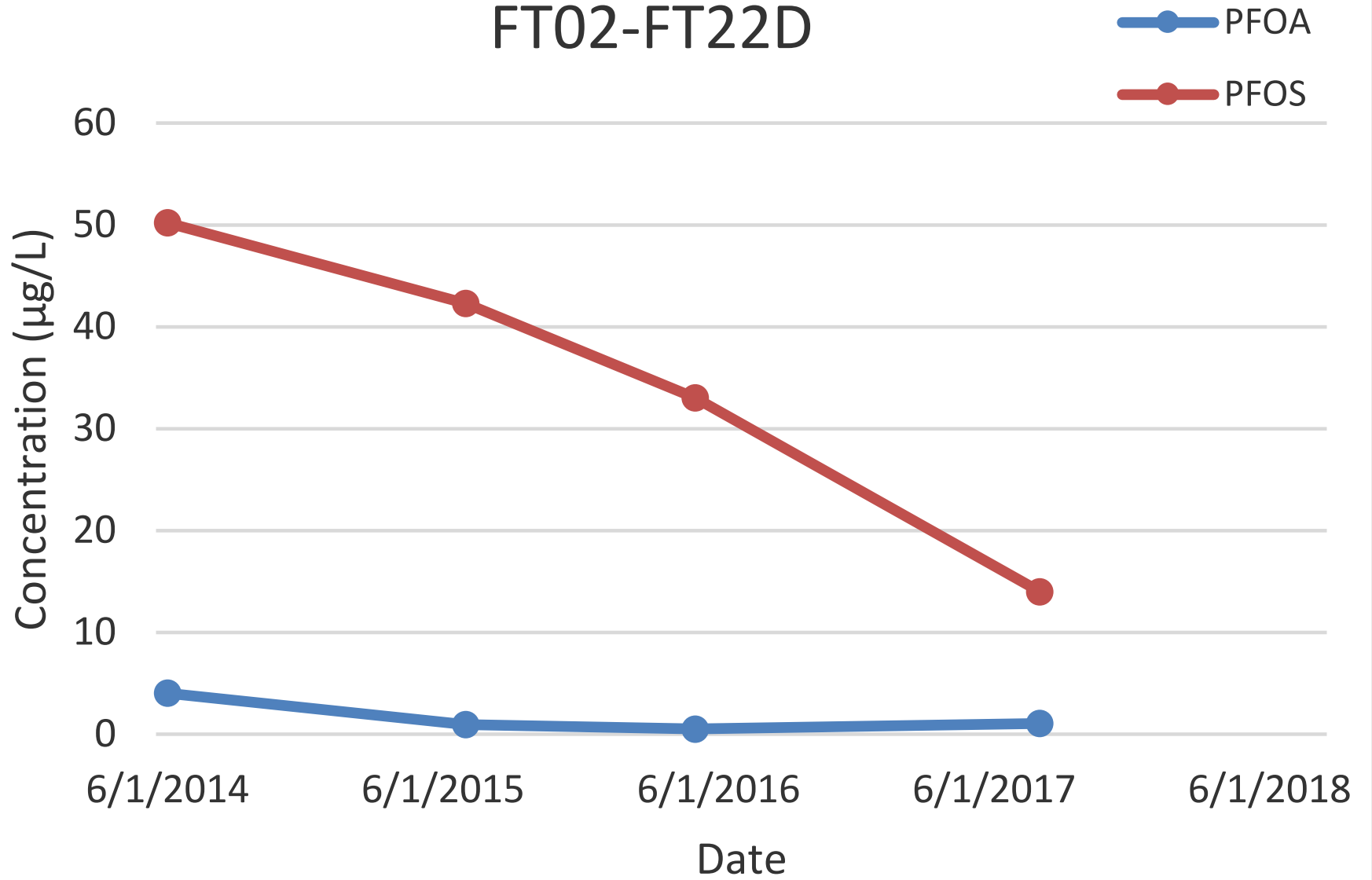
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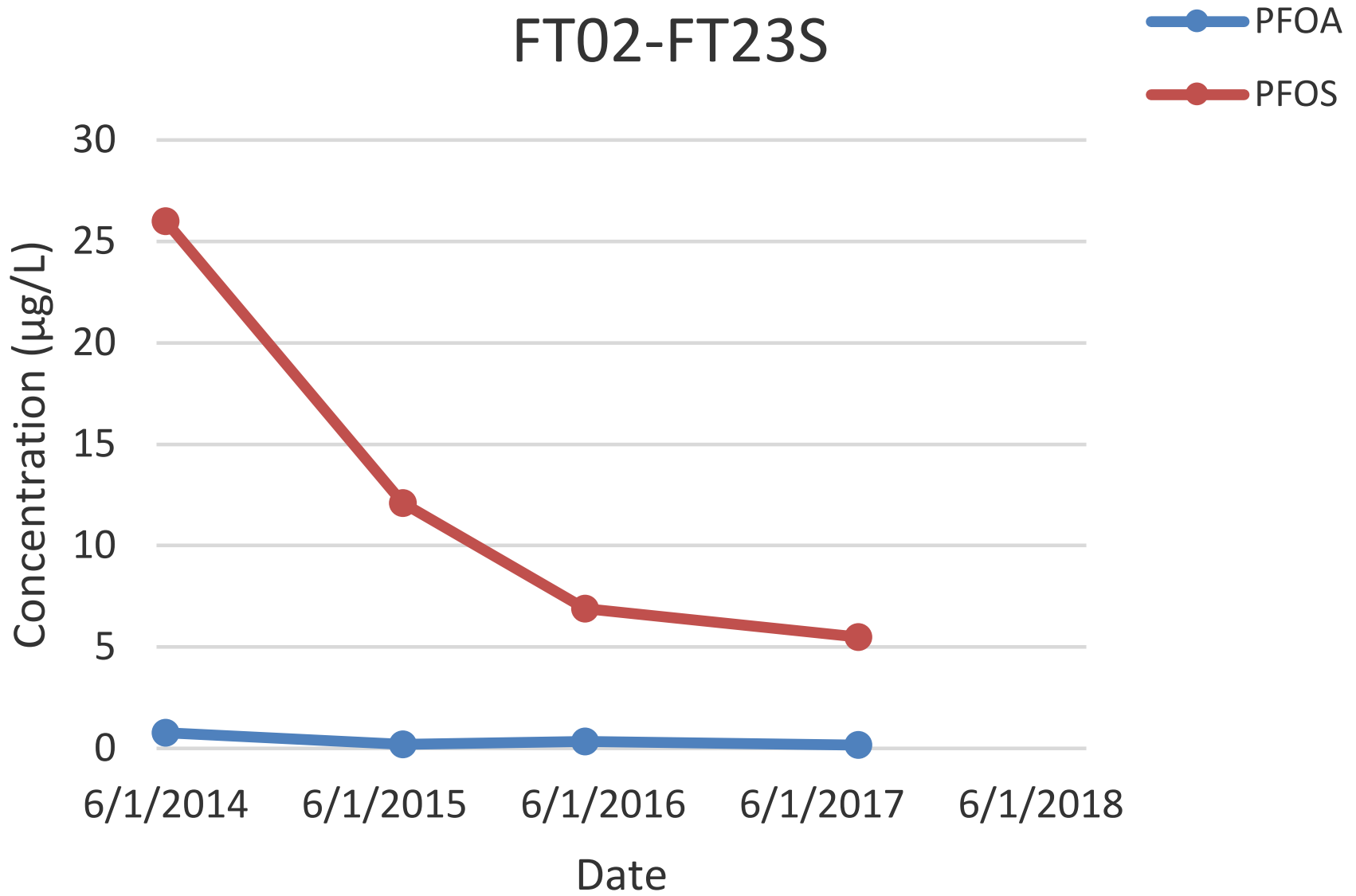
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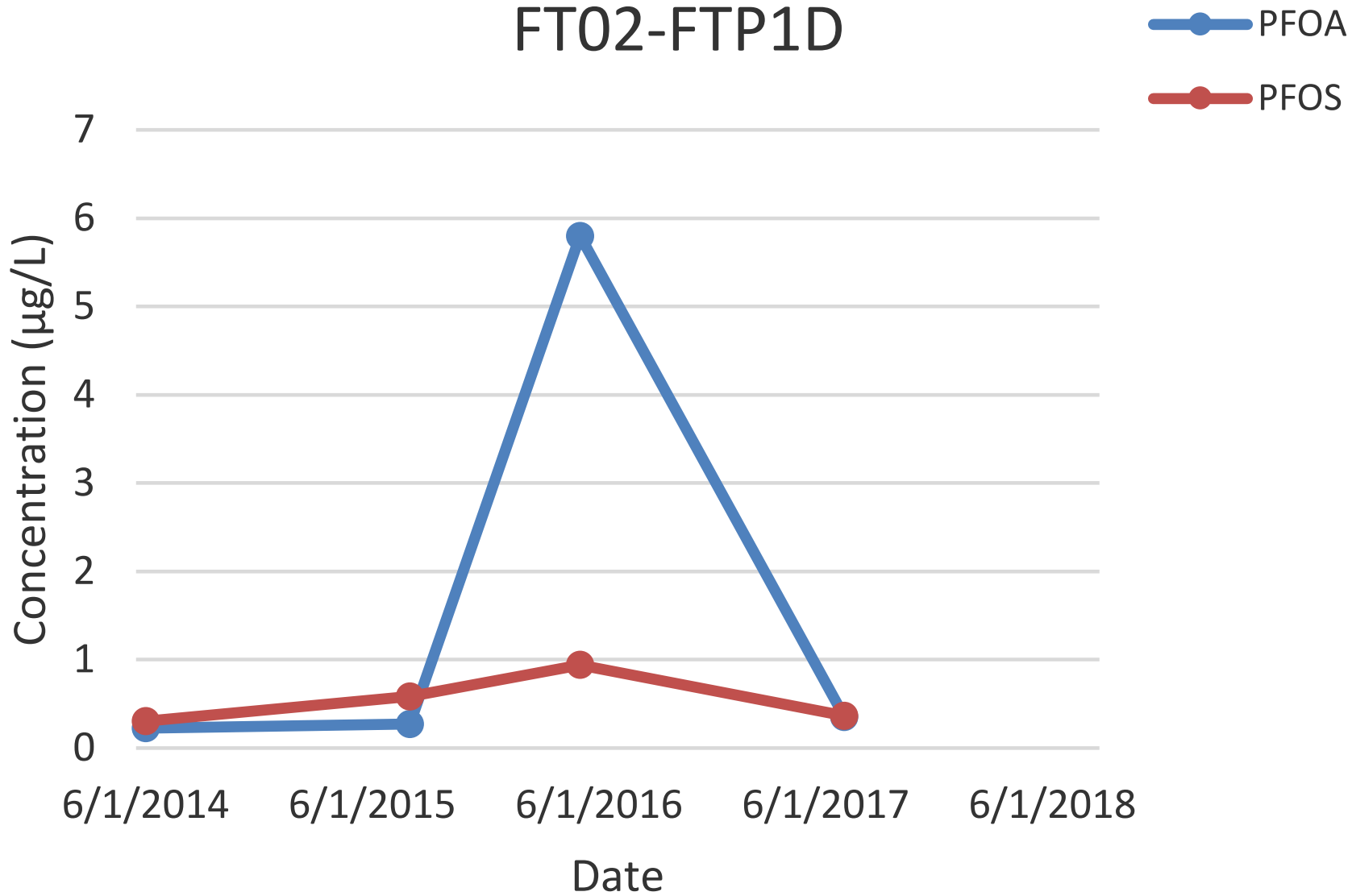
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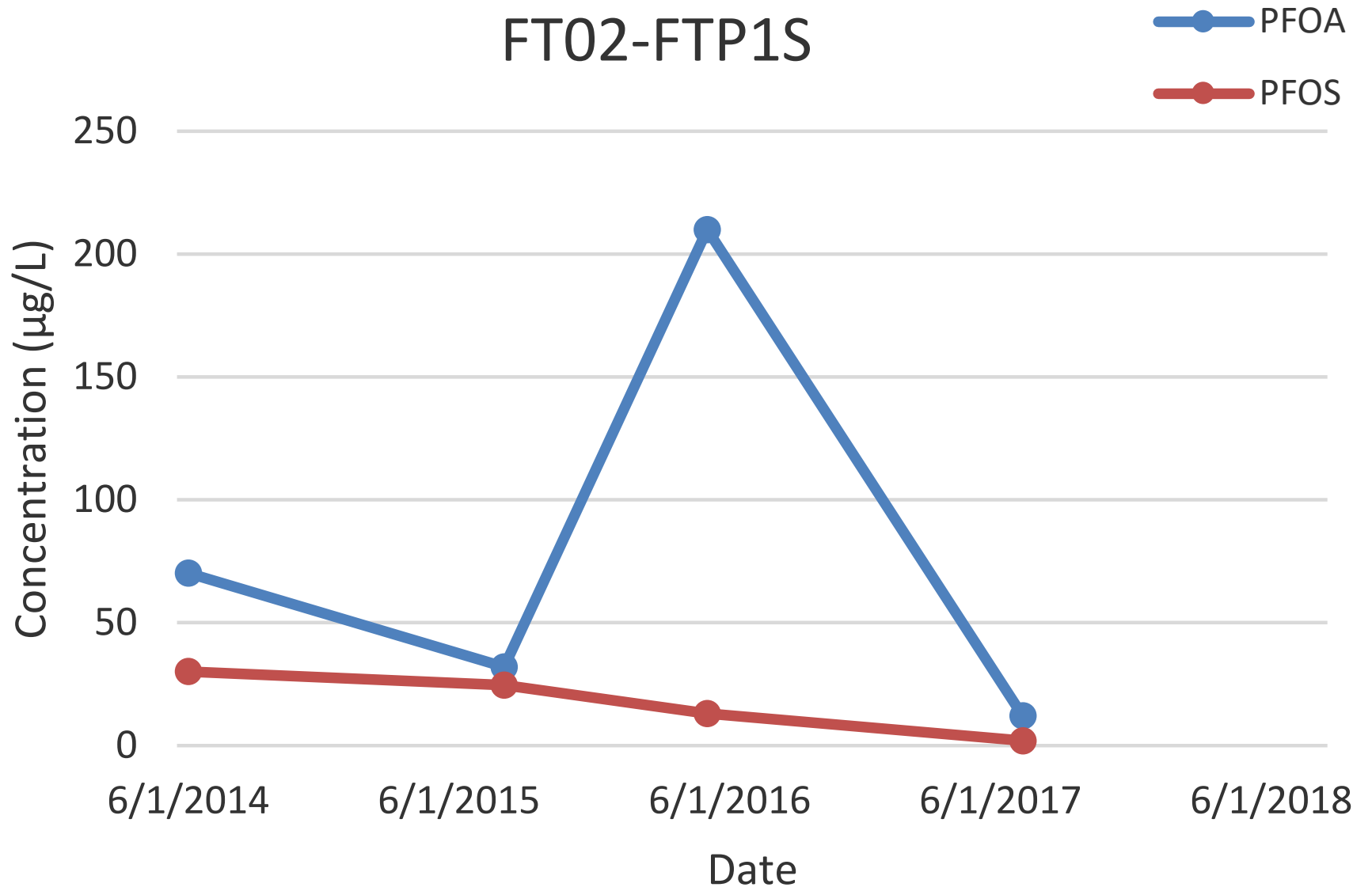
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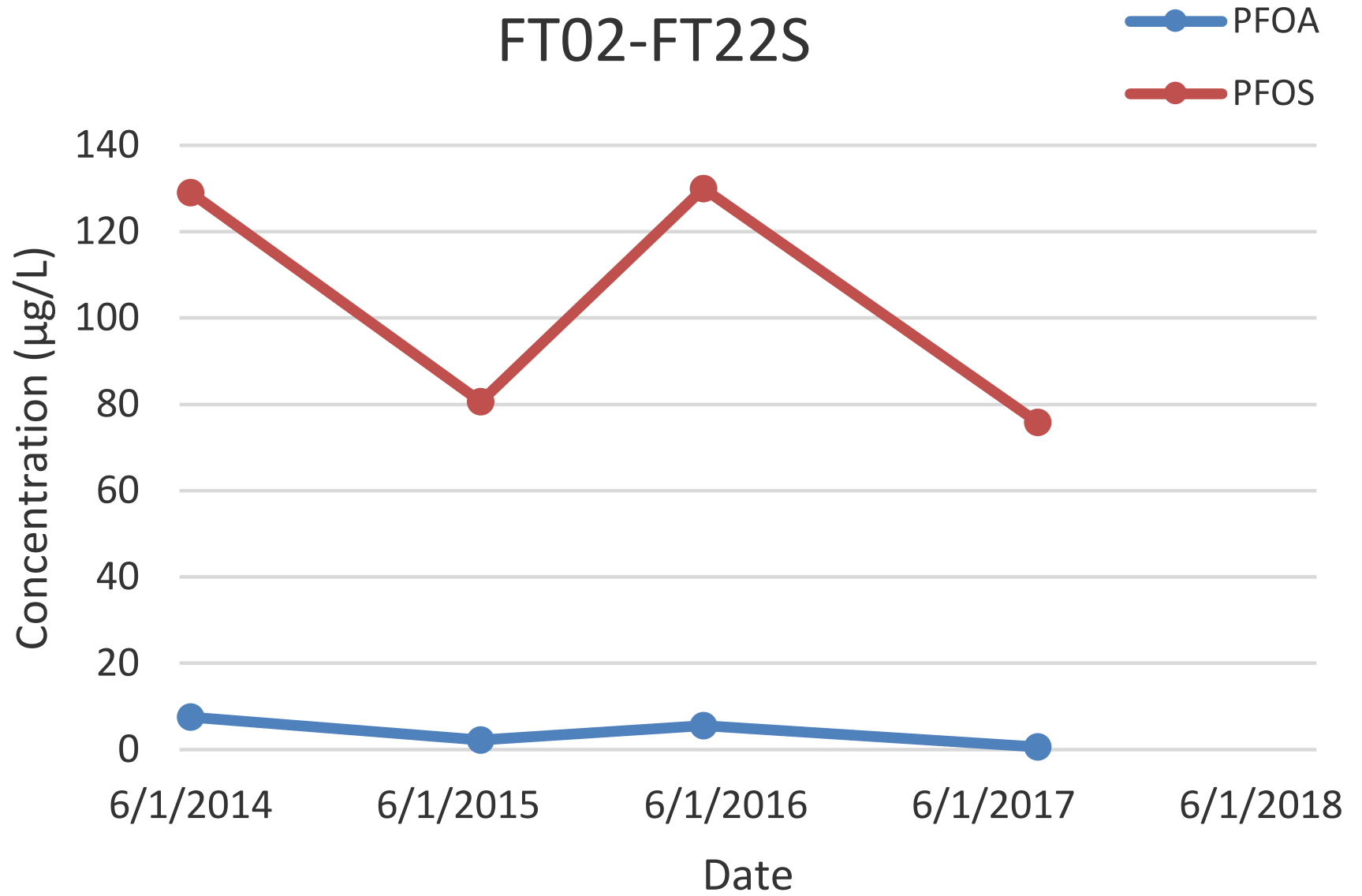
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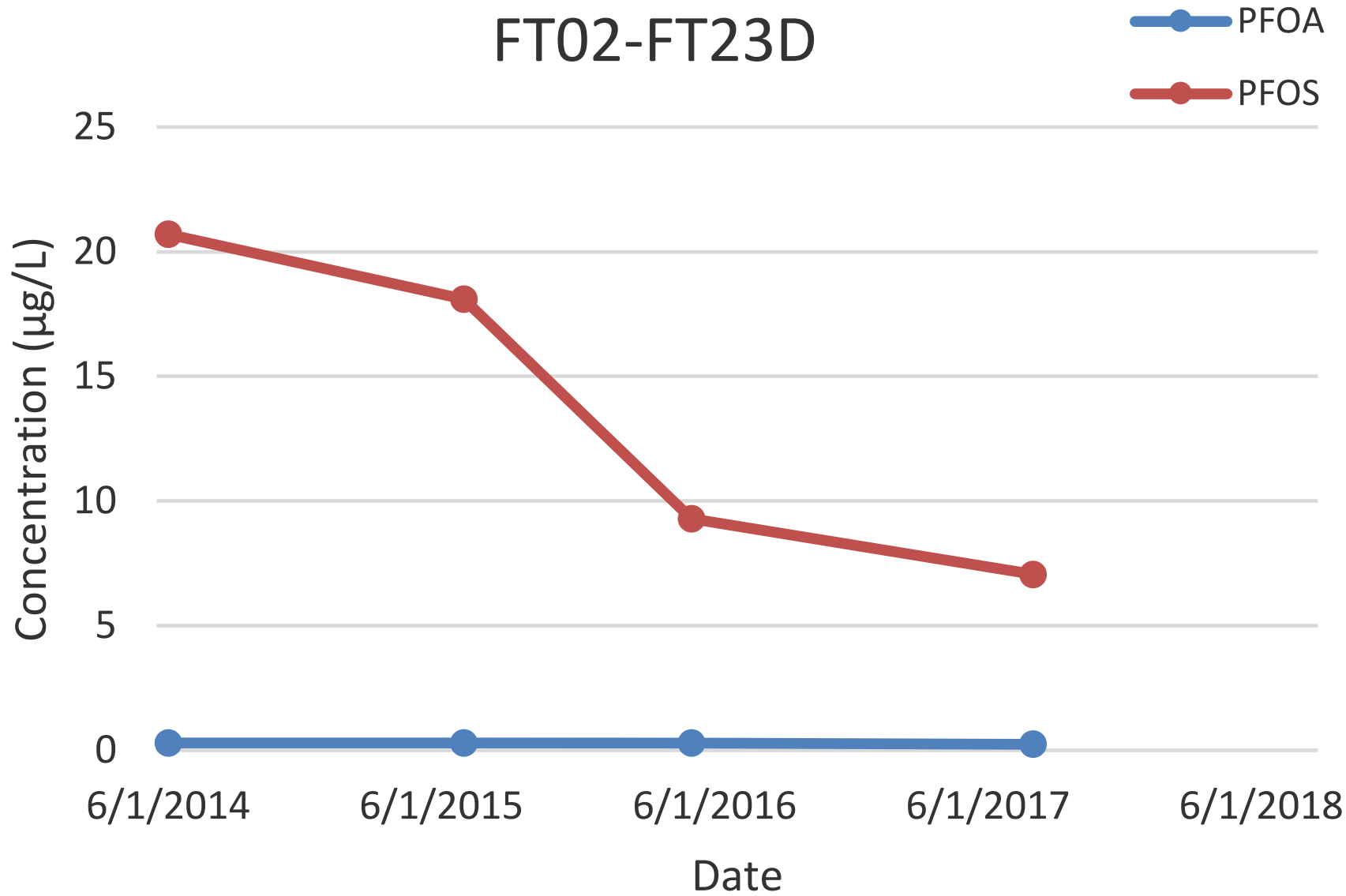
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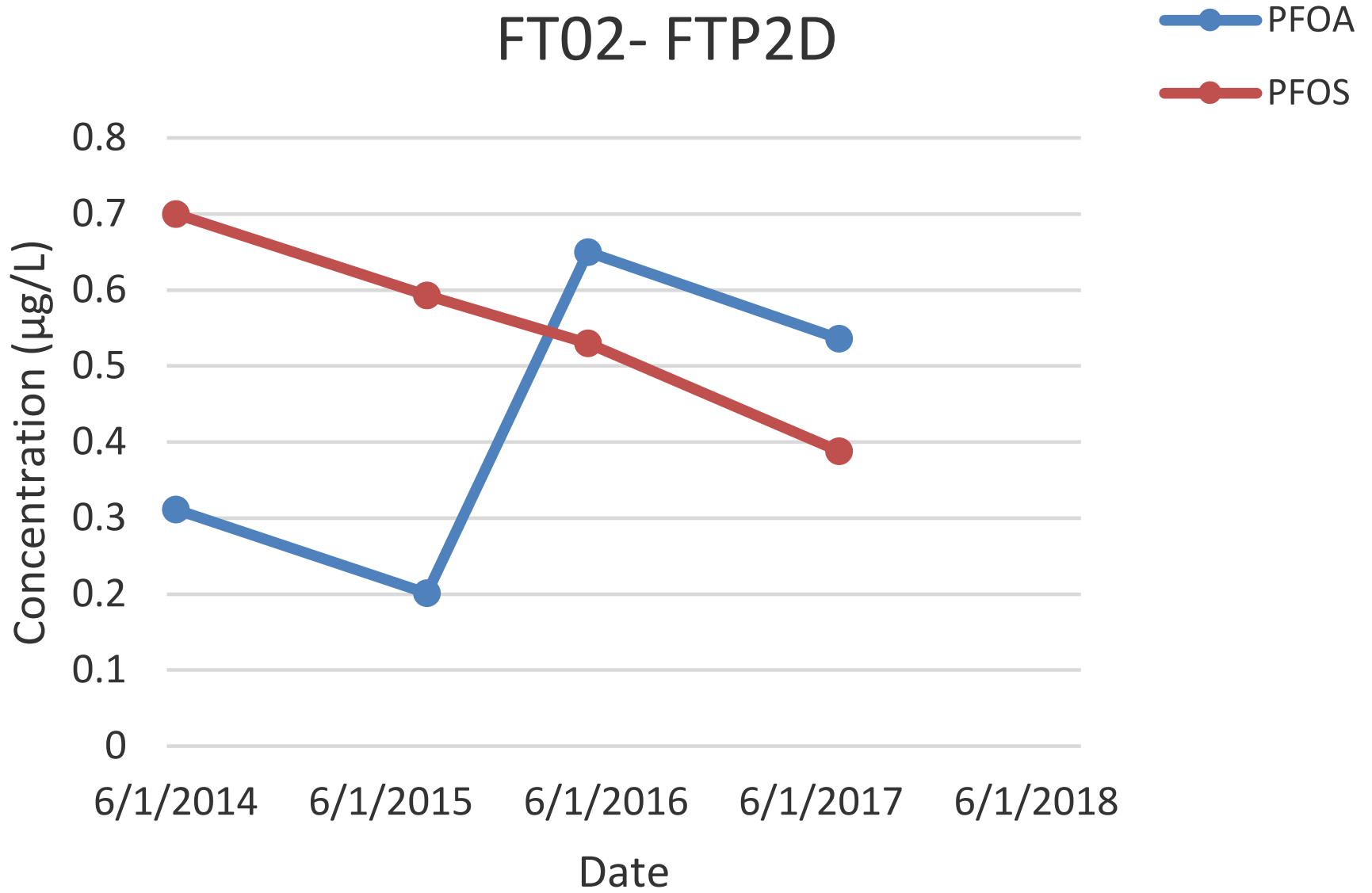
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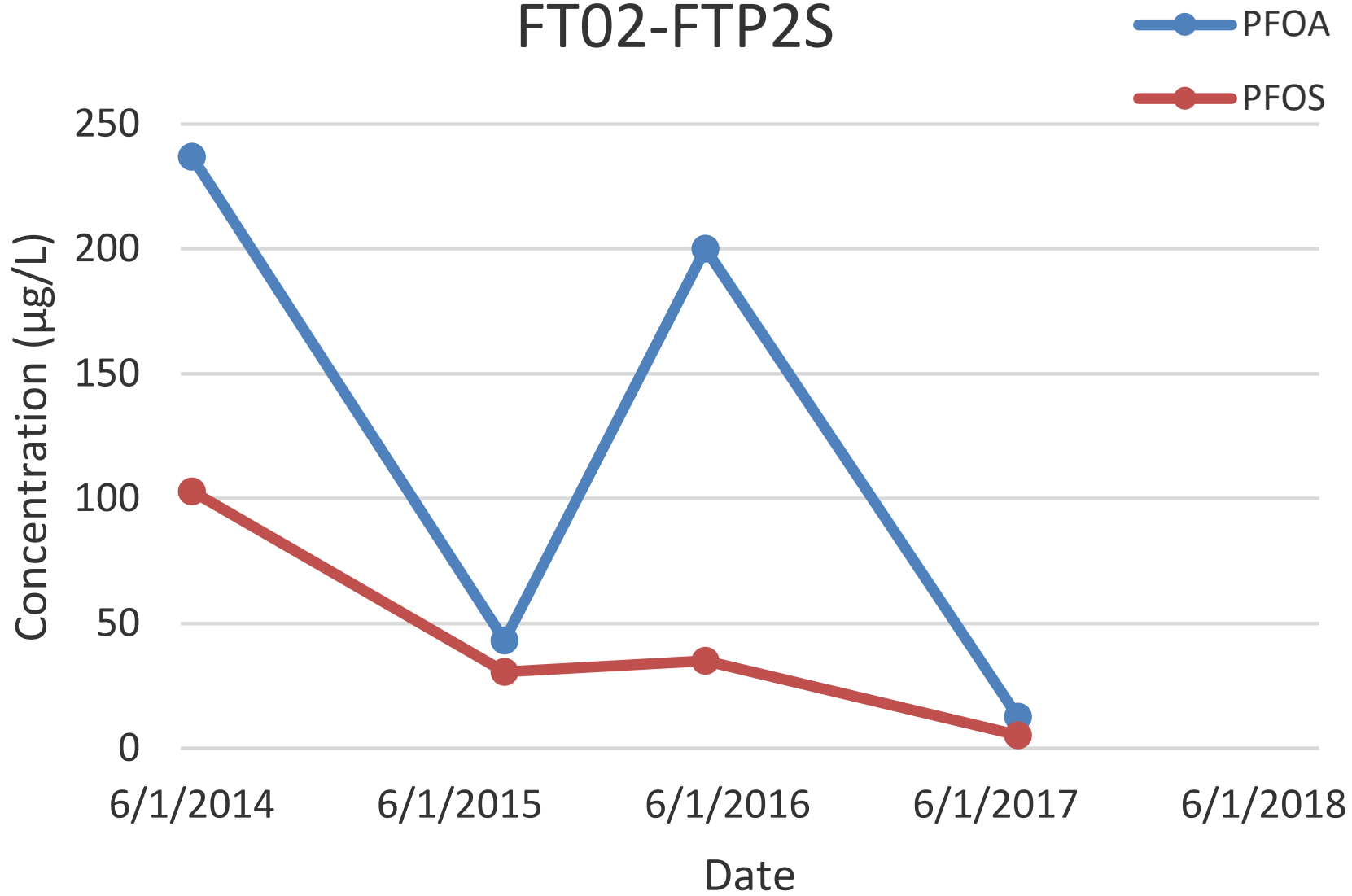
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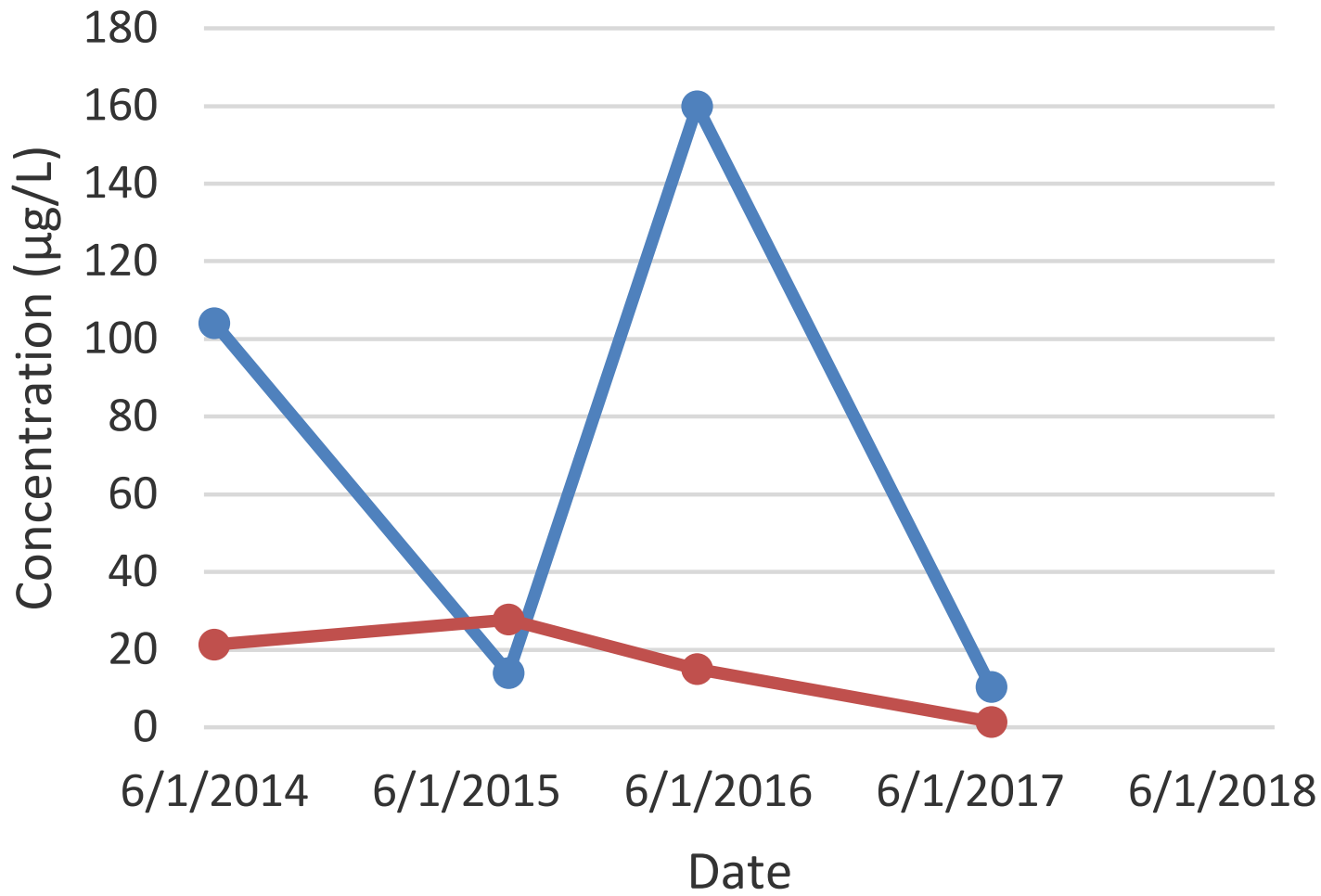


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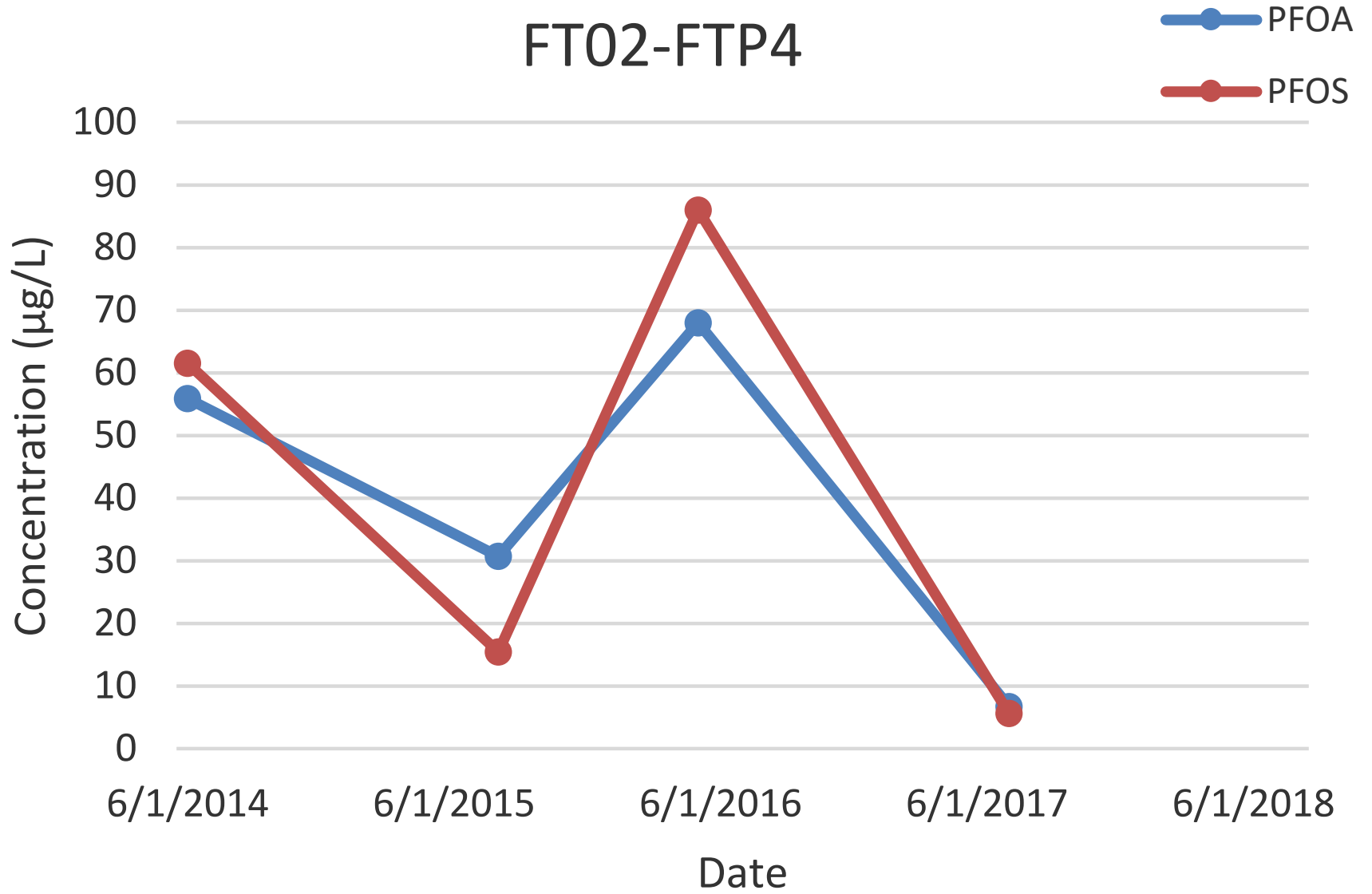


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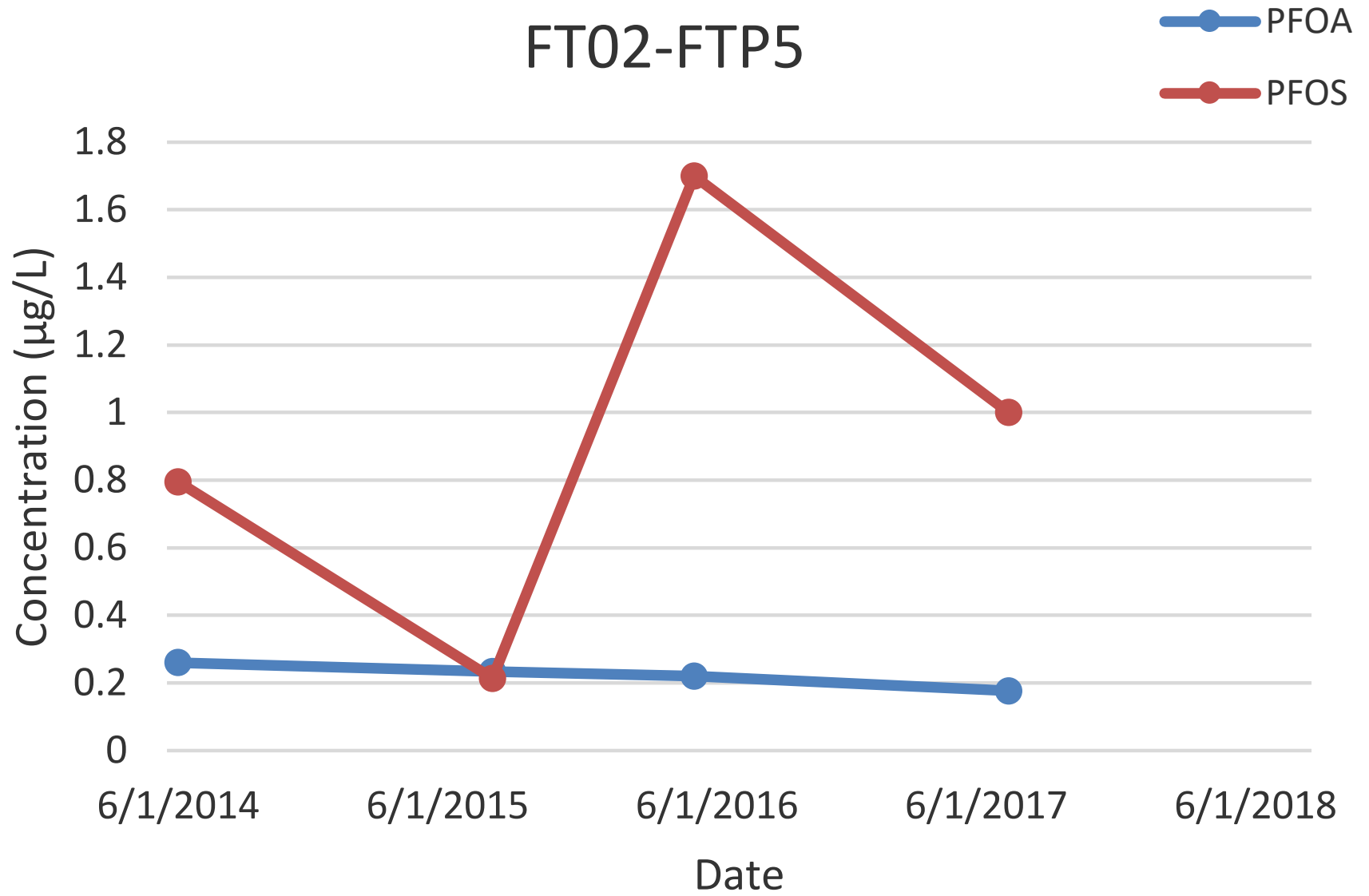
—●— PFOA
—●— PFOS



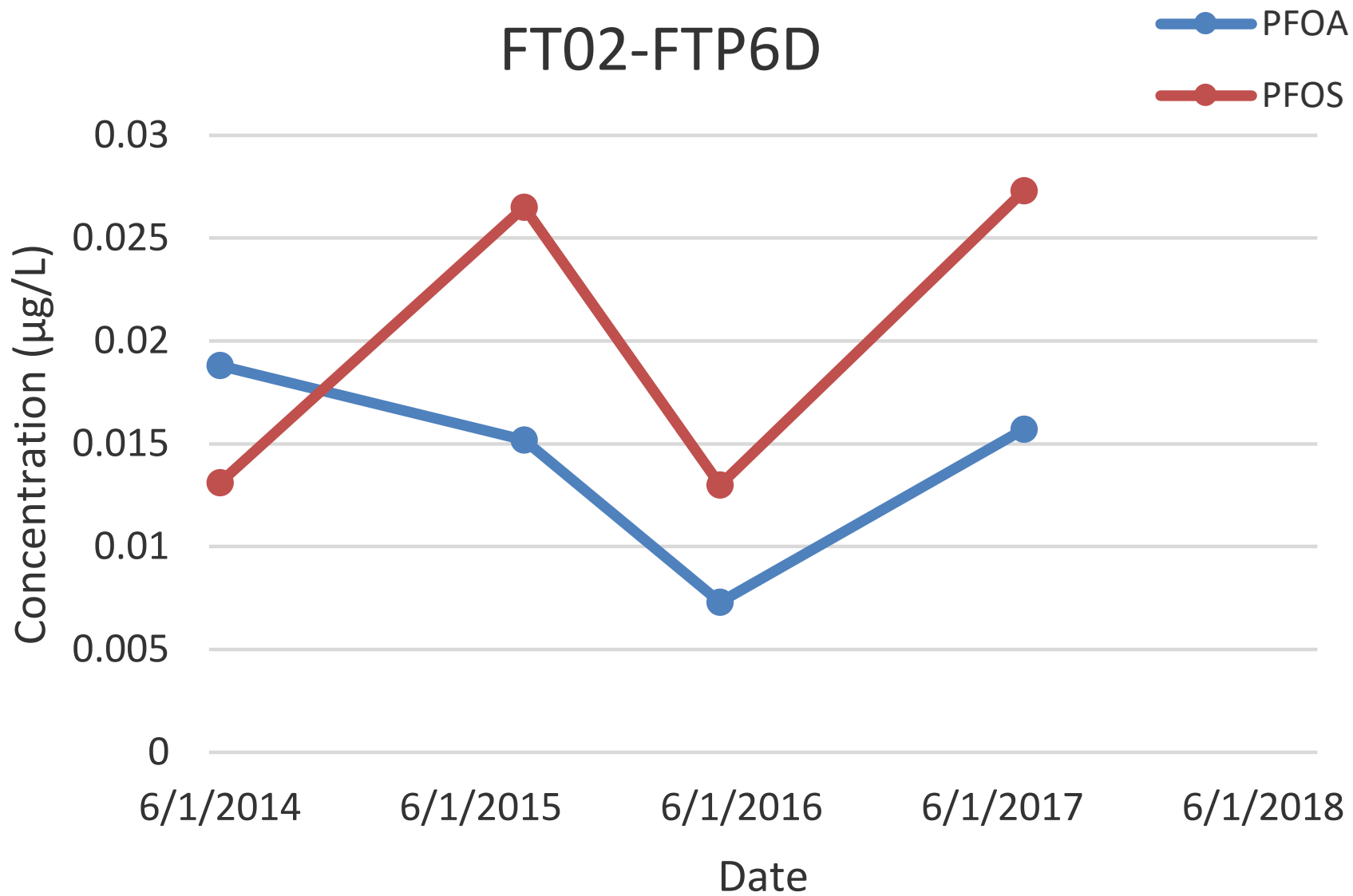
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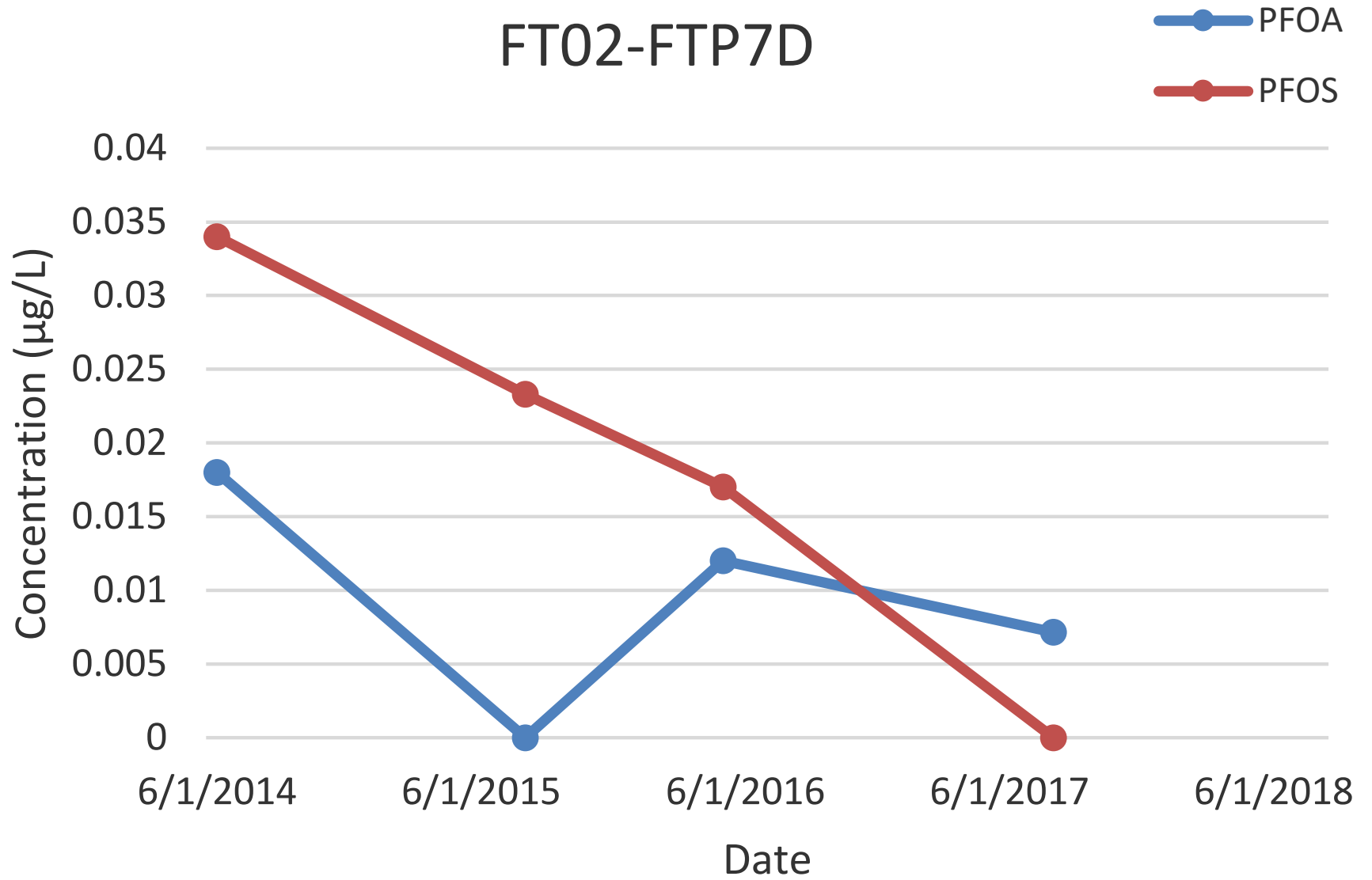
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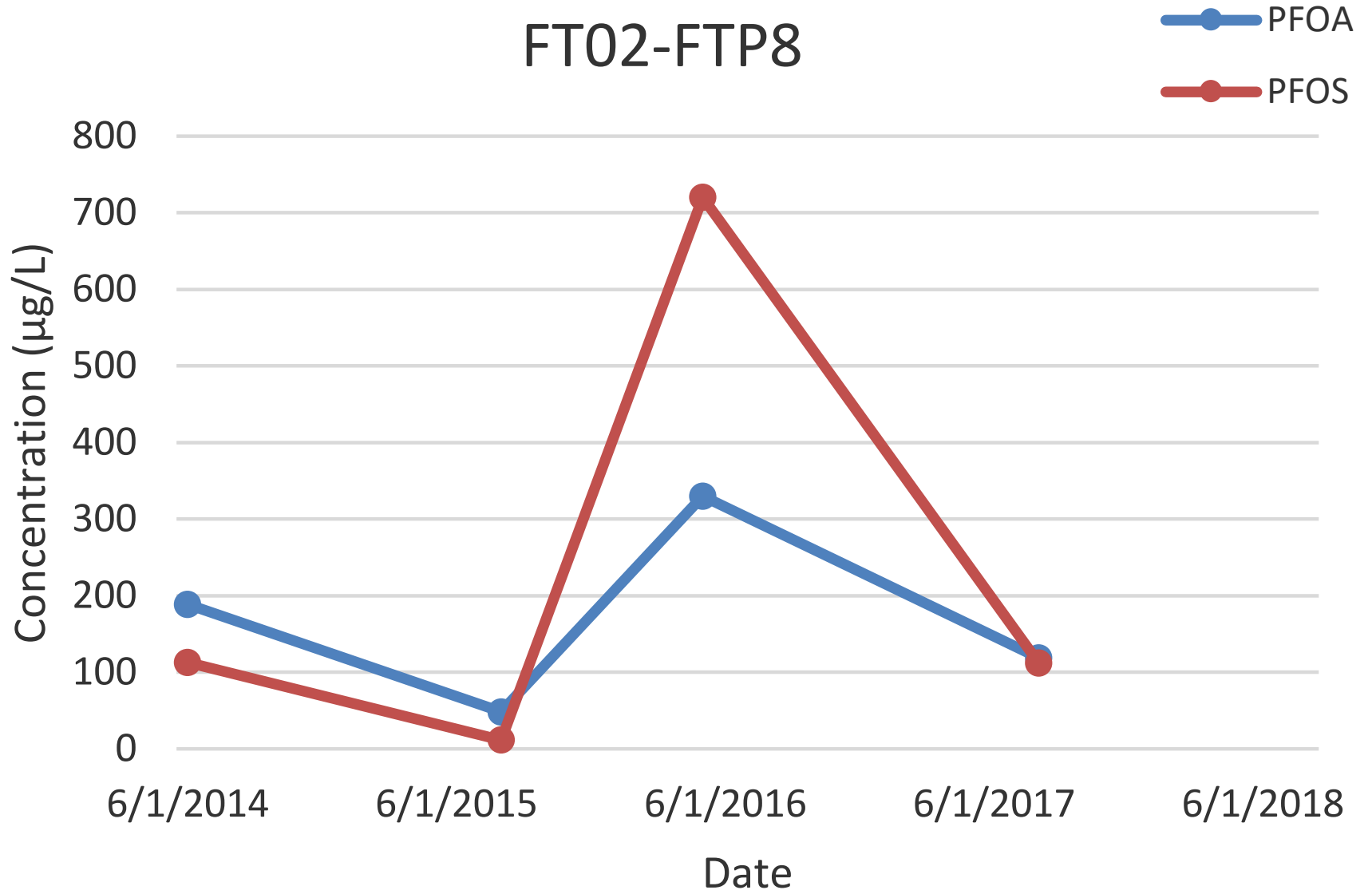
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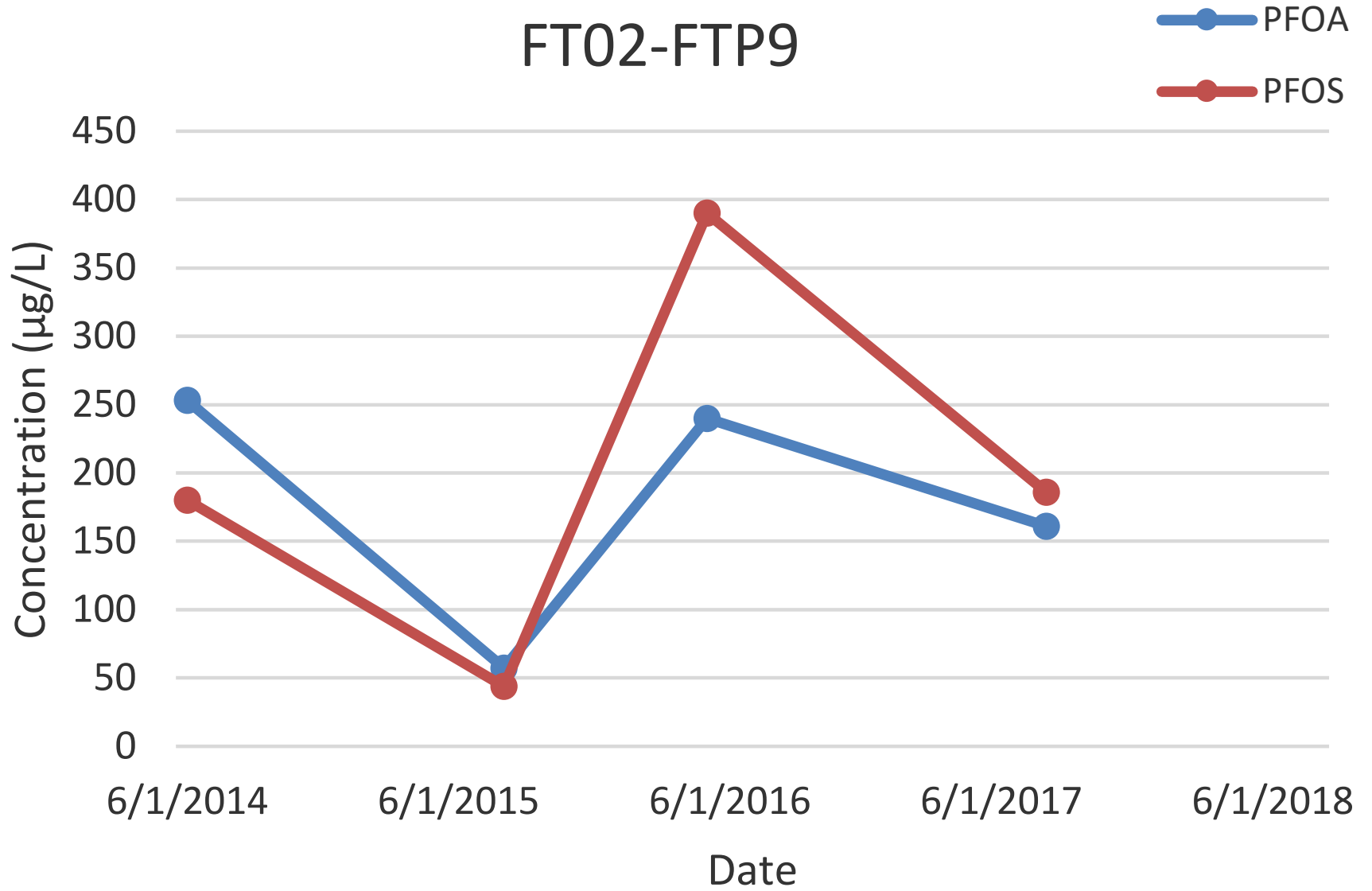
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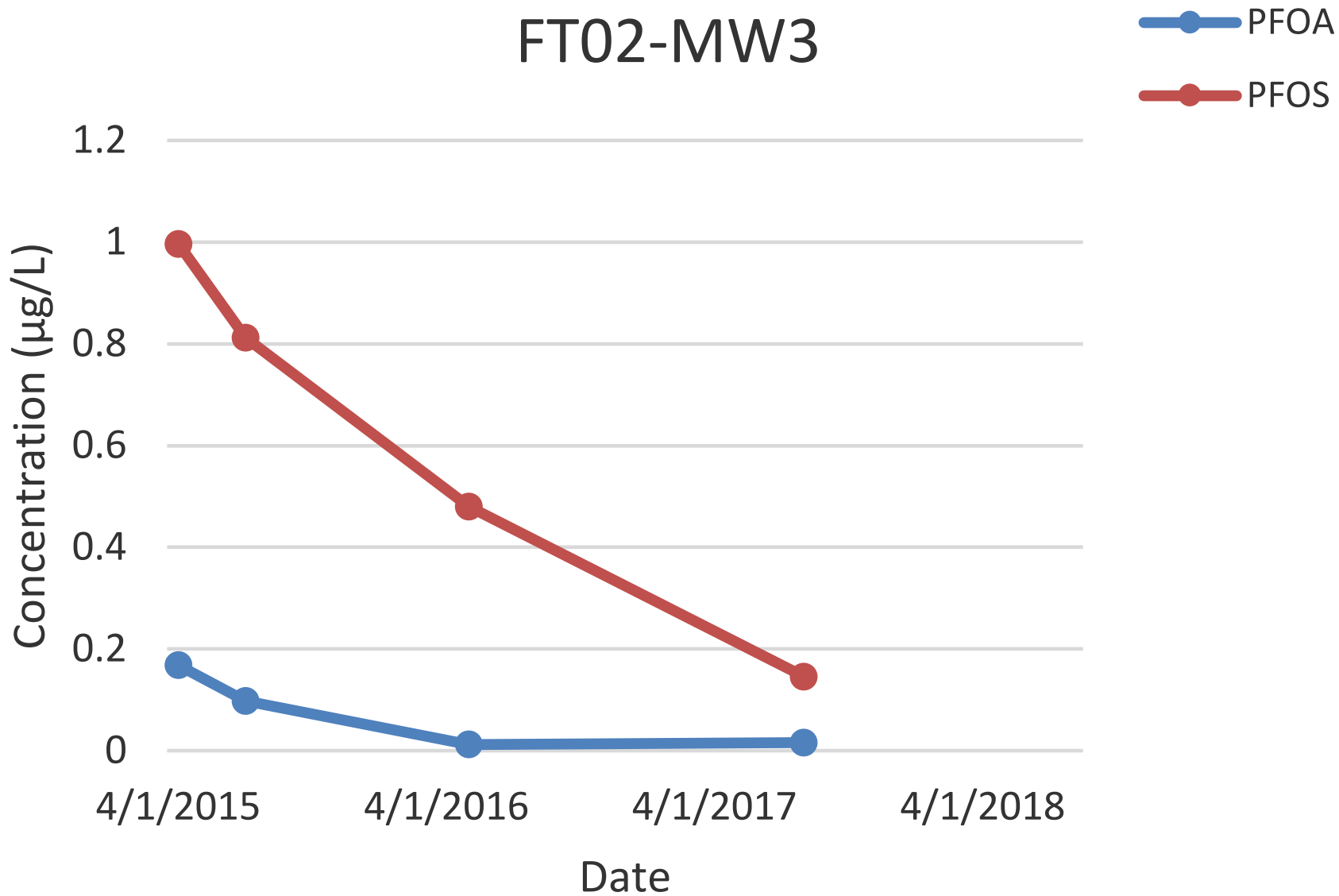
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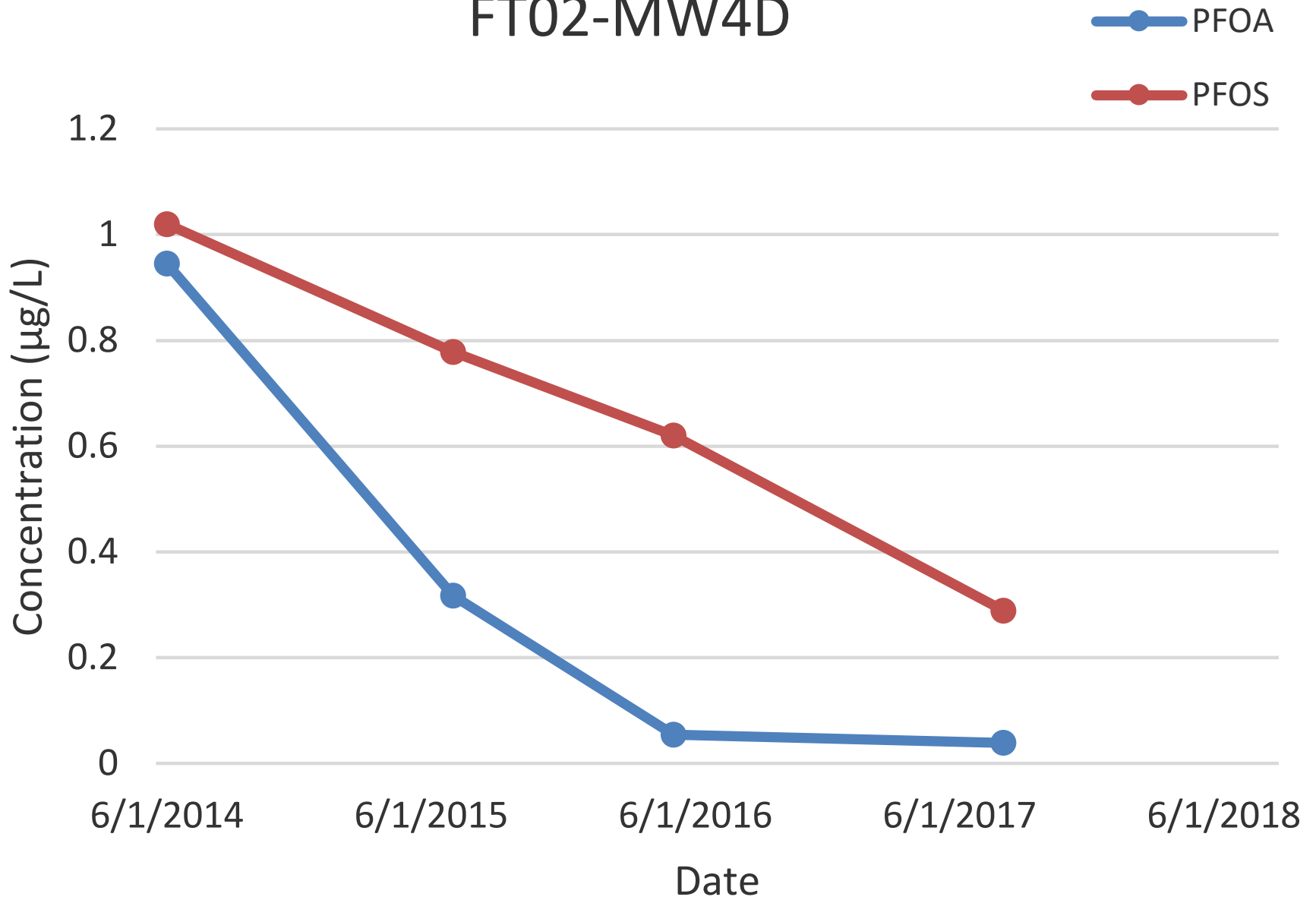
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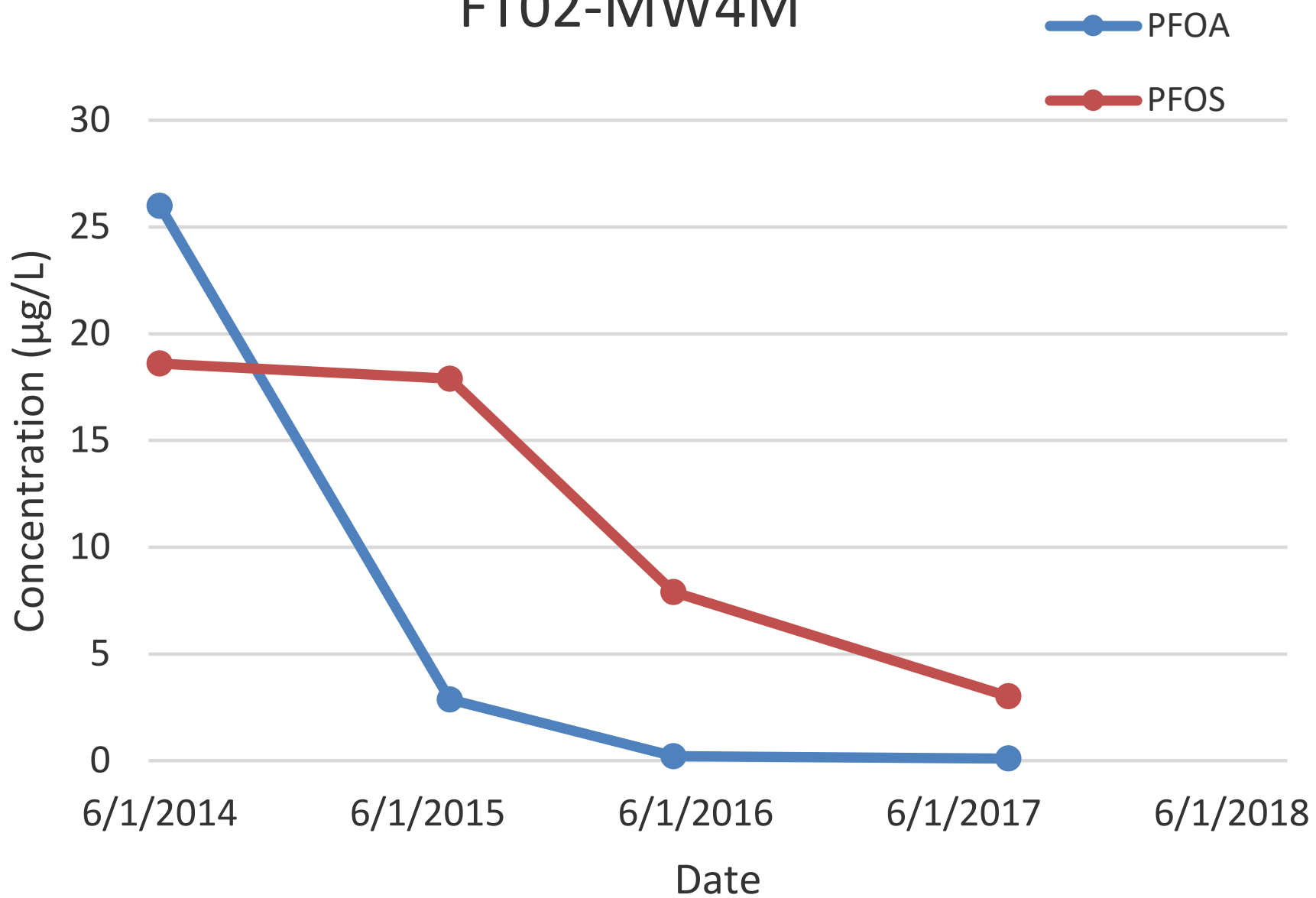
FT02-MW3



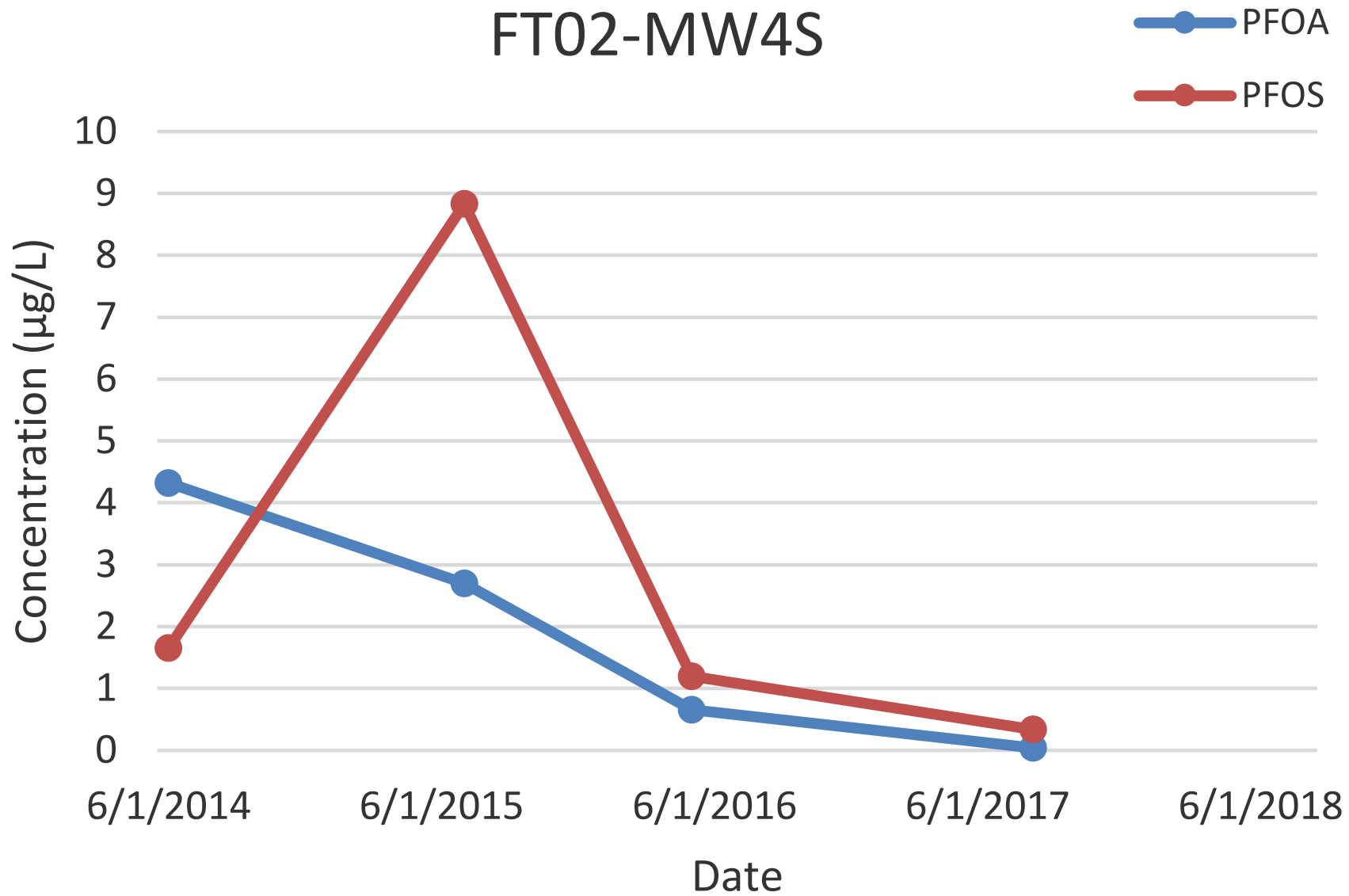
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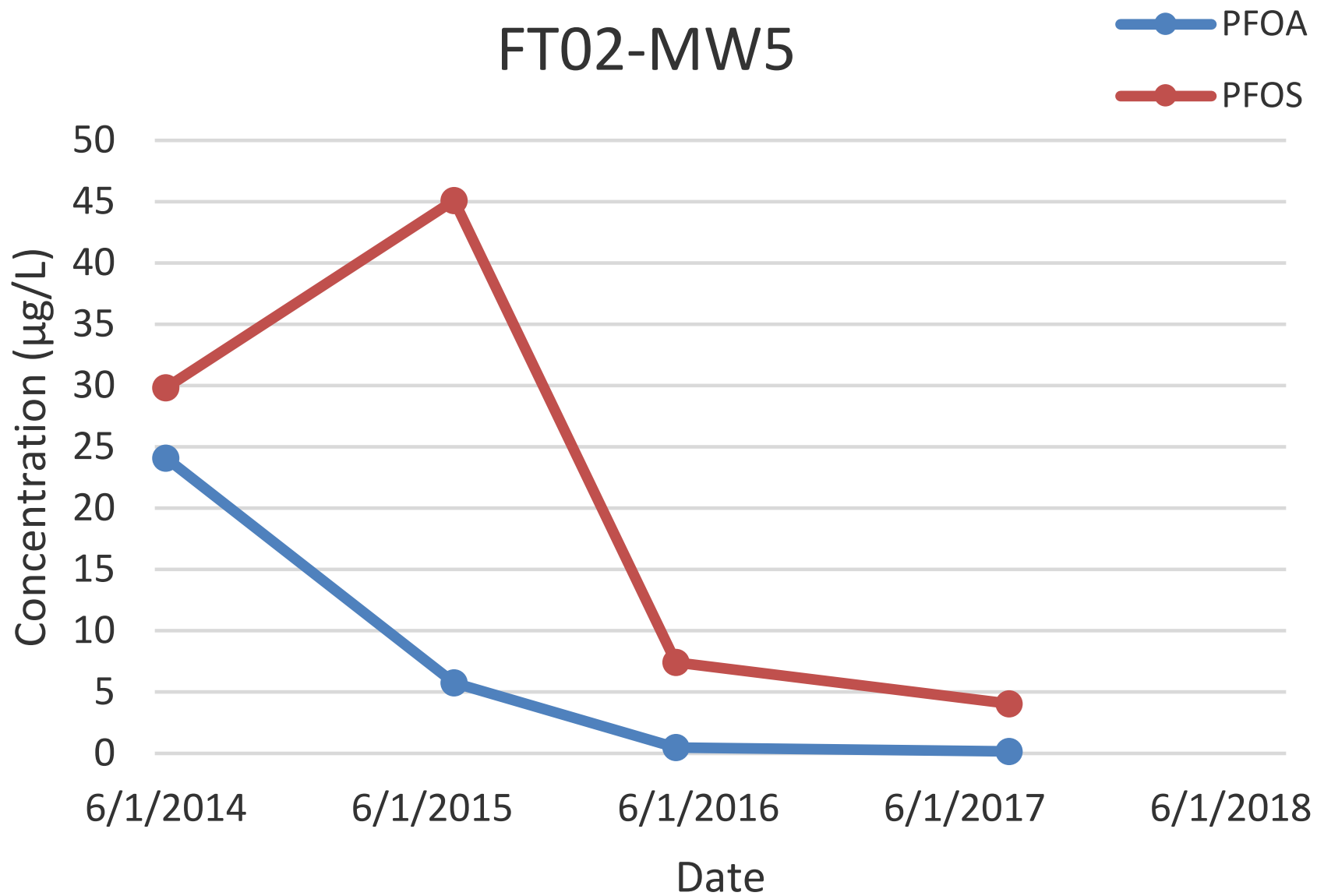
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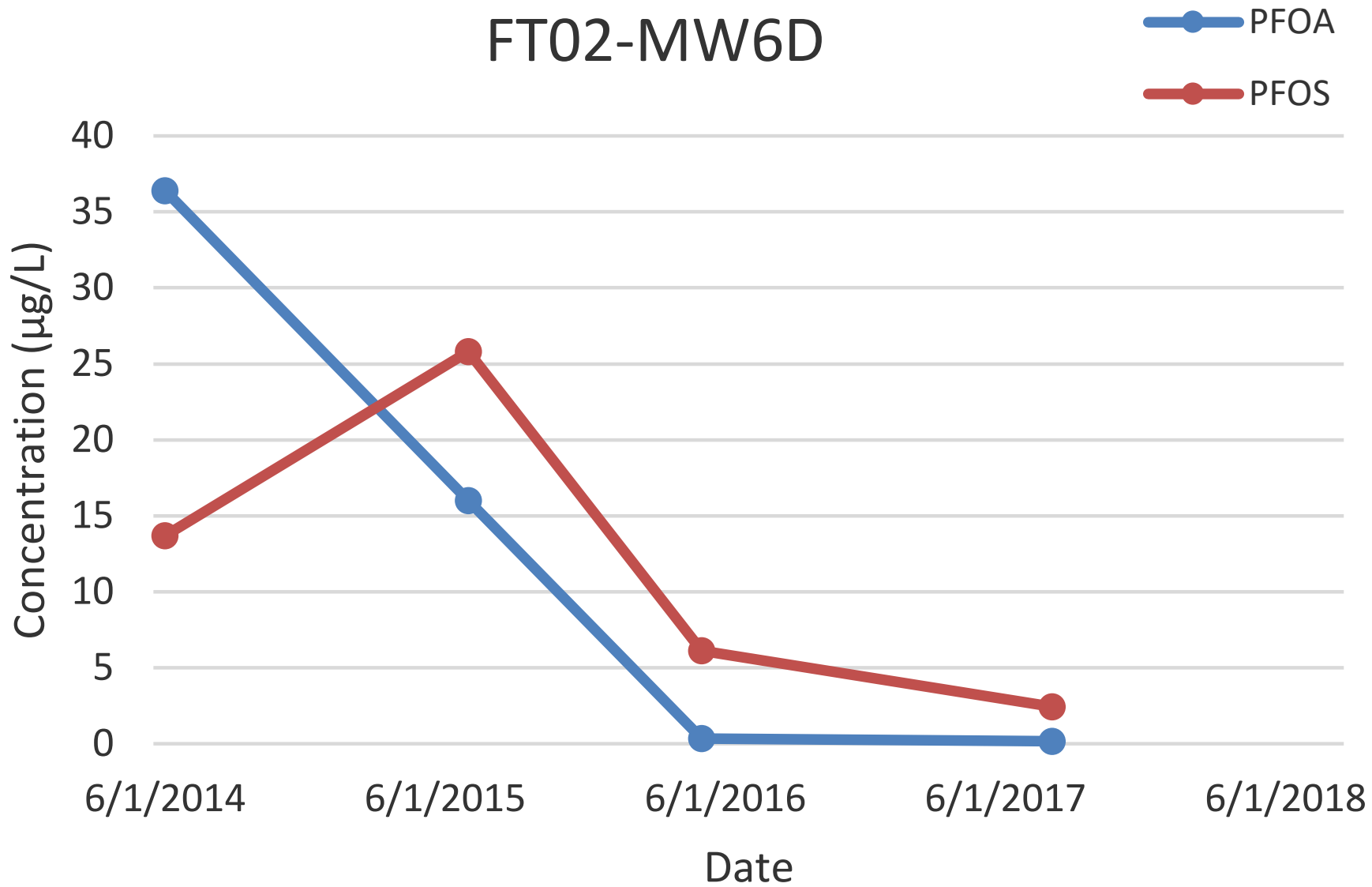
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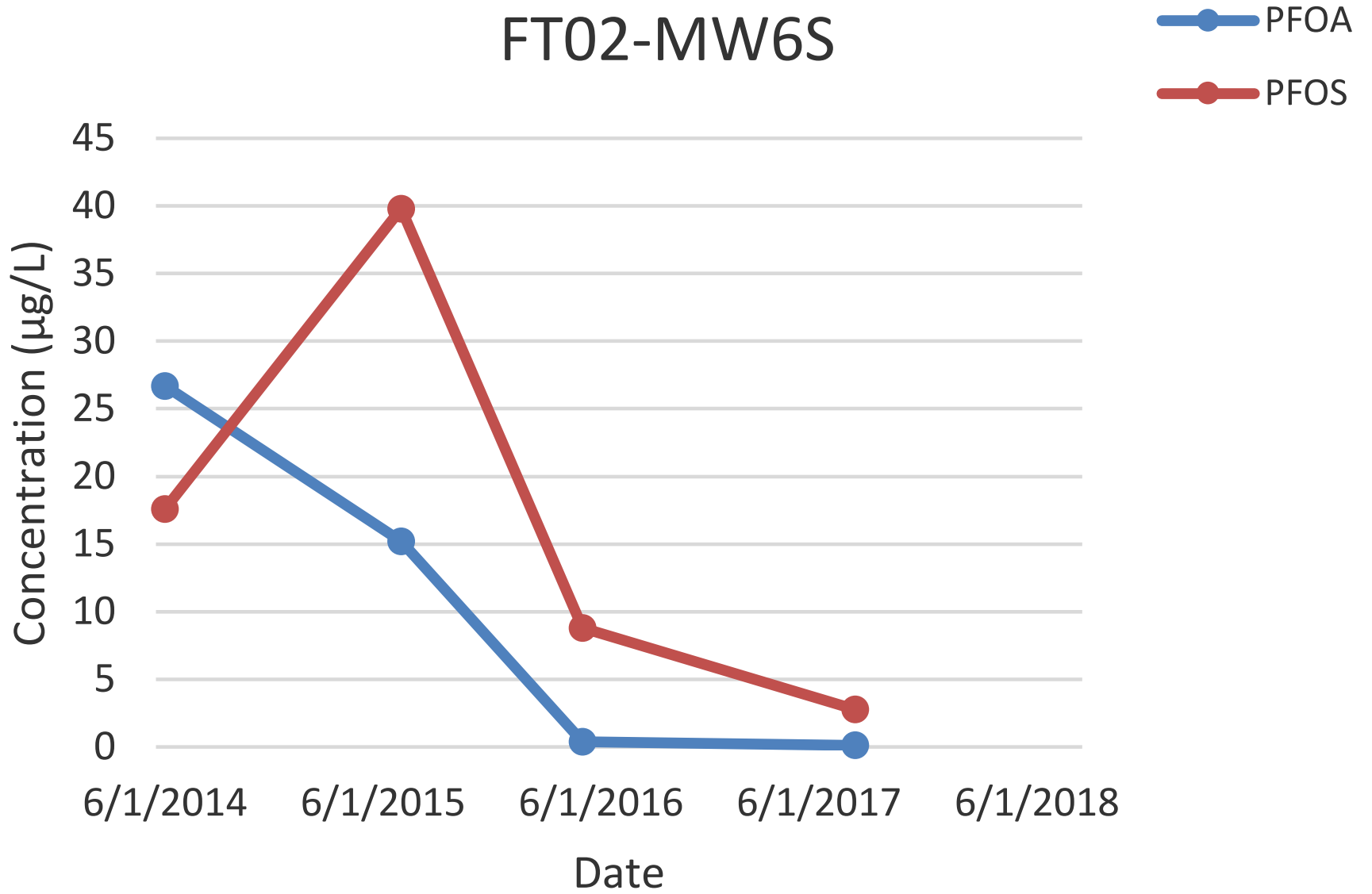
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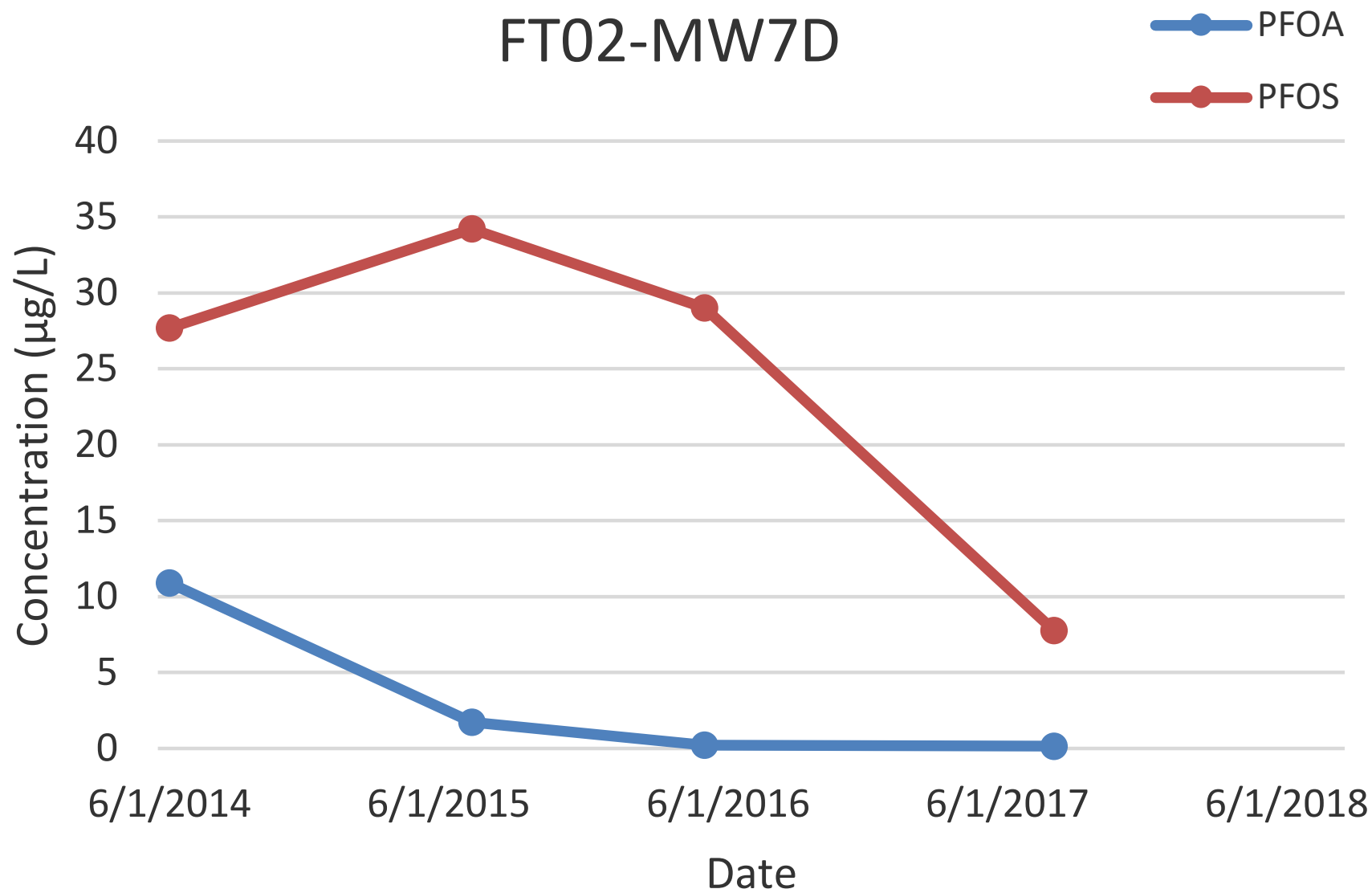
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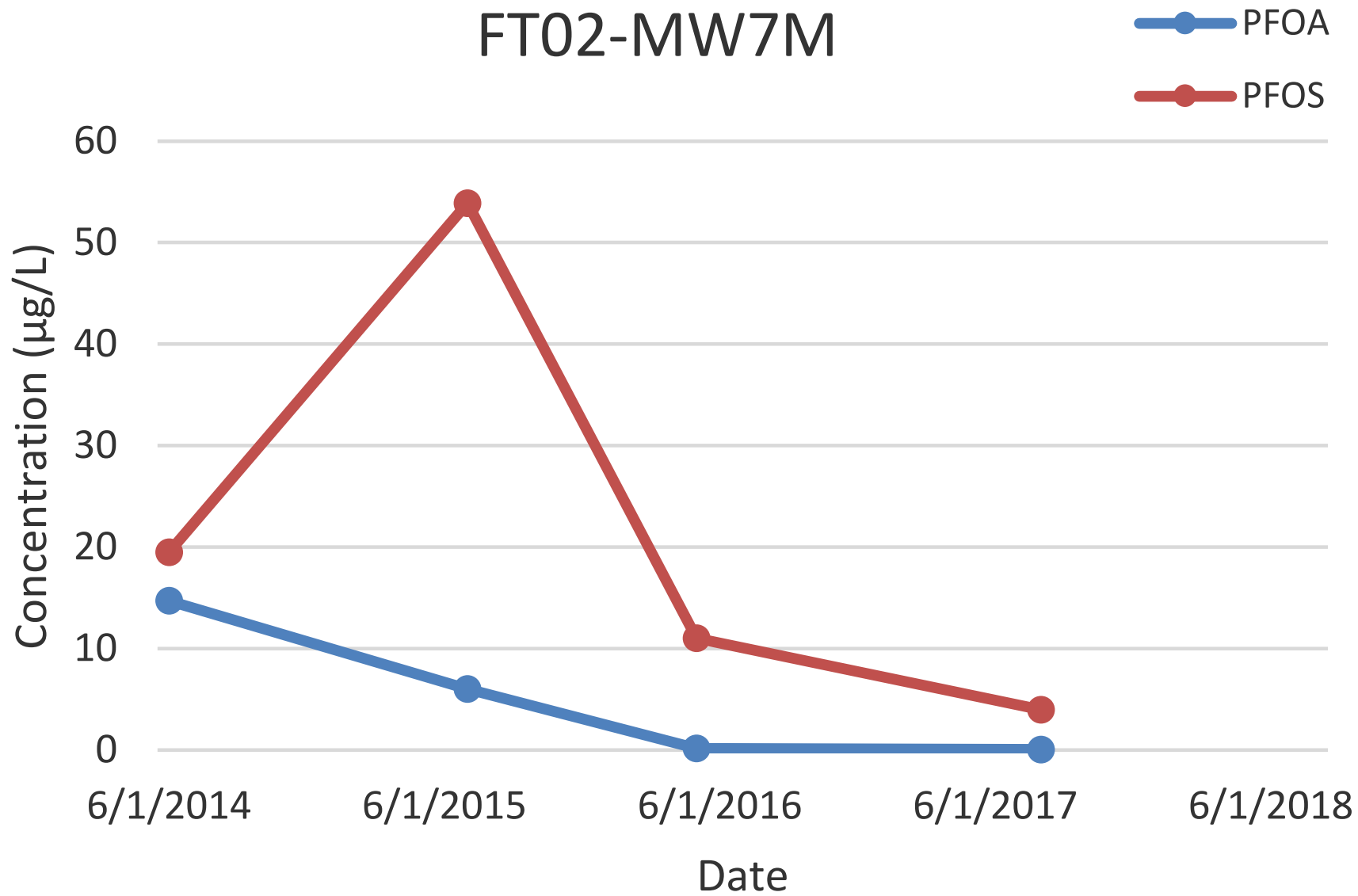
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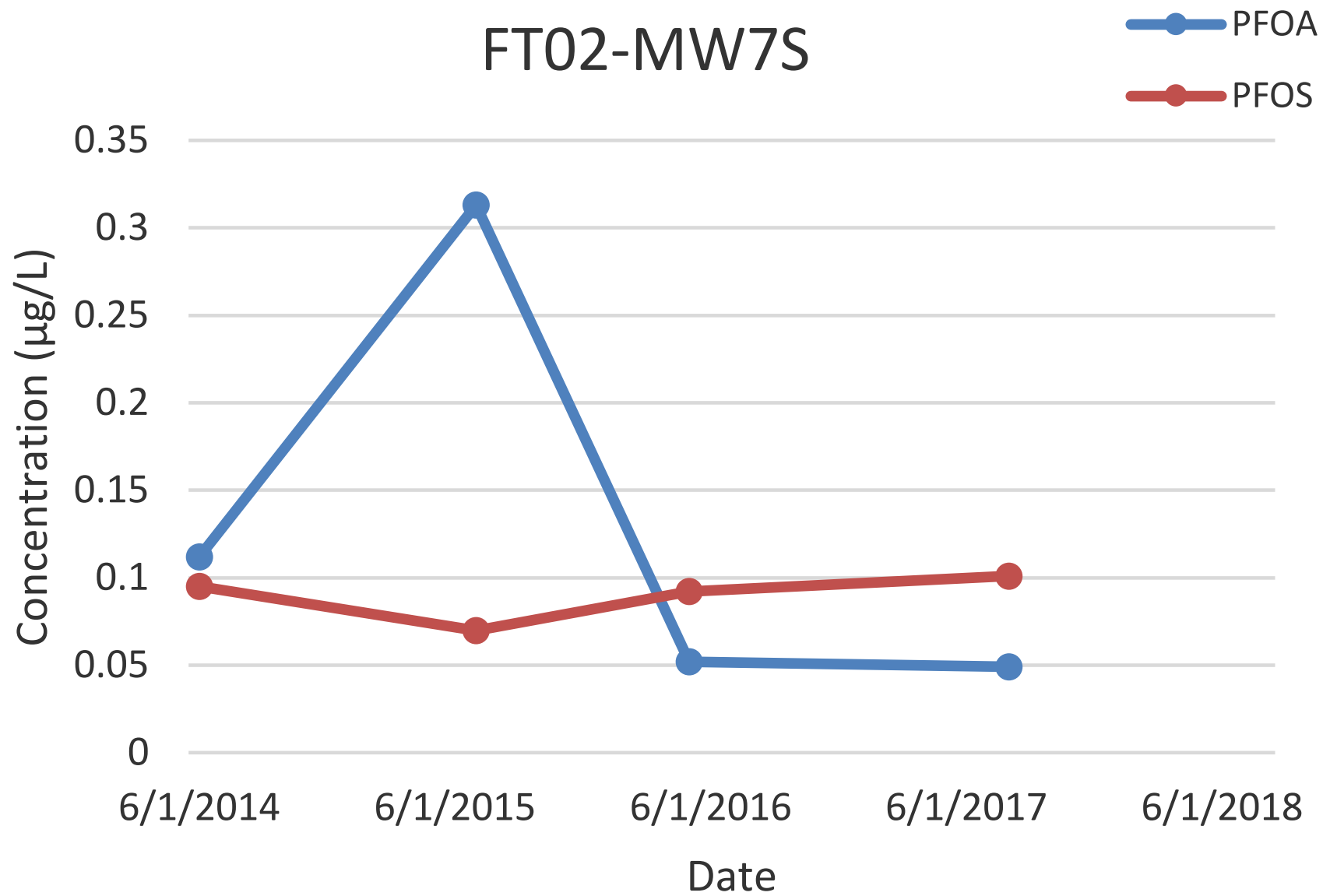
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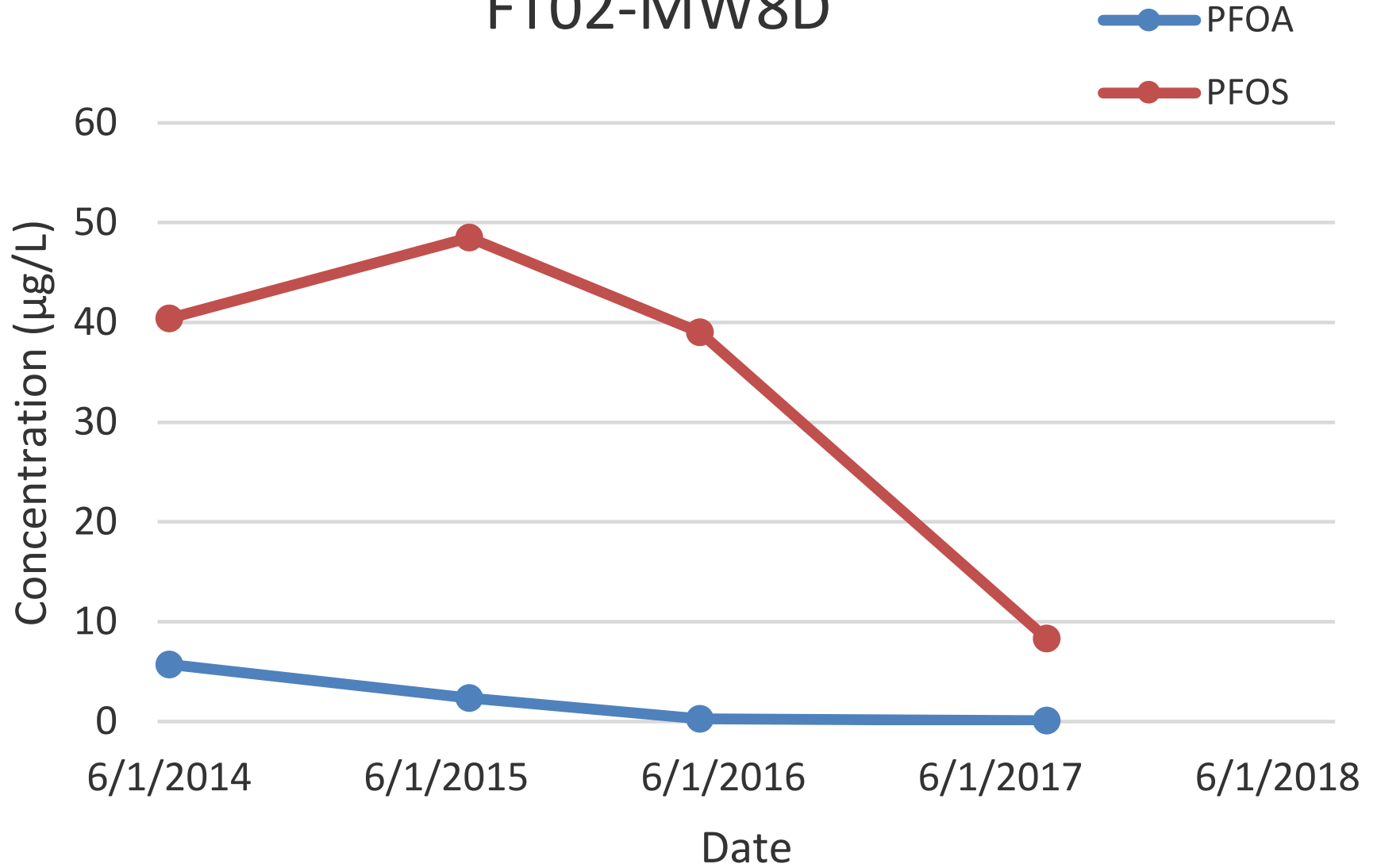
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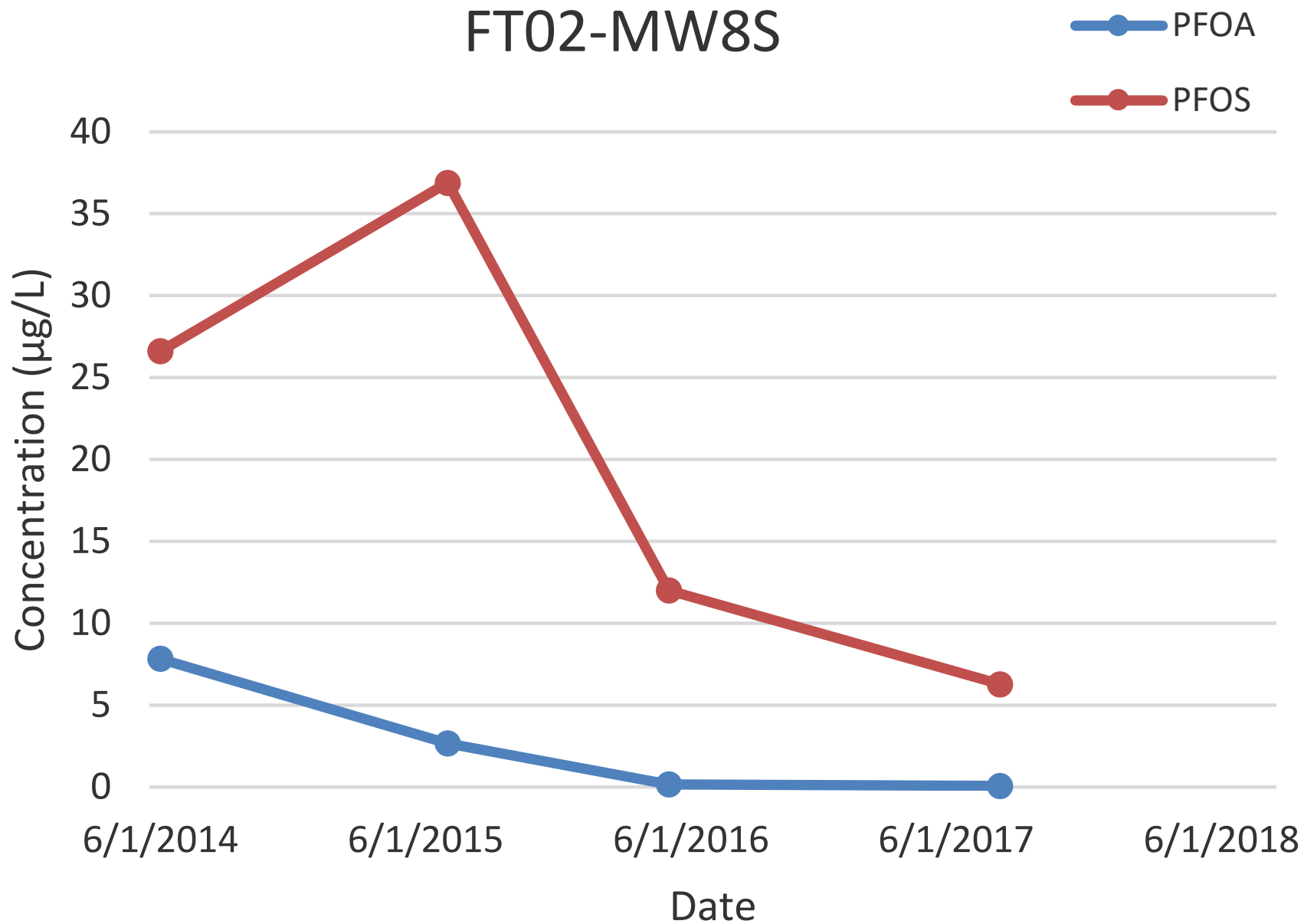
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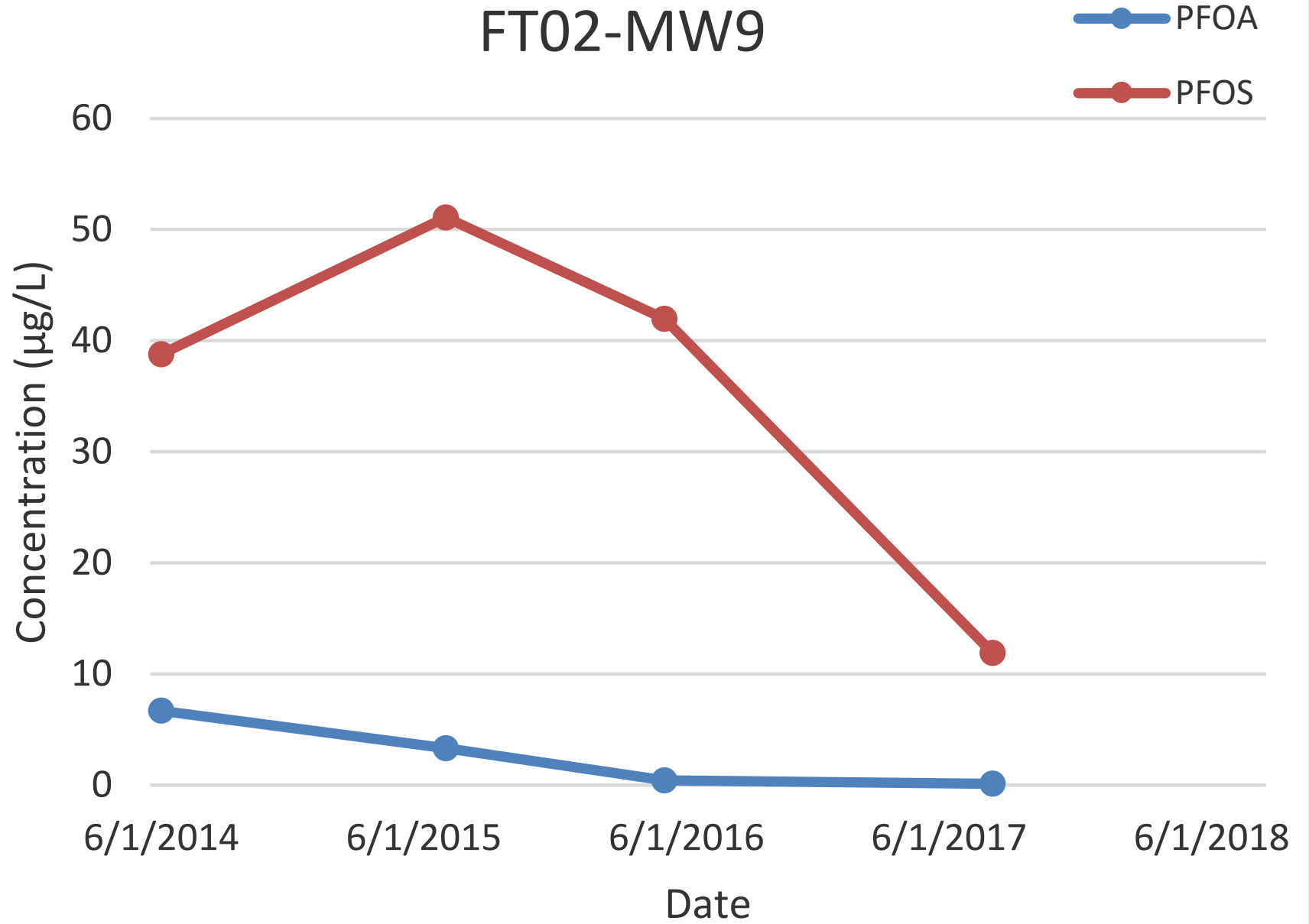
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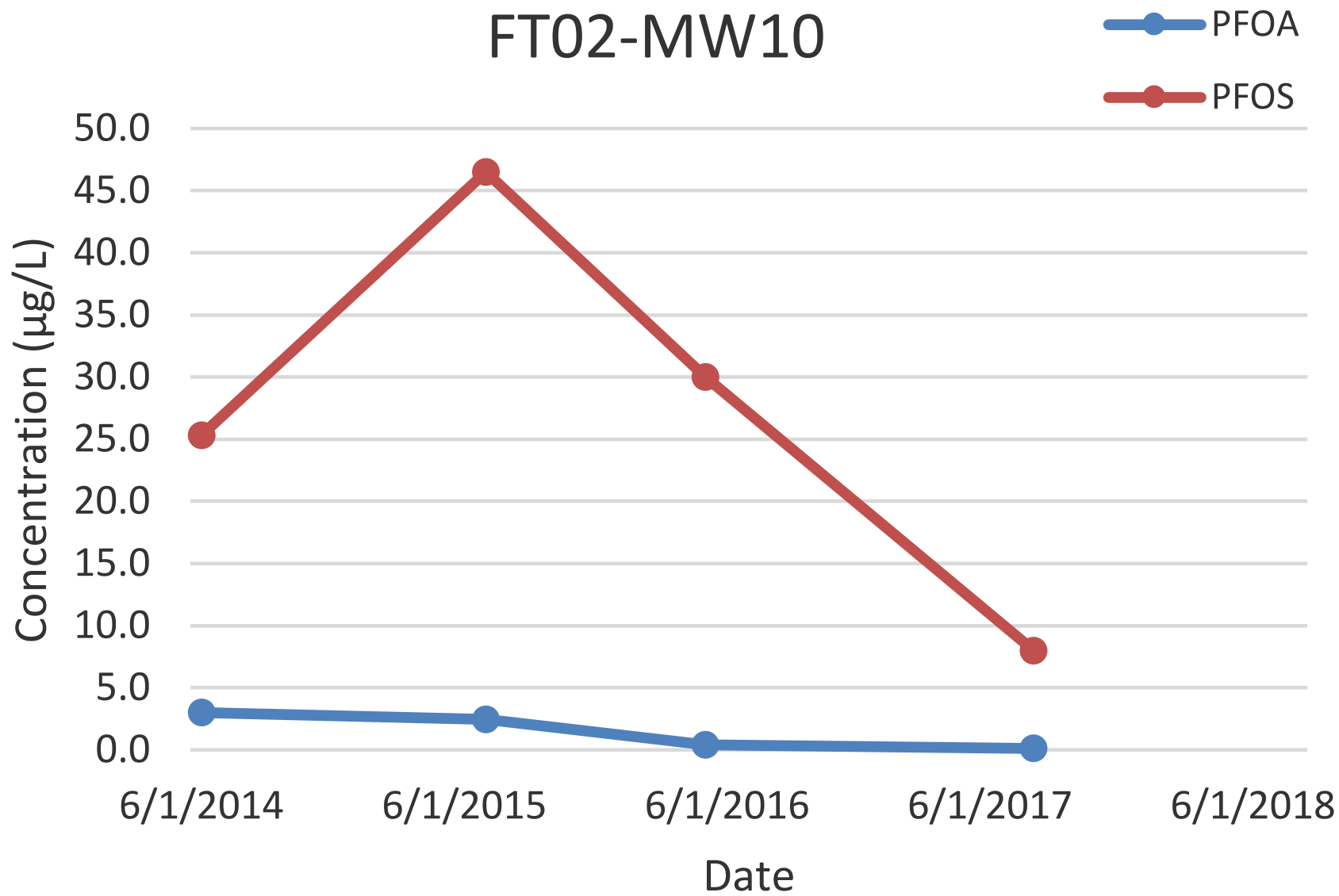
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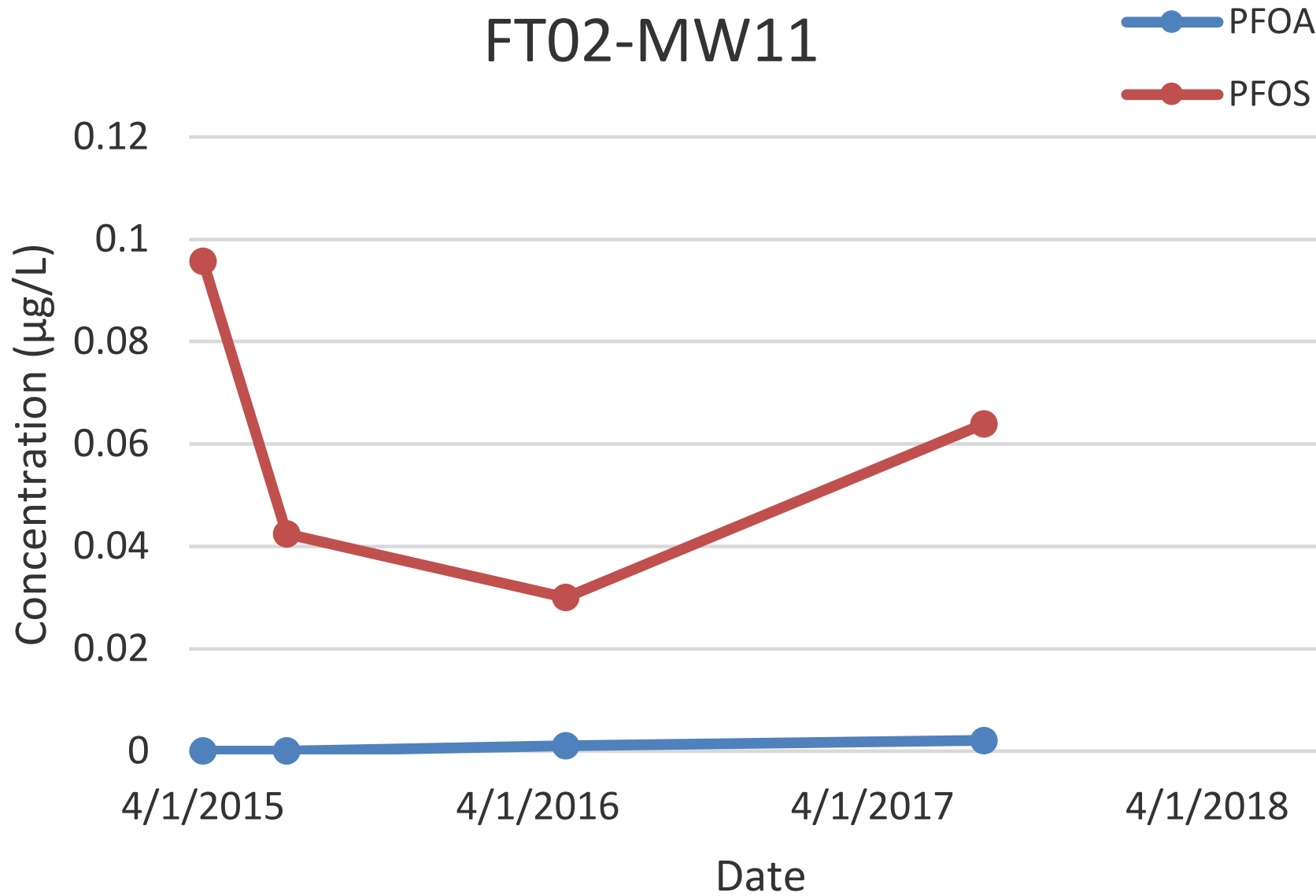
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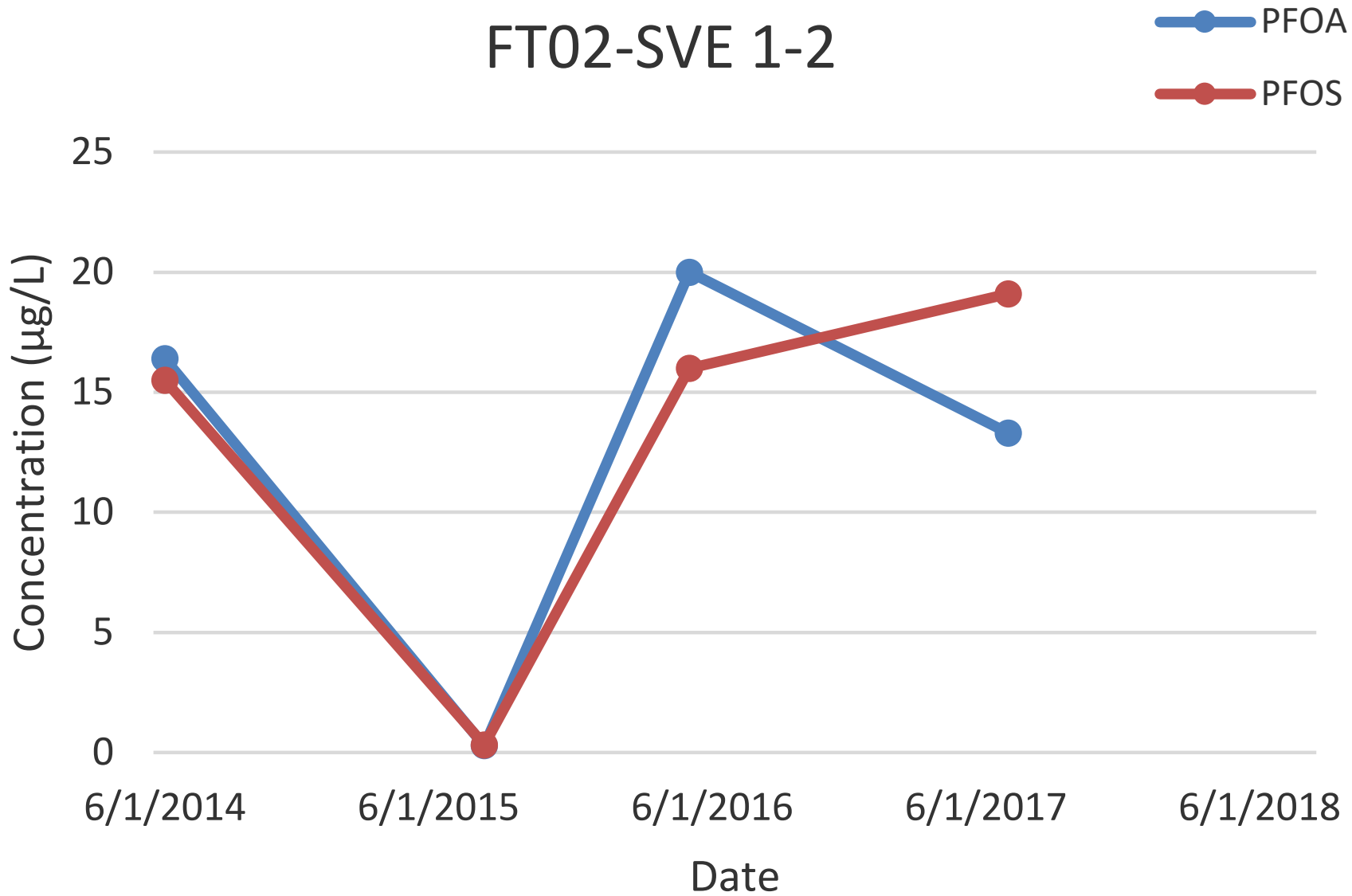
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FT02-MW11

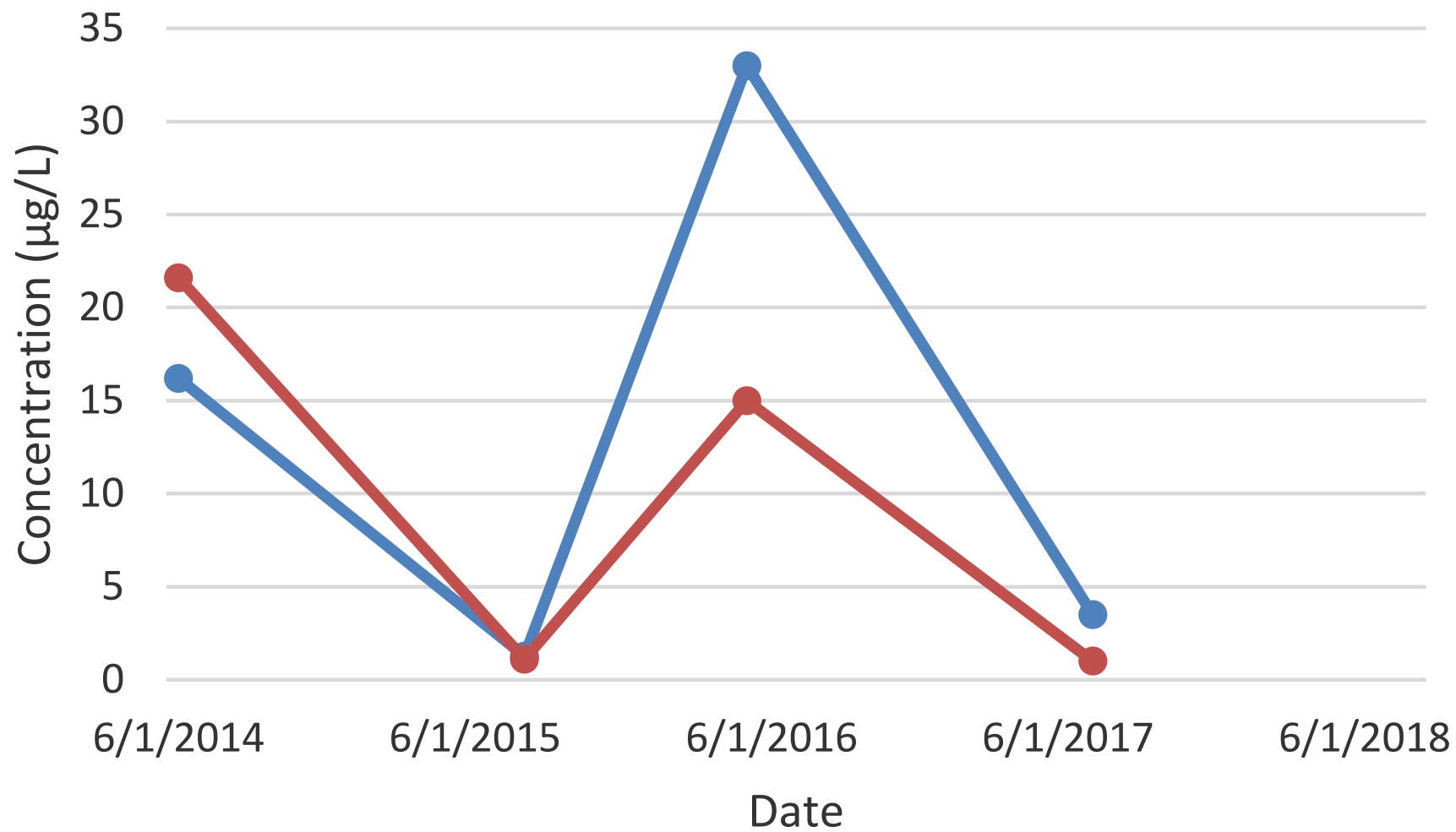


FT02-SVE 1-2

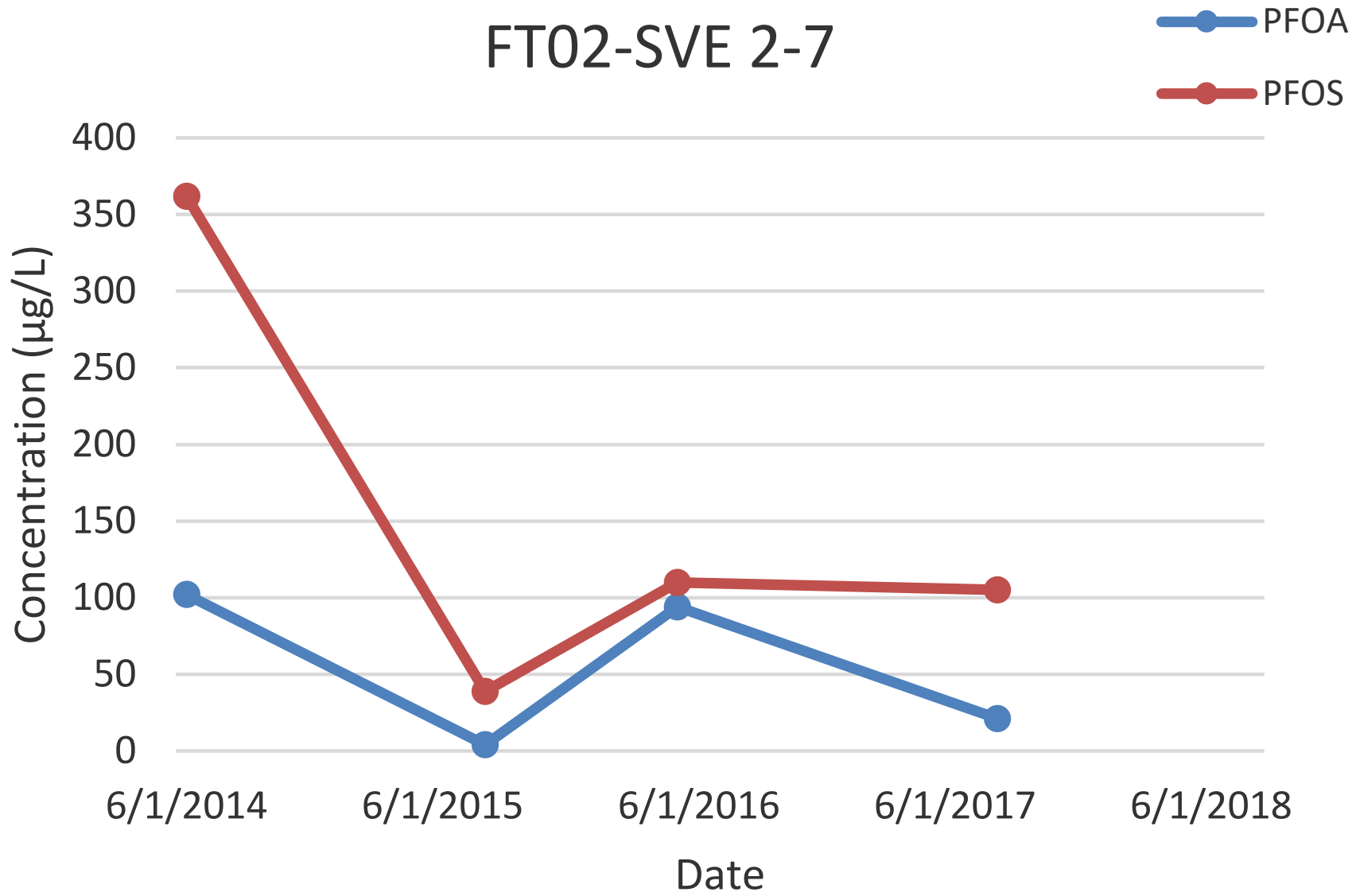


FT02-SVE 1-2-1

—●— PFOA
—●— PFOS



FT02-SVE 2-7



FT02-SVE 2-8

