GSI Job No.: 6892
Issued: 13 December 2024

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDICES

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INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX A

Appendix A. Preliminary Groundwater Sampling (March 2024) Data

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INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX A1

Appendix A. Preliminary Groundwater Sampling (March 2024) Data

Appendix A1 – Tables

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Table 1. Results for PFAS from Groundwater Collected March 2024 at SIA
Spokane International Airport
Spokane, WA

Area	Location ID	Depth (ft)	Result (ng/L)[1]																																								
			PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	PFDoS	4:2FTS	6:2FTS	8:2FTS	PFOSA	NMeFOSA	NEtFOSA	NMeFOSAA	NEtFOSAA	NMeFOSE	NEtFOSE	HFPO-DA	ADONA	PFMPA	PFMBA	NFDHA	9Cl-PF3ONS	11Cl-PF3OUdS	PFEESA	3:3FTCA	5:3FTCA	7:3FTCA
Tap Water - Deicing of Surfaces[2]	Tap Water Deicer FD	NA	0.55 J	0.98 J	0.69 J	0.46 U	0.53 J	0.52 U	0.46 U	0.46 U	0.46 U	-	-	0.47 J	0.46 U	0.46 U	0.46 U	0.98 J	-	-	-	0.46 U	0.46 U	0.46 U	-	-	-	-	-	-	-	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	-	-	-
	Tap Water Deicer	NA	0.59 J	1.1 J	0.64 J	0.46 U	0.56 J	0.52 U	0.46 U	0.46 U	0.46 U	-	-	0.46 U	0.46 U	0.46 U	0.46 U	0.98 J	-	-	-	0.46 U	0.46 U	0.46 U	-	-	-	-	-	-	-	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	-	-	-
Joint Fire Training Area	MW-13B	16	280	560	2100	290	740	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	1100	1600	16000	260	6300	14	3.1	0.47 U	1.9 U	25	1.9 U	39	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.4 U	12 U	12 U
	MW-14B	16.5	14.9	18.3	94.35	5.425	21.25	1.095 J	0.465 U	0.465 U	0.465 U	0.465 U	0.465 U	27.3	19.65	516	5.44	421.5	0.465 U	0.465 U	0.465 U	1.9 U	1.9 U	1.9 U	0.465 U	0.465 U	0.465 U	0.465 U	0.465 U	4.65 U	4.65 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
	MW-14A	30	26	42	200	28	150	0.86 J	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	190	260	930	92	2700	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
	EA-MW-5B	33	1.9 U	0.94 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	1.6 J	0.47 U	0.58 J	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.4 U	12 U	12 U
	MW-13A	37	12	14	46	8.4	52	1.8 J	2.3	0.47 U	1.5 J	0.47 U	0.47 U	7.1	17	490	11	320	2.6	0.89 J	0.47 U	1.9 U	1.9 U	1.9 U	5	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.95 U	0.95 U	0.95 U	1.9 U	1.9 U	0.95 U	2.4 U	12 U	12 U
	MW-8B	45	1.9 U	0.93 U	0.52 J	0.46 U	0.49 J	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	7.2	0.46 U	0.5 J	0.46 U	0.46 U	0.46 U	1.9 U	1.9 U	1.9 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	4.6 U	4.6 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
	MW-8A	71.5	1.9 U	0.94 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.4 U	12 U	12 U
	MW-5A	80	1.9 U	0.94 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.3 U	12 U	12 U
Land Treatment Area	MW-11	14	10	8.4	7.8	1.7 J	3.1	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.67 J	0.53 J	3.9	0.46 U	1.7 J	0.46 U	0.46 U	0.46 U	1.9 U	1.9 U	1.9 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	4.6 U	4.6 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
	MW-9	15.5	8.8	17	19	6.2	14	3.3	8.9	0.47 U	0.47 U	0.47 U	0.47 U	1.9	1.5 J	22	0.47 U	14	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
	MW-12	16	6.9 J	7.6	7	3.7	3.6	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	3.2	0.78 J	3.2	0.47 U	1.6 J	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.3 U	12 U	12 U
	MW-8	18	9.6	6.4	4.9	2.4	6.1	4.7	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	3.1	0.95 J	5.8	0.47 U	17	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.95 U	0.95 U	0.95 U	1.9 U	1.9 U	0.95 U	2.4 U	12 U	12 U
	MW-10	22.3	29	150	170	1.3 J	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.51 J	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	1.9 U	1.9 U	1.9 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	4.8 U	4.8 U	1.9 U	1.9 U	0.96 U	0.96 U	0.96 U	1.9 U	1.9 U	0.96 U	2.4 U	12 U	12 U
Park Drive Waste Disposal Area	MW-1A	70	3.6 J	2.5 J	2.4	2.8	3.8	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.4	3.8	27	1.2 J	28	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.4 U	12 U	12 U
Southeast Area of Business Park	MW-18	10.5	2.6 J	6.7	5.5	2.9	2.5	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	0.91 J	0.46 U	3.6	0.46 U	12	0.46 U	0.46 U	0.46 U	1.9 U	1.9 U	1.9 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	4.6 U	4.6 U	1.9 U	1.9 U	0.93 U	0.93 U	0.93 U	1.9 U	1.9 U	0.93 U	2.3 U	12 U	12 U
Stormwater Recovery Area	MW-3	7.5	75 J	190	170	110	310	36 J	45	10 U	10 U	10 U	10 U	10 U	10 U	54	10 U	26 J	10 U	10 U	10 U	40 U	40 U	40 U	10 U	10 U	10 U	10 U	10 U	100 U	100 U	40 U	40 U	20 U	20 U	20 U	40 U	40 U	20 U	50 U	250 U	250 U
	MW-13 FD	8	14	31	36	13	39	5.5	8.9	0.47 U	0.47 U	0.47 U	0.47 U	16	11	100	0.57 J	20	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.3 U	12 U	12 U
	MW-13	8	14	31	38	14	42	4.9	8.8	0.48 U	0.48 U	0.48 U	0.48 U	16	12	98	0.54 J	22	0.48 U	0.48 U	0.48 U	1.9 U	1.9 U	1.9 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	4.8 U	4.8 U	1.9 U	1.9 U	0.97 U	0.97 U	0.97 U	1.9 U	1.9 U	0.97 U	2.4 U	12 U	12 U
	MW-14	10	43	150	150	58	270	9.6	0.93 J	0.49 U	0.49 U	0.49 U	0.49 U	13	14	200	0.49 U	32	0.49 U	0.49 U	0.49 U	2 U	2 U	2 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	4.9 U	4.9 U	2 U	2 U	0.99 U	0.99 U	0.99 U	2 U	2 U	0.99 U	2.5 U	12 U	12 U
	MW-A	10.85	49	78	60	31	53	17	31	1 U	1 U	1 U	1 U	11	2.8 J	33	1 U	26	1 U	1 U	1 U	4 U	4 U	4 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	4 U	4 U	2 U	2 U	2 U	4 U	4 U	2 U	5 U	25 U	25 U
	MW-321	11	98	241	809	107	294	17.05	5.295	0.515 U	0.515 U	0.515 U	0.515 U	69.15	118.5	4150 J	12.3	167.5	0.515 U	0.515 U	0.515 U	2.05 U	3.875 J	2.05 U	14.25	0.515 U	0.515 U	0.515 U	0.515 U	5.15 U	5.15 U	2.05 U	2.05 U	1.045 U	1.045 U	1.045 U	2.05 U	2.05 U	1.045 U	2.6 U	12.5 U	12.5 U
	MW-1	12	18	38	74	16	72	6.4	2.9	0.5 U	0.5 U	0.5 U	0.5 U	28	22	410 J	1.8 J	47	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	2 U	2 U	0.99 U	0.99 U	0.99 U	2 U	2 U	0.99 U	2.5 U	12 U	12 U

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Table 1. Results for PFAS from Groundwater Collected March 2024 at SIA
Spokane International Airport
Spokane, WA

Area	Location ID	Depth (ft)	Result (ng/L)[1]																																								
			PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA	PFTrDA	PFTeDA	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	PFDoS	4:2FTS	6:2FTS	8:2FTS	PFOSA	NMeFOSA	NEtFOSA	NMeFOSAA	NEtFOSAA	NMeFOSE	NEtFOSE	HFPO-DA	ADONA	PFMPA	PFMBA	NFDHA	9Cl-PF3ONS	11Cl-PF3OUdS	PFEESA	3:3FTCA	5:3FTCA	7:3FTCA
Stormwater Recovery Area	MW-2	12	24	61	90	16	31	13	35	0.49 U	0.49 U	0.49 U	0.49 U	4.9	4	150	0.73 J	48	0.49 U	0.49 U	0.49 U	2 U	5.5 J	3.1 J	1.2 J	0.49 U	0.49 U	0.49 U	0.49 U	4.9 U	4.9 U	2 U	2 U	0.99 U	0.99 U	0.99 U	2 U	2 U	0.99 U	2.5 U	12 U	12 U
	MW-5	12.5	24	54	72	20	58	13	34	1 U	1 U	1 U	1 U	4.2	3.6 J	100	1 U	40	1 U	1 U	1 U	4 U	4 U	4 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	4 U	4 U	2 U	2 U	2 U	4 U	4 U	2 U	5 U	25 U	25 U
	MW-4	13	35	61	58	41	130	23	150	1 U	1 U	1 U	1 U	3 J	3 J	25	1 U	51	1 U	1 U	1 U	4 U	4 U	4 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	4 U	4 U	2 U	2 U	2 U	4 U	4 U	2 U	5 U	25 U	25 U
	MW-6	14.5	23	49	59	20	56	12	40	4.9	5.3	1 U	1 U	3.8 J	2.8 J	87	1 U	26	1 U	1 U	1 U	4 U	4.3 J	4 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	4 U	4 U	2 U	2 U	2 U	4 U	4 U	2 U	5 U	25 U	25 U
	MW-7 FD	14.5	14	35	27	13	39	5	7.4	0.46 U	0.46 U	0.46 U	0.46 U	4.8	3.8	39	0.46 U	32	0.46 U	0.46 U	0.46 U	1.8 U	1.8 U	1.8 U	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U	4.6 U	4.6 U	1.8 U	1.8 U	0.92 U	0.92 U	0.92 U	1.8 U	1.8 U	0.92 U	2.3 U	12 U	12 U
	MW-7	14.5	14	34	27	13	39	5.7	7	0.48 U	0.48 U	0.48 U	0.48 U	4.8	4	40	0.48 U	31	0.48 U	0.48 U	0.48 U	1.9 U	1.9 U	1.9 U	0.53 J	0.48 U	0.48 U	0.48 U	0.48 U	4.8 U	4.8 U	1.9 U	1.9 U	0.96 U	0.96 U	0.96 U	1.9 U	1.9 U	0.96 U	2.4 U	12 U	12 U
West Peripheral	MW-15 FD	9.5	2 U	0.99 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	2 U	2 U	0.99 U	0.99 U	0.99 U	2 U	2 U	0.99 U	2.5 U	12 U	12 U
	MW-15	9.5	2 U	0.98 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	2 U	2 U	2 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	4.9 U	4.9 U	2 U	2 U	0.98 U	0.98 U	0.98 U	2 U	2 U	0.98 U	2.5 U	12 U	12 U
	MW-17	20	7.7	2.3 J	2	1.3 J	2.1	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	3.8	0.47 U	1.9	0.47 U	3.2	0.47 U	0.47 U	0.47 U	1.9 U	1.9 U	1.9 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	4.7 U	4.7 U	1.9 U	1.9 U	0.94 U	0.94 U	0.94 U	1.9 U	1.9 U	0.94 U	2.4 U	12 U	12 U

Notes: NA = not applicable. Laboratory qualifiers: U = non-detect; J = estimated concentration

1. All samples were measured on a whole water basis. Unless otherwise indicated for tap water, all groundwater samples were a-lyzed via EPA Method 1633.

2. Tap water sample from spigot used for mixing decing fluid for paved areas was a-lyzed via EPA Method 533.

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Table 2. Results for Nutrients from Groundwater Collected in March 2024 at SIA
Spokane International Airport
Spokane, WA

Area	Location ID	Well Depth (ft)	Result (mg/L)[1]		
			Nitrate N	Phosphorus	Sulfate
Joint Fire Training Area	MW-13B	16	50	0.58	34
	MW-14B	16.5	4.6	0.03 U	29
	MW-14A	30	1.2	0.042 J	19
	EA-MW-5B	33	3.3	0.03 U	100
	MW-13A	37	3.8	1.225	7.1
	MW-8B	45	1.7	0.03 U	9.8
	MW-8A	71.5	0.77	0.097	3.2
	MW-5A	80	2.4	0.03 U	5.3
Land Treatment Area	MW-11	14	3.7	0.03 U	6.8
	MW-9	15.5	0.057 U	0.03 U	9.3
	MW-12	16	4.1	0.03 U	21
	MW-8	18	4.5	0.072	11
	MW-10	22.3	8.6	0.05 J	8.4
Park Drive Waste Disposal Area	MW-1A	70	2.4	0.043 J	22
Southeast Area of Business Park	MW-18	10.5	0.45	0.045 J	15
Stormwater Recovery Area	MW-3	7.5	0.057 U	0.31	0.77
	MW-13	8	0.057 U	0.03 U	14
	MW-14	10	0.11 J	0.03 U	14
	MW-A	10.85	0.064 J	0.03 U	18
	MW-321	11	5.4	0.03 U	41
	MW-1	12	2.6	0.03 U	18
	MW-2	12	0.057 U	0.03 U	7.8
	MW-5	12.5	0.057 U	0.083	0.13 U
	MW-4	13	0.057 U	0.03 U	0.13 U
	MW-6	14.5	0.057 U	0.03 U	0.19 J
	MW-7	14.5	0.75	0.03 U	12
West Peripheral	MW-15 FD	9.5	5.9	1.4	7
	MW-15	9.5	5.9	1.4	6.9
	MW-17	20	3.25	0.032 J	22

Notes: Laboratory qualifier: U = non-detect; J = estimated concentration

1. All samples were measured on a whole water basis.

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Table 3. Biochemical Oxygen Demand, Stable Isotopes, Anions and Cations, and Water Quality Parameters from Groundwater Collected March 2024 at SIA
Spokane International Airport
Spokane, WA

Area	Location ID	Well Depth (ft)	Biochemical Oxygen Demand	Stable Isoptopes		Anions and Cations					Water Quality Parameters					
			BOD (mg/L)	d2H-H2O (%)	d180-H2O (%)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	DO (mg/L)	ORP (mV)	pH (SU)	SpConductivity (uS/cm)	Temperature (degC)	Turbidity (NTU)
Tap Water - Deicing of Surfaces		NA	-	-	-	-	-	-	-	-	10	460	7.8	200	-	-2.3
Joint Fire Training Area	MW-13B	16	1.2 U	-111	-14.2	2.4	90	28	9.3	15	7.4	83	6.6	730	10	3.2
	MW-14B	16.5	1.2 U	-112	-14.6	110	94	20	7.1	15	7.7	85	6.8	730	11	22
	MW-14A	30	2 U	-	-	1.2	24	6.2	1	6.6	7.7	61	7.3	200	9.7	15
	EA-MW-5B	33	1.2 U	-114	-14.8	4.1	120	26	9.4	8.8	4.4	50	6.7	790	12	9
	MW-13A	37	1.2 U	-120	-15.6	1	20	5.3	3	10	1	59	7	190	10	17
	MW-8B	45	1.2 U	-122	-15.6	1.7	22	5.4	0.79	5.1	7.3	40	7.2	160	10	5.6
	MW-8A	71.5	1.2 U	-123	-15.8	1.2	20	6.1	1.7	7.7	520	42	7.2	170	11	2.7
	MW-5A	80	1.2 U	-121	-15.6	1.9	20	6	3.9	8.4	6	-18	7.4	190	11	10
	MW-11	14	1.2 U	-117	-15.3	32	24	7.8	4.7	7.5	4.2	130	6.4	210	7.4	1.8
	MW-9	15.5	1.6 J	-117	-15.1	360	120	36	8.1	67	1	43	7.1	1100	5	2.8
	MW-12	16	1.2 U	-116	-15	64	51	15	3.9	20	9.4	110	6.9	410	6.4	2.9
	MW-8	18	1.2 U	-114	-14.9	89	53	14	5.2	14	8.7	230	6.6	470	9.8	4.5
	MW-10	22.3	1.2 U	-114	-14.7	18	21.95	6.335	2.11	14.4	9	170	6.9	2400	9.1	2.6
Park Drive Waste Disposal Area	MW-1A	70	1.2 U	-119	-15.3	49	49	16	2.3	9	3.1	51	7.1	2000	10	100
Southeast Area of Business Park	MW-18	10.5	1.2 U	-112	-14.7	12	28	9.7	2.5	8.9	1.9	40	6.4	1300	8.5	4.1
Stormwater Recovery Area	MW-3	7.5	220	-110	-14.6	1000	200	66	29	410	1	-110	6.6	3600	4.3	7.7
	MW-13	8	1.2 U	-114	-14.6	360	130	37	14	58	1.7	18	6.9	6500	7.6	17
	MW-14	10	1.2 U	-113	-14.5	400	150	49	7.1	37	3.9	-14	6.7	6900	7.1	6.4
	MW-A	10.85	8.4 J	-115	-14.9	3200	390	140	23	900	0.99	20	6.3	38000	5.8	4.4
	MW-321	11	1.2 U	-116	-15.3	1400	200	62	7.5	360	5.5	250	5.1	17000	6.5	5.2
	MW-1	12	1.2 U	-111	-14.5	220	66	21	5.8	50	11	67	6.4	3900	4.5	9.3
	MW-2	12	2 U	-115	-15.1	210	57	18	26	87	0.99	24	7	4500	3.1	26
	MW-5	12.5	38 U	-116	-15.1	350	97	31	26	130	0.89	-16	6.5	250	6.5	26
	MW-4	13	8.9 J	-117	-15.4	1000	160	55	20	330	0.87	-100	6.7	16000	5.8	49
	MW-6	14.5	120	-116	-15.1	460	83	28	46	160	1.3	-46	6.8	8400	4.9	170
	MW-7	14.5	2 U	-116	-15.1	660	240	67	14	84	5.3	150	6.2	2300	8.8	6.3
West Peripheral	MW-15 FD	9.5	6 U	-115	-14.7	2.7	25	6.1	1.7	15	-	-	-	-	-	-
	MW-15	9.5	6 U	-115	-14.7	2.9	24	6	1.6	15	10	190	7.1	1000	7.6	81
	MW-17	20	1.2 U	-111.5	-14.5	310	110	26	7.55	81.5	7.9	180	6.7	5900	11	35

Notes: NA = not applicable. Laboratory qualifiers: U = non-detect; J = estimated concentration

1. All Samples were measured on a whole water basis.
2. DO - dissolved oxygen; ORP = oxidation-reduction potential; BOD = biochemical oxygen demand

GSI Job No.: 6892
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INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX A2

Appendix A. Preliminary Groundwater Sampling (March 2024) Data

Appendix A2 – Data Validation and Laboratory Reports

Data Validation Report

Characterization of PFAS Impacts to Groundwater
Spokane International Airport
Spokane, Washington

Prepared for:

Haley & Aldrich, Inc.
505 W Riverside Ave, Suite 450
Spokane, WA 99201

Haley & Aldrich Project No.: 0209800-000

Prepared by:

Pyron Environmental, Inc.
3530 32nd Way NW
Olympia, WA 98502

May 16, 2024

Approved By: _____

Mingta Lin, Principal Chemist

Table of Content

Acronyms

%R	percent recovery
%RSD	percent relative standard deviation
%RSE	percent relative Standard error
amu	atomic mass unit
CCB	continuing calibration blank
CCV	continuing calibration verification
CCVL	low-level (at or below reporting limit) continuing calibration verification
CLP	U.S. EPA Contract Laboratory Program
COC	chain-of-custody
DoD	U.S. Department of Defense
DQO	data quality objective
EIS	extracted internal standard
EPA	U.S. Environmental Protection Agency
ICAL	initial calibration
ICB	initial calibration blank
ICV	initial calibration verification
ISC	instrument sensitivity check
LC/MS-MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control sample
LLOPR	low-level ongoing precision and recovery
MS	matrix spike
MSD	matrix spike duplicate
NEtFOSA	N-ethyl perfluorooctanesulfonamide
NEtFOSE	N-ethyl perfluorooctanesulfonamidoethanol
***n*g/L**	nanogram per liter
NMeFOSA	N-methyl perfluorooctanesulfonamide
NMeFOSE	N-methyl perfluorooctane sulfonamidoethanol
NIS	non-extracted internal standard
OPR	ongoing precision and recovery
PFAS	per- and polyfluoroalkyl substances
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
QA/QC	quality assurance/quality control

RF	response factor
RPD	relative percent difference
RT	retention time
SDG	sample delivery group
S/N	signal-noise ratio
TCDA	taurochenodeoxycholic acid
TDCA	taurodeoxycholic acid
TUDCA	tauroursodeoxycholic acid

I. INTRODUCTION

This report presents and discusses findings of the chemical data quality review performed on analytical data associated with the 46 water samples collected in March 2024, for the referenced project. Sample analyses were performed by Eurofins Environment Testing America in West Sacramento, California (Eurofins). Sample results were reported in seven sample delivery groups (SDGs), assigned Eurofins Job Numbers: 590-23558-1, 590-23589-1, 590-23619-1, 590-23638-1, 590-23660-1, 590-23681-1, 590-23724-1, and 590-23928-1.

The data validation procedures followed the documents below as guidelines:

- United States Environmental Protection Agency (USEPA) *Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review*. Office of Superfund Remediation and Technical Innovation. November 2020. OLEM 9240.0-51. EPA-540-R-20-005.
- United States Department of Defense (DoD) *Data Validation Guidelines Module 6: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-24*. Environmental Data Quality Workgroup. November 1, 2022.
- DoD *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15*. Environmental Data Quality Workgroup. May 1, 2022.

A Stage 4 (as defined in DoD, 2022) validation was performed on data package of 590-23660-1; a Stage 2B validation was performed on remaining data packages. Instrument calibration, calibration verification, and analytical sequence requirements were checked against the analytical methods. Quality control components were evaluated against the data quality objectives (DQOs) specified in the Quality Assurance Project Plan ([QAPP], Haley & Aldrich, 2024) and the laboratory in-house performance-based control criteria (laboratory control limits).

Data validation findings are discussed in **Section II – Data Quality Review Findings**, pertinent to the QC parameters for each type of analysis. Field duplicate evaluation is presented in **Section III**. Qualified data along with proper data qualifiers, qualification reasons, and qualifier definitions are presented in **Section IV - Data Quality Review Summary**. Samples and the associated analyses validated herein are summarized as follows:

Field Sample ID	Laboratory Sample ID	Sampling Date	Matrix	Analysis	
				PFAS EPA 1633	PFAS EPA 533
WL-EB-03052024	590-23558-1	03/05/24	EB	X	
LA-MW8-N-03052024	590-23558-2	03/05/24	GW	X	
FB-03052024	590-23558-3	03/05/24	FB	X	
T-EB-03052024	590-23558-4	03/05/24	EB	X	

Field Sample ID	Laboratory Sample ID	Sampling Date	Matrix	Analysis	
				PFAS EPA 1633	PFAS EPA 533
LA-MW10-N-03052024	590-23558-5	03/05/24	GW	X	
EA-MW14B-N-03062024	590-23589-1	03/06/24	GW	X	
EA-MW14A-N-03062024	590-23589-2	03/06/24	GW	X	
SWN-MW7-FD-03062024	590-23589-3	03/06/24	GW	X	
SWN-MW7-N-03062024	590-23589-4	03/06/24	GW	X	
WL-EB-03062024	590-23589-5	03/06/24	EB	X	
EA-MW13A-N-03072024	590-23619-1	03/07/24	GW	X	
EA-MW13B-N-03072024	590-23619-2	03/07/24	GW	X	
EA-MW8B-N-03072024	590-23619-3	03/07/24	GW	X	
EA-MW8A-N-03072024	590-23619-4	03/07/24	GW	X	
EA-MW5A-N-03072024	590-23619-5	03/07/24	GW	X	
EA-MW5B-N-03072024	590-23619-6	03/07/24	GW	X	
SWN-MW3-03072024	590-23619-7	03/07/24	GW	X	
WL-EB-03072024	590-23619-8	03/07/24	EB	X	
FB-03072024	590-23619-9	03/07/24	FB	X	
LA-MW11-N-03082024	590-23638-1	03/08/24	GW	X	
LA-MW12-N-03082024	590-23638-2	03/08/24	GW	X	
LA-MW9-N-03082024	590-23638-3	03/08/24	GW	X	
WL-EB-03082024	590-23638-4	03/08/24	EB	X	
FB-03082024	590-23638-5	03/08/24	FB	X	
SWN-MWA-N-03112024	590-23660-1	03/11/24	GW	X	
SWN-MW6-03112024	590-23660-2	03/11/24	GW	X	
SWN-MW14-N-03112024	590-23660-3	03/11/24	GW	X	
SWN-MW13-N-03112024	590-23660-4	03/11/24	GW	X	
SWN-MW13-FD-03112024	590-23660-5	03/11/24	GW	X	
SWN-MW2-03112024	590-23660-6	03/11/24	GW	X	
SWN-MW1-03112024	590-23660-7	03/11/24	GW	X	
WL-EB-03112024	590-23660-8	03/11/24	EB	X	
FB-03112024	590-23660-9	03/11/24	FB	X	
SWN-MW321-N-03122024	590-23681-1	03/12/24	GW	X	
SWN-MW4-N-03122024	590-23681-2	03/12/24	GW	X	
SWN-MW5-N-03122024	590-23681-3	03/12/24	GW	X	
FGF-MW18-N-03122024	590-23681-4	03/12/24	GW	X	
PD-MW1A-N-03122024	590-23681-5	03/12/24	GW	X	

Field Sample ID	Laboratory Sample ID	Sampling Date	Matrix	Analysis	
				PFAS EPA 1633	PFAS EPA 533
WL-EB-03122024	590-23681-6	03/12/24	EB	X	
FB-03122024	590-23681-7	03/12/24	FB	X	
W-MW15-N-03132024	590-23724-1	03/13/24	GW	X	
W-MW15-FD-03132024	590-23724-2	03/13/24	GW	X	
W-MW17-N-03132024	590-23724-3	03/13/24	GW	X	
WL-EB-03132024	590-23724-5	03/13/24	GW	X	
FB-03132024	590-23724-6	03/13/24	FB	X	
Drum 1- 03132024	590-23724-7	03/13/24	WW	X	
Drum 2-03132024	590-23724-8	03/13/24	WW	X	
Drum 3-03132024	590-23724-9	03/13/24	WW	X	
DeiceTap N-03262024	590-23928-1	03/26/24	DW		X
DeiceTap FD-03262024	590-23928-2	03/26/24	DW		X
FB-03262024	590-23928-3	03/26/24	FB		X

Notes:
X: The analysis was requested and performed on the sample.
PFAS: Project specific per- and polyfluoroalkyl substances.
FB – Field blank
WW – Wastewater
DW – Drinking water
EB – Equipment Rinsate Blank
GW – Groundwater

The analytical parameters requested for the samples, the respective analytical methods, and the analytical laboratories are summarized below:

Parameter	Analytical Method	Analytical Laboratory
Per- and Polyfluoroalkyl Substances (PFAS) (Method Analyte List)	EPA Method 1633	Eurofins Environment Testing America West Sacramento, California
PFAS (Method Analyte List)	EPA Method 533	

Note:
a. EPA Method 1633: *Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue. Samples by LC-MS/MS*. USEPA, Office of Water. January 2024. EPA 821-R-24-001.
b. EPA Method 533: *Determination of Per- And Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry*. December 2019, 815-B-19-020.

II. DATA VALIDATION FINDINGS

1. Sample Custody, Preservation, and Analysis Completeness

Sample custody was maintained and documented as required from the sample collection to the receipt at the laboratory. The samples were received properly preserved and consistent with the accompanying chain-of-custody (COC) documentation. All analyses requested in the COC forms were completed.

2. Per- and Polyfluoroalkyl Substances ([PFAS]; EPA Method 1633)

2.1 Holding Times

The QAPP calls for water samples being extracted within 28 days of collection and extracts analyzed within 90 days of extraction. All samples were extracted and analyzed within the project required holding times.

2.2 Mass Calibration and Verification

As per the laboratory SOP, mass calibration and verification were performed per manufacturer's requirements. Mass calibration was performed initially when the method was first developed and thereafter as needed during troubleshooting. Once the optimal mass assignments are made, *i.e.,* within ±0.5 atomic mass unit (amu) of the true value, immediately following the initial tune, the lowest level standard from the initial calibration curve is assessed to ensure that a signal to noise ratio greater than 10 (S/N >10) is achieved for each PFAS analyte.

The first level standard from the initial calibration curve is used to evaluate the tune stability on an ongoing basis. The instrument mass windows are set initially at ±0.5 amu of the true value; therefore, continued detection of the analyte transition with S/N >10 serves as verification that the assigned mass remains within ±0.5 amu of the true value. No anomalies were identified in relation to instrument tuning.

2.3 Initial Calibration (ICAL)

The following criteria were applied to ICAL evaluation:

(1) A minimum of five standards should be used when using average response factor and/or linear calibration fits; a minimum of six analytical standards were to be used when a quadratic fit is used to generate the ICAL curve.
(2) For average response factors (RFs), the relative standard deviation (%RSD) or percent relative standard error (%RSE) values for all compounds and internal standards must be ≤20%.
(3) Immediately following the ICAL, a calibration blank (ICB) should be analyzed; ICB should consist of blank methanol/water containing all EIS and NIS compounds.

(4) Following the ICB, an initial calibration verification (ICV) standard at the mid-point level of the ICAL and obtained from a source different than the ICAL standards should be analyzed. The %R values for target compounds and internal standards must be within or equal to 70-130% of true values.

Both ICALs reported associated with this SDG met the criteria.

2.4 Continuing Calibration Verification (CCV)

The following criteria were applied to evaluate CCVs:

(1) A CCV containing all target compounds and internal standards at the mid-level of ICAL should be analyzed at the beginning of every analytical sequence prior to sample analysis, after every 10 samples, and at the end of the analytical sequence.
(2) An Instrument Sensitivity Check (ISC), named as low-level CCV (CCVL) by the laboratory, at or below the reporting limit (RL) should be analyzed at the beginning of an analytical sequence.
(3) The recovery for the CCV and CCVL must be within 70-130% of true value for all target analytes.
(4) A bile salts interference-check standard consisting of TDCA (if acetonitrile is used as mobile phase), or TDCA, TCDA, and TUDCA (if alternative mobile phase is used) was analyzed daily, prior to analysis of samples. The peak separation between retention time of the bile salts and the retention time window of PFOS must be greater than 1 minute.
(5) A Qualitative Identification Standard (QIS) containing a mixture of the branched and linear isomers of PFOA, PFNA, PFOSA, NMeFOSA, NEtFOSA, NEtFOSE, and NMeFOSE was analyzed daily, prior to analysis of all samples.

As noted by the laboratory, selected %R values exceeded the upper control limit of 130% in CCVs and/or CCVL for selected analytes, indicating a potential high bias associated with sample results analyzed in the same sequences. These analytes were not detected in samples at or above the MDLs; the biased high %R values had no effects on data quality. No data qualifying action was taken in these cases.

The %R value for EIS $^{13}C_7$-PFUnA (34.3%) biased high in CCV 320-748032/28. The %R values for this EIS were within control limits in associated samples. No data qualifying action was taken.

2.5 Blanks

ICB and CCB: ICBs and CCBs were evaluated in Stage 4 validation. ICBs and CCBs were analyzed as required by the Method. Target analytes were not detected in ICBs and CCB at or above the method detection limits (MDLs).

Method Blanks: Method blanks were prepared and analyzed as required by the Method and the laboratory SOP. Target analytes were not detected at or above the MDLs in method blanks.

Field Blank: A field blank sample (sample names prefixed with "FB") was collected and submitted for analysis on each date of sampling. Target analytes were not detected at or above the MDLs in these samples.

Equipment Rinsate Blank: An equipment rinsate blank sample (sample names prefixed with "EB") was collected and submitted for analysis on each date of sampling. Target analytes were not detected at or above the MDLs in these samples.

2.6 Ongoing Precision and Recovery (OPR) and Low-Level OPR (LLOPR)

OPR and LLOPR (named as LCS and LLCS by the laboratory) analyses were performed as required by the Method. All %R values met the laboratory control limits.

2.7 Extracted Internal Standard [EIS]

Proper EIS (named as surrogate spike) compounds were to be added to all samples and QC analyses as required by the Method. For Stage 4 validation, the EIS retention times for all field and QC samples were evaluated; the EIS retention times met the Method requirements for all samples (within 0.40 minutes of the retention time of the midpoint standard in the ICAL, or on days when an ICAL is not performed, the initial CV is used). %R values for selected EIS in some samples were outside the laboratory control limits. These samples were diluted and re-analyzed as required by the Method.

As per DoD Data Validation Guidelines Module 6 (see **Section I**), if EIS %R values were >200%; associated detected results are qualified (J-); non-detects are not qualified. If surrogate %R value is <10%, associated detected and non-detected results are qualified (X) as recommended to be excluded. No data were qualified following the Module 6 data flagging convention.

2.8 Non-extracted Internal Standard [NIS]

NIS recovery was evaluated in Stage 4 validation. NIS compounds (named as internal standard by the laboratory) should be added to samples and QC analyses. NIS response peak areas must be ≥30% of the average area of the corresponding NIS in the calibration standards. The NIS retention times for all field and QC samples should be within 0.40 minutes of the retention time of the midpoint standard in the ICAL, or on days when an ICAL is not performed, the initial CV is used. All NIS response and RTs met the Method control criteria.

2.9 Laboratory Duplicate Analysis

Laboratory duplicate analysis was performed on samples EA-MW14B-N-03062024 and SWN-MW321-N-03122024. The relative percent difference (RPD) and/or concentration difference values met the laboratory control limits.

2.10 Matrix Spike and Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses were not performed on a project sample in this SDG. The method applies isotope dilution technique, which generally precludes sample matrix effects. No further action was taken in this case.

2.11 Field Duplicates

Three field duplicates were collected for PFAS analyses. The RPD (or concentration difference) values and data qualification for detected target compounds are presented in **Section III**.

2.12 Compound Quantitation and Detection Limits

Project target PFAS containing linear and branch isomers (*e.g.,* PFBS, PFOA, PFNA, and PFOSA,) were properly integrated and quantitated. Manual integration was performed properly and consistently across calibrations and sample analyses.

RLs were supported with adequate initial calibration concentrations. The reported MDLs and RLs were consistent with those listed in the QAPP. Sample-specific MDLs and RLs were adjusted with sample amount extracted and/or required dilution. Some samples required dilution due to elevated concentrations of selected analytes in the samples or difficult sample matrix.

Samples Drum 1- 03132024, Drum 2- 03132024, and Drum 3- 03132024 in SDG: 590-23724-1 contained excessive amounts of particulates, and foams were observed on Drum 1 and Drum 3. Sample Drum 2 was diluted 10x and Drum 1 and Drum 3 diluted 100x (using less sample volumes). The MDLs/RLs were raised proportionally.

Samples SWN-MW-3-N-03072024 (Lab ID: 590-23619-7) and Drum1-03132024 (Lab ID: and Drum 3-03132024 contained excessive amounts of particulates; a smaller sample volume was used for extraction and the MDLs/RLs were elevated 20x for this sample. Various samples were diluted 2x due to sediments in the samples; the MDLs/RLs were raised proportionally for these samples.

Concentrations for selected analytes in six samples exceeded instrument calibration ranges. These samples, except SWN-MW1-03112024 (Lab ID: 590-23660-7) and SWN-MW321-N-03122024 (Lab ID: 590-23681-1), were diluted and re-analyzed to quantitate the high-concentration analytes. The reported value for PFHxS in samples SWN-MW1-03112024 and SWN-MW321-N-03122024 exceeded the instrument calibration range; the results were qualified (J) as estimated. The results from dilution analyses should be reported for the remaining cases. See **Section IV, 2** for specific data qualification.

As stated above, selected samples required dilution analysis and/or reanalysis due to various reasons. The optimal result for each analyte was determined in multiple analyses, based on the EIS recovery and the lowest possible MDL/RL for these samples, as summarized in **Section IV-1**.

Verification calculations were performed on more than 10% of the instrument calibration, calibration verifications, standard concentrations, and reported QC and sample analyses. No anomalies were found. Sample quantitation and reporting was correctly performed.

2.13 Target Compound Identification

Target compound identification is evaluated by examining if:

(1) The transition ions specified in the SOP were monitored consistently across the course of calibration and sample analyses.
(2) The relative RT for an analyte to the corresponding labeled internal standard should be within ±0.1 minute.
(3) S/N signal for both quantitative and qualitative transition ions must be ≥3.
(4) Transition lion abundance ratio should be within 50 – 150% of the ICV if analyzed immediately following the ICAL or the most recent CCV standard.

No anomalies were found in relation to target compound identification, except that transition ion abundance ratios for selected detections were outside the control limits. As noted by the laboratory, the ion abundance ratio for PFOS in LA-MW12-N-03082024 (Laboratory ID: 590-23638-2) was outside the control criteria; the result was qualified (J) as estimated.

2.14 System Performance

The system performance and stability over an analytical sequence was evaluated by examining chromatograms for abrupt baseline shifting, excessive baseline rise at elevated temperature, progressing peak tailing, or loss of resolution. In addition, the internal standard retention times and response areas were checked for trends of shifting. No anomalies were observed.

2.15 Overall Assessment of PFAS Data Usability

PFAS data reported from EPA Method 1633 are acceptable for use as qualified, based on the information submitted by the laboratory.

3. Per- and Polyfluoroalkyl Substances ([PFAS]; EPA Method 533)

3.1 Holding Times

The QAPP calls for water samples being extracted within 28 days of collection and extracts analyzed within 90 days of extraction. All samples were extracted and analyzed within the project required holding times.

3.2 Blanks

Method Blank: A method blank was prepared and analyzed as required by the Method. Target analytes were not detected at or above the MDLs in the method blank.

Field Blank: Sample FB-03262024 was a field blank associated with samples in this SDG. Target analytes were not detected at or above the MDLs in this sample.

3.3 Ongoing Precision and Recovery (OPR) and Low-Level OPR (LLOPR)

An LLOPR (named as LLCS by the laboratory) analysis was performed as required by the Method. All %R values met the laboratory control limits.

3.4 Isotope Dilution Labeled Compounds

Isotope dilution labeled compounds were added to all samples and QC analyses as required by the Method. All %R values met the laboratory control limits.

3.5 Matrix Spike and Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses were not performed on a project sample in this SDG.

3.6 Field Duplicates

Samples DeiceTap N-03262024 and DeiceTap FD-03262024 were field duplicate pairs. RPD and concentration difference values for detected compounds were calculated and data qualification were listed in **Section III**.

3.7 Reporting Limits

Sample-specific MDLs and RLs were adjusted with sample amount extracted. The reported RLs were consistent with those listed in the QAPP as applicable.

3.8 Overall Assessment of PFAS Data Usability

PFAS data reported from EPA Method 533 are acceptable for use as qualified, based on the information submitted by the laboratory.

III. Field Duplicates

Field duplicate RPD is indicative of field and laboratory precision and sample homogeneity in combination. The QAPP specifies criteria of ≤30% for precision evaluation. An advisory criterion of ≤2xRL for results <5xRL was applied to evaluating the concentration differences. The RPD (or concentration difference) values and data qualification for detected compounds in field duplicates are presented as follows:

Detected Analyte	Unit	RL	Field Duplicate Sample ID & Concentration		RPD (%)	Difference	Data Qualifier
			SWN-MW7-N-03062024	**SWN-MW7-FD-03062024**			
PFBA	*n*g/L	7.7	14	14		0	
PFBS	*n*g/L	1.9	4.8	4.8		0	
PFDA	*n*g/L	1.9	7	7.4		0.4	
PFHpA	*n*g/L	1.9	13	13	0%		
PFHxA	*n*g/L	1.9	27	27	0%		
PFHxS	*n*g/L	1.9	40	39	3%		
PFNA	*n*g/L	1.9	5.7	5		0.7	
PFOA	*n*g/L	1.9	39	39	0%		
PFOS	*n*g/L	1.9	31	32	3%		
PFOSA	*n*g/L	1.9	0.53	ND		0.53	
PFPeA	*n*g/L	3.8	34	35	3%		
PFPeS	*n*g/L	1.9	4	3.8		0.2	
			SWN-MW13-N-03112024	**SWN-MW13-FD-03112024**			
PFBA	*n*g/L	7.8	14	14		0	
PFBS	*n*g/L	1.9	16	16	0%		
PFDA	*n*g/L	1.9	8.8	8.9		0.1	
PFHpA	*n*g/L	1.9	14	13	7%		
PFHpS	*n*g/L	1.9	0.54	0.57		0.03	
PFHxA	*n*g/L	1.9	38	36	5%		
PFHxS	*n*g/L	1.9	98	100	2%		
PFNA	*n*g/L	1.9	4.9	5.5		0.6	
PFOA	*n*g/L	1.9	42	39	7%		
PFOS	*n*g/L	1.9	22	20	10%		
PFPeA	*n*g/L	3.9	31	31	0%		
PFPeS	*n*g/L	1.9	12	11	9%		
			W-MW15-N-03132024	**W-MW15-FD-03132024**			
All PFAS	*n*g/L	2.0 – 8.0	ND	ND		0	
			DeiceTap N-03262024	**DeiceTap FD-03262024**			
PFBA	*n*g/L	1.9	0.59	0.55		0.04	
PFBS	*n*g/L	1.9	ND	0.47		0.47	

Detected Analyte	Unit	RL	Field Duplicate Sample ID & Concentration		RPD (%)	Difference	Data Qualifier
PFHxA	*n*g/L	1.9	0.64	0.69		0.05	
PFOA	*n*g/L	1.9	0.56	0.53		0.03	
PFOS	*n*g/L	1.9	0.98	0.98		0	
PFPeA	*n*g/L	1.9	1.1	0.98		0.12	

Notes:
ND – Not detected at or above the method detection limit (MDL).
RL – Reporting limit
RPD – Relative percent difference
*n*g/L – nanogram per liter

IV. DATA VALIDATION SUMMARY

1. Data Qualification

Sample Name	Laboratory Sample ID	Analyte	Data Qualifier	Reason Code	Report Section
EA-MW14B-N-03062024	590-23589-1	PFHxS	**R**	ALT_DIL	**Section II, 2.12**
EA-MW14B-N-03062024	590-23589-1	PFOS	**R**	ALT_DIL	
EA-MW14A-N-03062024	590-23589-2_D10	EtFOSAA	**R**	ALT_IN	
EA-MW14A-N-03062024	590-23589-2	PFHxS	**R**	ALT_DIL	
EA-MW14A-N-03062024	590-23589-2_D10	PFOSA	**R**	ALT_IN	
EA-MW14A-N-03062024	590-23589-2	PFOS	**R**	ALT_DIL	
EA-MW13A-N-03072024	590-23619-1	PFHxS	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2_D10	MeFOSE	**R**	ALT_IN	
EA-MW13B-N-03072024	590-23619-2_D10	4:2 FTS	**R**	ALT_IN	
EA-MW13B-N-03072024	590-23619-2_D10	EtFOSE	**R**	ALT_IN	
EA-MW13B-N-03072024	590-23619-2_D10	NEtPFOSA	**R**	ALT_IN	
EA-MW13B-N-03072024	590-23619-2_D10	MeFOSA	**R**	ALT_IN	
EA-MW13B-N-03072024	590-23619-2	PFBS	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2	PFHpS	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2	PFHxA	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2	PFOSA	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2	PFOA	**R**	ALT_DIL	
EA-MW13B-N-03072024	590-23619-2	PFPeS	**R**	ALT_DIL	
SWN-MW1-03112024	590-23660-7	PFHxS	**J**	EXE	
SWN-MW321-N-03122024	590-23681-1_D10	4:2 FTS	**R**	ALT_IN	
SWN-MW321-N-03122024	590-23681-1	PFBS	**R**	ALT_DIL	
SWN-MW321-N-03122024	590-23681-1_D10	PFHxS	**J**	EXE	
SWN-MW321-N-03122024	590-23681-1	PFHxA	**R**	ALT_DIL	
LA-MW12-N-03082024	590-23638-2	PFOS	**J**	ION	**Section II, 2.13**

Notes:
Laboratory sample ID suffixed with "D10" indicates a 10x dilution analysis for the sample.
ALT_DIL: The result for this analyte should be reported from the dilution analysis.
ALT_IN: The result for this analyte should be reported from the initial analysis.
EXE: The reported value exceeded the instrument calibration range.
ION: The transition ion abundance ration was outside the control limits.

2. Data Qualifier Definition

Data Qualifier	Definition
J	The analyte was detected above the reported quantitation limit, and the reported concentration was an estimated value with an unknown bias.
R	The reported result should be rejected and discarded.

V. REFERENCES

United States Environmental Protection Agency (USEPA). 2024. *Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS*. Office of Water. January 2024. EPA 821-R-24-001

USEPA. 2020. *Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review.* Office of Superfund Remediation and Technical Innovation. November 2020. OLEM 9240.0-51. EPA-540-R-20-005.

USEPA. 2019. *Determination of Per- And Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry*. December 2019, 815-B-19-020.

Department of Defense, United States (DoD). 2022. *Data Validation Guidelines Module 6: Data Validation Guidelines Module 6: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-24.* Environmental Data Quality Workgroup. November 2022.

DoD. 2020. *Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15.* Environmental Data Quality Workgroup. May 1, 2020.

Haley & Aldrich, Inc. 2024. *Draft Quality Assurance Project Plan (QAPP*) - *Characterization of PFAS Impacts to Groundwater. Spokane International Airport.* Prepared for the Spokane Internation Airport. March 2024.

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

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JOB DESCRIPTION

Spokane International Airport

JOB NUMBER

590-23558-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

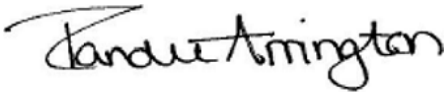
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23558-1 Eurofins Spokane

Job Narrative
590-23558-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/6/2024 11:50 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 5.1°C.

PFAS
Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-745247.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23558-1	WL-EB-03052024	Water	03/05/24 08:05	03/06/24 11:50
590-23558-2	LA-MW8-N-03052024	Water	03/05/24 14:30	03/06/24 11:50
590-23558-3	FB-03052024	Water	03/05/24 14:45	03/06/24 11:50
590-23558-4	T-EB-03052024	Water	03/05/24 14:55	03/06/24 11:50
590-23558-5	LA-MW10-N-03052024	Water	03/05/24 16:00	03/06/24 11:50

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Qualifiers

LCMS

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: WL-EB-03052024
Date Collected: 03/05/24 08:05
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-1
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
4:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
6:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
8:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
NMeFOSA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
NEtFOSA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 13:26	1
NMeFOSE	ND		20	5.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
NEtFOSE	ND		20	5.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
PFMPA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
PFMBA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
NFDHA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
PFEESA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 13:26	1
3:3 FTCA	ND		10	2.5	ng/L		03/08/24 04:06	03/09/24 13:26	1
5:3 FTCA	ND		50	13	ng/L		03/08/24 04:06	03/09/24 13:26	1
7:3 FTCA	ND		50	13	ng/L		03/08/24 04:06	03/09/24 13:26	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*79.3*		*5 - 130*	*03/08/24 04:06*	*03/09/24 13:26*	*1*
13C5 PFPeA	*79.8*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:26*	*1*
13C5 PFHxA	*80.0*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:26*	*1*
13C4 PFHpA	*81.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:26*	*1*
13C8 PFOA	*77.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:26*	*1*

Client Sample ID: WL-EB-03052024

Lab Sample ID: 590-23558-1

Date Collected: 03/05/24 08:05
Matrix: Water
Date Received: 03/06/24 11:50

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	79.0		40 - 130	03/08/24 04:06	03/09/24 13:26	1
13C6 PFDA	78.5		40 - 130	03/08/24 04:06	03/09/24 13:26	1
13C7 PFUnA	73.8		30 - 130	03/08/24 04:06	03/09/24 13:26	1
13C2 PFDoA	66.4		10 - 130	03/08/24 04:06	03/09/24 13:26	1
13C2 PFTeDA	57.3		10 - 130	03/08/24 04:06	03/09/24 13:26	1
13C3 PFBS	86.0		40 - 135	03/08/24 04:06	03/09/24 13:26	1
13C3 PFHxS	76.1		40 - 130	03/08/24 04:06	03/09/24 13:26	1
13C8 PFOS	77.0		40 - 130	03/08/24 04:06	03/09/24 13:26	1
13C8 PFOSA	70.2		40 - 130	03/08/24 04:06	03/09/24 13:26	1
d3-NMeFOSAA	84.1		40 - 170	03/08/24 04:06	03/09/24 13:26	1
d5-NEtFOSAA	80.9		25 - 135	03/08/24 04:06	03/09/24 13:26	1
13C2 4:2 FTS	91.6		40 - 200	03/08/24 04:06	03/09/24 13:26	1
13C2 6:2 FTS	87.0		40 - 200	03/08/24 04:06	03/09/24 13:26	1
13C2 8:2 FTS	89.0		40 - 300	03/08/24 04:06	03/09/24 13:26	1
13C3 HFPO-DA	82.1		40 - 130	03/08/24 04:06	03/09/24 13:26	1
d7-N-MeFOSE-M	60.0		10 - 130	03/08/24 04:06	03/09/24 13:26	1
d9-N-EtFOSE-M	60.6		10 - 130	03/08/24 04:06	03/09/24 13:26	1
d5-NEtPFOSA	54.1		10 - 130	03/08/24 04:06	03/09/24 13:26	1
d3-NMePFOSA	56.8		10 - 130	03/08/24 04:06	03/09/24 13:26	1

Client Sample ID: LA-MW8-N-03052024

Lab Sample ID: 590-23558-2

Date Collected: 03/05/24 14:30
Matrix: Water
Date Received: 03/06/24 11:50

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**9.6**		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluoropentanoic acid (PFPeA)	**6.4**		3.8	0.95	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorohexanoic acid (PFHxA)	**4.9**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluoroheptanoic acid (PFHpA)	**2.4**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorooctanoic acid (PFOA)	**6.1**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorononanoic acid (PFNA)	**4.7**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorobutanesulfonic acid (PFBS)	**3.1**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluoropentanesulfonic acid (PFPeS)	**0.95**	**J**	1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorohexanesulfonic acid (PFHxS)	**5.8**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorooctanesulfonic acid (PFOS)	**17**		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: LA-MW8-N-03052024
Date Collected: 03/05/24 14:30
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-2
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4:2 FTS	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
6:2 FTS	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
8:2 FTS	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
NMeFOSA	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
NEtFOSA	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/08/24 04:06	03/09/24 13:44	1
NMeFOSE	ND		19	4.7	ng/L		03/08/24 04:06	03/09/24 13:44	1
NEtFOSE	ND		19	4.7	ng/L		03/08/24 04:06	03/09/24 13:44	1
HFPO-DA (GenX)	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
PFMPA	ND		3.8	0.95	ng/L		03/08/24 04:06	03/09/24 13:44	1
PFMBA	ND		3.8	0.95	ng/L		03/08/24 04:06	03/09/24 13:44	1
NFDHA	ND		3.8	0.95	ng/L		03/08/24 04:06	03/09/24 13:44	1
9Cl-PF3ONS	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
11Cl-PF3OUdS	ND		7.6	1.9	ng/L		03/08/24 04:06	03/09/24 13:44	1
PFEESA	ND		3.8	0.95	ng/L		03/08/24 04:06	03/09/24 13:44	1
3:3 FTCA	ND		9.5	2.4	ng/L		03/08/24 04:06	03/09/24 13:44	1
5:3 FTCA	ND		47	12	ng/L		03/08/24 04:06	03/09/24 13:44	1
7:3 FTCA	ND		47	12	ng/L		03/08/24 04:06	03/09/24 13:44	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*80.0*		*5 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C5 PFPeA	*76.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C5 PFHxA	*78.7*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C4 PFHpA	*76.1*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C8 PFOA	*72.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C9 PFNA	*78.8*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C6 PFDA	*74.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C7 PFUnA	*70.4*		*30 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C2 PFDoA	*66.3*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C2 PFTeDA	*62.0*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C3 PFBS	*86.4*		*40 - 135*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C3 PFHxS	*74.9*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C8 PFOS	*75.7*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C8 PFOSA	*75.9*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d3-NMeFOSAA	*86.1*		*40 - 170*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d5-NEtFOSAA	*77.2*		*25 - 135*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C2 4:2 FTS	*111*		*40 - 200*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C2 6:2 FTS	*94.6*		*40 - 200*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C2 8:2 FTS	*85.0*		*40 - 300*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
13C3 HFPO-DA	*79.2*		*40 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d7-N-MeFOSE-M	*64.4*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d9-N-EtFOSE-M	*64.8*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d5-NEtPFOSA	*57.8*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*
d3-NMePFOSA	*60.5*		*10 - 130*	*03/08/24 04:06*	*03/09/24 13:44*	*1*

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: FB-03052024
Date Collected: 03/05/24 14:45
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-3
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluoropentanoic acid (PFPeA)	ND		4.2	1.0	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorohexanoic acid (PFHxA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluoroheptanoic acid (PFHpA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorooctanoic acid (PFOA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorononanoic acid (PFNA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorodecanoic acid (PFDA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluoroundecanoic acid (PFUnA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorododecanoic acid (PFDoA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorononanesulfonic acid (PFNS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
4:2 FTS	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
6:2 FTS	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
8:2 FTS	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
Perfluorooctanesulfonamide (FOSA)	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
NMeFOSA	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
NEtFOSA	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
NMeFOSAA	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
NEtFOSAA	ND		2.1	0.52	ng/L		03/08/24 04:06	03/09/24 14:37	1
NMeFOSE	ND		21	5.2	ng/L		03/08/24 04:06	03/09/24 14:37	1
NEtFOSE	ND		21	5.2	ng/L		03/08/24 04:06	03/09/24 14:37	1
HFPO-DA (GenX)	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
PFMPA	ND		4.2	1.0	ng/L		03/08/24 04:06	03/09/24 14:37	1
PFMBA	ND		4.2	1.0	ng/L		03/08/24 04:06	03/09/24 14:37	1
NFDHA	ND		4.2	1.0	ng/L		03/08/24 04:06	03/09/24 14:37	1
9Cl-PF3ONS	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
11Cl-PF3OUdS	ND		8.4	2.1	ng/L		03/08/24 04:06	03/09/24 14:37	1
PFEESA	ND		4.2	1.0	ng/L		03/08/24 04:06	03/09/24 14:37	1
3:3 FTCA	ND		10	2.6	ng/L		03/08/24 04:06	03/09/24 14:37	1
5:3 FTCA	ND		52	13	ng/L		03/08/24 04:06	03/09/24 14:37	1
7:3 FTCA	ND		52	13	ng/L		03/08/24 04:06	03/09/24 14:37	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*81.3*		*5 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C5 PFPeA	*82.1*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C5 PFHxA	*85.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C4 PFHpA	*78.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C8 PFOA	*79.2*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*

Client Sample ID: FB-03052024
Lab Sample ID: 590-23558-3

Date Collected: 03/05/24 14:45
Matrix: Water
Date Received: 03/06/24 11:50

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C9 PFNA	*80.2*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C6 PFDA	*80.9*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C7 PFUnA	*79.7*		*30 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C2 PFDoA	*67.8*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C2 PFTeDA	*60.1*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C3 PFBS	*85.3*		*40 - 135*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C3 PFHxS	*77.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C8 PFOS	*81.0*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C8 PFOSA	*74.5*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d3-NMeFOSAA	*90.8*		*40 - 170*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d5-NEtFOSAA	*85.6*		*25 - 135*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C2 4:2 FTS	*90.7*		*40 - 200*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C2 6:2 FTS	*90.1*		*40 - 200*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C2 8:2 FTS	*89.7*		*40 - 300*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
13C3 HFPO-DA	*85.5*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d7-N-MeFOSE-M	*62.4*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d9-N-EtFOSE-M	*62.5*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d5-NEtPFOSA	*58.1*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*
d3-NMePFOSA	*56.5*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:37*	*1*

Client Sample ID: T-EB-03052024
Lab Sample ID: 590-23558-4

Date Collected: 03/05/24 14:55
Matrix: Water
Date Received: 03/06/24 11:50

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluoropentanoic acid (PFPeA)	ND		3.7	0.92	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorohexanoic acid (PFHxA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorodecanoic acid (PFDA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluoroundecanoic acid (PFUnA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorododecanoic acid (PFDoA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorononanesulfonic acid (PFNS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
4:2 FTS	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
6:2 FTS	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
8:2 FTS	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: T-EB-03052024
Date Collected: 03/05/24 14:55
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-4
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
NMeFOSA	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
NEtFOSA	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
NMeFOSAA	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
NEtFOSAA	ND		1.8	0.46	ng/L		03/08/24 04:06	03/09/24 14:54	1
NMeFOSE	ND		18	4.6	ng/L		03/08/24 04:06	03/09/24 14:54	1
NEtFOSE	ND		18	4.6	ng/L		03/08/24 04:06	03/09/24 14:54	1
HFPO-DA (GenX)	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
PFMPA	ND		3.7	0.92	ng/L		03/08/24 04:06	03/09/24 14:54	1
PFMBA	ND		3.7	0.92	ng/L		03/08/24 04:06	03/09/24 14:54	1
NFDHA	ND		3.7	0.92	ng/L		03/08/24 04:06	03/09/24 14:54	1
9Cl-PF3ONS	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
11Cl-PF3OUdS	ND		7.4	1.8	ng/L		03/08/24 04:06	03/09/24 14:54	1
PFEESA	ND		3.7	0.92	ng/L		03/08/24 04:06	03/09/24 14:54	1
3:3 FTCA	ND		9.2	2.3	ng/L		03/08/24 04:06	03/09/24 14:54	1
5:3 FTCA	ND		46	12	ng/L		03/08/24 04:06	03/09/24 14:54	1
7:3 FTCA	ND		46	12	ng/L		03/08/24 04:06	03/09/24 14:54	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*83.1*		*5 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C5 PFPeA	*84.0*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C5 PFHxA	*83.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C4 PFHpA	*79.6*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C8 PFOA	*80.1*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C9 PFNA	*83.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C6 PFDA	*82.1*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C7 PFUnA	*78.0*		*30 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C2 PFDoA	*63.2*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C2 PFTeDA	*54.1*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C3 PFBS	*88.0*		*40 - 135*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C3 PFHxS	*78.9*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C8 PFOS	*81.9*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C8 PFOSA	*76.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d3-NMeFOSAA	*92.9*		*40 - 170*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d5-NEtFOSAA	*77.7*		*25 - 135*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C2 4:2 FTS	*88.5*		*40 - 200*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C2 6:2 FTS	*88.2*		*40 - 200*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C2 8:2 FTS	*88.7*		*40 - 300*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
13C3 HFPO-DA	*86.0*		*40 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d7-N-MeFOSE-M	*63.0*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d9-N-EtFOSE-M	*61.9*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d5-NEtPFOSA	*61.4*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*
d3-NMePFOSA	*62.3*		*10 - 130*	*03/08/24 04:06*	*03/09/24 14:54*	*1*

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: LA-MW10-N-03052024
Date Collected: 03/05/24 16:00
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-5
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**29**		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluoropentanoic acid (PFPeA)	**150**		3.8	0.96	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorohexanoic acid (PFHxA)	**170**		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluoroheptanoic acid (PFHpA)	**1.3**	**J**	1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorobutanesulfonic acid (PFBS)	**0.51**	**J**	1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
4:2 FTS	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
6:2 FTS	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
8:2 FTS	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
NMeFOSA	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
NEtFOSA	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
NMeFOSAA	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
NEtFOSAA	ND		1.9	0.48	ng/L		03/08/24 04:06	03/09/24 15:12	1
NMeFOSE	ND		19	4.8	ng/L		03/08/24 04:06	03/09/24 15:12	1
NEtFOSE	ND		19	4.8	ng/L		03/08/24 04:06	03/09/24 15:12	1
HFPO-DA (GenX)	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
PFMPA	ND		3.8	0.96	ng/L		03/08/24 04:06	03/09/24 15:12	1
PFMBA	ND		3.8	0.96	ng/L		03/08/24 04:06	03/09/24 15:12	1
NFDHA	ND		3.8	0.96	ng/L		03/08/24 04:06	03/09/24 15:12	1
9Cl-PF3ONS	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
11Cl-PF3OUdS	ND		7.7	1.9	ng/L		03/08/24 04:06	03/09/24 15:12	1
PFEESA	ND		3.8	0.96	ng/L		03/08/24 04:06	03/09/24 15:12	1
3:3 FTCA	ND		9.6	2.4	ng/L		03/08/24 04:06	03/09/24 15:12	1
5:3 FTCA	ND		48	12	ng/L		03/08/24 04:06	03/09/24 15:12	1
7:3 FTCA	ND		48	12	ng/L		03/08/24 04:06	03/09/24 15:12	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*79.7*		*5 - 130*	*03/08/24 04:06*	*03/09/24 15:12*	*1*
13C5 PFPeA	*76.5*		*40 - 130*	*03/08/24 04:06*	*03/09/24 15:12*	*1*
13C5 PFHxA	*76.3*		*40 - 130*	*03/08/24 04:06*	*03/09/24 15:12*	*1*
13C4 PFHpA	*77.8*		*40 - 130*	*03/08/24 04:06*	*03/09/24 15:12*	*1*

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: LA-MW10-N-03052024
Date Collected: 03/05/24 16:00
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-5
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 PFOA	75.5		40 - 130	03/08/24 04:06	03/09/24 15:12	1
13C9 PFNA	77.2		40 - 130	03/08/24 04:06	03/09/24 15:12	1
13C6 PFDA	72.4		40 - 130	03/08/24 04:06	03/09/24 15:12	1
13C7 PFUnA	74.7		30 - 130	03/08/24 04:06	03/09/24 15:12	1
13C2 PFDoA	68.2		10 - 130	03/08/24 04:06	03/09/24 15:12	1
13C2 PFTeDA	55.6		10 - 130	03/08/24 04:06	03/09/24 15:12	1
13C3 PFBS	82.2		40 - 135	03/08/24 04:06	03/09/24 15:12	1
13C3 PFHxS	74.3		40 - 130	03/08/24 04:06	03/09/24 15:12	1
13C8 PFOS	76.1		40 - 130	03/08/24 04:06	03/09/24 15:12	1
13C8 PFOSA	74.0		40 - 130	03/08/24 04:06	03/09/24 15:12	1
d3-NMeFOSAA	83.9		40 - 170	03/08/24 04:06	03/09/24 15:12	1
d5-NEtFOSAA	74.1		25 - 135	03/08/24 04:06	03/09/24 15:12	1
13C2 4:2 FTS	91.3		40 - 200	03/08/24 04:06	03/09/24 15:12	1
13C2 6:2 FTS	84.3		40 - 200	03/08/24 04:06	03/09/24 15:12	1
13C2 8:2 FTS	90.1		40 - 300	03/08/24 04:06	03/09/24 15:12	1
13C3 HFPO-DA	78.1		40 - 130	03/08/24 04:06	03/09/24 15:12	1
d7-N-MeFOSE-M	60.6		10 - 130	03/08/24 04:06	03/09/24 15:12	1
d9-N-EtFOSE-M	58.2		10 - 130	03/08/24 04:06	03/09/24 15:12	1
d5-NEtPFOSA	56.5		10 - 130	03/08/24 04:06	03/09/24 15:12	1
d3-NMePFOSA	58.2		10 - 130	03/08/24 04:06	03/09/24 15:12	1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-745247/1-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745247

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
4:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
6:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
8:2 FTS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
NMeFOSA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
NEtFOSA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/08/24 04:06	03/09/24 11:05	1
NMeFOSE	ND		20	5.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
NEtFOSE	ND		20	5.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
PFMPA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
PFMBA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
NFDHA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
PFEESA	ND		4.0	1.0	ng/L		03/08/24 04:06	03/09/24 11:05	1
3:3 FTCA	ND		10	2.5	ng/L		03/08/24 04:06	03/09/24 11:05	1
5:3 FTCA	ND		50	13	ng/L		03/08/24 04:06	03/09/24 11:05	1
7:3 FTCA	ND		50	13	ng/L		03/08/24 04:06	03/09/24 11:05	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*79.5*		*5 - 130*	*03/08/24 04:06*	*03/09/24 11:05*	*1*
13C5 PFPeA	*78.1*		*40 - 130*	*03/08/24 04:06*	*03/09/24 11:05*	*1*
13C5 PFHxA	*77.4*		*40 - 130*	*03/08/24 04:06*	*03/09/24 11:05*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-745247/1-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745247

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	74.6		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C8 PFOA	82.5		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C9 PFNA	80.5		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C6 PFDA	79.0		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C7 PFUnA	80.3		30 - 130	03/08/24 04:06	03/09/24 11:05	1
13C2 PFDoA	72.0		10 - 130	03/08/24 04:06	03/09/24 11:05	1
13C2 PFTeDA	65.5		10 - 130	03/08/24 04:06	03/09/24 11:05	1
13C3 PFBS	86.9		40 - 135	03/08/24 04:06	03/09/24 11:05	1
13C3 PFHxS	78.3		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C8 PFOS	83.1		40 - 130	03/08/24 04:06	03/09/24 11:05	1
13C8 PFOSA	75.4		40 - 130	03/08/24 04:06	03/09/24 11:05	1
d3-NMeFOSAA	87.8		40 - 170	03/08/24 04:06	03/09/24 11:05	1
d5-NEtFOSAA	81.8		25 - 135	03/08/24 04:06	03/09/24 11:05	1
13C2 4:2 FTS	85.4		40 - 200	03/08/24 04:06	03/09/24 11:05	1
13C2 6:2 FTS	89.0		40 - 200	03/08/24 04:06	03/09/24 11:05	1
13C2 8:2 FTS	86.6		40 - 300	03/08/24 04:06	03/09/24 11:05	1
13C3 HFPO-DA	80.2		40 - 130	03/08/24 04:06	03/09/24 11:05	1
d7-N-MeFOSE-M	63.1		10 - 130	03/08/24 04:06	03/09/24 11:05	1
d9-N-EtFOSE-M	67.6		10 - 130	03/08/24 04:06	03/09/24 11:05	1
d5-NEtPFOSA	59.4		10 - 130	03/08/24 04:06	03/09/24 11:05	1
d3-NMePFOSA	60.1		10 - 130	03/08/24 04:06	03/09/24 11:05	1

Lab Sample ID: LCS 320-745247/3-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745247

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	127		ng/L		99	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	56.7		ng/L		89	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	27.9		ng/L		87	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	28.2		ng/L		88	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	29.7		ng/L		93	70 - 150
Perfluorononanoic acid (PFNA)	32.0	31.0		ng/L		97	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	30.6		ng/L		96	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	30.9		ng/L		97	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	33.2		ng/L		104	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	32.6		ng/L		102	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	30.5		ng/L		95	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	26.4		ng/L		93	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	27.9		ng/L		93	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	27.5		ng/L		94	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	27.2		ng/L		89	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745247/3-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745247

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	27.6		ng/L		93	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	24.9		ng/L		81	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.0		ng/L		71	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	22.6		ng/L		73	50 - 145
4:2 FTS	120	96.5		ng/L		80	70 - 145
6:2 FTS	122	118		ng/L		97	65 - 155
8:2 FTS	123	123		ng/L		100	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	31.5		ng/L		98	70 - 145
NMeFOSA	32.0	27.4		ng/L		85	60 - 150
NEtFOSA	32.0	35.3		ng/L		110	65 - 145
NMeFOSAA	32.0	32.3		ng/L		101	50 - 140
NEtFOSAA	32.0	28.3		ng/L		89	70 - 145
NMeFOSE	320	321		ng/L		100	70 - 145
NEtFOSE	320	328		ng/L		103	70 - 135
HFPO-DA (GenX)	128	124		ng/L		97	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	107		ng/L		89	65 - 145
PFMPA	64.0	60.6		ng/L		95	55 - 140
PFMBA	64.0	51.1		ng/L		80	60 - 150
NFDHA	64.0	61.0		ng/L		95	50 - 150
9Cl-PF3ONS	120	106		ng/L		88	70 - 155
11Cl-PF3OUdS	121	107		ng/L		88	55 - 160
PFEESA	57.1	53.4		ng/L		94	70 - 140
3:3 FTCA	160	143		ng/L		90	65 - 130
5:3 FTCA	799	723		ng/L		91	70 - 135
7:3 FTCA	799	675		ng/L		84	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*80.0*		*5 - 130*
13C5 PFPeA	*80.0*		*40 - 130*
13C5 PFHxA	*79.8*		*40 - 130*
13C4 PFHpA	*78.2*		*40 - 130*
13C8 PFOA	*79.0*		*40 - 130*
13C9 PFNA	*77.0*		*40 - 130*
13C6 PFDA	*77.8*		*40 - 130*
13C7 PFUnA	*80.2*		*30 - 130*
13C2 PFDoA	*69.9*		*10 - 130*
13C2 PFTeDA	*65.3*		*10 - 130*
13C3 PFBS	*85.4*		*40 - 135*
13C3 PFHxS	*77.5*		*40 - 130*
13C8 PFOS	*77.8*		*40 - 130*
13C8 PFOSA	*68.1*		*40 - 130*
d3-NMeFOSAA	*84.6*		*40 - 170*
d5-NEtFOSAA	*74.7*		*25 - 135*
13C2 4:2 FTS	*87.3*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745247/3-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745247

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*80.4*		*40 - 200*
13C2 8:2 FTS	*82.6*		*40 - 300*
13C3 HFPO-DA	*82.9*		*40 - 130*
d7-N-MeFOSE-M	*56.5*		*10 - 130*
d9-N-EtFOSE-M	*60.0*		*10 - 130*
d5-NEtPFOSA	*54.8*		*10 - 130*
d3-NMePFOSA	*56.0*		*10 - 130*

Lab Sample ID: LLCS 320-745247/2-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745247

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	12.5		ng/L		98	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	5.52		ng/L		86	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	2.82		ng/L		88	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	2.97		ng/L		93	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	3.04		ng/L		95	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.26		ng/L		102	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	2.66		ng/L		83	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.54		ng/L		110	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.55		ng/L		111	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.58		ng/L		112	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.18		ng/L		99	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	2.69		ng/L		95	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.69		ng/L		90	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.06		ng/L		105	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.70		ng/L		88	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	2.91		ng/L		98	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.29		ng/L		74	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.11		ng/L		68	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.19		ng/L		70	50 - 145
4:2 FTS	12.0	9.90		ng/L		82	70 - 145
6:2 FTS	12.2	11.5		ng/L		94	65 - 155
8:2 FTS	12.3	13.4		ng/L		109	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.19		ng/L		100	70 - 145
NMeFOSA	3.20	2.70		ng/L		84	60 - 150
NEtFOSA	3.20	3.50		ng/L		109	65 - 145
NMeFOSAA	3.20	3.52		ng/L		110	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-745247/2-A
Matrix: Water
Analysis Batch: 745861

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745247

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
NEtFOSAA	3.20	2.91		ng/L		91	70 - 145
NMeFOSE	32.0	31.7		ng/L		99	70 - 145
NEtFOSE	32.0	36.9		ng/L		115	70 - 135
HFPO-DA (GenX)	12.8	11.5		ng/L		90	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	12.1	10.4		ng/L		86	65 - 145
PFMPA	6.40	5.96		ng/L		93	55 - 140
PFMBA	6.40	4.58		ng/L		72	60 - 150
NFDHA	6.40	6.10		ng/L		95	50 - 150
9Cl-PF3ONS	12.0	10.7		ng/L		89	70 - 155
11Cl-PF3OUdS	12.1	10.1		ng/L		84	55 - 160
PFEESA	5.71	5.26		ng/L		92	70 - 140
3:3 FTCA	16.0	14.0		ng/L		88	65 - 130
5:3 FTCA	79.9	71.4		ng/L		89	70 - 135
7:3 FTCA	79.9	65.3		ng/L		82	50 - 145

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*79.4*		*5 - 130*
13C5 PFPeA	*79.1*		*40 - 130*
13C5 PFHxA	*78.9*		*40 - 130*
13C4 PFHpA	*77.8*		*40 - 130*
13C8 PFOA	*74.8*		*40 - 130*
13C9 PFNA	*77.2*		*40 - 130*
13C6 PFDA	*73.4*		*40 - 130*
13C7 PFUnA	*72.2*		*30 - 130*
13C2 PFDoA	*63.1*		*10 - 130*
13C2 PFTeDA	*58.0*		*10 - 130*
13C3 PFBS	*82.5*		*40 - 135*
13C3 PFHxS	*75.9*		*40 - 130*
13C8 PFOS	*76.8*		*40 - 130*
13C8 PFOSA	*66.3*		*40 - 130*
d3-NMeFOSAA	*74.9*		*40 - 170*
d5-NEtFOSAA	*69.1*		*25 - 135*
13C2 4:2 FTS	*85.6*		*40 - 200*
13C2 6:2 FTS	*84.1*		*40 - 200*
13C2 8:2 FTS	*82.9*		*40 - 300*
13C3 HFPO-DA	*81.4*		*40 - 130*
d7-N-MeFOSE-M	*57.9*		*10 - 130*
d9-N-EtFOSE-M	*60.2*		*10 - 130*
d5-NEtPFOSA	*57.8*		*10 - 130*
d3-NMePFOSA	*56.6*		*10 - 130*

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Client Sample ID: WL-EB-03052024
Date Collected: 03/05/24 08:05
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			499.3 mL	5.0 mL	745247	03/08/24 04:06	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			745861	03/09/24 13:26	S1M	EET SAC

Client Sample ID: LA-MW8-N-03052024
Date Collected: 03/05/24 14:30
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			528.1 mL	5.0 mL	745247	03/08/24 04:06	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			745861	03/09/24 13:44	S1M	EET SAC

Client Sample ID: FB-03052024
Date Collected: 03/05/24 14:45
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			476.4 mL	5.0 mL	745247	03/08/24 04:06	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			745861	03/09/24 14:37	S1M	EET SAC

Client Sample ID: T-EB-03052024
Date Collected: 03/05/24 14:55
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			542.6 mL	5.0 mL	745247	03/08/24 04:06	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			745861	03/09/24 14:54	S1M	EET SAC

Client Sample ID: LA-MW10-N-03052024
Date Collected: 03/05/24 16:00
Date Received: 03/06/24 11:50

Lab Sample ID: 590-23558-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			520.6 mL	5.0 mL	745247	03/08/24 04:06	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			745861	03/09/24 15:12	S1M	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23558-1
Project/Site: Spokane International Airport

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509 924.9290

Chain of Custody Record

eurofins | Environment Testing America

Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723 5261 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only
(xxx) xxx-xxxx: FAX	TAT if different from Below _____			Walk-in Client:
Project Name: Spokane International Airport	☐ 2 weeks			Lab Sampling:
Site: SIA	☐ 1 week			Job / SDG No.
PO # 0209800-000	☐ 2 days ☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (16633)	Chloride, Nitrate, Sulfate (300.0)	Nitrate (353.2)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500P)	Alkalinity (SM 2320B)	BOD (405.1)	Sample Specific Notes.
WL-EB-03052024	3/5/24	8:05	G	H2O	2			X							
LA-MW8-N-03052024		14:30			6			X	X	X	X	X	X	X	
FB-03052024		14:45			2			X							
T-EB-03052024		14:55			2			X							
LA-MW10-N-03052024		16:00			6			X	X	X	X	X	X	X	

590-23558 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
EPA 16663 5-DAY TAT WDM 3/6/2024
REMAINING SAMPLES STANDARD TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd. 5.0 Corr'd. 5.1	Therm ID No. IR0006
Relinquished by:	Company: H&A	Date/Time: 3/5/24 (7:00)	Received by: (WDM) Company: H&A Date/Time: 3/5/2024 1700
Relinquished by: (WDM)	Company: H&A	Date/Time: 3/6/2024 1149	Received by: Company: EETNW Date/Time: 3/6/24 1150
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Company: Date/Time:

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone. 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8824 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23558-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/26/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
WL-EB-03052024 (590-23558-1)	3/5/24	08 05 Pacific		Water			X	2	
LA-MW8-N-03052024 (590-23558-2)	3/5/24	14 30 Pacific		Water			X	2	
FB-03052024 (590-23558-3)	3/5/24	14 45 Pacific		Water			X	2	
T-EB-03052024 (590-23558-4)	3/5/24	14.55 Pacific		Water			X	2	
LA-MW10-N-03052024 (590-23558-5)	3/5/24	16:00 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested. I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements.

Empty Kit Relinquished by:	Date.	Time.	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	3/6/24 15:13	EET SPO		03/07/24 0930	EESPO
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No. 2261237 | Cooler Temperature(s) °C and Other Remarks: 2.4°C

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23558-1

Login Number: 23558
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23558-1

Login Number: 23558
List Number: 2
Creator: Morazzini, Dominic S

List Source: Eurofins Sacramento
List Creation: 03/07/24 06:11 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261237
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.4
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23558 Field Sheet

Job _____

Tracking # 7101960002436

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID: L016 Corr. Factor (+ / -) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261237

Cooler ID _____

Temp Observed: 2.4 °C Corrected 2.4 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/07/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/07/24

Notes: _____

Trizma Lot #(s) _____

Ammonium Acetate Lot #(s). _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/07/24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23558-1	WL-EB-03052024	79.3	79.8	80.0	81.3	77.3	79.0	78.5	73.8
590-23558-2	LA-MW8-N-03052024	80.0	76.4	78.7	76.1	72.3	78.8	74.4	70.4
590-23558-3	FB-03052024	81.3	82.1	85.3	78.4	79.2	80.2	80.9	79.7
590-23558-4	T-EB-03052024	83.1	84.0	83.4	79.6	80.1	83.4	82.1	78.0
590-23558-5	LA-MW10-N-03052024	79.7	76.5	76.3	77.8	75.5	77.2	72.4	74.7
LCS 320-745247/3-A	Lab Control Sample	80.0	80.0	79.8	78.2	79.0	77.0	77.8	80.2
LLCS 320-745247/2-A	Lab Control Sample	79.4	79.1	78.9	77.8	74.8	77.2	73.4	72.2
MB 320-745247/1-A	Method Blank	79.5	78.1	77.4	74.6	82.5	80.5	79.0	80.3

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23558-1	WL-EB-03052024	66.4	57.3	86.0	76.1	77.0	70.2	84.1	80.9
590-23558-2	LA-MW8-N-03052024	66.3	62.0	86.4	74.9	75.7	75.9	86.1	77.2
590-23558-3	FB-03052024	67.8	60.1	85.3	77.3	81.0	74.5	90.8	85.6
590-23558-4	T-EB-03052024	63.2	54.1	88.0	78.9	81.9	76.3	92.9	77.7
590-23558-5	LA-MW10-N-03052024	68.2	55.6	82.2	74.3	76.1	74.0	83.9	74.1
LCS 320-745247/3-A	Lab Control Sample	69.9	65.3	85.4	77.5	77.8	68.1	84.6	74.7
LLCS 320-745247/2-A	Lab Control Sample	63.1	58.0	82.5	75.9	76.8	66.3	74.9	69.1
MB 320-745247/1-A	Method Blank	72.0	65.5	86.9	78.3	83.1	75.4	87.8	81.8

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23558-1	WL-EB-03052024	91.6	87.0	89.0	82.1	60.0	60.6	54.1	56.8
590-23558-2	LA-MW8-N-03052024	111	94.6	85.0	79.2	64.4	64.8	57.8	60.5
590-23558-3	FB-03052024	90.7	90.1	89.7	85.5	62.4	62.5	58.1	56.5
590-23558-4	T-EB-03052024	88.5	88.2	88.7	86.0	63.0	61.9	61.4	62.3
590-23558-5	LA-MW10-N-03052024	91.3	84.3	90.1	78.1	60.6	58.2	56.5	58.2
LCS 320-745247/3-A	Lab Control Sample	87.3	80.4	82.6	82.9	56.5	60.0	54.8	56.0
LLCS 320-745247/2-A	Lab Control Sample	85.6	84.1	82.9	81.4	57.9	60.2	57.8	56.6
MB 320-745247/1-A	Method Blank	85.4	89.0	86.6	80.2	63.1	67.6	59.4	60.1

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23558-1
Project/Site: Spokane International Airport

M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

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JOB DESCRIPTION

Spokane International Airport

JOB NUMBER

590-23558-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

Job Notes

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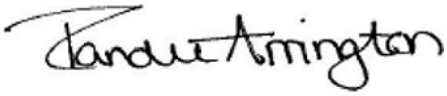

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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23558-2 Eurofins Spokane

Job Narrative
590-23558-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/6/2024 11:50 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 5.1°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method 2320B: The method blank for analytical batch 590-46213 contained Alkalinity as CaCO3 above the method detection limit (MDL). Associated samples were not re-analyzed because the method blank results were less than the reporting limit (RL)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23558-2	LA-MW8-N-03052024	Water	03/05/24 14:30	03/06/24 11:50
590-23558-5	LA-MW10-N-03052024	Water	03/05/24 16:00	03/06/24 11:50

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Job ID: 590-23558-2
Project/Site: Spokane International Airport

Qualifiers

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: LA-MW8-N-03052024

Lab Sample ID: 590-23558-2

Date Collected: 03/05/24 14:30

Matrix: Water

Date Received: 03/06/24 11:50

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	89		0.80	0.42	mg/L			03/06/24 15:50	1
Nitrate as N	4.5		0.20	0.057	mg/L			03/06/24 15:50	1
Sulfate	11		0.50	0.13	mg/L			03/06/24 15:50	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	53		2.0	0.20	mg/L		03/12/24 10:00	03/12/24 14:43	1
Magnesium	14		1.0	0.13	mg/L		03/12/24 10:00	03/12/24 14:43	1
Potassium	5.2		0.50	0.29	mg/L		03/12/24 10:00	03/13/24 15:53	1
Sodium	14		0.50	0.20	mg/L		03/12/24 10:00	03/12/24 14:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	75	B	20	5.0	mg/L			03/11/24 11:44	1
Phosphorus, Total (SM 4500 P E)	0.072		0.060	0.030	mg/L			03/20/24 14:46	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/06/24 11:55	1

Client Sample ID: LA-MW10-N-03052024

Lab Sample ID: 590-23558-5

Date Collected: 03/05/24 16:00

Matrix: Water

Date Received: 03/06/24 11:50

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	18		0.80	0.42	mg/L			03/06/24 16:00	1
Nitrate as N	8.6		0.20	0.057	mg/L			03/06/24 16:00	1
Sulfate	8.4		0.50	0.13	mg/L			03/06/24 16:00	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	22		2.0	0.20	mg/L		03/12/24 10:00	03/12/24 14:47	1
Magnesium	6.3		1.0	0.13	mg/L		03/12/24 10:00	03/12/24 14:47	1
Potassium	2.1		0.50	0.29	mg/L		03/12/24 10:00	03/13/24 15:57	1
Sodium	14		0.50	0.20	mg/L		03/12/24 10:00	03/12/24 14:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	55	B	20	5.0	mg/L			03/11/24 11:44	1
Phosphorus, Total (SM 4500 P E)	0.050	J	0.060	0.030	mg/L			03/20/24 14:46	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/06/24 11:55	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46138/1003
Matrix: Water
Analysis Batch: 46138

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/06/24 09:58	1

Lab Sample ID: LCS 590-46138/1004
Matrix: Water
Analysis Batch: 46138

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.30		mg/L		106	90 - 110

Lab Sample ID: MB 590-46139/1003
Matrix: Water
Analysis Batch: 46139

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/06/24 09:58	1
Sulfate	ND		0.50	0.13	mg/L			03/06/24 09:58	1

Lab Sample ID: LCS 590-46139/1004
Matrix: Water
Analysis Batch: 46139

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.4		mg/L		107	90 - 110
Sulfate	12.5	13.2		mg/L		106	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46231/2-A
Matrix: Water
Analysis Batch: 46247

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/12/24 10:00	03/12/24 14:35	1
Magnesium	ND		1.0	0.13	mg/L		03/12/24 10:00	03/12/24 14:35	1
Sodium	ND		0.50	0.20	mg/L		03/12/24 10:00	03/12/24 14:35	1

Lab Sample ID: MB 590-46231/2-A
Matrix: Water
Analysis Batch: 46274

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/12/24 10:00	03/13/24 15:49	1

Lab Sample ID: LCS 590-46231/1-A
Matrix: Water
Analysis Batch: 46247

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	52.9		mg/L		106	80 - 120
Magnesium	50.0	53.6		mg/L		107	80 - 120

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: LCS 590-46231/1-A
Matrix: Water
Analysis Batch: 46247

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Sodium			50.0	52.3		mg/L		105	80 - 154		

Lab Sample ID: LCS 590-46231/1-A
Matrix: Water
Analysis Batch: 46274

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Potassium			50.0	53.2		mg/L		106	80 - 135		

Lab Sample ID: 590-23558-5 MS
Matrix: Water
Analysis Batch: 46247

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Calcium	22		50.0	75.2		mg/L		107	75 - 125		
Magnesium	6.3		50.0	60.5		mg/L		108	75 - 125		
Sodium	14		50.0	67.5		mg/L		106	75 - 125		

Lab Sample ID: 590-23558-5 MS
Matrix: Water
Analysis Batch: 46274

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits		
Potassium	2.1		50.0	56.0		mg/L		108	75 - 125		

Lab Sample ID: 590-23558-5 MSD
Matrix: Water
Analysis Batch: 46247

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Calcium	22		50.0	76.6		mg/L		110	75 - 125	2	20
Magnesium	6.3		50.0	61.5		mg/L		110	75 - 125	2	20
Sodium	14		50.0	68.8		mg/L		109	75 - 125	2	20

Lab Sample ID: 590-23558-5 MSD
Matrix: Water
Analysis Batch: 46274

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Potassium	2.1		50.0	57.6		mg/L		111	75 - 125	3	20

Lab Sample ID: 590-23558-5 DU
Matrix: Water
Analysis Batch: 46247

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Calcium	22		21.9		mg/L		1	20
Magnesium	6.3		6.37		mg/L		0.9	20
Sodium	14		14.8		mg/L		2	20

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: 590-23558-5 DU
Matrix: Water
Analysis Batch: 46274

Client Sample ID: LA-MW10-N-03052024
Prep Type: Total Recoverable
Prep Batch: 46231

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Potassium	2.1		2.12		mg/L		3	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46213/1
Matrix: Water
Analysis Batch: 46213

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/11/24 11:44	1

Lab Sample ID: LCS 590-46213/2
Matrix: Water
Analysis Batch: 46213

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	500		mg/L		100	90 - 110

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46378/8
Matrix: Water
Analysis Batch: 46378

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/20/24 14:46	1

Lab Sample ID: LCS 590-46378/7
Matrix: Water
Analysis Batch: 46378

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Phosphorus, Total	0.500	0.485		mg/L		97	90 - 110

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46148/2
Matrix: Water
Analysis Batch: 46148

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/06/24 11:55	1

Lab Sample ID: USB 590-46148/1
Matrix: Water
Analysis Batch: 46148

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/06/24 11:55	1

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-2

Method: SM5210B - BOD, 5 Day (Continued)

Lab Sample ID: LCS 590-46148/3
Matrix: Water
Analysis Batch: 46148

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	205		mg/L		103	85 - 115

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-2

Client Sample ID: LA-MW8-N-03052024

Lab Sample ID: 590-23558-2

Date Collected: 03/05/24 14:30

Matrix: Water

Date Received: 03/06/24 11:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46138	03/06/24 15:50	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46139	03/06/24 15:50	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46231	03/12/24 10:00	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46247	03/12/24 14:43	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46231	03/12/24 10:00	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46274	03/13/24 15:53	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46213	03/11/24 11:44	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46378	03/20/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46148	03/06/24 11:55	JSP	EET SPK

Client Sample ID: LA-MW10-N-03052024

Lab Sample ID: 590-23558-5

Date Collected: 03/05/24 16:00

Matrix: Water

Date Received: 03/06/24 11:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46138	03/06/24 16:00	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46139	03/06/24 16:00	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46231	03/12/24 10:00	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46247	03/12/24 14:47	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46231	03/12/24 10:00	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46274	03/13/24 15:57	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46213	03/11/24 11:44	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46378	03/20/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46148	03/06/24 11:55	JSP	EET SPK

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23558-2
Project/Site: Spokane International Airport

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: Spokane International Airport

Job ID: 590-23558-2

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509 924.9290

Chain of Custody Record

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Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723 5261 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only
(xxx) xxx-xxxx: FAX	TAT if different from Below _____			Walk-in Client:
Project Name: Spokane International Airport	☐ 2 weeks			Lab Sampling:
Site: SIA	☐ 1 week			Job / SDG No.
PO # 0209800-000	☐ 2 days ☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (16633)	Chloride, Nitrate, Sulfate (300.0)	Nitrate (353.2)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500P)	Alkalinity (SM 2320B)	BOD (405.1)	Sample Specific Notes.
WL-EB-03052024	3/5/24	8:05	G	H2O	2			X							
LA-MW8-N-03052024		14:30			6			X	X	X	X	X	X	X	
FB-03052024		14:45			2			X							
T-EB-03052024		14:55			2			X							
LA-MW10-N-03052024		16:00			6			X	X	X	X	X	X	X	

590-23558 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
EPA 16663 5-DAY TAT WDM 3/6/2024
REMAINING SAMPLES STANDARD TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd. 5.0 Corr'd. 5.1	Therm ID No. IR0006
Relinquished by:	Company: H&A	Date/Time: 3/5/24 (7:00)	Received by: (WDM) Company: H&A Date/Time: 3/5/2024 1700
Relinquished by: (WDM)	Company: H&A	Date/Time: 3/6/2024 1149	Received by: Company: EETNW Date/Time: 3/6/24 1150
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Company: Date/Time:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23558-2

Login Number: 23558
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23558 Field Sheet

Job _____

Tracking # 7101960002436

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID: L016 Corr. Factor (+ / -) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261237

Cooler ID _____

Temp Observed: 2.4 °C Corrected 2.4 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/07/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/07/24

Notes: _____

Trizma Lot #(s) _____

Ammonium Acetate Lot #(s). _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/07/24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/15/2024 1:51:10 PM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23589-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

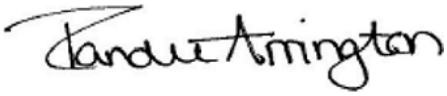
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23589-1 Eurofins Spokane

Job Narrative
590-23589-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/7/2024 10:10 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.4°C.

PFAS
Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-745917.

Method 1633: The concentration of analytes associated with the following samples exceeded the instrument calibration range: EA-MW14B-N-03062024 (590-23589-1), EA-MW14A-N-03062024 (590-23589-2) and (590-23589-B-1-A DU). These analytes have been qualified; however, the peaks did not saturate the instrument detector. The samples were diluted within calibration range, and both sets of data were reported.

Method 1633: Isotope Dilution Analyte (IDA) recovery is above the method recommended limit for the following samples: EA-MW14A-N-03062024 (590-23589-2). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries. These samples were re-analyzed at dilution with IDA recoveries within control limits. Both sets of data are reported.

Method 1633: Results for samples EA-MW14B-N-03062024 (590-23589-1), EA-MW14A-N-03062024 (590-23589-2) and (590-23589-B-1-A DU) were reported from the analysis of a diluted extract due to high concentration of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits

Method 1633: The continuing calibration verification (CCV) associated with batch 320-746488 recovered above the upper control limit for the isotope dilution analyte, d5-NEtFOSAA. The samples associated with this CCV were analyzed previously with CCVs within control limits. Both sets of data are reported. The associated samples are impacted: EA-MW14A-N-03062024 (590-23589-2) and (CCV 320-746488/31).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23589-1	EA-MW14B-N-03062024	Water	03/06/24 13:21	03/07/24 10:10
590-23589-2	EA-MW14A-N-03062024	Water	03/06/24 15:06	03/07/24 10:10
590-23589-3	SWN-MW7-FD-03062024	Water	03/06/24 16:58	03/07/24 10:10
590-23589-4	SWN-MW7-N-03062024	Water	03/06/24 16:28	03/07/24 10:10
590-23589-5	WL-EB-03062024	Water	03/06/24 16:50	03/07/24 10:10

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

LCMS

Qualifier	Qualifier Description
*3	ISTD response or retention time outside acceptable limits.
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
E	Result exceeded calibration range.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: EA-MW14B-N-03062024
Lab Sample ID: 590-23589-1

Date Collected: 03/06/24 13:21
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**15**		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluoropentanoic acid (PFPeA)	**19**		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorohexanoic acid (PFHxA)	**98**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluoroheptanoic acid (PFHpA)	**5.7**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorooctanoic acid (PFOA)	**22**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorononanoic acid (PFNA)	**1.0**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorobutanesulfonic acid (PFBS)	**28**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluoropentanesulfonic acid (PFPeS)	**20**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorohexanesulfonic acid (PFHxS)	**570**	**E**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluoroheptanesulfonic acid (PFHpS)	**5.6**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorooctanesulfonic acid (PFOS)	**530**	**E**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
4:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
6:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
8:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
NMeFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
NEtFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
NMeFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
NEtFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 15:27	1
NMeFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 15:27	1
NEtFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 15:27	1
HFPO-DA (GenX)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
PFMPA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 15:27	1
PFMBA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 15:27	1
NFDHA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 15:27	1
9Cl-PF3ONS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
11Cl-PF3OUdS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 15:27	1
PFEESA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 15:27	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/11/24 03:58	03/11/24 15:27	1
5:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 15:27	1
7:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 15:27	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*78.4*		*5 - 130*	*03/11/24 03:58*	*03/11/24 15:27*	*1*
13C5 PFPeA	*75.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 15:27*	*1*
13C5 PFHxA	*75.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 15:27*	*1*

Client Sample ID: EA-MW14B-N-03062024
Lab Sample ID: 590-23589-1
Date Collected: 03/06/24 13:21
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	77.5		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C8 PFOA	72.5		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C9 PFNA	79.3		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C6 PFDA	76.2		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C7 PFUnA	70.4		30 - 130	03/11/24 03:58	03/11/24 15:27	1
13C2 PFDoA	56.8		10 - 130	03/11/24 03:58	03/11/24 15:27	1
13C2 PFTeDA	55.5		10 - 130	03/11/24 03:58	03/11/24 15:27	1
13C3 PFBS	96.4		40 - 135	03/11/24 03:58	03/11/24 15:27	1
13C3 PFHxS	76.5		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C8 PFOS	73.7		40 - 130	03/11/24 03:58	03/11/24 15:27	1
13C8 PFOSA	94.8		40 - 130	03/11/24 03:58	03/11/24 15:27	1
d3-NMeFOSAA	95.7		40 - 170	03/11/24 03:58	03/11/24 15:27	1
d5-NEtFOSAA	85.3		25 - 135	03/11/24 03:58	03/11/24 15:27	1
13C2 4:2 FTS	115		40 - 200	03/11/24 03:58	03/11/24 15:27	1
13C2 6:2 FTS	96.7		40 - 200	03/11/24 03:58	03/11/24 15:27	1
13C2 8:2 FTS	90.4		40 - 300	03/11/24 03:58	03/11/24 15:27	1
13C3 HFPO-DA	73.6		40 - 130	03/11/24 03:58	03/11/24 15:27	1
d7-N-MeFOSE-M	73.1		10 - 130	03/11/24 03:58	03/11/24 15:27	1
d9-N-EtFOSE-M	69.5		10 - 130	03/11/24 03:58	03/11/24 15:27	1
d5-NEtPFOSA	72.4		10 - 130	03/11/24 03:58	03/11/24 15:27	1
d3-NMePFOSA	76.2		10 - 130	03/11/24 03:58	03/11/24 15:27	1

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**520**		9.3	2.3	ng/L		03/11/24 03:58	03/12/24 23:46	5
Perfluorooctanesulfonic acid (PFOS)	**420**		9.3	2.3	ng/L		03/11/24 03:58	03/12/24 23:46	5

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	76.3	*3	40 - 130	03/11/24 03:58	03/12/24 23:46	5
13C8 PFOS	85.7	*3	40 - 130	03/11/24 03:58	03/12/24 23:46	5

Client Sample ID: EA-MW14A-N-03062024
Lab Sample ID: 590-23589-2
Date Collected: 03/06/24 15:06
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**26**		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluoropentanoic acid (PFPeA)	**42**		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorohexanoic acid (PFHxA)	**200**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluoroheptanoic acid (PFHpA)	**28**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorooctanoic acid (PFOA)	**150**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorononanoic acid (PFNA)	**0.86**	J	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorobutanesulfonic acid (PFBS)	**190**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1

Client Sample ID: EA-MW14A-N-03062024
Lab Sample ID: 590-23589-2

Date Collected: 03/06/24 15:06
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoropentanesulfonic acid (PFPeS)	**260**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorohexanesulfonic acid (PFHxS)	**970**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluoroheptanesulfonic acid (PFHpS)	**92**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorooctanesulfonic acid (PFOS)	**3000**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 16:02	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 16:02	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 16:02	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
PFMPA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 16:02	1
PFMBA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 16:02	1
NFDHA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 16:02	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 16:02	1
PFEESA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 16:02	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/11/24 03:58	03/11/24 16:02	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 16:02	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 16:02	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*81.8*		*5 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C5 PFPeA	*82.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C5 PFHxA	*80.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C4 PFHpA	*91.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C8 PFOA	*80.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C9 PFNA	*78.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C6 PFDA	*82.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C7 PFUnA	*108*		*30 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C2 PFDoA	*93.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C2 PFTeDA	*85.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C3 PFBS	*109*		*40 - 135*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C3 PFHxS	*80.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C8 PFOS	*78.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C8 PFOSA	*143*	**5+*	*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d3-NMeFOSAA	*132*		*40 - 170*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d5-NEtFOSAA	*138*	**5+*	*25 - 135*	*03/11/24 03:58*	*03/11/24 16:02*	*1*

Client Sample ID: EA-MW14A-N-03062024
Lab Sample ID: 590-23589-2
Date Collected: 03/06/24 15:06
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C2 4:2 FTS	*112*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C2 6:2 FTS	*106*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C2 8:2 FTS	*101*		*40 - 300*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
13C3 HFPO-DA	*87.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d7-N-MeFOSE-M	*115*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d9-N-EtFOSE-M	*112*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d5-NEtPFOSA	*100*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*
d3-NMePFOSA	*109*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:02*	*1*

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**930**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:19	10
Perfluorooctanesulfonic acid (PFOS)	**2700**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:19	10
Perfluorooctanesulfonamide (FOSA)	ND		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:19	10
NEtFOSAA	ND		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:19	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*74.0*	**3*	*40 - 130*	*03/11/24 03:58*	*03/13/24 00:19*	*10*
13C8 PFOS	*77.3*	**3*	*40 - 130*	*03/11/24 03:58*	*03/13/24 00:19*	*10*
13C8 PFOSA	*80.7*	**3*	*40 - 130*	*03/11/24 03:58*	*03/13/24 00:19*	*10*
d5-NEtFOSAA	*97.5*	**3*	*25 - 135*	*03/11/24 03:58*	*03/13/24 00:19*	*10*

Client Sample ID: SWN-MW7-FD-03062024
Lab Sample ID: 590-23589-3
Date Collected: 03/06/24 16:58
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**14**		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluoropentanoic acid (PFPeA)	**35**		3.7	0.92	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorohexanoic acid (PFHxA)	**27**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluoroheptanoic acid (PFHpA)	**13**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorooctanoic acid (PFOA)	**39**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorononanoic acid (PFNA)	**5.0**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorodecanoic acid (PFDA)	**7.4**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluoroundecanoic acid (PFUnA)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorododecanoic acid (PFDoA)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorobutanesulfonic acid (PFBS)	**4.8**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluoropentanesulfonic acid (PFPeS)	**3.8**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorohexanesulfonic acid (PFHxS)	**39**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorooctanesulfonic acid (PFOS)	**32**		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorononanesulfonic acid (PFNS)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW7-FD-03062024
Lab Sample ID: 590-23589-3
Date Collected: 03/06/24 16:58
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanesulfonic acid (PFDoS)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
4:2 FTS	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
6:2 FTS	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
8:2 FTS	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
Perfluorooctanesulfonamide (FOSA)	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
NMeFOSA	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
NEtFOSA	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
NMeFOSAA	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
NEtFOSAA	ND		1.8	0.46	ng/L		03/11/24 03:58	03/11/24 16:20	1
NMeFOSE	ND		18	4.6	ng/L		03/11/24 03:58	03/11/24 16:20	1
NEtFOSE	ND		18	4.6	ng/L		03/11/24 03:58	03/11/24 16:20	1
HFPO-DA (GenX)	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
PFMPA	ND		3.7	0.92	ng/L		03/11/24 03:58	03/11/24 16:20	1
PFMBA	ND		3.7	0.92	ng/L		03/11/24 03:58	03/11/24 16:20	1
NFDHA	ND		3.7	0.92	ng/L		03/11/24 03:58	03/11/24 16:20	1
9Cl-PF3ONS	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
11Cl-PF3OUdS	ND		7.4	1.8	ng/L		03/11/24 03:58	03/11/24 16:20	1
PFEESA	ND		3.7	0.92	ng/L		03/11/24 03:58	03/11/24 16:20	1
3:3 FTCA	ND		9.2	2.3	ng/L		03/11/24 03:58	03/11/24 16:20	1
5:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 16:20	1
7:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 16:20	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*80.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C5 PFPeA	*80.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C5 PFHxA	*80.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C4 PFHpA	*84.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C8 PFOA	*75.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C9 PFNA	*79.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C6 PFDA	*71.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C7 PFUnA	*73.6*		*30 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C2 PFDoA	*57.3*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C2 PFTeDA	*57.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C3 PFBS	*85.4*		*40 - 135*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C3 PFHxS	*77.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C8 PFOS	*77.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C8 PFOSA	*74.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d3-NMeFOSAA	*76.8*		*40 - 170*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d5-NEtFOSAA	*69.8*		*25 - 135*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C2 4:2 FTS	*107*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C2 6:2 FTS	*87.8*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C2 8:2 FTS	*73.5*		*40 - 300*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
13C3 HFPO-DA	*78.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d7-N-MeFOSE-M	*62.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d9-N-EtFOSE-M	*59.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d5-NEtPFOSA	*60.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*
d3-NMePFOSA	*63.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:20*	*1*

Client Sample ID: SWN-MW7-N-03062024
Lab Sample ID: 590-23589-4

Date Collected: 03/06/24 16:28
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**14**		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluoropentanoic acid (PFPeA)	**34**		3.8	0.96	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorohexanoic acid (PFHxA)	**27**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluoroheptanoic acid (PFHpA)	**13**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorooctanoic acid (PFOA)	**39**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorononanoic acid (PFNA)	**5.7**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorodecanoic acid (PFDA)	**7.0**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorobutanesulfonic acid (PFBS)	**4.8**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluoropentanesulfonic acid (PFPeS)	**4.0**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorohexanesulfonic acid (PFHxS)	**40**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorooctanesulfonic acid (PFOS)	**31**		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
4:2 FTS	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
6:2 FTS	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
8:2 FTS	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
Perfluorooctanesulfonamide (FOSA)	**0.53**	**J**	1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
NMeFOSA	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
NEtFOSA	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
NMeFOSAA	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
NEtFOSAA	ND		1.9	0.48	ng/L		03/11/24 03:58	03/11/24 16:37	1
NMeFOSE	ND		19	4.8	ng/L		03/11/24 03:58	03/11/24 16:37	1
NEtFOSE	ND		19	4.8	ng/L		03/11/24 03:58	03/11/24 16:37	1
HFPO-DA (GenX)	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
PFMPA	ND		3.8	0.96	ng/L		03/11/24 03:58	03/11/24 16:37	1
PFMBA	ND		3.8	0.96	ng/L		03/11/24 03:58	03/11/24 16:37	1
NFDHA	ND		3.8	0.96	ng/L		03/11/24 03:58	03/11/24 16:37	1
9Cl-PF3ONS	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
11Cl-PF3OUdS	ND		7.7	1.9	ng/L		03/11/24 03:58	03/11/24 16:37	1
PFEESA	ND		3.8	0.96	ng/L		03/11/24 03:58	03/11/24 16:37	1
3:3 FTCA	ND		9.6	2.4	ng/L		03/11/24 03:58	03/11/24 16:37	1
5:3 FTCA	ND		48	12	ng/L		03/11/24 03:58	03/11/24 16:37	1
7:3 FTCA	ND		48	12	ng/L		03/11/24 03:58	03/11/24 16:37	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*78.2*		*5 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C5 PFPeA	*77.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*

Client Sample ID: SWN-MW7-N-03062024
Lab Sample ID: 590-23589-4

Date Collected: 03/06/24 16:28
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C5 PFHxA	*80.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C4 PFHpA	*81.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C8 PFOA	*72.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C9 PFNA	*74.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C6 PFDA	*70.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C7 PFUnA	*61.0*		*30 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C2 PFDoA	*51.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C2 PFTeDA	*49.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C3 PFBS	*81.9*		*40 - 135*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C3 PFHxS	*73.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C8 PFOS	*73.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C8 PFOSA	*67.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d3-NMeFOSAA	*67.6*		*40 - 170*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d5-NEtFOSAA	*64.4*		*25 - 135*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C2 4:2 FTS	*98.3*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C2 6:2 FTS	*84.1*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C2 8:2 FTS	*72.1*		*40 - 300*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
13C3 HFPO-DA	*78.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d7-N-MeFOSE-M	*53.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d9-N-EtFOSE-M	*51.3*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d5-NEtPFOSA	*52.9*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*
d3-NMePFOSA	*53.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:37*	*1*

Client Sample ID: WL-EB-03062024
Lab Sample ID: 590-23589-5

Date Collected: 03/06/24 16:50
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluoropentanoic acid (PFPeA)	ND		4.1	1.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: WL-EB-03062024
Lab Sample ID: 590-23589-5
Date Collected: 03/06/24 16:50
Matrix: Water
Date Received: 03/07/24 10:10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4:2 FTS	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
6:2 FTS	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
8:2 FTS	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
NMeFOSA	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
NEtFOSA	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
NMeFOSAA	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
NEtFOSAA	ND		2.0	0.51	ng/L		03/11/24 03:58	03/11/24 16:55	1
NMeFOSE	ND		20	5.1	ng/L		03/11/24 03:58	03/11/24 16:55	1
NEtFOSE	ND		20	5.1	ng/L		03/11/24 03:58	03/11/24 16:55	1
HFPO-DA (GenX)	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
PFMPA	ND		4.1	1.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
PFMBA	ND		4.1	1.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
NFDHA	ND		4.1	1.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
9Cl-PF3ONS	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
11Cl-PF3OUdS	ND		8.2	2.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
PFEESA	ND		4.1	1.0	ng/L		03/11/24 03:58	03/11/24 16:55	1
3:3 FTCA	ND		10	2.6	ng/L		03/11/24 03:58	03/11/24 16:55	1
5:3 FTCA	ND		51	13	ng/L		03/11/24 03:58	03/11/24 16:55	1
7:3 FTCA	ND		51	13	ng/L		03/11/24 03:58	03/11/24 16:55	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.1*		*5 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C5 PFPeA	*77.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C5 PFHxA	*79.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C4 PFHpA	*78.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C8 PFOA	*78.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C9 PFNA	*81.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C6 PFDA	*81.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C7 PFUnA	*81.5*		*30 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C2 PFDoA	*72.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C2 PFTeDA	*60.3*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C3 PFBS	*82.2*		*40 - 135*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C3 PFHxS	*77.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C8 PFOS	*75.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C8 PFOSA	*67.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d3-NMeFOSAA	*74.9*		*40 - 170*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d5-NEtFOSAA	*68.6*		*25 - 135*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C2 4:2 FTS	*81.8*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C2 6:2 FTS	*82.0*		*40 - 200*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C2 8:2 FTS	*77.6*		*40 - 300*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
13C3 HFPO-DA	*81.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d7-N-MeFOSE-M	*57.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d9-N-EtFOSE-M	*56.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d5-NEtPFOSA	*58.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*
d3-NMePFOSA	*59.9*		*10 - 130*	*03/11/24 03:58*	*03/11/24 16:55*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
4:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
6:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
8:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMPA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMBA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NFDHA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFEESA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
3:3 FTCA	ND		10	2.5	ng/L		03/11/24 03:58	03/11/24 14:34	1
5:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1
7:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*72.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFPeA	*73.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFHxA	*73.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	73.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C9 PFNA	70.3		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C6 PFDA	68.2		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C7 PFUnA	73.3		30 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFDoA	64.6		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFTeDA	61.2		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C3 PFBS	74.9		40 - 135	03/11/24 03:58	03/11/24 14:34	1
13C3 PFHxS	72.1		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOS	79.4		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOSA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMeFOSAA	76.8		40 - 170	03/11/24 03:58	03/11/24 14:34	1
d5-NEtFOSAA	70.2		25 - 135	03/11/24 03:58	03/11/24 14:34	1
13C2 4:2 FTS	70.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 6:2 FTS	68.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 8:2 FTS	68.9		40 - 300	03/11/24 03:58	03/11/24 14:34	1
13C3 HFPO-DA	77.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d7-N-MeFOSE-M	68.5		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d9-N-EtFOSE-M	65.4		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d5-NEtPFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMePFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	127		ng/L		99	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	57.3		ng/L		89	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	27.8		ng/L		87	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	28.0		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	28.6		ng/L		89	70 - 150
Perfluorononanoic acid (PFNA)	32.0	31.4		ng/L		98	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	30.0		ng/L		94	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	32.4		ng/L		101	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	35.2		ng/L		110	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	33.8		ng/L		106	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	32.7		ng/L		102	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	27.1		ng/L		95	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	26.9		ng/L		90	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	28.1		ng/L		96	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	28.5		ng/L		93	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	28.8		ng/L		97	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	25.2		ng/L		82	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.3		ng/L		72	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	22.8		ng/L		74	50 - 145
4:2 FTS	120	107		ng/L		89	70 - 145
6:2 FTS	122	112		ng/L		92	65 - 155
8:2 FTS	123	126		ng/L		103	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	31.3		ng/L		98	70 - 145
NMeFOSA	32.0	27.4		ng/L		86	60 - 150
NEtFOSA	32.0	34.9		ng/L		109	65 - 145
NMeFOSAA	32.0	33.0		ng/L		103	50 - 140
NEtFOSAA	32.0	28.0		ng/L		88	70 - 145
NMeFOSE	320	319		ng/L		100	70 - 145
NEtFOSE	320	330		ng/L		103	70 - 135
HFPO-DA (GenX)	128	139		ng/L		109	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	112		ng/L		92	65 - 145
PFMPA	64.0	60.9		ng/L		95	55 - 140
PFMBA	64.0	51.2		ng/L		80	60 - 150
NFDHA	64.0	66.0		ng/L		103	50 - 150
9Cl-PF3ONS	120	115		ng/L		97	70 - 155
11Cl-PF3OUdS	121	112		ng/L		93	55 - 160
PFEESA	57.1	56.0		ng/L		98	70 - 140
3:3 FTCA	160	148		ng/L		93	65 - 130
5:3 FTCA	799	776		ng/L		97	70 - 135
7:3 FTCA	799	742		ng/L		93	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*76.6*		*5 - 130*
13C5 PFPeA	*73.6*		*40 - 130*
13C5 PFHxA	*73.7*		*40 - 130*
13C4 PFHpA	*75.4*		*40 - 130*
13C8 PFOA	*75.8*		*40 - 130*
13C9 PFNA	*74.4*		*40 - 130*
13C6 PFDA	*73.6*		*40 - 130*
13C7 PFUnA	*67.6*		*30 - 130*
13C2 PFDoA	*64.8*		*10 - 130*
13C2 PFTeDA	*56.0*		*10 - 130*
13C3 PFBS	*77.6*		*40 - 135*
13C3 PFHxS	*74.4*		*40 - 130*
13C8 PFOS	*72.5*		*40 - 130*
13C8 PFOSA	*70.4*		*40 - 130*
d3-NMeFOSAA	*72.8*		*40 - 170*
d5-NEtFOSAA	*67.9*		*25 - 135*
13C2 4:2 FTS	*70.4*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*71.4*		*40 - 200*
13C2 8:2 FTS	*67.9*		*40 - 300*
13C3 HFPO-DA	*76.7*		*40 - 130*
d7-N-MeFOSE-M	*60.6*		*10 - 130*
d9-N-EtFOSE-M	*58.7*		*10 - 130*
d5-NEtPFOSA	*57.6*		*10 - 130*
d3-NMePFOSA	*61.5*		*10 - 130*

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	12.9		ng/L		101	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	5.79		ng/L		90	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.00		ng/L		94	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	2.79		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	2.93		ng/L		92	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.15		ng/L		99	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	2.96		ng/L		93	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.76		ng/L		118	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.46		ng/L		108	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.53		ng/L		110	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.14		ng/L		98	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	2.52		ng/L		89	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.63		ng/L		87	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.02		ng/L		103	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.54		ng/L		83	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	2.73		ng/L		92	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.20		ng/L		71	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.15		ng/L		70	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.22		ng/L		71	50 - 145
4:2 FTS	12.0	10.7		ng/L		89	70 - 145
6:2 FTS	12.2	11.6		ng/L		95	65 - 155
8:2 FTS	12.3	13.2		ng/L		107	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.25		ng/L		102	70 - 145
NMeFOSA	3.20	2.99		ng/L		94	60 - 150
NEtFOSA	3.20	3.29		ng/L		103	65 - 145
NMeFOSAA	3.20	3.13		ng/L		98	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
NEtFOSAA	3.20	2.66		ng/L		83	70 - 145
NMeFOSE	32.0	31.8		ng/L		99	70 - 145
NEtFOSE	32.0	32.4		ng/L		101	70 - 135
HFPO-DA (GenX)	12.8	13.3		ng/L		104	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	12.1	11.1		ng/L		92	65 - 145
PFMPA	6.40	6.18		ng/L		97	55 - 140
PFMBA	6.40	4.75		ng/L		74	60 - 150
NFDHA	6.40	6.67		ng/L		104	50 - 150
9Cl-PF3ONS	12.0	11.1		ng/L		93	70 - 155
11Cl-PF3OUdS	12.1	11.0		ng/L		91	55 - 160
PFEESA	5.71	5.77		ng/L		101	70 - 140
3:3 FTCA	16.0	14.6		ng/L		91	65 - 130
5:3 FTCA	79.9	77.6		ng/L		97	70 - 135
7:3 FTCA	79.9	73.8		ng/L		92	50 - 145

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*71.6*		*5 - 130*
13C5 PFPeA	*68.2*		*40 - 130*
13C5 PFHxA	*66.5*		*40 - 130*
13C4 PFHpA	*70.3*		*40 - 130*
13C8 PFOA	*70.9*		*40 - 130*
13C9 PFNA	*66.4*		*40 - 130*
13C6 PFDA	*74.3*		*40 - 130*
13C7 PFUnA	*75.0*		*30 - 130*
13C2 PFDoA	*62.1*		*10 - 130*
13C2 PFTeDA	*57.3*		*10 - 130*
13C3 PFBS	*71.3*		*40 - 135*
13C3 PFHxS	*69.3*		*40 - 130*
13C8 PFOS	*68.8*		*40 - 130*
13C8 PFOSA	*61.2*		*40 - 130*
d3-NMeFOSAA	*68.4*		*40 - 170*
d5-NEtFOSAA	*60.9*		*25 - 135*
13C2 4:2 FTS	*66.5*		*40 - 200*
13C2 6:2 FTS	*68.5*		*40 - 200*
13C2 8:2 FTS	*66.9*		*40 - 300*
13C3 HFPO-DA	*70.1*		*40 - 130*
d7-N-MeFOSE-M	*53.7*		*10 - 130*
d9-N-EtFOSE-M	*52.2*		*10 - 130*
d5-NEtPFOSA	*50.4*		*10 - 130*
d3-NMePFOSA	*50.0*		*10 - 130*

Lab Sample ID: 590-23589-1 DU
Matrix: Water
Analysis Batch: 746051

Client Sample ID: EA-MW14B-N-03062024
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	15		14.8		ng/L		4	30
Perfluoropentanoic acid (PFPeA)	19		17.6		ng/L		5	30

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 590-23589-1 DU
Client Sample ID: EA-MW14B-N-03062024
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 746051
Prep Batch: 745917

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluorohexanoic acid (PFHxA)	98			90.7		ng/L				8	30
Perfluoroheptanoic acid (PFHpA)	5.7			5.15		ng/L				10	30
Perfluorooctanoic acid (PFOA)	22			20.5		ng/L				5	30
Perfluorononanoic acid (PFNA)	1.0	J		1.19	J	ng/L				17	30
Perfluorodecanoic acid (PFDA)	ND			ND		ng/L				NC	30
Perfluoroundecanoic acid (PFUnA)	ND			ND		ng/L				NC	30
Perfluorododecanoic acid (PFDoA)	ND			ND		ng/L				NC	30
Perfluorotridecanoic acid (PFTrDA)	ND			ND		ng/L				NC	30
Perfluorotetradecanoic acid (PFTeA)	ND			ND		ng/L				NC	30
Perfluorobutanesulfonic acid (PFBS)	28			26.6		ng/L				5	30
Perfluoropentanesulfonic acid (PFPeS)	20			19.3		ng/L				5	30
Perfluorohexanesulfonic acid (PFHxS)	570	E		531	E	ng/L				7	30
Perfluoroheptanesulfonic acid (PFHpS)	5.6			5.28		ng/L				6	30
Perfluorooctanesulfonic acid (PFOS)	530	E		525	E	ng/L				1	30
Perfluorononanesulfonic acid (PFNS)	ND			ND		ng/L				NC	30
Perfluorodecanesulfonic acid (PFDS)	ND			ND		ng/L				NC	30
Perfluorododecanesulfonic acid (PFDoS)	ND			ND		ng/L				NC	30
4:2 FTS	ND			ND		ng/L				NC	30
6:2 FTS	ND			ND		ng/L				NC	30
8:2 FTS	ND			ND		ng/L				NC	30
Perfluorooctanesulfonamide (FOSA)	ND			ND		ng/L				NC	30
NMeFOSA	ND			ND		ng/L				NC	30
NEtFOSA	ND			ND		ng/L				NC	30
NMeFOSAA	ND			ND		ng/L				NC	30
NEtFOSAA	ND			ND		ng/L				NC	30
NMeFOSE	ND			ND		ng/L				NC	30
NEtFOSE	ND			ND		ng/L				NC	30
HFPO-DA (GenX)	ND			ND		ng/L				NC	30
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND			ND		ng/L				NC	30
PFMPA	ND			ND		ng/L				NC	30
PFMBA	ND			ND		ng/L				NC	30
NFDHA	ND			ND		ng/L				NC	30
9Cl-PF3ONS	ND			ND		ng/L				NC	30
11Cl-PF3OUdS	ND			ND		ng/L				NC	30
PFEESA	ND			ND		ng/L				NC	30
3:3 FTCA	ND			ND		ng/L				NC	30
5:3 FTCA	ND			ND		ng/L				NC	30
7:3 FTCA	ND			ND		ng/L				NC	30

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	DU %Recovery	DU Qualifier	Limits
13C4 PFBA	80.4		5 - 130
13C5 PFPeA	79.6		40 - 130
13C5 PFHxA	80.5		40 - 130
13C4 PFHpA	80.5		40 - 130
13C8 PFOA	77.4		40 - 130
13C9 PFNA	75.4		40 - 130
13C6 PFDA	80.7		40 - 130
13C7 PFUnA	76.5		30 - 130
13C2 PFDoA	68.4		10 - 130
13C2 PFTeDA	64.1		10 - 130
13C3 PFBS	96.8		40 - 135
13C3 PFHxS	75.9		40 - 130
13C8 PFOS	76.2		40 - 130
13C8 PFOSA	94.6		40 - 130
d3-NMeFOSAA	95.8		40 - 170
d5-NEtFOSAA	92.7		25 - 135
13C2 4:2 FTS	115		40 - 200
13C2 6:2 FTS	97.6		40 - 200
13C2 8:2 FTS	88.9		40 - 300
13C3 HFPO-DA	76.6		40 - 130
d7-N-MeFOSE-M	79.3		10 - 130
d9-N-EtFOSE-M	78.3		10 - 130
d5-NEtPFOSA	76.5		10 - 130
d3-NMePFOSA	77.4		10 - 130

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Lab Sample ID: 590-23589-1 DU **Client Sample ID: EA-MW14B-N-03062024**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 746488 **Prep Batch: 745917**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluorohexanesulfonic acid (PFHxS) - DL	520			512		ng/L				2	30
Perfluorooctanesulfonic acid (PFOS) - DL	420			423		ng/L				0.2	30

Isotope Dilution	DU %Recovery	DU Qualifier	Limits
13C3 PFHxS - DL	75.5	*3	40 - 130
13C8 PFOS - DL	77.0	*3	40 - 130

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW14B-N-03062024
Lab Sample ID: 590-23589-1
Date Collected: 03/06/24 13:21
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633	DL		539 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633	DL	5			746488	03/12/24 23:46	RS1	EET SAC
Total/NA	Prep	1633			539 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 15:27	RS1	EET SAC

Client Sample ID: EA-MW14A-N-03062024
Lab Sample ID: 590-23589-2
Date Collected: 03/06/24 15:06
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633	DL		535.1 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633	DL	10			746488	03/13/24 00:19	RS1	EET SAC
Total/NA	Prep	1633			535.1 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 16:02	RS1	EET SAC

Client Sample ID: SWN-MW7-FD-03062024
Lab Sample ID: 590-23589-3
Date Collected: 03/06/24 16:58
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			543.4 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 16:20	RS1	EET SAC

Client Sample ID: SWN-MW7-N-03062024
Lab Sample ID: 590-23589-4
Date Collected: 03/06/24 16:28
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			521.8 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 16:37	RS1	EET SAC

Client Sample ID: WL-EB-03062024
Lab Sample ID: 590-23589-5
Date Collected: 03/06/24 16:50
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			489.9 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 16:55	RS1	EET SAC

Laboratory References:
EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue

Spokane WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Wood McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723526 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx: FAX	TAT if different from Below _____			Walk-in Client:
Project Name: GEG Support	☐ 2 weeks			Lab Sampling
Site: GEG	☐ 1 week			
PO # 0209800-000	☐ 2 days			Job / SDG No.
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO3, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500)	Alkalinity (SM 2320B)	BOD (405.1)	Sample Specific Notes
EA-MW14B-N-03062024	3/6/24	13:21	G	H_2O	6			X	X	X	X	X	X	
EA-MW14A-N-03062024	3/6/24	15:06						X	X	X	X	X	X	Short on Volume 500mL
SWN-MW7-FD-03062024		16:58			2			X						
SWN-MW7-N-03062024		16:28						X	X	X	X	X	X	
WL-EB-03062024		16:50			2			X						

590-23589 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification.
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
EPA 1663 5-day TAT
Remaining Samples Standard TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd. 0.3 Corr'd. 0.9	Therm ID No.: 7R006
Relinquished by:	Company: H&A	Date/Time: 3/6/24 15:40	Received by:	Company: HA	Date/Time: 3/6/24 1541
Relinquished by:	Company: HA	Date/Time: 3/7/24 1010	Received by:	Company: EETNW	Date/Time: 3/7/24 1010
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone: 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8833.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23589-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/27/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F MeOH, G - Amchlor, H - Ascorbic Acid, I Ice, J - DI Water, K - EDTA, L - EDA, M Hexane, N None, O - AsNaO2, P - Na2O4S, Q Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y Trizma, Z other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
EA-MW14B-N-03062024 (590-23589-1)	3/6/24	13.21 Pacific		Water			X	2	
EA-MW14A-N-03062024 (590-23589-2)	3/6/24	15 06 Pacific		Water			X	2	
SWN-MW7-FD-03062024 (590-23589-3)	3/6/24	16:58 Pacific		Water			X	2	
SWN-MW7-N-03062024 (590-23589-4)	3/6/24	16:28 Pacific		Water			X	2	
WL-EB-03062024 (590-23589-5)	3/6/24	16:50 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	3/7/24 15:42	EET SAC		03/08/24 0930	EET SAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No 2261230	Cooler Temperature(s) °C and Other Remarks: 1.3 °C

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23589-1

Login Number: 23589
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23589-1

Login Number: 23589
List Number: 2
Creator: Morazzini, Dominic S

List Source: Eurofins Sacramento
List Creation: 03/08/24 10:45 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261230
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.3
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23589 Field Sheet

Job ____ ____

Tracking # 7107 9600 2528

SO / (PO) / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID: L016 Corr Factor: (+ / -) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261230

Cooler ID _____

Temp Observed 1.3 °C Corrected 1.3 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/08/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/08/24

Notes: _____

Trizma Lot #(s) _____

Ammonium Acetate Lot #(s): _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/08/24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water
Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23589-1	EA-MW14B-N-03062024	78.4	75.6	75.5	77.5	72.5	79.3	76.2	70.4
590-23589-1 - DL	EA-MW14B-N-03062024								
590-23589-1 DU	EA-MW14B-N-03062024	80.4	79.6	80.5	80.5	77.4	75.4	80.7	76.5
590-23589-1 DU - DL	EA-MW14B-N-03062024								
590-23589-2	EA-MW14A-N-03062024	81.8	82.8	80.5	91.5	80.0	78.3	82.9	108
590-23589-2 - DL	EA-MW14A-N-03062024								
590-23589-3	SWN-MW7-FD-03062024	80.7	80.4	80.4	84.1	75.0	79.9	71.3	73.6
590-23589-4	SWN-MW7-N-03062024	78.2	77.8	80.2	81.5	72.8	74.8	70.0	61.0
590-23589-5	WL-EB-03062024	77.1	77.2	79.0	78.3	78.3	81.1	81.3	81.5
LCS 320-745917/3-A	Lab Control Sample	76.6	73.6	73.7	75.4	75.8	74.4	73.6	67.6
LLCS 320-745917/2-A	Lab Control Sample	71.6	68.2	66.5	70.3	70.9	66.4	74.3	75.0
MB 320-745917/1-A	Method Blank	72.7	73.9	73.2	73.7	73.6	70.3	68.2	73.3

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23589-1	EA-MW14B-N-03062024	56.8	55.5	96.4	76.5	73.7	94.8	95.7	85.3
590-23589-1 - DL	EA-MW14B-N-03062024				76.3 *3	85.7 *3			
590-23589-1 DU	EA-MW14B-N-03062024	68.4	64.1	96.8	75.9	76.2	94.6	95.8	92.7
590-23589-1 DU - DL	EA-MW14B-N-03062024				75.5 *3	77.0 *3			
590-23589-2	EA-MW14A-N-03062024	93.0	85.1	109	80.9	78.1	143 *5+	132	138 *5+
590-23589-2 - DL	EA-MW14A-N-03062024				74.0 *3	77.3 *3	80.7 *3		97.5 *3
590-23589-3	SWN-MW7-FD-03062024	57.3	57.0	85.4	77.1	77.3	74.2	76.8	69.8
590-23589-4	SWN-MW7-N-03062024	51.2	49.4	81.9	73.4	73.6	67.3	67.6	64.4
590-23589-5	WL-EB-03062024	72.0	60.3	82.2	77.9	75.9	67.1	74.9	68.6
LCS 320-745917/3-A	Lab Control Sample	64.8	56.0	77.6	74.4	72.5	70.4	72.8	67.9
LLCS 320-745917/2-A	Lab Control Sample	62.1	57.3	71.3	69.3	68.8	61.2	68.4	60.9
MB 320-745917/1-A	Method Blank	64.6	61.2	74.9	72.1	79.4	73.6	76.8	70.2

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23589-1	EA-MW14B-N-03062024	115	96.7	90.4	73.6	73.1	69.5	72.4	76.2
590-23589-1 - DL	EA-MW14B-N-03062024								
590-23589-1 DU	EA-MW14B-N-03062024	115	97.6	88.9	76.6	79.3	78.3	76.5	77.4
590-23589-1 DU - DL	EA-MW14B-N-03062024								
590-23589-2	EA-MW14A-N-03062024	112	106	101	87.6	115	112	100	109
590-23589-2 - DL	EA-MW14A-N-03062024								
590-23589-3	SWN-MW7-FD-03062024	107	87.8	73.5	78.6	62.4	59.7	60.7	63.0
590-23589-4	SWN-MW7-N-03062024	98.3	84.1	72.1	78.7	53.2	51.3	52.9	53.5
590-23589-5	WL-EB-03062024	81.8	82.0	77.6	81.0	57.1	56.0	58.7	59.9
LCS 320-745917/3-A	Lab Control Sample	70.4	71.4	67.9	76.7	60.6	58.7	57.6	61.5
LLCS 320-745917/2-A	Lab Control Sample	66.5	68.5	66.9	70.1	53.7	52.2	50.4	50.0
MB 320-745917/1-A	Method Blank	70.4	68.4	68.9	77.7	68.5	65.4	58.3	58.3

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-1
Project/Site: GEG Groundwater Monitoring/209800-000

C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS
M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/24/2024 8:27:29 AM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23589-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

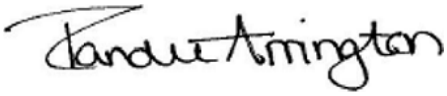
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23589-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/7/2024 10:10 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.4°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46404 recovered above the upper control limit for Potassium. The samples associated with this ICV were either 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46419 recovered above the upper control limit for Calcium. The samples associated with this ICV were either 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method 2320B: The method blank for analytical batch 590-46213 contained Alkalinity as CaCO3 above the method detection limit (MDL). Associated samples were not re-analyzed because the method blank results were less than the reporting limit (RL)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23589-1	EA-MW14B-N-03062024	Water	03/06/24 13:21	03/07/24 10:10
590-23589-2	EA-MW14A-N-03062024	Water	03/06/24 15:06	03/07/24 10:10
590-23589-4	SWN-MW7-N-03062024	Water	03/06/24 16:28	03/07/24 10:10

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

Metals

Qualifier	Qualifier Description
^1+	Initial Calibration Verification (ICV) is outside acceptance limits, high biased.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: EA-MW14B-N-03062024 — Lab Sample ID: 590-23589-1

Date Collected: 03/06/24 13:21 — **Matrix: Water**
Date Received: 03/07/24 10:10

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	110		8.0	4.2	mg/L			03/14/24 17:02	10
Nitrate as N	4.6		0.20	0.057	mg/L			03/07/24 17:16	1
Sulfate	29		0.50	0.13	mg/L			03/07/24 17:16	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	94		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 17:39	1
Magnesium	20		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 17:39	1
Potassium	7.1		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:23	1
Sodium	15		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 17:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	190	B	20	5.0	mg/L			03/11/24 11:45	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/20/24 14:46	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/07/24 13:55	1

Client Sample ID: EA-MW14A-N-03062024 — Lab Sample ID: 590-23589-2

Date Collected: 03/06/24 15:06 — **Matrix: Water**
Date Received: 03/07/24 10:10

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.2		0.80	0.42	mg/L			03/07/24 17:46	1
Nitrate as N	1.2		0.20	0.057	mg/L			03/07/24 17:46	1
Sulfate	19		0.50	0.13	mg/L			03/07/24 17:46	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	24		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:04	1
Magnesium	6.2		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:04	1
Potassium	1.0		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:48	1
Sodium	6.6		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	81	B	25	6.3	mg/L			03/11/24 11:45	1
Phosphorus, Total (SM 4500 P E)	0.042	J	0.060	0.030	mg/L			03/20/24 14:46	1
Biochemical Oxygen Demand (SM5210B)	ND		4.0	2.0	mg/L			03/07/24 13:55	1

Client Sample ID: SWN-MW7-N-03062024 — Lab Sample ID: 590-23589-4

Date Collected: 03/06/24 16:28 — **Matrix: Water**
Date Received: 03/07/24 10:10

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	660		16	8.4	mg/L			03/14/24 17:13	20
Nitrate as N	0.75		0.20	0.057	mg/L			03/07/24 17:56	1
Sulfate	12		0.50	0.13	mg/L			03/07/24 17:56	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW7-N-03062024
Lab Sample ID: 590-23589-4
Date Collected: 03/06/24 16:28
Matrix: Water
Date Received: 03/07/24 10:10

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	240	^1+	4.0	0.40	mg/L		03/21/24 10:52	03/23/24 19:26	2
Magnesium	67		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:08	1
Potassium	14		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:52	1
Sodium	84		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	65	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/20/24 14:46	1
Biochemical Oxygen Demand (SM5210B)	ND		4.0	2.0	mg/L			03/08/24 11:25	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46179/1003
Matrix: Water
Analysis Batch: 46179

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/07/24 15:26	1

Lab Sample ID: LCS 590-46179/1004
Matrix: Water
Analysis Batch: 46179

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.34		mg/L		107	90 - 110

Lab Sample ID: MB 590-46180/1003
Matrix: Water
Analysis Batch: 46180

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/07/24 15:26	1
Sulfate	ND		0.50	0.13	mg/L			03/07/24 15:26	1

Lab Sample ID: LCS 590-46180/1004
Matrix: Water
Analysis Batch: 46180

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.4		mg/L		107	90 - 110
Sulfate	12.5	13.2		mg/L		106	90 - 110

Lab Sample ID: MB 590-46278/1027
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 14:42	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 14:42	1

Lab Sample ID: LCS 590-46278/1015
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.5		mg/L		100	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1
Magnesium	ND		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 17:35	1

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	ND		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:19	1

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	49.9		mg/L		100	80 - 120
Magnesium	50.0	50.6		mg/L		101	80 - 120
Sodium	50.0	50.3		mg/L		101	80 - 154

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Potassium	50.0	52.6		mg/L		105	80 - 135

Lab Sample ID: 590-23589-1 MS
Matrix: Water
Analysis Batch: 46404

Client Sample ID: EA-MW14B-N-03062024
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	94		50.0	143		mg/L		99	75 - 125
Magnesium	20		50.0	69.1		mg/L		98	75 - 125
Sodium	15		50.0	64.7		mg/L		99	75 - 125

Lab Sample ID: 590-23589-1 MS
Matrix: Water
Analysis Batch: 46418

Client Sample ID: EA-MW14B-N-03062024
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Potassium	7.1		50.0	60.1		mg/L		106	75 - 125

Lab Sample ID: 590-23589-1 MSD
Matrix: Water
Analysis Batch: 46404

Client Sample ID: EA-MW14B-N-03062024
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Calcium	94		50.0	146		mg/L		104	75 - 125	2	20
Magnesium	20		50.0	70.9		mg/L		102	75 - 125	2	20
Sodium	15		50.0	66.0		mg/L		101	75 - 125	2	20

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: 590-23589-1 MSD
Client Sample ID: EA-MW14B-N-03062024
Matrix: Water
Prep Type: Total Recoverable
Analysis Batch: 46418
Prep Batch: 46381

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Potassium	7.1		50.0	60.5		mg/L		107	75 - 125	1	20

Lab Sample ID: 590-23589-1 DU
Client Sample ID: EA-MW14B-N-03062024
Matrix: Water
Prep Type: Total Recoverable
Analysis Batch: 46418
Prep Batch: 46381

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Potassium	7.1		7.10		mg/L		0.4	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46213/1
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 46213

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/11/24 11:44	1

Lab Sample ID: LCS 590-46213/2
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 46213

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	500		mg/L		100	90 - 110

Lab Sample ID: MB 590-46265/1
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 46265

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/13/24 17:21	1

Lab Sample ID: LCS 590-46265/2
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 46265

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	505		mg/L		101	90 - 110

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46378/8
Client Sample ID: Method Blank
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 46378

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/20/24 14:46	1

Method: SM 4500 P E - Phosphorus (Continued)

Lab Sample ID: LCS 590-46378/7
Matrix: Water
Analysis Batch: 46378

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Phosphorus, Total	0.500	0.485		mg/L		97	90 - 110

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46170/2
Matrix: Water
Analysis Batch: 46170

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/07/24 13:55	1

Lab Sample ID: USB 590-46170/1
Matrix: Water
Analysis Batch: 46170

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/07/24 13:55	1

Lab Sample ID: LCS 590-46170/3
Matrix: Water
Analysis Batch: 46170

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	215		mg/L		108	85 - 115

Lab Sample ID: SCB 590-46181/2
Matrix: Water
Analysis Batch: 46181

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 09:25	1

Lab Sample ID: USB 590-46181/1
Matrix: Water
Analysis Batch: 46181

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 09:25	1

Lab Sample ID: LCS 590-46181/3
Matrix: Water
Analysis Batch: 46181

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	180		mg/L		91	85 - 115

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW14B-N-03062024
Lab Sample ID: 590-23589-1
Date Collected: 03/06/24 13:21
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46179	03/07/24 17:16	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46180	03/07/24 17:16	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46278	03/14/24 17:02	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 17:39	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 13:23	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46213	03/11/24 11:45	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46378	03/20/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46170	03/07/24 13:55	JSP	EET SPK

Client Sample ID: EA-MW14A-N-03062024
Lab Sample ID: 590-23589-2
Date Collected: 03/06/24 15:06
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46179	03/07/24 17:46	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46180	03/07/24 17:46	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:04	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 13:48	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	80 mL	100 mL	46213	03/11/24 11:45	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46378	03/20/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	150 mL	300 mL	46170	03/07/24 13:55	JSP	EET SPK

Client Sample ID: SWN-MW7-N-03062024
Lab Sample ID: 590-23589-4
Date Collected: 03/06/24 16:28
Matrix: Water
Date Received: 03/07/24 10:10

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46179	03/07/24 17:56	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46180	03/07/24 17:56	NMI	EET SPK
Total/NA	Analysis	300.0		20	5 mL	5 mL	46278	03/14/24 17:13	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:08	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 13:52	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		2			46419	03/23/24 19:26	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46378	03/20/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	150 mL	300 mL	46181	03/08/24 11:25	JSP	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23589-2
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue

Spokane WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

eurofins | Environment Testing America

Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723526 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx: FAX	TAT if different from Below			Walk-in Client:
Project Name: GEG Support	☐ 2 weeks			Lab Sampling
Site: GEG	☐ 1 week			
PO # 0209800-000	☐ 2 days			Job / SDG No.
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO3, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500)	Alkalinity (SM 2320B)	BOD (405.1)	Sample Specific Notes
EA-MW14B-N-03062024	3/6/24	13:21	G	H_2O	6			X	X	X	X	X	X	
EA-MW14A-N-03062024	3/6/24	15:06						X	X	X	X	X	X	Short on Volume 590mL
SWN-MW7-FD-03062024		16:58			2			X						
SWN-MW7-N-03062024		16:28						X	X	X	X	X	X	
WL-EB-03062024		16:50			2			X						

590-23589 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification.
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
EPA 1663 5-day TAT
Remaining Samples Standard TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd. 0.3 Corr'd. 0.9	Therm ID No.: 7R006
Relinquished by:	Company: H&A	Date/Time: 3/6/24 15:40	Received by:	Company: HA	Date/Time: 3/6/24 1541
Relinquished by:	Company: HA	Date/Time: 3/7/24 1010	Received by:	Company: EETNW	Date/Time: 3/7/24 1010
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23589-2

Login Number: 23589

List Source: Eurofins Spokane

List Number: 1

Creator: Morris, Mackenzie 1

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23589 Field Sheet

Job ____ ____

Tracking # 7107 9600 2528

SO / (PO) / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID: L06 Corr Factor: (+ / -) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261230

Cooler ID _____

Temp Observed 1.3 °C Corrected 1.3 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/08/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4')

Initials DM Date 03/08/24

Notes: _____

Trizma Lot #(s) _____

Ammonium Acetate Lot #(s): _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/08/24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/15/2024 3:47:29 PM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23619-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

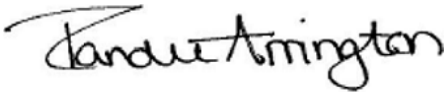
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23619-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/8/2024 9:33 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 2.4°C.

PFAS
Method 1633: The following samples in preparation batch 320-745917 were light yellow in color following extraction: EA-MW13A-N-03072024 (590-23619-1) and SWN-MW-3-N-03072024 (590-23619-7).

Method 1633: The following sample in preparation batch 320-745917 was observed to have a thin layer of sediment present in the bottom of the bottle prior to extraction: SWN-MW-3-N-03072024 (590-23619-7).

Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-745917.

Method 1633: Due to the large amount of particulates, the initial volume used for the following sample SWN-MW-3-N-03072024 (590-23619-7) in preparation batch 320-745917 deviated from the standard procedure. A 20x dilution was made on the samples, then fortified IDA and extracted. The reporting limits (RLs) have been adjusted proportionately.

Method 1633: The following sample in preparation batch 320-745917 was yellow in color following concentration. EA-MW13A-N-03072024 (590-23619-1).

Method 1633: During the solid phase extraction process, the following samples clogged the cartridge: EA-MW13A-N-03072024 (590-23619-1), EA-MW5A-N-03072024 (590-23619-5) and EA-MW5B-N-03072024 (590-23619-6). As such, reporting limits (RLs) are not impacted.

Method 1633: The concentration of analytes associated with the following samples exceeded the instrument calibration range: EA-MW13A-N-03072024 (590-23619-1) and EA-MW13B-N-03072024 (590-23619-2). These analytes have been qualified; however, the peaks did not saturate the instrument detector. The samples were diluted within calibration range, and both sets of data were reported.

Method 1633: Due to high PFHxS and PFOS concentrations, the initial volume used for the following sample EA-MW13B-N-03072024 (590-23619-2) in preparation batch 320-746595 deviated from the standard procedure. A 50x dilution was made on the sample, then fortified IDA and extracted. The reporting limits (RLs) have been adjusted proportionately.

Method 1633: Isotope Dilution Analyte (IDA) recovery is above the method recommended limit for the following samples: EA-MW13B-N-03072024 (590-23619-2). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries. These samples were re-analyzed at dilution with IDA recoveries within control limits. Both sets of data are reported.

Method 1633: Results for samples EA-MW13A-N-03072024 (590-23619-1) and EA-MW13B-N-03072024 (590-23619-2) were reported from the analysis of a diluted extract due to high concentration of the target analyte in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Eurofins Spokane

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23619-1	EA-MW13A-N-03072024	Water	03/07/24 14:45	03/08/24 09:33
590-23619-2	EA-MW13B-N-03072024	Water	03/07/24 13:40	03/08/24 09:33
590-23619-3	EA-MW8B-N-03072024	Water	03/07/24 12:20	03/08/24 09:33
590-23619-4	EA-MW8A-N-03072024	Water	03/07/24 12:50	03/08/24 09:33
590-23619-5	EA-MW5A-N-03072024	Water	03/07/24 10:10	03/08/24 09:33
590-23619-6	EA-MW5B-N-03072024	Water	03/07/24 11:09	03/08/24 09:33
590-23619-7	SWN-MW-3-N-03072024	Water	03/07/24 16:30	03/08/24 09:33
590-23619-8	WL-EB-03072024	Water	03/07/24 16:50	03/08/24 09:33
590-23619-9	FB-03072024	Water	03/07/24 17:00	03/08/24 09:33

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

LCMS

Qualifier	Qualifier Description
*3	ISTD response or retention time outside acceptable limits.
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
E	Result exceeded calibration range.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW13A-N-03072024
Lab Sample ID: 590-23619-1
Date Collected: 03/07/24 14:45
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**12**		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluoropentanoic acid (PFPeA)	**14**		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorohexanoic acid (PFHxA)	**46**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluoroheptanoic acid (PFHpA)	**8.4**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorooctanoic acid (PFOA)	**52**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorononanoic acid (PFNA)	**1.8**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorodecanoic acid (PFDA)	**2.3**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorododecanoic acid (PFDoA)	**1.5**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorobutanesulfonic acid (PFBS)	**7.1**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluoropentanesulfonic acid (PFPeS)	**17**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorohexanesulfonic acid (PFHxS)	**520**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluoroheptanesulfonic acid (PFHpS)	**11**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorooctanesulfonic acid (PFOS)	**320**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorononanesulfonic acid (PFNS)	**2.6**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorodecanesulfonic acid (PFDS)	**0.89**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
4:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
6:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
8:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
Perfluorooctanesulfonamide (FOSA)	**5.0**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 17:13	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 17:13	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 17:13	1
HFPO-DA (GenX)	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
PFMPA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 17:13	1
PFMBA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 17:13	1
NFDHA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 17:13	1
9Cl-PF3ONS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
11Cl-PF3OUdS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 17:13	1
PFEESA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 17:13	1
3:3 FTCA	ND		9.5	2.4	ng/L		03/11/24 03:58	03/11/24 17:13	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 17:13	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 17:13	1

Client Sample ID: EA-MW13A-N-03072024
Lab Sample ID: 590-23619-1

Date Collected: 03/07/24 14:45
Matrix: Water
Date Received: 03/08/24 09:33

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*44.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C5 PFPeA	*44.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C5 PFHxA	*46.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C4 PFHpA	*44.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C8 PFOA	*43.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C9 PFNA	*42.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C6 PFDA	*46.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C7 PFUnA	*48.3*		*30 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C2 PFDoA	*35.6*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C2 PFTeDA	*22.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C3 PFBS	*51.0*		*40 - 135*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C3 PFHxS	*44.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C8 PFOS	*43.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C8 PFOSA	*47.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d3-NMeFOSAA	*51.9*		*40 - 170*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d5-NEtFOSAA	*52.4*		*25 - 135*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C2 4:2 FTS	*77.9*		*40 - 200*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C2 6:2 FTS	*62.9*		*40 - 200*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C2 8:2 FTS	*54.6*		*40 - 300*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
13C3 HFPO-DA	*46.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d7-N-MeFOSE-M	*32.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d9-N-EtFOSE-M	*28.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d5-NEtPFOSA	*30.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*
d3-NMePFOSA	*34.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 17:13*	*1*

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**490**		9.5	2.4	ng/L		03/11/24 03:58	03/13/24 00:35	5

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFHxS	*44.5*	**3*	*40 - 130*	*03/11/24 03:58*	*03/13/24 00:35*	*5*

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2

Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**280**		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluoropentanoic acid (PFPeA)	**560**		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorohexanoic acid (PFHxA)	**1400**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluoroheptanoic acid (PFHpA)	**290**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorooctanoic acid (PFOA)	**820**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorobutanesulfonic acid (PFBS)	**900**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2
Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoropentanesulfonic acid (PFPeS)	**2900**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluoroheptanesulfonic acid (PFHpS)	**510**	**E**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorononanesulfonic acid (PFNS)	**14**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorodecanesulfonic acid (PFDS)	**3.1**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
6:2 FTS	**25**		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
Perfluorooctanesulfonamide (FOSA)	**40**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:05	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:05	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:05	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
PFMPA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:05	1
PFMBA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:05	1
NFDHA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:05	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:05	1
PFEESA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:05	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/11/24 03:58	03/11/24 18:05	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:05	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:05	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*81.3*		*5 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C5 PFPeA	*93.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C5 PFHxA	*76.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C4 PFHpA	*103*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C8 PFOA	*74.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C9 PFNA	*80.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C6 PFDA	*86.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C7 PFUnA	*106*		*30 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C2 PFDoA	*93.3*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C2 PFTeDA	*89.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C3 PFBS	*179*	**5+*	*40 - 135*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C3 PFHxS	*65.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C8 PFOS	*77.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C8 PFOSA	*172*	**5+*	*40 - 130*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
d3-NMeFOSAA	*153*		*40 - 170*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
d5-NEtFOSAA	*173*	**5+*	*25 - 135*	*03/11/24 03:58*	*03/11/24 18:05*	*1*
13C2 4:2 FTS	*241*	**5+*	*40 - 200*	*03/11/24 03:58*	*03/11/24 18:05*	*1*

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2

Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2 6:2 FTS	178		40 - 200	03/11/24 03:58	03/11/24 18:05	1
13C2 8:2 FTS	173		40 - 300	03/11/24 03:58	03/11/24 18:05	1
13C3 HFPO-DA	111		40 - 130	03/11/24 03:58	03/11/24 18:05	1
d7-N-MeFOSE-M	155	*5+	10 - 130	03/11/24 03:58	03/11/24 18:05	1
d9-N-EtFOSE-M	146	*5+	10 - 130	03/11/24 03:58	03/11/24 18:05	1
d5-NEtPFOSA	153	*5+	10 - 130	03/11/24 03:58	03/11/24 18:05	1
d3-NMePFOSA	154	*5+	10 - 130	03/11/24 03:58	03/11/24 18:05	1

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanoic acid (PFHxA)	**2100**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
Perfluorooctanoic acid (PFOA)	**740**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
Perfluorobutanesulfonic acid (PFBS)	**1100**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
Perfluoropentanesulfonic acid (PFPeS)	**1600**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
Perfluoroheptanesulfonic acid (PFHpS)	**260**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
4:2 FTS	ND		75	19	ng/L		03/11/24 03:58	03/13/24 00:51	10
Perfluorooctanesulfonamide (FOSA)	**39**		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
NMeFOSA	ND		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
NEtFOSA	ND		19	4.7	ng/L		03/11/24 03:58	03/13/24 00:51	10
NMeFOSE	ND		190	47	ng/L		03/11/24 03:58	03/13/24 00:51	10
NEtFOSE	ND		190	47	ng/L		03/11/24 03:58	03/13/24 00:51	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C5 PFHxA	72.7	*3	40 - 130	03/11/24 03:58	03/13/24 00:51	10
13C8 PFOA	76.8	*3	40 - 130	03/11/24 03:58	03/13/24 00:51	10
13C3 PFBS	69.6	*3	40 - 135	03/11/24 03:58	03/13/24 00:51	10
13C8 PFOS	97.9	*3	40 - 130	03/11/24 03:58	03/13/24 00:51	10
13C8 PFOSA	99.6	*3	40 - 130	03/11/24 03:58	03/13/24 00:51	10
13C2 4:2 FTS	76.8	*3	40 - 200	03/11/24 03:58	03/13/24 00:51	10
d7-N-MeFOSE-M	82.3	*3	10 - 130	03/11/24 03:58	03/13/24 00:51	10
d9-N-EtFOSE-M	83.7	*3	10 - 130	03/11/24 03:58	03/13/24 00:51	10
d5-NEtPFOSA	71.9	*3	10 - 130	03/11/24 03:58	03/13/24 00:51	10
d3-NMePFOSA	83.3	*3	10 - 130	03/11/24 03:58	03/13/24 00:51	10

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	**16000**		100	25	ng/L		03/13/24 12:18	03/15/24 02:21	1
Perfluorooctanesulfonic acid (PFOS)	**6300**		100	25	ng/L		03/13/24 12:18	03/15/24 02:21	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	75.2		40 - 130	03/13/24 12:18	03/15/24 02:21	1
13C8 PFOS	70.3		40 - 130	03/13/24 12:18	03/15/24 02:21	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluoropentanoic acid (PFPeA)	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorohexanoic acid (PFHxA)	**0.52**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorooctanoic acid (PFOA)	**0.49**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorohexanesulfonic acid (PFHxS)	**7.2**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorooctanesulfonic acid (PFOS)	**0.50**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
4:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
6:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
8:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
NMeFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
NEtFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
NMeFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
NEtFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 18:23	1
NMeFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 18:23	1
NEtFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 18:23	1
HFPO-DA (GenX)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
PFMPA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 18:23	1
PFMBA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 18:23	1
NFDHA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 18:23	1
9Cl-PF3ONS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
11Cl-PF3OUdS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 18:23	1
PFEESA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 18:23	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/11/24 03:58	03/11/24 18:23	1
5:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 18:23	1
7:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 18:23	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*80.6*		*5 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C5 PFPeA	*79.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C5 PFHxA	*78.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C4 PFHpA	*77.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOA	*79.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C9 PFNA	*74.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C6 PFDA	*81.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C7 PFUnA	*75.3*		*30 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C2 PFDoA	*62.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C2 PFTeDA	*61.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C3 PFBS	*84.7*		*40 - 135*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C3 PFHxS	*81.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C8 PFOS	*82.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C8 PFOSA	*81.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d3-NMeFOSAA	*85.9*		*40 - 170*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d5-NEtFOSAA	*78.1*		*25 - 135*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C2 4:2 FTS	*86.0*		*40 - 200*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C2 6:2 FTS	*84.1*		*40 - 200*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C2 8:2 FTS	*86.3*		*40 - 300*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
13C3 HFPO-DA	*80.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d7-N-MeFOSE-M	*67.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d9-N-EtFOSE-M	*66.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d5-NEtPFOSA	*66.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*
d3-NMePFOSA	*68.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:23*	*1*

Client Sample ID: EA-MW8A-N-03072024
Lab Sample ID: 590-23619-4
Date Collected: 03/07/24 12:50
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluoropentanoic acid (PFPeA)	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1

Client Sample ID: EA-MW8A-N-03072024
Lab Sample ID: 590-23619-4

Date Collected: 03/07/24 12:50
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:41	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:41	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:41	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
PFMPA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:41	1
PFMBA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:41	1
NFDHA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:41	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:41	1
PFEESA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 18:41	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/11/24 03:58	03/11/24 18:41	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:41	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:41	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*78.5*		*5 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C5 PFPeA	*76.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C5 PFHxA	*76.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C4 PFHpA	*71.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C8 PFOA	*73.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C9 PFNA	*71.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C6 PFDA	*73.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C7 PFUnA	*73.3*		*30 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C2 PFDoA	*65.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C2 PFTeDA	*58.3*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C3 PFBS	*80.2*		*40 - 135*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C3 PFHxS	*74.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C8 PFOS	*77.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C8 PFOSA	*76.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d3-NMeFOSAA	*70.9*		*40 - 170*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d5-NEtFOSAA	*71.3*		*25 - 135*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C2 4:2 FTS	*83.4*		*40 - 200*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C2 6:2 FTS	*84.4*		*40 - 200*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C2 8:2 FTS	*78.5*		*40 - 300*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
13C3 HFPO-DA	*78.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d7-N-MeFOSE-M	*63.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d9-N-EtFOSE-M	*59.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d5-NEtPFOSA	*59.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*
d3-NMePFOSA	*63.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 18:41*	*1*

Client Sample ID: EA-MW5A-N-03072024
Lab Sample ID: 590-23619-5

Date Collected: 03/07/24 10:10
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluoropentanoic acid (PFPeA)	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 18:58	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:58	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 18:58	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
PFMPA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 18:58	1
PFMBA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 18:58	1
NFDHA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 18:58	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 18:58	1
PFEESA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 18:58	1
3:3 FTCA	ND		9.4	2.3	ng/L		03/11/24 03:58	03/11/24 18:58	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:58	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 18:58	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*60.5*		*5 - 130*	*03/11/24 03:58*	*03/11/24 18:58*	*1*
13C5 PFPeA	*59.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:58*	*1*
13C5 PFHxA	*57.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:58*	*1*
13C4 PFHpA	*60.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:58*	*1*
13C8 PFOA	*62.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 18:58*	*1*

Client Sample ID: EA-MW5A-N-03072024 Lab Sample ID: 590-23619-5

Date Collected: 03/07/24 10:10 **Matrix: Water**
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	54.6		40 - 130	03/11/24 03:58	03/11/24 18:58	1
13C6 PFDA	57.3		40 - 130	03/11/24 03:58	03/11/24 18:58	1
13C7 PFUnA	47.3		30 - 130	03/11/24 03:58	03/11/24 18:58	1
13C2 PFDoA	42.9		10 - 130	03/11/24 03:58	03/11/24 18:58	1
13C2 PFTeDA	36.7		10 - 130	03/11/24 03:58	03/11/24 18:58	1
13C3 PFBS	64.3		40 - 135	03/11/24 03:58	03/11/24 18:58	1
13C3 PFHxS	59.8		40 - 130	03/11/24 03:58	03/11/24 18:58	1
13C8 PFOS	59.9		40 - 130	03/11/24 03:58	03/11/24 18:58	1
13C8 PFOSA	57.8		40 - 130	03/11/24 03:58	03/11/24 18:58	1
d3-NMeFOSAA	51.8		40 - 170	03/11/24 03:58	03/11/24 18:58	1
d5-NEtFOSAA	48.9		25 - 135	03/11/24 03:58	03/11/24 18:58	1
13C2 4:2 FTS	66.5		40 - 200	03/11/24 03:58	03/11/24 18:58	1
13C2 6:2 FTS	64.3		40 - 200	03/11/24 03:58	03/11/24 18:58	1
13C2 8:2 FTS	59.3		40 - 300	03/11/24 03:58	03/11/24 18:58	1
13C3 HFPO-DA	61.2		40 - 130	03/11/24 03:58	03/11/24 18:58	1
d7-N-MeFOSE-M	38.6		10 - 130	03/11/24 03:58	03/11/24 18:58	1
d9-N-EtFOSE-M	37.1		10 - 130	03/11/24 03:58	03/11/24 18:58	1
d5-NEtPFOSA	39.5		10 - 130	03/11/24 03:58	03/11/24 18:58	1
d3-NMePFOSA	42.0		10 - 130	03/11/24 03:58	03/11/24 18:58	1

Client Sample ID: EA-MW5B-N-03072024 Lab Sample ID: 590-23619-6

Date Collected: 03/07/24 11:09 **Matrix: Water**
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluoropentanoic acid (PFPeA)	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorohexanesulfonic acid (PFHxS)	**1.6**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorooctanesulfonic acid (PFOS)	**0.58**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1

Client Sample ID: EA-MW5B-N-03072024
Lab Sample ID: 590-23619-6

Date Collected: 03/07/24 11:09
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:16	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 19:16	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 19:16	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
PFMPA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 19:16	1
PFMBA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 19:16	1
NFDHA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 19:16	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 19:16	1
PFEESA	ND		3.8	0.94	ng/L		03/11/24 03:58	03/11/24 19:16	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/11/24 03:58	03/11/24 19:16	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 19:16	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 19:16	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*51.0*		*5 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C5 PFPeA	*49.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C5 PFHxA	*50.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C4 PFHpA	*49.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C8 PFOA	*48.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C9 PFNA	*48.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C6 PFDA	*53.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C7 PFUnA	*44.9*		*30 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C2 PFDoA	*32.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C2 PFTeDA	*31.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C3 PFBS	*54.0*		*40 - 135*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C3 PFHxS	*47.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C8 PFOS	*52.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C8 PFOSA	*48.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d3-NMeFOSAA	*46.1*		*40 - 170*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d5-NEtFOSAA	*38.5*		*25 - 135*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C2 4:2 FTS	*65.0*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C2 6:2 FTS	*58.3*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C2 8:2 FTS	*51.1*		*40 - 300*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
13C3 HFPO-DA	*49.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d7-N-MeFOSE-M	*33.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d9-N-EtFOSE-M	*32.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d5-NEtPFOSA	*33.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*
d3-NMePFOSA	*33.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:16*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW-3-N-03072024
Lab Sample ID: 590-23619-7
Date Collected: 03/07/24 16:30
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**75**	**J**	160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluoropentanoic acid (PFPeA)	**190**		80	20	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorohexanoic acid (PFHxA)	**170**		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluoroheptanoic acid (PFHpA)	**110**		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorooctanoic acid (PFOA)	**310**		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorononanoic acid (PFNA)	**36**	**J**	40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorodecanoic acid (PFDA)	**45**		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluoroundecanoic acid (PFUnA)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorododecanoic acid (PFDoA)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorotridecanoic acid (PFTrDA)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorotetradecanoic acid (PFTeA)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorobutanesulfonic acid (PFBS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluoropentanesulfonic acid (PFPeS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorohexanesulfonic acid (PFHxS)	**54**		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorooctanesulfonic acid (PFOS)	**26**	**J**	40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorononanesulfonic acid (PFNS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorodecanesulfonic acid (PFDS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorododecanesulfonic acid (PFDoS)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
4:2 FTS	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
6:2 FTS	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
8:2 FTS	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
Perfluorooctanesulfonamide (FOSA)	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
NMeFOSA	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
NEtFOSA	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
NMeFOSAA	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
NEtFOSAA	ND		40	10	ng/L		03/11/24 03:58	03/11/24 19:34	1
NMeFOSE	ND		400	100	ng/L		03/11/24 03:58	03/11/24 19:34	1
NEtFOSE	ND		400	100	ng/L		03/11/24 03:58	03/11/24 19:34	1
HFPO-DA (GenX)	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
PFMPA	ND		80	20	ng/L		03/11/24 03:58	03/11/24 19:34	1
PFMBA	ND		80	20	ng/L		03/11/24 03:58	03/11/24 19:34	1
NFDHA	ND		80	20	ng/L		03/11/24 03:58	03/11/24 19:34	1
9Cl-PF3ONS	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
11Cl-PF3OUdS	ND		160	40	ng/L		03/11/24 03:58	03/11/24 19:34	1
PFEESA	ND		80	20	ng/L		03/11/24 03:58	03/11/24 19:34	1
3:3 FTCA	ND		200	50	ng/L		03/11/24 03:58	03/11/24 19:34	1
5:3 FTCA	ND		1000	250	ng/L		03/11/24 03:58	03/11/24 19:34	1
7:3 FTCA	ND		1000	250	ng/L		03/11/24 03:58	03/11/24 19:34	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*78.2*		*5 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C5 PFPeA	*76.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C5 PFHxA	*76.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C4 PFHpA	*79.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*

Client Sample ID: SWN-MW-3-N-03072024
Lab Sample ID: 590-23619-7

Date Collected: 03/07/24 16:30
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOA	*75.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C9 PFNA	*77.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C6 PFDA	*79.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C7 PFUnA	*70.0*		*30 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C2 PFDoA	*64.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C2 PFTeDA	*65.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C3 PFBS	*81.1*		*40 - 135*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C3 PFHxS	*77.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C8 PFOS	*79.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C8 PFOSA	*75.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d3-NMeFOSAA	*80.1*		*40 - 170*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d5-NEtFOSAA	*75.9*		*25 - 135*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C2 4:2 FTS	*85.9*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C2 6:2 FTS	*80.0*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C2 8:2 FTS	*77.9*		*40 - 300*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
13C3 HFPO-DA	*77.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d7-N-MeFOSE-M	*68.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d9-N-EtFOSE-M	*65.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d5-NEtPFOSA	*62.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*
d3-NMePFOSA	*65.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:34*	*1*

Client Sample ID: WL-EB-03072024
Lab Sample ID: 590-23619-8

Date Collected: 03/07/24 16:50
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluoropentanoic acid (PFPeA)	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
4:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
6:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: WL-EB-03072024
Lab Sample ID: 590-23619-8
Date Collected: 03/07/24 16:50
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
8:2 FTS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 19:51	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 19:51	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 19:51	1
HFPO-DA (GenX)	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
PFMPA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 19:51	1
PFMBA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 19:51	1
NFDHA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 19:51	1
9Cl-PF3ONS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
11Cl-PF3OUdS	ND		7.6	1.9	ng/L		03/11/24 03:58	03/11/24 19:51	1
PFEESA	ND		3.8	0.95	ng/L		03/11/24 03:58	03/11/24 19:51	1
3:3 FTCA	ND		9.5	2.4	ng/L		03/11/24 03:58	03/11/24 19:51	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 19:51	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 19:51	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*79.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C5 PFPeA	*80.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C5 PFHxA	*75.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C4 PFHpA	*79.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C8 PFOA	*76.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C9 PFNA	*76.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C6 PFDA	*87.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C7 PFUnA	*88.2*		*30 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C2 PFDoA	*81.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C2 PFTeDA	*65.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C3 PFBS	*82.8*		*40 - 135*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C3 PFHxS	*76.1*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C8 PFOS	*77.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C8 PFOSA	*74.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d3-NMeFOSAA	*77.3*		*40 - 170*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d5-NEtFOSAA	*71.2*		*25 - 135*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C2 4:2 FTS	*84.9*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C2 6:2 FTS	*87.1*		*40 - 200*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C2 8:2 FTS	*77.1*		*40 - 300*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
13C3 HFPO-DA	*78.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d7-N-MeFOSE-M	*65.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d9-N-EtFOSE-M	*63.4*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d5-NEtPFOSA	*62.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*
d3-NMePFOSA	*60.9*		*10 - 130*	*03/11/24 03:58*	*03/11/24 19:51*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03072024
Lab Sample ID: 590-23619-9
Date Collected: 03/07/24 17:00
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluoropentanoic acid (PFPeA)	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:09	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 20:09	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 20:09	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
PFMPA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:09	1
PFMBA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:09	1
NFDHA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:09	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:09	1
PFEESA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:09	1
3:3 FTCA	ND		9.4	2.3	ng/L		03/11/24 03:58	03/11/24 20:09	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 20:09	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 20:09	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*78.5*		*5 - 130*	*03/11/24 03:58*	*03/11/24 20:09*	*1*
13C5 PFPeA	*79.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:09*	*1*
13C5 PFHxA	*78.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:09*	*1*
13C4 PFHpA	*79.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:09*	*1*
13C8 PFOA	*73.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:09*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03072024
Lab Sample ID: 590-23619-9
Date Collected: 03/07/24 17:00
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	74.7		40 - 130	03/11/24 03:58	03/11/24 20:09	1
13C6 PFDA	73.8		40 - 130	03/11/24 03:58	03/11/24 20:09	1
13C7 PFUnA	71.9		30 - 130	03/11/24 03:58	03/11/24 20:09	1
13C2 PFDoA	58.5		10 - 130	03/11/24 03:58	03/11/24 20:09	1
13C2 PFTeDA	54.0		10 - 130	03/11/24 03:58	03/11/24 20:09	1
13C3 PFBS	80.6		40 - 135	03/11/24 03:58	03/11/24 20:09	1
13C3 PFHxS	73.7		40 - 130	03/11/24 03:58	03/11/24 20:09	1
13C8 PFOS	78.8		40 - 130	03/11/24 03:58	03/11/24 20:09	1
13C8 PFOSA	70.6		40 - 130	03/11/24 03:58	03/11/24 20:09	1
d3-NMeFOSAA	81.8		40 - 170	03/11/24 03:58	03/11/24 20:09	1
d5-NEtFOSAA	75.2		25 - 135	03/11/24 03:58	03/11/24 20:09	1
13C2 4:2 FTS	82.8		40 - 200	03/11/24 03:58	03/11/24 20:09	1
13C2 6:2 FTS	83.7		40 - 200	03/11/24 03:58	03/11/24 20:09	1
13C2 8:2 FTS	82.1		40 - 300	03/11/24 03:58	03/11/24 20:09	1
13C3 HFPO-DA	78.8		40 - 130	03/11/24 03:58	03/11/24 20:09	1
d7-N-MeFOSE-M	59.3		10 - 130	03/11/24 03:58	03/11/24 20:09	1
d9-N-EtFOSE-M	57.8		10 - 130	03/11/24 03:58	03/11/24 20:09	1
d5-NEtPFOSA	56.0		10 - 130	03/11/24 03:58	03/11/24 20:09	1
d3-NMePFOSA	58.2		10 - 130	03/11/24 03:58	03/11/24 20:09	1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
4:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
6:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
8:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMPA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMBA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NFDHA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFEESA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
3:3 FTCA	ND		10	2.5	ng/L		03/11/24 03:58	03/11/24 14:34	1
5:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1
7:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*72.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFPeA	*73.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFHxA	*73.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	73.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C9 PFNA	70.3		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C6 PFDA	68.2		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C7 PFUnA	73.3		30 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFDoA	64.6		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFTeDA	61.2		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C3 PFBS	74.9		40 - 135	03/11/24 03:58	03/11/24 14:34	1
13C3 PFHxS	72.1		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOS	79.4		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOSA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMeFOSAA	76.8		40 - 170	03/11/24 03:58	03/11/24 14:34	1
d5-NEtFOSAA	70.2		25 - 135	03/11/24 03:58	03/11/24 14:34	1
13C2 4:2 FTS	70.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 6:2 FTS	68.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 8:2 FTS	68.9		40 - 300	03/11/24 03:58	03/11/24 14:34	1
13C3 HFPO-DA	77.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d7-N-MeFOSE-M	68.5		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d9-N-EtFOSE-M	65.4		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d5-NEtPFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMePFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	127		ng/L		99	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	57.3		ng/L		89	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	27.8		ng/L		87	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	28.0		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	28.6		ng/L		89	70 - 150
Perfluorononanoic acid (PFNA)	32.0	31.4		ng/L		98	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	30.0		ng/L		94	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	32.4		ng/L		101	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	35.2		ng/L		110	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	33.8		ng/L		106	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	32.7		ng/L		102	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	27.1		ng/L		95	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	26.9		ng/L		90	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	28.1		ng/L		96	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	28.5		ng/L		93	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	28.8		ng/L		97	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	25.2		ng/L		82	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.3		ng/L		72	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	22.8		ng/L		74	50 - 145
4:2 FTS	120	107		ng/L		89	70 - 145
6:2 FTS	122	112		ng/L		92	65 - 155
8:2 FTS	123	126		ng/L		103	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	31.3		ng/L		98	70 - 145
NMeFOSA	32.0	27.4		ng/L		86	60 - 150
NEtFOSA	32.0	34.9		ng/L		109	65 - 145
NMeFOSAA	32.0	33.0		ng/L		103	50 - 140
NEtFOSAA	32.0	28.0		ng/L		88	70 - 145
NMeFOSE	320	319		ng/L		100	70 - 145
NEtFOSE	320	330		ng/L		103	70 - 135
HFPO-DA (GenX)	128	139		ng/L		109	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	112		ng/L		92	65 - 145
PFMPA	64.0	60.9		ng/L		95	55 - 140
PFMBA	64.0	51.2		ng/L		80	60 - 150
NFDHA	64.0	66.0		ng/L		103	50 - 150
9Cl-PF3ONS	120	115		ng/L		97	70 - 155
11Cl-PF3OUdS	121	112		ng/L		93	55 - 160
PFEESA	57.1	56.0		ng/L		98	70 - 140
3:3 FTCA	160	148		ng/L		93	65 - 130
5:3 FTCA	799	776		ng/L		97	70 - 135
7:3 FTCA	799	742		ng/L		93	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*76.6*		*5 - 130*
13C5 PFPeA	*73.6*		*40 - 130*
13C5 PFHxA	*73.7*		*40 - 130*
13C4 PFHpA	*75.4*		*40 - 130*
13C8 PFOA	*75.8*		*40 - 130*
13C9 PFNA	*74.4*		*40 - 130*
13C6 PFDA	*73.6*		*40 - 130*
13C7 PFUnA	*67.6*		*30 - 130*
13C2 PFDoA	*64.8*		*10 - 130*
13C2 PFTeDA	*56.0*		*10 - 130*
13C3 PFBS	*77.6*		*40 - 135*
13C3 PFHxS	*74.4*		*40 - 130*
13C8 PFOS	*72.5*		*40 - 130*
13C8 PFOSA	*70.4*		*40 - 130*
d3-NMeFOSAA	*72.8*		*40 - 170*
d5-NEtFOSAA	*67.9*		*25 - 135*
13C2 4:2 FTS	*70.4*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*71.4*		*40 - 200*
13C2 8:2 FTS	*67.9*		*40 - 300*
13C3 HFPO-DA	*76.7*		*40 - 130*
d7-N-MeFOSE-M	*60.6*		*10 - 130*
d9-N-EtFOSE-M	*58.7*		*10 - 130*
d5-NEtPFOSA	*57.6*		*10 - 130*
d3-NMePFOSA	*61.5*		*10 - 130*

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	12.9		ng/L		101	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	5.79		ng/L		90	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.00		ng/L		94	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	2.79		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	2.93		ng/L		92	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.15		ng/L		99	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	2.96		ng/L		93	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.76		ng/L		118	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.46		ng/L		108	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.53		ng/L		110	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.14		ng/L		98	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	2.52		ng/L		89	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.63		ng/L		87	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.02		ng/L		103	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.54		ng/L		83	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	2.73		ng/L		92	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.20		ng/L		71	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.15		ng/L		70	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.22		ng/L		71	50 - 145
4:2 FTS	12.0	10.7		ng/L		89	70 - 145
6:2 FTS	12.2	11.6		ng/L		95	65 - 155
8:2 FTS	12.3	13.2		ng/L		107	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.25		ng/L		102	70 - 145
NMeFOSA	3.20	2.99		ng/L		94	60 - 150
NEtFOSA	3.20	3.29		ng/L		103	65 - 145
NMeFOSAA	3.20	3.13		ng/L		98	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
NEtFOSAA	3.20	2.66		ng/L		83	70 - 145
NMeFOSE	32.0	31.8		ng/L		99	70 - 145
NEtFOSE	32.0	32.4		ng/L		101	70 - 135
HFPO-DA (GenX)	12.8	13.3		ng/L		104	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	12.1	11.1		ng/L		92	65 - 145
PFMPA	6.40	6.18		ng/L		97	55 - 140
PFMBA	6.40	4.75		ng/L		74	60 - 150
NFDHA	6.40	6.67		ng/L		104	50 - 150
9Cl-PF3ONS	12.0	11.1		ng/L		93	70 - 155
11Cl-PF3OUdS	12.1	11.0		ng/L		91	55 - 160
PFEESA	5.71	5.77		ng/L		101	70 - 140
3:3 FTCA	16.0	14.6		ng/L		91	65 - 130
5:3 FTCA	79.9	77.6		ng/L		97	70 - 135
7:3 FTCA	79.9	73.8		ng/L		92	50 - 145

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*71.6*		*5 - 130*
13C5 PFPeA	*68.2*		*40 - 130*
13C5 PFHxA	*66.5*		*40 - 130*
13C4 PFHpA	*70.3*		*40 - 130*
13C8 PFOA	*70.9*		*40 - 130*
13C9 PFNA	*66.4*		*40 - 130*
13C6 PFDA	*74.3*		*40 - 130*
13C7 PFUnA	*75.0*		*30 - 130*
13C2 PFDoA	*62.1*		*10 - 130*
13C2 PFTeDA	*57.3*		*10 - 130*
13C3 PFBS	*71.3*		*40 - 135*
13C3 PFHxS	*69.3*		*40 - 130*
13C8 PFOS	*68.8*		*40 - 130*
13C8 PFOSA	*61.2*		*40 - 130*
d3-NMeFOSAA	*68.4*		*40 - 170*
d5-NEtFOSAA	*60.9*		*25 - 135*
13C2 4:2 FTS	*66.5*		*40 - 200*
13C2 6:2 FTS	*68.5*		*40 - 200*
13C2 8:2 FTS	*66.9*		*40 - 300*
13C3 HFPO-DA	*70.1*		*40 - 130*
d7-N-MeFOSE-M	*53.7*		*10 - 130*
d9-N-EtFOSE-M	*52.2*		*10 - 130*
d5-NEtPFOSA	*50.4*		*10 - 130*
d3-NMePFOSA	*50.0*		*10 - 130*

Lab Sample ID: MB 320-746595/1-A
Matrix: Water
Analysis Batch: 747316

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 746595

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/13/24 12:18	03/15/24 00:53	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/13/24 12:18	03/15/24 00:53	1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFHxS	74.0		40 - 130	03/13/24 12:18	03/15/24 00:53	1
13C8 PFOS	73.3		40 - 130	03/13/24 12:18	03/15/24 00:53	1

Lab Sample ID: LCS 320-746595/3-A
Matrix: Water
Analysis Batch: 747316

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 746595

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Perfluorohexanesulfonic acid (PFHxS)			29.2	34.8		ng/L		119	65 - 145		
Perfluorooctanesulfonic acid (PFOS)			29.8	33.7		ng/L		113	55 - 150		

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C3 PFHxS	68.0		40 - 130
13C8 PFOS	68.4		40 - 130

Lab Sample ID: LLCS 320-746595/2-A
Matrix: Water
Analysis Batch: 747316

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 746595

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Perfluorohexanesulfonic acid (PFHxS)			2.92	3.56		ng/L		122	65 - 145		
Perfluorooctanesulfonic acid (PFOS)			2.98	3.30		ng/L		111	55 - 150		

Isotope Dilution	LLCS %Recovery	LLCS Qualifier	Limits
13C3 PFHxS	65.4		40 - 130
13C8 PFOS	65.0		40 - 130

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW13A-N-03072024
Lab Sample ID: 590-23619-1
Date Collected: 03/07/24 14:45
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633	DL		528.2 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633	DL	5			746488	03/13/24 00:35	RS1	EET SAC
Total/NA	Prep	1633			528.2 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 17:13	RS1	EET SAC

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2
Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633	DL		530.1 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633	DL	10			746488	03/13/24 00:51	RS1	EET SAC
Total/NA	Prep	1633			530.1 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 18:05	RS1	EET SAC
Total/NA	Prep	1633	RE		10.0 mL	5.0 mL	746595	03/13/24 12:18	EWH	EET SAC
Total/NA	Analysis	Draft 1633	RE	1			747316	03/15/24 02:21	SEY	EET SAC

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			539.4 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 18:23	RS1	EET SAC

Client Sample ID: EA-MW8A-N-03072024
Lab Sample ID: 590-23619-4
Date Collected: 03/07/24 12:50
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			531 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 18:41	RS1	EET SAC

Client Sample ID: EA-MW5A-N-03072024
Lab Sample ID: 590-23619-5
Date Collected: 03/07/24 10:10
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			534.5 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 18:58	RS1	EET SAC

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW5B-N-03072024
Lab Sample ID: 590-23619-6
Date Collected: 03/07/24 11:09
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			530.9 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 19:16	RS1	EET SAC

Client Sample ID: SWN-MW-3-N-03072024
Lab Sample ID: 590-23619-7
Date Collected: 03/07/24 16:30
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			25 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 19:34	RS1	EET SAC

Client Sample ID: WL-EB-03072024
Lab Sample ID: 590-23619-8
Date Collected: 03/07/24 16:50
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			528.8 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 19:51	RS1	EET SAC

Client Sample ID: FB-03072024
Lab Sample ID: 590-23619-9
Date Collected: 03/07/24 17:00
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			533.6 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 20:09	RS1	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Chain of Custody Record

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

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Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact:	Carrier:
Address: 505 W Riverside Ave	Tel/Fax:		
City/State/Zip: Spokane, WA 99201	**Analysis Turnaround Time**		
(xxx) xxx-xxxx: 509 723 5261 Phone	☐ CALENDAR DAYS ☐ WORKING DAYS		
(xxx) xxx-xxxx FAX	TAT if different from Below _____		
Project Name: GEG Support	☐ 2 weeks		
Site: GEG	☐ 1 week		
PO # 0209800-000	☐ 2 days		
	☐ 1 day		

COC No: ___ of ___ COCs
TALS Project #:
Sampler:
For Lab Use Only:
Walk-in Client:
Lab Sampling
Job / SDG No.:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO3, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM4500)	Alkalinity (SM2320B)	BOD (Lab Std.)	Sample Specific Notes:
EA-MW13A-N-03072024	3/7/24	14:45	G		6			X	X	X	X	X	X	
EA-MW13B-N-03072024		13:40						X	X	X	X	X	X	
EA-MW8B-N-03072024		12:20						X	X	X	X	X	X	
EA-MW8A N-03072024		12:50						X	X	X	X	X	X	
EA-MW5A N-03072024		10:10						X	X	X	X	X	X	
EA-MW5B-N-03072024		11:09						X	X	X	X	X	X	
SWN-MW3-N-03072024		16:30						X	X	X	X	X	X	
WL-EB-03072024		16:50			2			X						
FB-03072024		17:00			2			X						

590-23619 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments.
EPA 1633 5-day TAT
Remaining Samples Standard TAT

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 2.3	Corr'd: 2.4	Therm ID No.: R006
Relinquished by:	Company: H&A	Date/Time: 3/8/24 6:30	Received by:	Company: HA	Date/Time: 3/8/2024 0631
Relinquished by: WDM	Company: HA	Date/Time: 3/8/24 0934	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EEC SPS	Date/Time: 3/8/24 9:33

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone. 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8841 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23619-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/28/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
EA-MW13A-N-03072024 (590-23619-1)	3/7/24	14 45 Pacific		Water			X	2	
EA-MW13B-N-03072024 (590-23619-2)	3/7/24	13 40 Pacific		Water			X	2	
EA-MW8B-N-03072024 (590-23619-3)	3/7/24	12.20 Pacific		Water			X	2	
EA-MW8A-N-03072024 (590-23619-4)	3/7/24	12.50 Pacific		Water			X	2	
EA-MW5A-N-03072024 (590-23619-5)	3/7/24	10 10 Pacific		Water			X	2	
EA-MW5B-N-03072024 (590-23619-6)	3/7/24	11 09 Pacific		Water			X	2	
SWN-MW-3-N-03072024 (590-23619-7)	3/7/24	16 30 Pacific		Water			X	2	
WL-EB-03072024 (590-23619-8)	3/7/24	16:50 Pacific		Water			X	2	
FB-03072024 (590-23619-9)	3/7/24	17 00 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested. I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements.

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	3/8/24 16:25	EET SAC	[signature]	03/09/24 0845	EET SAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No: 2261210	Cooler Temperature(s) °C and Other Remarks: 1.2 °C

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23619-1

Login Number: 23619
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23619-1

Login Number: 23619
List Number: 2
Creator: Morazzini, Dominic S

List Source: Eurofins Sacramento
List Creation: 03/09/24 10:14 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261210
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23619 Field Sheet

Job ________

Tracking # 7101 9600 2664

SO / PO / FO / (SAT) / 2-Day / Ground / UPS / CDO / Courier
GSL / OnTrac / Goldstreak / USPS / Other __________

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID: 106 Corr. Factor (+/-) NA °C

Ice ✓ Wet ✓ Gel ____ Other ____

Cooler Custody Seal 2261210

Cooler ID ____________

Temp Observed: 1.2 °C Corrected: 1.2 °C

From Temp Blank ☐ Sample ☒

Opening/Processing The Shipment	**Yes**	**No**	**NA**
Cooler compromised/tampered with?	☐	☒	☐
Cooler Temperature is acceptable?	☒	☐	☐
Frozen samples show signs of thaw?	☐	☐	☒

Initials DM Date 03/09/24

Unpacking/Labeling The Samples	**Yes**	**No**	**NA**
Containers are not broken or leaking?	☒	☐	☐
Samples compromised/tampered with?	☐	☒	☐
COC is complete w/o discrepancies	☒	☐	☐
Sample custody seal?	☐	☐	☒
Sample containers have legible labels?	☒	☐	☐
Sample date/times are provided?	☒	☐	☐
Appropriate containers are used?	☒	☐	☐
Sample bottles are completely filled?	☒	☐	☐
Sample preservatives verified?	☐	☐	☒
Is the Field Sampler's name on COC?	☐	☐	☒
Samples w/o discrepancies?	☒	☐	☐
Zero headspace?*	☐	☐	☒
Alkalinity has no headspace?	☐	☐	☒
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☒
Multiphasic samples are not present?	☒	☐	☐

**Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")*

Initials DM Date 03/09/24

Notes: ____________

Trizma Lot #(s) ____________

Ammonium Acetate Lot #(s) ____________

Login Completion	**Yes**	**No**	**NA**
Receipt Temperature on COC?	☒	☐	☐
NCM Filed?	☐	☐	☒
Samples received within hold time?	☐	☐	☒
Log Release checked in TALS?	☐	☐	☒

Initials DM Date 03/09/24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water
Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23619-1	EA-MW13A-N-03072024	44.7	44.9	46.7	44.8	43.8	42.5	46.4	48.3
590-23619-1 - DL	EA-MW13A-N-03072024								
590-23619-2	EA-MW13B-N-03072024	81.3	93.0	76.7	103	74.3	80.9	86.5	106
590-23619-2 - DL	EA-MW13B-N-03072024			72.7 *3		76.8 *3			
590-23619-2 - RE	EA-MW13B-N-03072024								
590-23619-3	EA-MW8B-N-03072024	80.6	79.1	78.7	77.0	79.8	74.7	81.4	75.3
590-23619-4	EA-MW8A-N-03072024	78.5	76.7	76.1	71.8	73.9	71.9	73.9	73.3
590-23619-5	EA-MW5A-N-03072024	60.5	59.5	57.8	60.9	62.6	54.6	57.3	47.3
590-23619-6	EA-MW5B-N-03072024	51.0	49.2	50.3	49.2	48.2	48.5	53.0	44.9
590-23619-7	SWN-MW-3-N-03072024	78.2	76.9	76.1	79.1	75.8	77.6	79.5	70.0
590-23619-8	WL-EB-03072024	79.7	80.0	75.0	79.8	76.1	76.8	87.2	88.2
590-23619-9	FB-03072024	78.5	79.0	78.2	79.6	73.0	74.7	73.8	71.9
LCS 320-745917/3-A	Lab Control Sample	76.6	73.6	73.7	75.4	75.8	74.4	73.6	67.6
LCS 320-746595/3-A	Lab Control Sample								
LLCS 320-745917/2-A	Lab Control Sample	71.6	68.2	66.5	70.3	70.9	66.4	74.3	75.0
LLCS 320-746595/2-A	Lab Control Sample								
MB 320-745917/1-A	Method Blank	72.7	73.9	73.2	73.7	73.6	70.3	68.2	73.3
MB 320-746595/1-A	Method Blank								

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23619-1	EA-MW13A-N-03072024	35.6	22.2	51.0	44.2	43.6	47.0	51.9	52.4
590-23619-1 - DL	EA-MW13A-N-03072024				44.5 *3				
590-23619-2	EA-MW13B-N-03072024	93.3	89.8	179 *5+	65.7	77.7	172 *5+	153	173 *5+
590-23619-2 - DL	EA-MW13B-N-03072024			69.6 *3		97.9 *3	99.6 *3		
590-23619-2 - RE	EA-MW13B-N-03072024				75.2	70.3			
590-23619-3	EA-MW8B-N-03072024	62.8	61.2	84.7	81.3	82.5	81.4	85.9	78.1
590-23619-4	EA-MW8A-N-03072024	65.1	58.3	80.2	74.1	77.5	76.5	70.9	71.3
590-23619-5	EA-MW5A-N-03072024	42.9	36.7	64.3	59.8	59.9	57.8	51.8	48.9
590-23619-6	EA-MW5B-N-03072024	32.0	31.7	54.0	47.8	52.0	48.2	46.1	38.5
590-23619-7	SWN-MW-3-N-03072024	64.2	65.4	81.1	77.0	79.9	75.9	80.1	75.9
590-23619-8	WL-EB-03072024	81.0	65.1	82.8	76.1	77.5	74.2	77.3	71.2
590-23619-9	FB-03072024	58.5	54.0	80.6	73.7	78.8	70.6	81.8	75.2
LCS 320-745917/3-A	Lab Control Sample	64.8	56.0	77.6	74.4	72.5	70.4	72.8	67.9
LCS 320-746595/3-A	Lab Control Sample				68.0	68.4			
LLCS 320-745917/2-A	Lab Control Sample	62.1	57.3	71.3	69.3	68.8	61.2	68.4	60.9
LLCS 320-746595/2-A	Lab Control Sample				65.4	65.0			
MB 320-745917/1-A	Method Blank	64.6	61.2	74.9	72.1	79.4	73.6	76.8	70.2
MB 320-746595/1-A	Method Blank				74.0	73.3			

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23619-1	EA-MW13A-N-03072024	77.9	62.9	54.6	46.5	32.1	28.5	30.2	34.5
590-23619-1 - DL	EA-MW13A-N-03072024								
590-23619-2	EA-MW13B-N-03072024	241 *5+	178	173	111	155 *5+	146 *5+	153 *5+	154 *5+
590-23619-2 - DL	EA-MW13B-N-03072024	76.8 *3				82.3 *3	83.7 *3	71.9 *3	83.3 *3
590-23619-2 - RE	EA-MW13B-N-03072024								
590-23619-3	EA-MW8B-N-03072024	86.0	84.1	86.3	80.9	67.5	66.5	66.8	68.4
590-23619-4	EA-MW8A-N-03072024	83.4	84.4	78.5	78.4	63.5	59.1	59.8	63.1

Isotope Dilution Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23619-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23619-5	EA-MW5A-N-03072024	66.5	64.3	59.3	61.2	38.6	37.1	39.5	42.0
590-23619-6	EA-MW5B-N-03072024	65.0	58.3	51.1	49.8	33.7	32.1	33.7	33.5
590-23619-7	SWN-MW-3-N-03072024	85.9	80.0	77.9	77.1	68.2	65.4	62.7	65.0
590-23619-8	WL-EB-03072024	84.9	87.1	77.1	78.6	65.0	63.4	62.0	60.9
590-23619-9	FB-03072024	82.8	83.7	82.1	78.8	59.3	57.8	56.0	58.2
LCS 320-745917/3-A	Lab Control Sample	70.4	71.4	67.9	76.7	60.6	58.7	57.6	61.5
LCS 320-746595/3-A	Lab Control Sample								
LLCS 320-745917/2-A	Lab Control Sample	66.5	68.5	66.9	70.1	53.7	52.2	50.4	50.0
LLCS 320-746595/2-A	Lab Control Sample								
MB 320-745917/1-A	Method Blank	70.4	68.4	68.9	77.7	68.5	65.4	58.3	58.3
MB 320-746595/1-A	Method Blank								

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS
M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/24/2024 8:30:22 AM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23619-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

Job Notes

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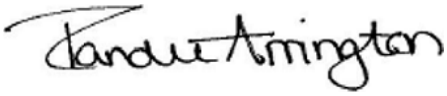

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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23619-2 Eurofins Spokane

Job Narrative
590-23619-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/8/2024 9:33 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 2.4°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6010D - Total Recoverable: The continuing calibration blank (CCB) for analytical batch 590-46419 contained Sodium above the reporting limit (RL). All reported samples associated with this CCB were either ND for this analyte or contained this analyte at a concentration greater than 10X the value found in the CCB; therefore, re-analysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23619-1	EA-MW13A-N-03072024	Water	03/07/24 14:45	03/08/24 09:33
590-23619-2	EA-MW13B-N-03072024	Water	03/07/24 13:40	03/08/24 09:33
590-23619-3	EA-MW8B-N-03072024	Water	03/07/24 12:20	03/08/24 09:33
590-23619-4	EA-MW8A-N-03072024	Water	03/07/24 12:50	03/08/24 09:33
590-23619-5	EA-MW5A-N-03072024	Water	03/07/24 10:10	03/08/24 09:33
590-23619-6	EA-MW5B-N-03072024	Water	03/07/24 11:09	03/08/24 09:33
590-23619-7	SWN-MW-3-N-03072024	Water	03/07/24 16:30	03/08/24 09:33

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

Metals

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: EA-MW13A-N-03072024
Lab Sample ID: 590-23619-1
Date Collected: 03/07/24 14:45
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0		0.80	0.42	mg/L			03/08/24 14:46	1
Nitrate as N	3.8		0.20	0.057	mg/L			03/08/24 14:46	1
Sulfate	7.1		0.50	0.13	mg/L			03/08/24 14:46	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	20		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:25	1
Magnesium	5.3		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:25	1
Potassium	3.0		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:09	1
Sodium	10		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	75	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	1.2		0.12	0.060	mg/L			03/22/24 09:37	2
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2
Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2.4		0.80	0.42	mg/L			03/08/24 15:00	1
Nitrate as N	50		2.0	0.57	mg/L			03/08/24 23:00	10
Sulfate	34		0.50	0.13	mg/L			03/08/24 15:00	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	90		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:29	1
Magnesium	28		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:29	1
Potassium	9.3		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:13	1
Sodium	15		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	200	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	0.58		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.7		0.80	0.42	mg/L			03/08/24 15:10	1
Nitrate as N	1.7		0.20	0.057	mg/L			03/08/24 15:10	1
Sulfate	9.8		0.50	0.13	mg/L			03/08/24 15:10	1

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	22		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:33	1
Magnesium	5.4		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:33	1
Potassium	0.79		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:17	1
Sodium	5.1		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	75	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: EA-MW8A-N-03072024
Lab Sample ID: 590-23619-4
Date Collected: 03/07/24 12:50
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.2		0.80	0.42	mg/L			03/08/24 15:40	1
Nitrate as N	0.77		0.20	0.057	mg/L			03/08/24 15:40	1
Sulfate	3.2		0.50	0.13	mg/L			03/08/24 15:40	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	20		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:38	1
Magnesium	6.1		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:38	1
Potassium	1.7		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:21	1
Sodium	7.7		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	95	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	0.097		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: EA-MW5A-N-03072024
Lab Sample ID: 590-23619-5
Date Collected: 03/07/24 10:10
Matrix: Water
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.9		0.80	0.42	mg/L			03/08/24 15:50	1
Nitrate as N	2.4		0.20	0.057	mg/L			03/08/24 15:50	1
Sulfate	5.3		0.50	0.13	mg/L			03/08/24 15:50	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	20		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:42	1
Magnesium	6.0		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:42	1
Potassium	3.9		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:25	1
Sodium	8.4		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:42	1

Client Sample ID: EA-MW5A-N-03072024 — Lab Sample ID: 590-23619-5

Date Collected: 03/07/24 10:10 — **Matrix: Water**
Date Received: 03/08/24 09:33

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	85	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: EA-MW5B-N-03072024 — Lab Sample ID: 590-23619-6

Date Collected: 03/07/24 11:09 — **Matrix: Water**
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	4.1		0.80	0.42	mg/L			03/08/24 16:00	1
Nitrate as N	3.3		0.20	0.057	mg/L			03/08/24 16:00	1
Sulfate	100		5.0	1.3	mg/L			03/14/24 15:42	10

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	120		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:46	1
Magnesium	26		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:46	1
Potassium	9.4		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:29	1
Sodium	8.8		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 18:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	360	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 11:30	1

Client Sample ID: SWN-MW-3-N-03072024 — Lab Sample ID: 590-23619-7

Date Collected: 03/07/24 16:30 — **Matrix: Water**
Date Received: 03/08/24 09:33

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1000		16	8.4	mg/L			03/14/24 15:52	20
Nitrate as N	ND		0.20	0.057	mg/L			03/08/24 16:10	1
Sulfate	0.77		0.50	0.13	mg/L			03/08/24 16:10	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	200		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 18:50	1
Magnesium	66		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 18:50	1
Potassium	29		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:34	1
Sodium	410	^2	1.0	0.39	mg/L		03/21/24 10:52	03/23/24 19:21	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	510	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	0.31		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	220		120	60	mg/L			03/08/24 11:30	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46188/1003
Matrix: Water
Analysis Batch: 46188

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/08/24 11:59	1

Lab Sample ID: LCS 590-46188/1004
Matrix: Water
Analysis Batch: 46188

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.32		mg/L		106	90 - 110

Lab Sample ID: MB 590-46189/1003
Matrix: Water
Analysis Batch: 46189

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/08/24 11:59	1
Sulfate	ND		0.50	0.13	mg/L			03/08/24 11:59	1

Lab Sample ID: LCS 590-46189/1004
Matrix: Water
Analysis Batch: 46189

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.3		mg/L		107	90 - 110
Sulfate	12.5	13.1		mg/L		105	90 - 110

Lab Sample ID: MB 590-46198/1001
Matrix: Water
Analysis Batch: 46198

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/08/24 22:40	1

Lab Sample ID: LCS 590-46198/1002
Matrix: Water
Analysis Batch: 46198

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.47		mg/L		109	90 - 110

Lab Sample ID: MB 590-46278/1027
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 14:42	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 14:42	1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 590-46278/1015
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.5		mg/L		100	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1
Magnesium	ND		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 17:35	1
Sodium	ND		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:19	1

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	49.9		mg/L		100	80 - 120
Magnesium	50.0	50.6		mg/L		101	80 - 120
Sodium	50.0	50.3		mg/L		101	80 - 154

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Potassium	50.0	52.6		mg/L		105	80 - 135

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46265/1
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/13/24 17:21	1

Method: SM 2320B - Alkalinity (Continued)

Lab Sample ID: LCS 590-46265/2
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Alkalinity as CaCO3			501	505		mg/L		101	90 - 110		

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46398/8
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/22/24 09:37	1

Lab Sample ID: LCS 590-46398/7
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Phosphorus, Total			0.500	0.484		mg/L		97	90 - 110		

Lab Sample ID: 590-23619-1 DU
Matrix: Water
Analysis Batch: 46398

Client Sample ID: EA-MW13A-N-03072024
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Phosphorus, Total	1.2			1.25		mg/L				0.3	20

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46182/2
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 11:30	1

Lab Sample ID: USB 590-46182/1
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 11:30	1

Lab Sample ID: LCS 590-46182/3
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Biochemical Oxygen Demand			198	214		mg/L		108	85 - 115		

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW13A-N-03072024
Lab Sample ID: 590-23619-1
Date Collected: 03/07/24 14:45
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 14:46	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 14:46	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:25	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:09	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		2	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Client Sample ID: EA-MW13B-N-03072024
Lab Sample ID: 590-23619-2
Date Collected: 03/07/24 13:40
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 15:00	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46198	03/08/24 23:00	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:29	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:13	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Client Sample ID: EA-MW8B-N-03072024
Lab Sample ID: 590-23619-3
Date Collected: 03/07/24 12:20
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 15:10	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 15:10	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:33	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:17	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: EA-MW8A-N-03072024
Lab Sample ID: 590-23619-4
Date Collected: 03/07/24 12:50
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 15:40	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 15:40	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:38	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:21	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Client Sample ID: EA-MW5A-N-03072024
Lab Sample ID: 590-23619-5
Date Collected: 03/07/24 10:10
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 15:50	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 15:50	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:42	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:25	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Client Sample ID: EA-MW5B-N-03072024
Lab Sample ID: 590-23619-6
Date Collected: 03/07/24 11:09
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 16:00	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 16:00	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46278	03/14/24 15:42	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:46	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:29	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW-3-N-03072024
Lab Sample ID: 590-23619-7

Date Collected: 03/07/24 16:30
Matrix: Water
Date Received: 03/08/24 09:33

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46188	03/08/24 16:10	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46189	03/08/24 16:10	NMI	EET SPK
Total/NA	Analysis	300.0		20	5 mL	5 mL	46278	03/14/24 15:52	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 18:50	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:34	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		2			46419	03/23/24 19:21	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	5 mL	300 mL	46182	03/08/24 11:30	JSP	EET SPK

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23619-2
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Chain of Custody Record

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

eurofins | Environment Testing America

Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich	Lab Contact:	Carrier:
Address: 505 W Riverside Ave	Tel/Fax:		
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time: ☐CALENDAR DAYS ☐WORKING DAYS		
(xxx) xxx-xxxx: 509 723 5261 Phone	TAT if different from Below: ☐2 weeks ☐1 week ☐2 days ☐1 day		
(xxx) xxx-xxxx FAX			
Project Name: GEG Support			
Site: GEG			
PO # 0209800-000			

COC No: ___1___ of ___1___ COCs

TALS Project #:

Sampler:

For Lab Use Only:
Walk-in Client:
Lab Sampling

Job / SDG No.:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO2, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM4500)	Alkalinity (SM2320B)	BOD (Lab Std.)	Sample Specific Notes:
EA-MW13A-N-03072024	3/7/24	14:45	G		6			X	X	X	X	X	X	
EA-MW13B-N-03072024		13:40						X	X	X	X	X	X	
EA-MW8B-N-03072024		12:20						X	X	X	X	X	X	
EA-MW8A N-03072024		12:50						X	X	X	X	X	X	
EA-MW5A N-03072024		10:10						X	X	X	X	X	X	
EA-MW5B-N-03072024		11:09						X	X	X	X	X	X	
SWN-MW3-N-03072024		16:30						X	X	X	X	X	X	
WL-EB-03072024		16:50			2			X						
FB-03072024		17:00			2			X						

590-23619 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for ___ Months

Special Instructions/QC Requirements & Comments.
EPA 1633 5-day TAT
Remaining Samples Standard TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 2.3 Corr'd: 2.4	Therm ID No.: R006	
Relinquished by:	Company: H&A	Date/Time: 3/8/24 6:30	Received by:	Company: HA	Date/Time: 3/8/2024 0631
Relinquished by: WDM	Company: HA	Date/Time: 3/8/24 0934	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EEC SPS	Date/Time: 3/8/24 9:33

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23619-2

Login Number: 23619
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23619 Field Sheet

Job _____

Tracking # 7101 9600 2664

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other _____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID: 106 Corr. Factor (+/-) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261210

Cooler ID _____

Temp Observed: 1.2 °C Corrected: 1.2 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/09/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/09/24

Notes: _____

Trizma Lot #(s) _____

Ammonium Acetate Lot #(s) _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/09/24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/15/2024 2:00:18 PM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23638-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

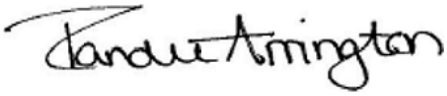
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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3/15/2024 2:00:18 PM

Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23638-1 Eurofins Spokane

Job Narrative
590-23638-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/8/2024 12:52 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.7°C.

PFAS
Method 1633: The following sample in preparation batch 320-745917 was light yellow in color following extraction: LA-MW9-N-03082024 (590-23638-3).

Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-745917.

Method 1633: During the solid phase extraction process, the following sample clogged the cartridge: LA-MW9-N-03082024 (590-23638-3). As such, reporting limits (RLs) are not impacted.

Method 1633: The "I" qualifier means the transition mass ratio for Perfluorooctanesulfonic acid (PFOS) was above the established ratio limits. However, the sample was re-analyzed with concurring result, therefore, the best set of data was reported: LA-MW12-N-03082024 (590-23638-2) .

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23638-1	LA-MW11-N-03082024	Water	03/08/24 08:30	03/08/24 12:52
590-23638-2	LA-MW12-N-03082024	Water	03/08/24 09:14	03/08/24 12:52
590-23638-3	LA-MW9-N-03082024	Water	03/08/24 10:22	03/08/24 12:52
590-23638-4	WL-EB-03082024	Water	03/08/24 10:43	03/08/24 12:52
590-23638-5	FB-03082024	Water	03/08/24 10:50	03/08/24 12:52

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

LCMS

Qualifier	Qualifier Description
I	Value is EMPC (estimated maximum possible concentration).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: LA-MW11-N-03082024
Lab Sample ID: 590-23638-1

Date Collected: 03/08/24 08:30
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**10**		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluoropentanoic acid (PFPeA)	**8.4**		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorohexanoic acid (PFHxA)	**7.8**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluoroheptanoic acid (PFHpA)	**1.7**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorooctanoic acid (PFOA)	**3.1**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorobutanesulfonic acid (PFBS)	**0.67**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluoropentanesulfonic acid (PFPeS)	**0.53**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorohexanesulfonic acid (PFHxS)	**3.9**		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorooctanesulfonic acid (PFOS)	**1.7**	**J**	1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
4:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
6:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
8:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
NMeFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
NEtFOSA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
NMeFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
NEtFOSAA	ND		1.9	0.46	ng/L		03/11/24 03:58	03/11/24 20:27	1
NMeFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 20:27	1
NEtFOSE	ND		19	4.6	ng/L		03/11/24 03:58	03/11/24 20:27	1
HFPO-DA (GenX)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
PFMPA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 20:27	1
PFMBA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 20:27	1
NFDHA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 20:27	1
9Cl-PF3ONS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
11Cl-PF3OUdS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 20:27	1
PFEESA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 20:27	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/11/24 03:58	03/11/24 20:27	1
5:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 20:27	1
7:3 FTCA	ND		46	12	ng/L		03/11/24 03:58	03/11/24 20:27	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*80.1*		*5 - 130*	*03/11/24 03:58*	*03/11/24 20:27*	*1*
13C5 PFPeA	*79.7*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:27*	*1*
13C5 PFHxA	*77.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:27*	*1*

Client Sample ID: LA-MW11-N-03082024 Lab Sample ID: 590-23638-1

Date Collected: 03/08/24 08:30 **Matrix: Water**
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	78.5		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C8 PFOA	72.8		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C9 PFNA	79.7		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C6 PFDA	82.6		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C7 PFUnA	79.6		30 - 130	03/11/24 03:58	03/11/24 20:27	1
13C2 PFDoA	64.3		10 - 130	03/11/24 03:58	03/11/24 20:27	1
13C2 PFTeDA	52.1		10 - 130	03/11/24 03:58	03/11/24 20:27	1
13C3 PFBS	82.7		40 - 135	03/11/24 03:58	03/11/24 20:27	1
13C3 PFHxS	74.8		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C8 PFOS	77.6		40 - 130	03/11/24 03:58	03/11/24 20:27	1
13C8 PFOSA	72.9		40 - 130	03/11/24 03:58	03/11/24 20:27	1
d3-NMeFOSAA	72.6		40 - 170	03/11/24 03:58	03/11/24 20:27	1
d5-NEtFOSAA	67.0		25 - 135	03/11/24 03:58	03/11/24 20:27	1
13C2 4:2 FTS	95.3		40 - 200	03/11/24 03:58	03/11/24 20:27	1
13C2 6:2 FTS	87.6		40 - 200	03/11/24 03:58	03/11/24 20:27	1
13C2 8:2 FTS	80.7		40 - 300	03/11/24 03:58	03/11/24 20:27	1
13C3 HFPO-DA	77.7		40 - 130	03/11/24 03:58	03/11/24 20:27	1
d7-N-MeFOSE-M	59.6		10 - 130	03/11/24 03:58	03/11/24 20:27	1
d9-N-EtFOSE-M	56.8		10 - 130	03/11/24 03:58	03/11/24 20:27	1
d5-NEtPFOSA	57.0		10 - 130	03/11/24 03:58	03/11/24 20:27	1
d3-NMePFOSA	61.8		10 - 130	03/11/24 03:58	03/11/24 20:27	1

Client Sample ID: LA-MW12-N-03082024 Lab Sample ID: 590-23638-2

Date Collected: 03/08/24 09:14 **Matrix: Water**
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**6.9**	**J**	7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluoropentanoic acid (PFPeA)	**7.6**		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorohexanoic acid (PFHxA)	**7.0**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluoroheptanoic acid (PFHpA)	**3.7**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorooctanoic acid (PFOA)	**3.6**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorobutanesulfonic acid (PFBS)	**3.2**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluoropentanesulfonic acid (PFPeS)	**0.78**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorohexanesulfonic acid (PFHxS)	**3.2**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorooctanesulfonic acid (PFOS)	**1.6**	**J I**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: LA-MW12-N-03082024
Lab Sample ID: 590-23638-2
Date Collected: 03/08/24 09:14
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
4:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
6:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
8:2 FTS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 20:44	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 20:44	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 20:44	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
PFMPA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:44	1
PFMBA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:44	1
NFDHA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:44	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/11/24 03:58	03/11/24 20:44	1
PFEESA	ND		3.7	0.94	ng/L		03/11/24 03:58	03/11/24 20:44	1
3:3 FTCA	ND		9.4	2.3	ng/L		03/11/24 03:58	03/11/24 20:44	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 20:44	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 20:44	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.6*		*5 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C5 PFPeA	*72.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C5 PFHxA	*75.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C4 PFHpA	*77.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C8 PFOA	*71.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C9 PFNA	*71.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C6 PFDA	*78.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C7 PFUnA	*73.6*		*30 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C2 PFDoA	*60.0*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C2 PFTeDA	*54.5*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C3 PFBS	*81.9*		*40 - 135*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C3 PFHxS	*72.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C8 PFOS	*73.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C8 PFOSA	*76.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d3-NMeFOSAA	*72.7*		*40 - 170*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d5-NEtFOSAA	*72.1*		*25 - 135*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C2 4:2 FTS	*121*		*40 - 200*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C2 6:2 FTS	*90.6*		*40 - 200*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C2 8:2 FTS	*78.6*		*40 - 300*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
13C3 HFPO-DA	*75.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d7-N-MeFOSE-M	*60.6*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d9-N-EtFOSE-M	*58.6*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d5-NEtPFOSA	*56.1*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*
d3-NMePFOSA	*60.2*		*10 - 130*	*03/11/24 03:58*	*03/11/24 20:44*	*1*

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3

Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**8.8**		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluoropentanoic acid (PFPeA)	**17**		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorohexanoic acid (PFHxA)	**19**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluoroheptanoic acid (PFHpA)	**6.2**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorooctanoic acid (PFOA)	**14**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorononanoic acid (PFNA)	**3.3**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorodecanoic acid (PFDA)	**8.9**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorobutanesulfonic acid (PFBS)	**1.9**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluoropentanesulfonic acid (PFPeS)	**1.5**	**J**	1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorohexanesulfonic acid (PFHxS)	**22**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorooctanesulfonic acid (PFOS)	**14**		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
4:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
6:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
8:2 FTS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
NMeFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
NEtFOSA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/11/24 03:58	03/11/24 21:37	1
NMeFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 21:37	1
NEtFOSE	ND		19	4.7	ng/L		03/11/24 03:58	03/11/24 21:37	1
HFPO-DA (GenX)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
PFMPA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 21:37	1
PFMBA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 21:37	1
NFDHA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 21:37	1
9Cl-PF3ONS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
11Cl-PF3OUdS	ND		7.4	1.9	ng/L		03/11/24 03:58	03/11/24 21:37	1
PFEESA	ND		3.7	0.93	ng/L		03/11/24 03:58	03/11/24 21:37	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/11/24 03:58	03/11/24 21:37	1
5:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 21:37	1
7:3 FTCA	ND		47	12	ng/L		03/11/24 03:58	03/11/24 21:37	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*46.5*		*5 - 130*	*03/11/24 03:58*	*03/11/24 21:37*	*1*
13C5 PFPeA	*44.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:37*	*1*
13C5 PFHxA	*44.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:37*	*1*

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3
Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	44.8		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C8 PFOA	47.8		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C9 PFNA	47.0		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C6 PFDA	42.7		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C7 PFUnA	35.0		30 - 130	03/11/24 03:58	03/11/24 21:37	1
13C2 PFDoA	30.4		10 - 130	03/11/24 03:58	03/11/24 21:37	1
13C2 PFTeDA	22.5		10 - 130	03/11/24 03:58	03/11/24 21:37	1
13C3 PFBS	48.7		40 - 135	03/11/24 03:58	03/11/24 21:37	1
13C3 PFHxS	44.9		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C8 PFOS	47.1		40 - 130	03/11/24 03:58	03/11/24 21:37	1
13C8 PFOSA	46.3		40 - 130	03/11/24 03:58	03/11/24 21:37	1
d3-NMeFOSAA	47.2		40 - 170	03/11/24 03:58	03/11/24 21:37	1
d5-NEtFOSAA	41.4		25 - 135	03/11/24 03:58	03/11/24 21:37	1
13C2 4:2 FTS	62.5		40 - 200	03/11/24 03:58	03/11/24 21:37	1
13C2 6:2 FTS	54.1		40 - 200	03/11/24 03:58	03/11/24 21:37	1
13C2 8:2 FTS	50.4		40 - 300	03/11/24 03:58	03/11/24 21:37	1
13C3 HFPO-DA	42.6		40 - 130	03/11/24 03:58	03/11/24 21:37	1
d7-N-MeFOSE-M	30.8		10 - 130	03/11/24 03:58	03/11/24 21:37	1
d9-N-EtFOSE-M	27.3		10 - 130	03/11/24 03:58	03/11/24 21:37	1
d5-NEtPFOSA	30.0		10 - 130	03/11/24 03:58	03/11/24 21:37	1
d3-NMePFOSA	32.9		10 - 130	03/11/24 03:58	03/11/24 21:37	1

Client Sample ID: WL-EB-03082024
Lab Sample ID: 590-23638-4
Date Collected: 03/08/24 10:43
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluoropentanoic acid (PFPeA)	ND		3.9	0.98	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
4:2 FTS	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1

Client Sample ID: WL-EB-03082024
Lab Sample ID: 590-23638-4
Date Collected: 03/08/24 10:43
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
6:2 FTS	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
8:2 FTS	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
NMeFOSA	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
NEtFOSA	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
NMeFOSAA	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
NEtFOSAA	ND		2.0	0.49	ng/L		03/11/24 03:58	03/11/24 21:55	1
NMeFOSE	ND		20	4.9	ng/L		03/11/24 03:58	03/11/24 21:55	1
NEtFOSE	ND		20	4.9	ng/L		03/11/24 03:58	03/11/24 21:55	1
HFPO-DA (GenX)	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
PFMPA	ND		3.9	0.98	ng/L		03/11/24 03:58	03/11/24 21:55	1
PFMBA	ND		3.9	0.98	ng/L		03/11/24 03:58	03/11/24 21:55	1
NFDHA	ND		3.9	0.98	ng/L		03/11/24 03:58	03/11/24 21:55	1
9Cl-PF3ONS	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
11Cl-PF3OUdS	ND		7.8	2.0	ng/L		03/11/24 03:58	03/11/24 21:55	1
PFEESA	ND		3.9	0.98	ng/L		03/11/24 03:58	03/11/24 21:55	1
3:3 FTCA	ND		9.8	2.4	ng/L		03/11/24 03:58	03/11/24 21:55	1
5:3 FTCA	ND		49	12	ng/L		03/11/24 03:58	03/11/24 21:55	1
7:3 FTCA	ND		49	12	ng/L		03/11/24 03:58	03/11/24 21:55	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.4*		*5 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C5 PFPeA	*77.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C5 PFHxA	*77.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C4 PFHpA	*78.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C8 PFOA	*76.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C9 PFNA	*74.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C6 PFDA	*71.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C7 PFUnA	*66.9*		*30 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C2 PFDoA	*63.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C2 PFTeDA	*58.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C3 PFBS	*77.8*		*40 - 135*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C3 PFHxS	*74.5*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C8 PFOS	*78.3*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C8 PFOSA	*72.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d3-NMeFOSAA	*82.3*		*40 - 170*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d5-NEtFOSAA	*70.6*		*25 - 135*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C2 4:2 FTS	*81.2*		*40 - 200*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C2 6:2 FTS	*83.2*		*40 - 200*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C2 8:2 FTS	*80.7*		*40 - 300*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
13C3 HFPO-DA	*78.6*		*40 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d7-N-MeFOSE-M	*63.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d9-N-EtFOSE-M	*61.8*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d5-NEtPFOSA	*63.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*
d3-NMePFOSA	*62.7*		*10 - 130*	*03/11/24 03:58*	*03/11/24 21:55*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03082024
Lab Sample ID: 590-23638-5
Date Collected: 03/08/24 10:50
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluoropentanoic acid (PFPeA)	ND		3.6	0.91	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorohexanoic acid (PFHxA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorodecanoic acid (PFDA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluoroundecanoic acid (PFUnA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorododecanoic acid (PFDoA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorononanesulfonic acid (PFNS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
4:2 FTS	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
6:2 FTS	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
8:2 FTS	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
Perfluorooctanesulfonamide (FOSA)	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
NMeFOSA	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
NEtFOSA	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
NMeFOSAA	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
NEtFOSAA	ND		1.8	0.45	ng/L		03/11/24 03:58	03/11/24 22:12	1
NMeFOSE	ND		18	4.5	ng/L		03/11/24 03:58	03/11/24 22:12	1
NEtFOSE	ND		18	4.5	ng/L		03/11/24 03:58	03/11/24 22:12	1
HFPO-DA (GenX)	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
PFMPA	ND		3.6	0.91	ng/L		03/11/24 03:58	03/11/24 22:12	1
PFMBA	ND		3.6	0.91	ng/L		03/11/24 03:58	03/11/24 22:12	1
NFDHA	ND		3.6	0.91	ng/L		03/11/24 03:58	03/11/24 22:12	1
9Cl-PF3ONS	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
11Cl-PF3OUdS	ND		7.3	1.8	ng/L		03/11/24 03:58	03/11/24 22:12	1
PFEESA	ND		3.6	0.91	ng/L		03/11/24 03:58	03/11/24 22:12	1
3:3 FTCA	ND		9.1	2.3	ng/L		03/11/24 03:58	03/11/24 22:12	1
5:3 FTCA	ND		45	11	ng/L		03/11/24 03:58	03/11/24 22:12	1
7:3 FTCA	ND		45	11	ng/L		03/11/24 03:58	03/11/24 22:12	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.2*		*5 - 130*	*03/11/24 03:58*	*03/11/24 22:12*	*1*
13C5 PFPeA	*77.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 22:12*	*1*
13C5 PFHxA	*72.4*		*40 - 130*	*03/11/24 03:58*	*03/11/24 22:12*	*1*
13C4 PFHpA	*77.8*		*40 - 130*	*03/11/24 03:58*	*03/11/24 22:12*	*1*
13C8 PFOA	*74.0*		*40 - 130*	*03/11/24 03:58*	*03/11/24 22:12*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03082024
Lab Sample ID: 590-23638-5
Date Collected: 03/08/24 10:50
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	66.3		40 - 130	03/11/24 03:58	03/11/24 22:12	1
13C6 PFDA	73.5		40 - 130	03/11/24 03:58	03/11/24 22:12	1
13C7 PFUnA	73.3		30 - 130	03/11/24 03:58	03/11/24 22:12	1
13C2 PFDoA	59.3		10 - 130	03/11/24 03:58	03/11/24 22:12	1
13C2 PFTeDA	59.2		10 - 130	03/11/24 03:58	03/11/24 22:12	1
13C3 PFBS	78.5		40 - 135	03/11/24 03:58	03/11/24 22:12	1
13C3 PFHxS	75.5		40 - 130	03/11/24 03:58	03/11/24 22:12	1
13C8 PFOS	75.6		40 - 130	03/11/24 03:58	03/11/24 22:12	1
13C8 PFOSA	77.0		40 - 130	03/11/24 03:58	03/11/24 22:12	1
d3-NMeFOSAA	80.7		40 - 170	03/11/24 03:58	03/11/24 22:12	1
d5-NEtFOSAA	78.3		25 - 135	03/11/24 03:58	03/11/24 22:12	1
13C2 4:2 FTS	77.1		40 - 200	03/11/24 03:58	03/11/24 22:12	1
13C2 6:2 FTS	78.3		40 - 200	03/11/24 03:58	03/11/24 22:12	1
13C2 8:2 FTS	81.4		40 - 300	03/11/24 03:58	03/11/24 22:12	1
13C3 HFPO-DA	78.8		40 - 130	03/11/24 03:58	03/11/24 22:12	1
d7-N-MeFOSE-M	65.9		10 - 130	03/11/24 03:58	03/11/24 22:12	1
d9-N-EtFOSE-M	63.6		10 - 130	03/11/24 03:58	03/11/24 22:12	1
d5-NEtPFOSA	62.2		10 - 130	03/11/24 03:58	03/11/24 22:12	1
d3-NMePFOSA	60.3		10 - 130	03/11/24 03:58	03/11/24 22:12	1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
4:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
6:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
8:2 FTS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/11/24 03:58	03/11/24 14:34	1
NMeFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NEtFOSE	ND		20	5.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMPA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFMBA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
NFDHA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
PFEESA	ND		4.0	1.0	ng/L		03/11/24 03:58	03/11/24 14:34	1
3:3 FTCA	ND		10	2.5	ng/L		03/11/24 03:58	03/11/24 14:34	1
5:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1
7:3 FTCA	ND		50	13	ng/L		03/11/24 03:58	03/11/24 14:34	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*72.7*		*5 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFPeA	*73.9*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*
13C5 PFHxA	*73.2*		*40 - 130*	*03/11/24 03:58*	*03/11/24 14:34*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-745917/1-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	73.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C9 PFNA	70.3		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C6 PFDA	68.2		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C7 PFUnA	73.3		30 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFDoA	64.6		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C2 PFTeDA	61.2		10 - 130	03/11/24 03:58	03/11/24 14:34	1
13C3 PFBS	74.9		40 - 135	03/11/24 03:58	03/11/24 14:34	1
13C3 PFHxS	72.1		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOS	79.4		40 - 130	03/11/24 03:58	03/11/24 14:34	1
13C8 PFOSA	73.6		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMeFOSAA	76.8		40 - 170	03/11/24 03:58	03/11/24 14:34	1
d5-NEtFOSAA	70.2		25 - 135	03/11/24 03:58	03/11/24 14:34	1
13C2 4:2 FTS	70.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 6:2 FTS	68.4		40 - 200	03/11/24 03:58	03/11/24 14:34	1
13C2 8:2 FTS	68.9		40 - 300	03/11/24 03:58	03/11/24 14:34	1
13C3 HFPO-DA	77.7		40 - 130	03/11/24 03:58	03/11/24 14:34	1
d7-N-MeFOSE-M	68.5		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d9-N-EtFOSE-M	65.4		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d5-NEtPFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1
d3-NMePFOSA	58.3		10 - 130	03/11/24 03:58	03/11/24 14:34	1

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	127		ng/L		99	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	57.3		ng/L		89	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	27.8		ng/L		87	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	28.0		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	28.6		ng/L		89	70 - 150
Perfluorononanoic acid (PFNA)	32.0	31.4		ng/L		98	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	30.0		ng/L		94	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	32.4		ng/L		101	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	35.2		ng/L		110	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	33.8		ng/L		106	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	32.7		ng/L		102	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	27.1		ng/L		95	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	26.9		ng/L		90	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	28.1		ng/L		96	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	28.5		ng/L		93	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	28.8		ng/L		97	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	25.2		ng/L		82	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.3		ng/L		72	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	22.8		ng/L		74	50 - 145
4:2 FTS	120	107		ng/L		89	70 - 145
6:2 FTS	122	112		ng/L		92	65 - 155
8:2 FTS	123	126		ng/L		103	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	31.3		ng/L		98	70 - 145
NMeFOSA	32.0	27.4		ng/L		86	60 - 150
NEtFOSA	32.0	34.9		ng/L		109	65 - 145
NMeFOSAA	32.0	33.0		ng/L		103	50 - 140
NEtFOSAA	32.0	28.0		ng/L		88	70 - 145
NMeFOSE	320	319		ng/L		100	70 - 145
NEtFOSE	320	330		ng/L		103	70 - 135
HFPO-DA (GenX)	128	139		ng/L		109	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	112		ng/L		92	65 - 145
PFMPA	64.0	60.9		ng/L		95	55 - 140
PFMBA	64.0	51.2		ng/L		80	60 - 150
NFDHA	64.0	66.0		ng/L		103	50 - 150
9Cl-PF3ONS	120	115		ng/L		97	70 - 155
11Cl-PF3OUdS	121	112		ng/L		93	55 - 160
PFEESA	57.1	56.0		ng/L		98	70 - 140
3:3 FTCA	160	148		ng/L		93	65 - 130
5:3 FTCA	799	776		ng/L		97	70 - 135
7:3 FTCA	799	742		ng/L		93	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*76.6*		*5 - 130*
13C5 PFPeA	*73.6*		*40 - 130*
13C5 PFHxA	*73.7*		*40 - 130*
13C4 PFHpA	*75.4*		*40 - 130*
13C8 PFOA	*75.8*		*40 - 130*
13C9 PFNA	*74.4*		*40 - 130*
13C6 PFDA	*73.6*		*40 - 130*
13C7 PFUnA	*67.6*		*30 - 130*
13C2 PFDoA	*64.8*		*10 - 130*
13C2 PFTeDA	*56.0*		*10 - 130*
13C3 PFBS	*77.6*		*40 - 135*
13C3 PFHxS	*74.4*		*40 - 130*
13C8 PFOS	*72.5*		*40 - 130*
13C8 PFOSA	*70.4*		*40 - 130*
d3-NMeFOSAA	*72.8*		*40 - 170*
d5-NEtFOSAA	*67.9*		*25 - 135*
13C2 4:2 FTS	*70.4*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-745917/3-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*71.4*		*40 - 200*
13C2 8:2 FTS	*67.9*		*40 - 300*
13C3 HFPO-DA	*76.7*		*40 - 130*
d7-N-MeFOSE-M	*60.6*		*10 - 130*
d9-N-EtFOSE-M	*58.7*		*10 - 130*
d5-NEtPFOSA	*57.6*		*10 - 130*
d3-NMePFOSA	*61.5*		*10 - 130*

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	12.9		ng/L		101	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	5.79		ng/L		90	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.00		ng/L		94	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	2.79		ng/L		87	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	2.93		ng/L		92	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.15		ng/L		99	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	2.96		ng/L		93	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.76		ng/L		118	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.46		ng/L		108	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.53		ng/L		110	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.14		ng/L		98	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	2.52		ng/L		89	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.63		ng/L		87	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.02		ng/L		103	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.54		ng/L		83	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	2.73		ng/L		92	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.20		ng/L		71	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.15		ng/L		70	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.22		ng/L		71	50 - 145
4:2 FTS	12.0	10.7		ng/L		89	70 - 145
6:2 FTS	12.2	11.6		ng/L		95	65 - 155
8:2 FTS	12.3	13.2		ng/L		107	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.25		ng/L		102	70 - 145
NMeFOSA	3.20	2.99		ng/L		94	60 - 150
NEtFOSA	3.20	3.29		ng/L		103	65 - 145
NMeFOSAA	3.20	3.13		ng/L		98	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-745917/2-A
Matrix: Water
Analysis Batch: 746051

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 745917

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
NEtFOSAA			3.20	2.66		ng/L		83	70 - 145		
NMeFOSE			32.0	31.8		ng/L		99	70 - 145		
NEtFOSE			32.0	32.4		ng/L		101	70 - 135		
HFPO-DA (GenX)			12.8	13.3		ng/L		104	70 - 140		
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)			12.1	11.1		ng/L		92	65 - 145		
PFMPA			6.40	6.18		ng/L		97	55 - 140		
PFMBA			6.40	4.75		ng/L		74	60 - 150		
NFDHA			6.40	6.67		ng/L		104	50 - 150		
9Cl-PF3ONS			12.0	11.1		ng/L		93	70 - 155		
11Cl-PF3OUdS			12.1	11.0		ng/L		91	55 - 160		
PFEESA			5.71	5.77		ng/L		101	70 - 140		
3:3 FTCA			16.0	14.6		ng/L		91	65 - 130		
5:3 FTCA			79.9	77.6		ng/L		97	70 - 135		
7:3 FTCA			79.9	73.8		ng/L		92	50 - 145		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*71.6*		*5 - 130*
13C5 PFPeA	*68.2*		*40 - 130*
13C5 PFHxA	*66.5*		*40 - 130*
13C4 PFHpA	*70.3*		*40 - 130*
13C8 PFOA	*70.9*		*40 - 130*
13C9 PFNA	*66.4*		*40 - 130*
13C6 PFDA	*74.3*		*40 - 130*
13C7 PFUnA	*75.0*		*30 - 130*
13C2 PFDoA	*62.1*		*10 - 130*
13C2 PFTeDA	*57.3*		*10 - 130*
13C3 PFBS	*71.3*		*40 - 135*
13C3 PFHxS	*69.3*		*40 - 130*
13C8 PFOS	*68.8*		*40 - 130*
13C8 PFOSA	*61.2*		*40 - 130*
d3-NMeFOSAA	*68.4*		*40 - 170*
d5-NEtFOSAA	*60.9*		*25 - 135*
13C2 4:2 FTS	*66.5*		*40 - 200*
13C2 6:2 FTS	*68.5*		*40 - 200*
13C2 8:2 FTS	*66.9*		*40 - 300*
13C3 HFPO-DA	*70.1*		*40 - 130*
d7-N-MeFOSE-M	*53.7*		*10 - 130*
d9-N-EtFOSE-M	*52.2*		*10 - 130*
d5-NEtPFOSA	*50.4*		*10 - 130*
d3-NMePFOSA	*50.0*		*10 - 130*

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: LA-MW11-N-03082024
Lab Sample ID: 590-23638-1
Date Collected: 03/08/24 08:30
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			538.5 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 20:27	RS1	EET SAC

Client Sample ID: LA-MW12-N-03082024
Lab Sample ID: 590-23638-2
Date Collected: 03/08/24 09:14
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			533.9 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 20:44	RS1	EET SAC

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3
Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			537.3 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 21:37	RS1	EET SAC

Client Sample ID: WL-EB-03082024
Lab Sample ID: 590-23638-4
Date Collected: 03/08/24 10:43
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			510.5 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 21:55	RS1	EET SAC

Client Sample ID: FB-03082024
Lab Sample ID: 590-23638-5
Date Collected: 03/08/24 10:50
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			549.7 mL	5.0 mL	745917	03/11/24 03:58	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			746051	03/11/24 22:12	RS1	EET SAC

Laboratory References:
EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

eurofins | Environment Testing America

Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email:	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside	Tel/Fax			TALS Project #:
City/State/Zip: Spokane WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723 5224 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx FAX	TAT if different from Below			Walk-in Client:
Project Name: GEC Support	☐ 2 weeks			Lab Sampling
Site: GEC	☐ 1 week			
PO # 0209800-000	☐ 2 days			Job / SDG No.
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, SO4, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
LA-MW11-N-03082024	3/8/24	8:30						X	X	X	X	X	X	
LA-MW12-N-03082024		9:14						X	X	X	X	X	X	
LA-MW9-N-03082024		10:22						X	X	X	X	X	X	
WL-EB-03082024		10:43						X						
FB-03082024		10:50						X						

590-23638 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
1633 5-day TAT
remainig samples standard TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd: 4.6 Corr'd. 4.7	Therm ID No.: IR0006

Relinquished by:	Company: HA	Date/Time: 3/8/24 12:50	Received by:	Company: EEC	Date/Time: 3/8/24 12:52
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

3/15/2024

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone. 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8841 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23638-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/28/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
LA-MW11-N-03082024 (590-23638-1)	3/8/24	08 30 Pacific		Water			X	2	
LA-MW12-N-03082024 (590-23638-2)	3/8/24	09 14 Pacific		Water			X	2	
LA-MW9-N-03082024 (590-23638-3)	3/8/24	10:22 Pacific		Water			X	2	
WL-EB-03082024 (590-23638-4)	3/8/24	10:43 Pacific		Water			X	2	
FB-03082024 (590-23638-5)	3/8/24	10 50 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	3/8/24 15:25	EET SPO		03/09/24 0845	EETSPK
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No. 2261210	Cooler Temperature(s) °C and Other Remarks: 1, 2°C

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23638-1

Login Number: 23638
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23638-1

Login Number: 23638
List Number: 2
Creator: Morazzini, Dominic S

List Source: Eurofins Sacramento
List Creation: 03/09/24 10:14 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261210
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23638 Field Sheet

Job _____

Tracking # 7101 9600 2664

SO / PO / FO / (SAT) / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID: 106 Corr. Factor (+/-) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261210

Cooler ID _____

Temp Observed: 1.2 °C Corrected 1.2 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/09/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/09/24

Notes:_____

Trizma Lot #(s). _____

Ammonium Acetate Lot #(s). _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/09/24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFBA	PFPeA	13C5PHA	C4PFHA	C8PFOA	C9PFNA	C6PFDA	13C7PUA
Lab Sample ID	Client Sample ID	(5-130)	(40-130)	(40-130)	(40-130)	(40-130)	(40-130)	(40-130)	(30-130)
590-23638-1	LA-MW11-N-03082024	80.1	79.7	77.0	78.5	72.8	79.7	82.6	79.6
590-23638-2	LA-MW12-N-03082024	77.6	72.8	75.3	77.5	71.4	71.5	78.9	73.6
590-23638-3	LA-MW9-N-03082024	46.5	44.6	44.2	44.8	47.8	47.0	42.7	35.0
590-23638-4	WL-EB-03082024	77.4	77.8	77.8	78.2	76.6	74.5	71.6	66.9
590-23638-5	FB-03082024	77.2	77.8	72.4	77.8	74.0	66.3	73.5	73.3
LCS 320-745917/3-A	Lab Control Sample	76.6	73.6	73.7	75.4	75.8	74.4	73.6	67.6
LLCS 320-745917/2-A	Lab Control Sample	71.6	68.2	66.5	70.3	70.9	66.4	74.3	75.0
MB 320-745917/1-A	Method Blank	72.7	73.9	73.2	73.7	73.6	70.3	68.2	73.3

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFDoA	PFTDA	C3PFBS	C3PFHS	C8PFOS	PFOSA	d3NMFOS	d5NEFOS
Lab Sample ID	Client Sample ID	(10-130)	(10-130)	(40-135)	(40-130)	(40-130)	(40-130)	(40-170)	(25-135)
590-23638-1	LA-MW11-N-03082024	64.3	52.1	82.7	74.8	77.6	72.9	72.6	67.0
590-23638-2	LA-MW12-N-03082024	60.0	54.5	81.9	72.8	73.4	76.2	72.7	72.1
590-23638-3	LA-MW9-N-03082024	30.4	22.5	48.7	44.9	47.1	46.3	47.2	41.4
590-23638-4	WL-EB-03082024	63.7	58.7	77.8	74.5	78.3	72.8	82.3	70.6
590-23638-5	FB-03082024	59.3	59.2	78.5	75.5	75.6	77.0	80.7	78.3
LCS 320-745917/3-A	Lab Control Sample	64.8	56.0	77.6	74.4	72.5	70.4	72.8	67.9
LLCS 320-745917/2-A	Lab Control Sample	62.1	57.3	71.3	69.3	68.8	61.2	68.4	60.9
MB 320-745917/1-A	Method Blank	64.6	61.2	74.9	72.1	79.4	73.6	76.8	70.2

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		M242FTS	M262FTS	M282FTS	HFPODA	NMFM	NEFM	d5NPFSA	d3NMFSA
Lab Sample ID	Client Sample ID	(40-200)	(40-200)	(40-300)	(40-130)	(10-130)	(10-130)	(10-130)	(10-130)
590-23638-1	LA-MW11-N-03082024	95.3	87.6	80.7	77.7	59.6	56.8	57.0	61.8
590-23638-2	LA-MW12-N-03082024	121	90.6	78.6	75.0	60.6	58.6	56.1	60.2
590-23638-3	LA-MW9-N-03082024	62.5	54.1	50.4	42.6	30.8	27.3	30.0	32.9
590-23638-4	WL-EB-03082024	81.2	83.2	80.7	78.6	63.8	61.8	63.7	62.7
590-23638-5	FB-03082024	77.1	78.3	81.4	78.8	65.9	63.6	62.2	60.3
LCS 320-745917/3-A	Lab Control Sample	70.4	71.4	67.9	76.7	60.6	58.7	57.6	61.5
LLCS 320-745917/2-A	Lab Control Sample	66.5	68.5	66.9	70.1	53.7	52.2	50.4	50.0
MB 320-745917/1-A	Method Blank	70.4	68.4	68.9	77.7	68.5	65.4	58.3	58.3

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-1
Project/Site: GEG Groundwater Monitoring/209800-000

M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/24/2024 8:38:12 AM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23638-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

Job Notes

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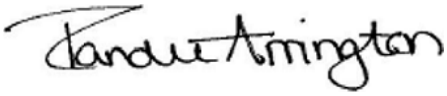
Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23638-2 Eurofins Spokane

Job Narrative
590-23638-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/8/2024 12:52 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.7°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23638-1	LA-MW11-N-03082024	Water	03/08/24 08:30	03/08/24 12:52
590-23638-2	LA-MW12-N-03082024	Water	03/08/24 09:14	03/08/24 12:52
590-23638-3	LA-MW9-N-03082024	Water	03/08/24 10:22	03/08/24 12:52

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

Metals

Qualifier	Qualifier Description
^1+	Initial Calibration Verification (ICV) is outside acceptance limits, high biased.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: LA-MW11-N-03082024
Lab Sample ID: 590-23638-1
Date Collected: 03/08/24 08:30
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32		0.80	0.42	mg/L			03/08/24 19:10	1
Nitrate as N	3.7		0.20	0.057	mg/L			03/08/24 19:10	1
Sulfate	6.8		0.50	0.13	mg/L			03/08/24 19:10	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	24		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 19:32	1
Magnesium	7.8		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 19:32	1
Potassium	4.7		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:38	1
Sodium	7.5		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 19:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	70	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 15:00	1

Client Sample ID: LA-MW12-N-03082024
Lab Sample ID: 590-23638-2
Date Collected: 03/08/24 09:14
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	64		0.80	0.42	mg/L			03/08/24 19:20	1
Nitrate as N	4.1		0.20	0.057	mg/L			03/08/24 19:20	1
Sulfate	21		0.50	0.13	mg/L			03/08/24 19:20	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	51		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 19:36	1
Magnesium	15		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 19:36	1
Potassium	3.9		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:42	1
Sodium	20		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 19:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	130	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/08/24 15:00	1

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3
Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	360		8.0	4.2	mg/L			03/14/24 16:02	10
Nitrate as N	ND		0.20	0.057	mg/L			03/08/24 19:50	1
Sulfate	9.3		0.50	0.13	mg/L			03/08/24 19:50	1

Client Sample Results

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3
Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	120		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 19:40	1
Magnesium	36		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 19:40	1
Potassium	8.1		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 14:46	1
Sodium	67		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 19:40	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	190	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	1.6	J	2.4	1.2	mg/L			03/08/24 15:00	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46196/1001
Matrix: Water
Analysis Batch: 46196

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/08/24 17:30	1

Lab Sample ID: LCS 590-46196/1002
Matrix: Water
Analysis Batch: 46196

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.40		mg/L		108	90 - 110

Lab Sample ID: MB 590-46197/1001
Matrix: Water
Analysis Batch: 46197

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/08/24 17:30	1
Sulfate	ND		0.50	0.13	mg/L			03/08/24 17:30	1

Lab Sample ID: LCS 590-46197/1002
Matrix: Water
Analysis Batch: 46197

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.5		mg/L		108	90 - 110
Sulfate	12.5	13.3		mg/L		107	90 - 110

Lab Sample ID: MB 590-46278/1027
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 14:42	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 14:42	1

Lab Sample ID: LCS 590-46278/1015
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.5		mg/L		100	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1
Magnesium	ND		1.0	0.13	mg/L		03/21/24 10:52	03/21/24 17:35	1

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND	^1+	0.50	0.29	mg/L		03/21/24 10:52	03/21/24 17:35	1
Sodium	ND		0.50	0.20	mg/L		03/21/24 10:52	03/21/24 17:35	1

Lab Sample ID: MB 590-46381/2-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/21/24 10:52	03/23/24 13:19	1

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46404

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	49.9		mg/L		100	80 - 120
Magnesium	50.0	50.6		mg/L		101	80 - 120
Potassium	50.0	49.1	^1+	mg/L		98	80 - 135
Sodium	50.0	50.3		mg/L		101	80 - 154

Lab Sample ID: LCS 590-46381/1-A
Matrix: Water
Analysis Batch: 46418

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46381

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Potassium	50.0	52.6		mg/L		105	80 - 135

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46265/1
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/13/24 17:21	1

Lab Sample ID: LCS 590-46265/2
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	505		mg/L		101	90 - 110

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46398/8
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/22/24 09:37	1

Method: SM 4500 P E - Phosphorus

Lab Sample ID: LCS 590-46398/7
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Phosphorus, Total	0.500	0.484		mg/L		97	90 - 110

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46182/2
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 11:30	1

Lab Sample ID: USB 590-46182/1
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/08/24 11:30	1

Lab Sample ID: LCS 590-46182/3
Matrix: Water
Analysis Batch: 46182

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	214		mg/L		108	85 - 115

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: LA-MW11-N-03082024
Lab Sample ID: 590-23638-1
Date Collected: 03/08/24 08:30
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46196	03/08/24 19:10	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46197	03/08/24 19:10	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 19:32	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:38	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 15:00	JSP	EET SPK

Client Sample ID: LA-MW12-N-03082024
Lab Sample ID: 590-23638-2
Date Collected: 03/08/24 09:14
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46196	03/08/24 19:20	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46197	03/08/24 19:20	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 19:36	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:42	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 15:00	JSP	EET SPK

Client Sample ID: LA-MW9-N-03082024
Lab Sample ID: 590-23638-3
Date Collected: 03/08/24 10:22
Matrix: Water
Date Received: 03/08/24 12:52

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46196	03/08/24 19:50	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46197	03/08/24 19:50	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46278	03/14/24 16:02	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46404	03/21/24 19:40	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46381	03/21/24 10:52	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46418	03/23/24 14:46	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46182	03/08/24 15:00	JSP	EET SPK

Laboratory References:
EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23638-2
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email:	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside	Tel/Fax			TALS Project #:
City/State/Zip: Spokane WA 99201	Analysis Turnaround Time: ☐CALENDAR DAYS ☐WORKING DAYS			Sampler:
(xxx) xxx-xxxx: 509 723 5924 Phone	TAT if different from Below: ☐2 weeks ☐1 week ☐2 days ☐1 day			For Lab Use Only: Walk-in Client: / Lab Sampling:
(xxx) xxx-xxxx FAX				
Project Name: GEC Support				Job / SDG No.
Site: GEC				
PO # 0209800-000				

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, SO4, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
LA-MW11-N-03082024	3/8/24	8:30						X	X	X	X	X	X	
LA-MW12-N-03082024		9:14						X	X	X	X	X	X	
LA-MW9-N-03082024		10:22						X	X	X	X	X	X	
WL-EB-03082024		10:43						X						
FB-03082024		10:50						X						

590-23638 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6= Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments
1633 5-day TAT
remainig samples standard TAT

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd: 4.6 Corr'd: 4.7	Therm ID No.: IR0006
Relinquished by:	Company: H&A 12.50	Date/Time: 3/8/24	Received by:	Company: EEC 8:20	Date/Time: 3/8/24 12 52
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23638-2

Login Number: 23638
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

590-23638 Field Sheet

Job _____

Tracking # 7101 9600 2664

SO / PO / FO / (SAT) / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID: 106 Corr. Factor (+/-) NA °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal 2261210

Cooler ID _____

Temp Observed: 1.2 °C Corrected 1.2 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials DM Date 03/09/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials DM Date 03/09/24

Notes:_____

Trizma Lot #(s). _____

Ammonium Acetate Lot #(s). _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials DM Date 03/09/24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/20/2024 4:38:58 PM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23660-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

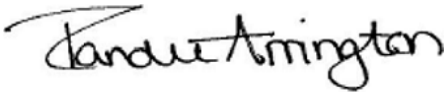
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23660-1 Eurofins Spokane

Job Narrative
590-23660-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/12/2024 9:42 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 3.6°C.

PFAS
Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate/sample duplicate (MS/MSD/DUP) associated with preparation batch 320-747045.

Method 1633: The following samples in preparation batch 320-747045 were pale yellow in color prior to extraction. SWN-MW13-N-03112024 (590-23660-4) and SWN-MW13-FD-03112024 (590-23660-5)

Method 1633: The following samples in preparation batch 320-747045 were observed to have a thin layer of sediment present in the bottom of the bottle prior to extraction. SWN-MWA-N-03112024 (590-23660-1) and SWN-MW6-N-03112024 (590-23660-2)

Method 1633: The following sample in preparation batch 320-747045 was brown in color prior to extraction. SWN-MW6-N-03112024 (590-23660-2)

Method 1633: The following sample in preparation batch 320-747045 was light brown in color prior to extraction. SWN-MWA-N-03112024 (590-23660-1)

Method 1633: Due the presence of sediment within the samples, the initial volumes used for the following samples SWN-MWA-N-03112024 (590-23660-1) and SWN-MW6-N-03112024 (590-23660-2) in preparation batch 320-747045 deviated from the standard procedure. A 2x dilution was made on the samples, then fortified IDA and extracted. The reporting limits (RLs) have been adjusted proportionately.

Method 1633: The concentration of one or more analytes associated with the following sample exceeded the instrument calibration range: SWN-MW1-N-03112024 (590-23660-7). These analytes have been qualified; however, the peak did not saturate the instrument detector. . Historical data indicate that for the isotope dilution method, dilution and re-analysis will not produce significantly different results from those reported above the calibration range.

Method 1633: Isotope Dilution Analyte (IDA) recovery for 13C7 PFUnA is above the method recommended limit for the following continuing calibration verification (CCV) and continuing calibration blank (CCB): SWN-MW13-N-03112024 (590-23660-4), SWN-MW13-FD-03112024 (590-23660-5), SWN-MW2-N-03112024 (590-23660-6), SWN-MW1-N-03112024 (590-23660-7), WL-EB-03112024 (590-23660-8), FB-03112024 (590-23660-9), (CCB 320-748032/29) and (CCV 320-748032/28). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries. The samples, method blank (MB), low level laboratory control sample (LLCS), and laboratory control sample (LCS) are within limits for the IDA; and the associated samples are non-detect for the affected target analyte, Perfluoroundecanoic acid.therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23660-1	SWN-MWA-N-03112024	Water	03/11/24 08:50	03/12/24 09:42
590-23660-2	SWN-MW6-N-03112024	Water	03/11/24 10:50	03/12/24 09:42
590-23660-3	SWN-MW14-N-03112024	Water	03/11/24 11:45	03/12/24 09:42
590-23660-4	SWN-MW13-N-03112024	Water	03/11/24 13:15	03/12/24 09:42
590-23660-5	SWN-MW13-FD-03112024	Water	03/11/24 13:45	03/12/24 09:42
590-23660-6	SWN-MW2-N-03112024	Water	03/11/24 14:50	03/12/24 09:42
590-23660-7	SWN-MW1-N-03112024	Water	03/11/24 16:05	03/12/24 09:42
590-23660-8	WL-EB-03112024	Water	03/11/24 16:25	03/12/24 09:42
590-23660-9	FB-03112024	Water	03/11/24 16:30	03/12/24 09:42

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

LCMS

Qualifier	Qualifier Description
E	Result exceeded calibration range.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: SWN-MWA-N-03112024
Lab Sample ID: 590-23660-1

Date Collected: 03/11/24 08:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**49**		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluoropentanoic acid (PFPeA)	**78**		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorohexanoic acid (PFHxA)	**60**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluoroheptanoic acid (PFHpA)	**31**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorooctanoic acid (PFOA)	**53**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorononanoic acid (PFNA)	**17**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorodecanoic acid (PFDA)	**31**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluoroundecanoic acid (PFUnA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorododecanoic acid (PFDoA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorotridecanoic acid (PFTrDA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorotetradecanoic acid (PFTeA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorobutanesulfonic acid (PFBS)	**11**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluoropentanesulfonic acid (PFPeS)	**2.8**	**J**	4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorohexanesulfonic acid (PFHxS)	**33**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorooctanesulfonic acid (PFOS)	**26**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorononanesulfonic acid (PFNS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorodecanesulfonic acid (PFDS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorododecanesulfonic acid (PFDoS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
4:2 FTS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
6:2 FTS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
8:2 FTS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
Perfluorooctanesulfonamide (FOSA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NMeFOSA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NEtFOSA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NMeFOSAA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NEtFOSAA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NMeFOSE	ND		40	10	ng/L		03/14/24 11:25	03/16/24 17:07	1
NEtFOSE	ND		40	10	ng/L		03/14/24 11:25	03/16/24 17:07	1
HFPO-DA (GenX)	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
PFMPA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
PFMBA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
NFDHA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
9Cl-PF3ONS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
11Cl-PF3OUdS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
PFEESA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
3:3 FTCA	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 17:07	1
5:3 FTCA	ND		100	25	ng/L		03/14/24 11:25	03/16/24 17:07	1
7:3 FTCA	ND		100	25	ng/L		03/14/24 11:25	03/16/24 17:07	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*76.3*		*5 - 130*	*03/14/24 11:25*	*03/16/24 17:07*	*1*
13C5 PFPeA	*70.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:07*	*1*
13C5 PFHxA	*75.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:07*	*1*

Client Sample ID: SWN-MWA-N-03112024 Lab Sample ID: 590-23660-1

Date Collected: 03/11/24 08:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	78.9		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C8 PFOA	74.2		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C9 PFNA	69.3		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C6 PFDA	71.4		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C7 PFUnA	61.2		30 - 130	03/14/24 11:25	03/16/24 17:07	1
13C2 PFDoA	43.7		10 - 130	03/14/24 11:25	03/16/24 17:07	1
13C2 PFTeDA	48.4		10 - 130	03/14/24 11:25	03/16/24 17:07	1
13C3 PFBS	87.3		40 - 135	03/14/24 11:25	03/16/24 17:07	1
13C3 PFHxS	76.7		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C8 PFOS	72.0		40 - 130	03/14/24 11:25	03/16/24 17:07	1
13C8 PFOSA	68.5		40 - 130	03/14/24 11:25	03/16/24 17:07	1
d3-NMeFOSAA	57.4		40 - 170	03/14/24 11:25	03/16/24 17:07	1
d5-NEtFOSAA	57.4		25 - 135	03/14/24 11:25	03/16/24 17:07	1
13C2 4:2 FTS	133		40 - 200	03/14/24 11:25	03/16/24 17:07	1
13C2 6:2 FTS	89.8		40 - 200	03/14/24 11:25	03/16/24 17:07	1
13C2 8:2 FTS	72.4		40 - 300	03/14/24 11:25	03/16/24 17:07	1
13C3 HFPO-DA	73.8		40 - 130	03/14/24 11:25	03/16/24 17:07	1
d7-N-MeFOSE-M	49.7		10 - 130	03/14/24 11:25	03/16/24 17:07	1
d9-N-EtFOSE-M	44.0		10 - 130	03/14/24 11:25	03/16/24 17:07	1
d5-NEtPFOSA	50.9		10 - 130	03/14/24 11:25	03/16/24 17:07	1
d3-NMePFOSA	48.7		10 - 130	03/14/24 11:25	03/16/24 17:07	1

Client Sample ID: SWN-MW6-N-03112024 Lab Sample ID: 590-23660-2

Date Collected: 03/11/24 10:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**23**		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluoropentanoic acid (PFPeA)	**49**		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorohexanoic acid (PFHxA)	**59**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluoroheptanoic acid (PFHpA)	**20**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorooctanoic acid (PFOA)	**56**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorononanoic acid (PFNA)	**12**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorodecanoic acid (PFDA)	**40**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluoroundecanoic acid (PFUnA)	**4.9**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorododecanoic acid (PFDoA)	**5.3**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorotridecanoic acid (PFTrDA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorotetradecanoic acid (PFTeA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorobutanesulfonic acid (PFBS)	**3.8**	**J**	4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluoropentanesulfonic acid (PFPeS)	**2.8**	**J**	4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorohexanesulfonic acid (PFHxS)	**87**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorooctanesulfonic acid (PFOS)	**26**		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorononanesulfonic acid (PFNS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1

Client Sample ID: SWN-MW6-N-03112024
Lab Sample ID: 590-23660-2

Date Collected: 03/11/24 10:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorodecanesulfonic acid (PFDS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorododecanesulfonic acid (PFDoS)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
4:2 FTS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
6:2 FTS	**4.3**	**J**	16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
8:2 FTS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
Perfluorooctanesulfonamide (FOSA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NMeFOSA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NEtFOSA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NMeFOSAA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NEtFOSAA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NMeFOSE	ND		40	10	ng/L		03/14/24 11:25	03/16/24 17:25	1
NEtFOSE	ND		40	10	ng/L		03/14/24 11:25	03/16/24 17:25	1
HFPO-DA (GenX)	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
PFMPA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
PFMBA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
NFDHA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
9Cl-PF3ONS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
11Cl-PF3OUdS	ND		16	4.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
PFEESA	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
3:3 FTCA	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 17:25	1
5:3 FTCA	ND		100	25	ng/L		03/14/24 11:25	03/16/24 17:25	1
7:3 FTCA	ND		100	25	ng/L		03/14/24 11:25	03/16/24 17:25	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*75.5*		*5 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C5 PFPeA	*75.3*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C5 PFHxA	*79.6*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C4 PFHpA	*74.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C8 PFOA	*72.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C9 PFNA	*84.5*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C6 PFDA	*75.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C7 PFUnA	*71.6*		*30 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C2 PFDoA	*52.1*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C2 PFTeDA	*55.3*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C3 PFBS	*86.5*		*40 - 135*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C3 PFHxS	*75.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C8 PFOS	*72.0*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C8 PFOSA	*68.0*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d3-NMeFOSAA	*66.9*		*40 - 170*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d5-NEtFOSAA	*59.5*		*25 - 135*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C2 4:2 FTS	*116*		*40 - 200*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C2 6:2 FTS	*92.7*		*40 - 200*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C2 8:2 FTS	*86.9*		*40 - 300*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
13C3 HFPO-DA	*73.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d7-N-MeFOSE-M	*52.1*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d9-N-EtFOSE-M	*47.0*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d5-NEtPFOSA	*54.6*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*
d3-NMePFOSA	*52.7*		*10 - 130*	*03/14/24 11:25*	*03/16/24 17:25*	*1*

Client Sample ID: SWN-MW14-N-03112024
Lab Sample ID: 590-23660-3

Date Collected: 03/11/24 11:45
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**43**		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluoropentanoic acid (PFPeA)	**150**		3.9	0.99	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorohexanoic acid (PFHxA)	**150**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluoroheptanoic acid (PFHpA)	**58**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorooctanoic acid (PFOA)	**270**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorononanoic acid (PFNA)	**9.6**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorodecanoic acid (PFDA)	**0.93**	**J**	2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorobutanesulfonic acid (PFBS)	**13**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluoropentanesulfonic acid (PFPeS)	**14**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorohexanesulfonic acid (PFHxS)	**200**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorooctanesulfonic acid (PFOS)	**32**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
4:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
6:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
8:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
NMeFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
NEtFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
NMeFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
NEtFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 17:43	1
NMeFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 17:43	1
NEtFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 17:43	1
HFPO-DA (GenX)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
PFMPA	ND		3.9	0.99	ng/L		03/14/24 11:25	03/16/24 17:43	1
PFMBA	ND		3.9	0.99	ng/L		03/14/24 11:25	03/16/24 17:43	1
NFDHA	ND		3.9	0.99	ng/L		03/14/24 11:25	03/16/24 17:43	1
9Cl-PF3ONS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
11Cl-PF3OUdS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 17:43	1
PFEESA	ND		3.9	0.99	ng/L		03/14/24 11:25	03/16/24 17:43	1
3:3 FTCA	ND		9.9	2.5	ng/L		03/14/24 11:25	03/16/24 17:43	1
5:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 17:43	1
7:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 17:43	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*76.0*		*5 - 130*	*03/14/24 11:25*	*03/16/24 17:43*	*1*
13C5 PFPeA	*78.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:43*	*1*
13C5 PFHxA	*79.7*		*40 - 130*	*03/14/24 11:25*	*03/16/24 17:43*	*1*

Client Sample ID: SWN-MW14-N-03112024 Lab Sample ID: 590-23660-3

Date Collected: 03/11/24 11:45 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	81.6		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C8 PFOA	71.5		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C9 PFNA	70.0		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C6 PFDA	67.9		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C7 PFUnA	63.2		30 - 130	03/14/24 11:25	03/16/24 17:43	1
13C2 PFDoA	51.3		10 - 130	03/14/24 11:25	03/16/24 17:43	1
13C2 PFTeDA	55.3		10 - 130	03/14/24 11:25	03/16/24 17:43	1
13C3 PFBS	87.4		40 - 135	03/14/24 11:25	03/16/24 17:43	1
13C3 PFHxS	73.7		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C8 PFOS	71.1		40 - 130	03/14/24 11:25	03/16/24 17:43	1
13C8 PFOSA	69.1		40 - 130	03/14/24 11:25	03/16/24 17:43	1
d3-NMeFOSAA	60.8		40 - 170	03/14/24 11:25	03/16/24 17:43	1
d5-NEtFOSAA	52.6		25 - 135	03/14/24 11:25	03/16/24 17:43	1
13C2 4:2 FTS	101		40 - 200	03/14/24 11:25	03/16/24 17:43	1
13C2 6:2 FTS	79.6		40 - 200	03/14/24 11:25	03/16/24 17:43	1
13C2 8:2 FTS	78.8		40 - 300	03/14/24 11:25	03/16/24 17:43	1
13C3 HFPO-DA	78.1		40 - 130	03/14/24 11:25	03/16/24 17:43	1
d7-N-MeFOSE-M	52.2		10 - 130	03/14/24 11:25	03/16/24 17:43	1
d9-N-EtFOSE-M	46.3		10 - 130	03/14/24 11:25	03/16/24 17:43	1
d5-NEtPFOSA	55.1		10 - 130	03/14/24 11:25	03/16/24 17:43	1
d3-NMePFOSA	55.5		10 - 130	03/14/24 11:25	03/16/24 17:43	1

Client Sample ID: SWN-MW13-N-03112024 Lab Sample ID: 590-23660-4

Date Collected: 03/11/24 13:15 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**14**		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluoropentanoic acid (PFPeA)	**31**		3.9	0.97	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorohexanoic acid (PFHxA)	**38**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluoroheptanoic acid (PFHpA)	**14**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorooctanoic acid (PFOA)	**42**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorononanoic acid (PFNA)	**4.9**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorodecanoic acid (PFDA)	**8.8**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorobutanesulfonic acid (PFBS)	**16**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluoropentanesulfonic acid (PFPeS)	**12**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorohexanesulfonic acid (PFHxS)	**98**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.54**	**J**	1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorooctanesulfonic acid (PFOS)	**22**		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW13-N-03112024
Lab Sample ID: 590-23660-4
Date Collected: 03/11/24 13:15
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
4:2 FTS	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
6:2 FTS	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
8:2 FTS	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
NMeFOSA	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
NEtFOSA	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
NMeFOSAA	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
NEtFOSAA	ND		1.9	0.48	ng/L		03/14/24 11:25	03/16/24 18:36	1
NMeFOSE	ND		19	4.8	ng/L		03/14/24 11:25	03/16/24 18:36	1
NEtFOSE	ND		19	4.8	ng/L		03/14/24 11:25	03/16/24 18:36	1
HFPO-DA (GenX)	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
PFMPA	ND		3.9	0.97	ng/L		03/14/24 11:25	03/16/24 18:36	1
PFMBA	ND		3.9	0.97	ng/L		03/14/24 11:25	03/16/24 18:36	1
NFDHA	ND		3.9	0.97	ng/L		03/14/24 11:25	03/16/24 18:36	1
9Cl-PF3ONS	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
11Cl-PF3OUdS	ND		7.8	1.9	ng/L		03/14/24 11:25	03/16/24 18:36	1
PFEESA	ND		3.9	0.97	ng/L		03/14/24 11:25	03/16/24 18:36	1
3:3 FTCA	ND		9.7	2.4	ng/L		03/14/24 11:25	03/16/24 18:36	1
5:3 FTCA	ND		48	12	ng/L		03/14/24 11:25	03/16/24 18:36	1
7:3 FTCA	ND		48	12	ng/L		03/14/24 11:25	03/16/24 18:36	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*66.2*		*5 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C5 PFPeA	*68.3*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C5 PFHxA	*66.5*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C4 PFHpA	*66.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C8 PFOA	*61.6*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C9 PFNA	*63.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C6 PFDA	*59.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C7 PFUnA	*47.6*		*30 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C2 PFDoA	*34.4*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C2 PFTeDA	*25.4*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C3 PFBS	*70.8*		*40 - 135*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C3 PFHxS	*59.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C8 PFOS	*49.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C8 PFOSA	*53.6*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d3-NMeFOSAA	*47.0*		*40 - 170*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d5-NEtFOSAA	*39.3*		*25 - 135*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C2 4:2 FTS	*84.7*		*40 - 200*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C2 6:2 FTS	*65.8*		*40 - 200*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C2 8:2 FTS	*58.6*		*40 - 300*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
13C3 HFPO-DA	*66.0*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d7-N-MeFOSE-M	*26.6*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d9-N-EtFOSE-M	*17.3*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d5-NEtPFOSA	*31.0*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*
d3-NMePFOSA	*33.7*		*10 - 130*	*03/14/24 11:25*	*03/16/24 18:36*	*1*

Client Sample ID: SWN-MW13-FD-03112024
Lab Sample ID: 590-23660-5

Date Collected: 03/11/24 13:45
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**14**		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluoropentanoic acid (PFPeA)	**31**		3.8	0.94	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorohexanoic acid (PFHxA)	**36**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluoroheptanoic acid (PFHpA)	**13**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorooctanoic acid (PFOA)	**39**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorononanoic acid (PFNA)	**5.5**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorodecanoic acid (PFDA)	**8.9**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorobutanesulfonic acid (PFBS)	**16**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluoropentanesulfonic acid (PFPeS)	**11**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorohexanesulfonic acid (PFHxS)	**100**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.57**	**J**	1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorooctanesulfonic acid (PFOS)	**20**		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
4:2 FTS	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
6:2 FTS	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
8:2 FTS	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
NMeFOSA	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
NEtFOSA	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/14/24 11:25	03/16/24 18:53	1
NMeFOSE	ND		19	4.7	ng/L		03/14/24 11:25	03/16/24 18:53	1
NEtFOSE	ND		19	4.7	ng/L		03/14/24 11:25	03/16/24 18:53	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
PFMPA	ND		3.8	0.94	ng/L		03/14/24 11:25	03/16/24 18:53	1
PFMBA	ND		3.8	0.94	ng/L		03/14/24 11:25	03/16/24 18:53	1
NFDHA	ND		3.8	0.94	ng/L		03/14/24 11:25	03/16/24 18:53	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/14/24 11:25	03/16/24 18:53	1
PFEESA	ND		3.8	0.94	ng/L		03/14/24 11:25	03/16/24 18:53	1
3:3 FTCA	ND		9.4	2.3	ng/L		03/14/24 11:25	03/16/24 18:53	1
5:3 FTCA	ND		47	12	ng/L		03/14/24 11:25	03/16/24 18:53	1
7:3 FTCA	ND		47	12	ng/L		03/14/24 11:25	03/16/24 18:53	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*76.7*		*5 - 130*	*03/14/24 11:25*	*03/16/24 18:53*	*1*
13C5 PFPeA	*76.4*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:53*	*1*
13C5 PFHxA	*77.7*		*40 - 130*	*03/14/24 11:25*	*03/16/24 18:53*	*1*

Client Sample ID: SWN-MW13-FD-03112024
Lab Sample ID: 590-23660-5

Date Collected: 03/11/24 13:45
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	76.4		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C8 PFOA	69.8		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C9 PFNA	75.4		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C6 PFDA	71.9		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C7 PFUnA	62.5		30 - 130	03/14/24 11:25	03/16/24 18:53	1
13C2 PFDoA	48.6		10 - 130	03/14/24 11:25	03/16/24 18:53	1
13C2 PFTeDA	44.8		10 - 130	03/14/24 11:25	03/16/24 18:53	1
13C3 PFBS	87.5		40 - 135	03/14/24 11:25	03/16/24 18:53	1
13C3 PFHxS	74.7		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C8 PFOS	72.5		40 - 130	03/14/24 11:25	03/16/24 18:53	1
13C8 PFOSA	72.9		40 - 130	03/14/24 11:25	03/16/24 18:53	1
d3-NMeFOSAA	64.3		40 - 170	03/14/24 11:25	03/16/24 18:53	1
d5-NEtFOSAA	53.4		25 - 135	03/14/24 11:25	03/16/24 18:53	1
13C2 4:2 FTS	101		40 - 200	03/14/24 11:25	03/16/24 18:53	1
13C2 6:2 FTS	84.7		40 - 200	03/14/24 11:25	03/16/24 18:53	1
13C2 8:2 FTS	77.2		40 - 300	03/14/24 11:25	03/16/24 18:53	1
13C3 HFPO-DA	74.6		40 - 130	03/14/24 11:25	03/16/24 18:53	1
d7-N-MeFOSE-M	50.0		10 - 130	03/14/24 11:25	03/16/24 18:53	1
d9-N-EtFOSE-M	43.8		10 - 130	03/14/24 11:25	03/16/24 18:53	1
d5-NEtPFOSA	49.8		10 - 130	03/14/24 11:25	03/16/24 18:53	1
d3-NMePFOSA	52.0		10 - 130	03/14/24 11:25	03/16/24 18:53	1

Client Sample ID: SWN-MW2-N-03112024
Lab Sample ID: 590-23660-6

Date Collected: 03/11/24 14:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**24**		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluoropentanoic acid (PFPeA)	**61**		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorohexanoic acid (PFHxA)	**90**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluoroheptanoic acid (PFHpA)	**16**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorooctanoic acid (PFOA)	**31**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorononanoic acid (PFNA)	**13**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorodecanoic acid (PFDA)	**35**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorobutanesulfonic acid (PFBS)	**4.9**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluoropentanesulfonic acid (PFPeS)	**4.0**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorohexanesulfonic acid (PFHxS)	**150**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluoroheptanesulfonic acid (PFHpS)	**0.73**	**J**	2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorooctanesulfonic acid (PFOS)	**48**		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1

Client Sample ID: SWN-MW2-N-03112024
Lab Sample ID: 590-23660-6
Date Collected: 03/11/24 14:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
4:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
6:2 FTS	**5.5**	**J**	7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
8:2 FTS	**3.1**	**J**	7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
Perfluorooctanesulfonamide (FOSA)	**1.2**	**J**	2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
NMeFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
NEtFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
NMeFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
NEtFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 19:11	1
NMeFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 19:11	1
NEtFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 19:11	1
HFPO-DA (GenX)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
PFMPA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:11	1
PFMBA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:11	1
NFDHA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:11	1
9Cl-PF3ONS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
11Cl-PF3OUdS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:11	1
PFEESA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:11	1
3:3 FTCA	ND		9.9	2.5	ng/L		03/14/24 11:25	03/16/24 19:11	1
5:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 19:11	1
7:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 19:11	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*79.8*		*5 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C5 PFPeA	*74.3*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C5 PFHxA	*77.4*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C4 PFHpA	*81.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C8 PFOA	*76.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C9 PFNA	*72.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C6 PFDA	*77.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C7 PFUnA	*74.3*		*30 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C2 PFDoA	*56.0*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C2 PFTeDA	*46.6*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C3 PFBS	*90.9*		*40 - 135*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C3 PFHxS	*78.7*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C8 PFOS	*75.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C8 PFOSA	*74.4*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d3-NMeFOSAA	*71.8*		*40 - 170*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d5-NEtFOSAA	*69.2*		*25 - 135*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C2 4:2 FTS	*137*		*40 - 200*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C2 6:2 FTS	*109*		*40 - 200*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C2 8:2 FTS	*94.3*		*40 - 300*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
13C3 HFPO-DA	*73.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d7-N-MeFOSE-M	*50.5*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d9-N-EtFOSE-M	*43.2*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d5-NEtPFOSA	*50.5*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*
d3-NMePFOSA	*48.5*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:11*	*1*

Client Sample ID: SWN-MW1-N-03112024
Lab Sample ID: 590-23660-7
Date Collected: 03/11/24 16:05
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**18**		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluoropentanoic acid (PFPeA)	**38**		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorohexanoic acid (PFHxA)	**74**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluoroheptanoic acid (PFHpA)	**16**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorooctanoic acid (PFOA)	**72**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorononanoic acid (PFNA)	**6.4**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorodecanoic acid (PFDA)	**2.9**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorobutanesulfonic acid (PFBS)	**28**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluoropentanesulfonic acid (PFPeS)	**22**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorohexanesulfonic acid (PFHxS)	**410**	**E**	2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluoroheptanesulfonic acid (PFHpS)	**1.8**	**J**	2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorooctanesulfonic acid (PFOS)	**47**		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
4:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
6:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
8:2 FTS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
NMeFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
NEtFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:29	1
NMeFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
NEtFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
HFPO-DA (GenX)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
PFMPA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:29	1
PFMBA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:29	1
NFDHA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:29	1
9Cl-PF3ONS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
11Cl-PF3OUdS	ND		7.9	2.0	ng/L		03/14/24 11:25	03/16/24 19:29	1
PFEESA	ND		4.0	0.99	ng/L		03/14/24 11:25	03/16/24 19:29	1
3:3 FTCA	ND		9.9	2.5	ng/L		03/14/24 11:25	03/16/24 19:29	1
5:3 FTCA	ND		50	12	ng/L		03/14/24 11:25	03/16/24 19:29	1
7:3 FTCA	ND		50	12	ng/L		03/14/24 11:25	03/16/24 19:29	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.5*		*5 - 130*	*03/14/24 11:25*	*03/16/24 19:29*	*1*
13C5 PFPeA	*79.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:29*	*1*
13C5 PFHxA	*79.3*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:29*	*1*

Client Sample ID: SWN-MW1-N-03112024
Lab Sample ID: 590-23660-7

Date Collected: 03/11/24 16:05
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	81.7		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C8 PFOA	78.3		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C9 PFNA	69.7		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C6 PFDA	70.3		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C7 PFUnA	73.2		30 - 130	03/14/24 11:25	03/16/24 19:29	1
13C2 PFDoA	57.2		10 - 130	03/14/24 11:25	03/16/24 19:29	1
13C2 PFTeDA	59.0		10 - 130	03/14/24 11:25	03/16/24 19:29	1
13C3 PFBS	94.9		40 - 135	03/14/24 11:25	03/16/24 19:29	1
13C3 PFHxS	75.7		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C8 PFOS	76.6		40 - 130	03/14/24 11:25	03/16/24 19:29	1
13C8 PFOSA	75.4		40 - 130	03/14/24 11:25	03/16/24 19:29	1
d3-NMeFOSAA	71.2		40 - 170	03/14/24 11:25	03/16/24 19:29	1
d5-NEtFOSAA	65.1		25 - 135	03/14/24 11:25	03/16/24 19:29	1
13C2 4:2 FTS	114		40 - 200	03/14/24 11:25	03/16/24 19:29	1
13C2 6:2 FTS	91.3		40 - 200	03/14/24 11:25	03/16/24 19:29	1
13C2 8:2 FTS	79.9		40 - 300	03/14/24 11:25	03/16/24 19:29	1
13C3 HFPO-DA	75.5		40 - 130	03/14/24 11:25	03/16/24 19:29	1
d7-N-MeFOSE-M	56.5		10 - 130	03/14/24 11:25	03/16/24 19:29	1
d9-N-EtFOSE-M	51.4		10 - 130	03/14/24 11:25	03/16/24 19:29	1
d5-NEtPFOSA	58.5		10 - 130	03/14/24 11:25	03/16/24 19:29	1
d3-NMePFOSA	54.2		10 - 130	03/14/24 11:25	03/16/24 19:29	1

Client Sample ID: WL-EB-03112024
Lab Sample ID: 590-23660-8

Date Collected: 03/11/24 16:25
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
4:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1

Client Sample ID: WL-EB-03112024
Lab Sample ID: 590-23660-8
Date Collected: 03/11/24 16:25
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
6:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
8:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
NMeFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
NEtFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 19:46	1
NMeFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
NEtFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
PFMPA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
PFMBA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
NFDHA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
PFEESA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 19:46	1
3:3 FTCA	ND		10	2.5	ng/L		03/14/24 11:25	03/16/24 19:46	1
5:3 FTCA	ND		50	13	ng/L		03/14/24 11:25	03/16/24 19:46	1
7:3 FTCA	ND		50	13	ng/L		03/14/24 11:25	03/16/24 19:46	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*70.3*		*5 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C5 PFPeA	*72.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C5 PFHxA	*71.0*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C4 PFHpA	*73.0*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C8 PFOA	*71.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C9 PFNA	*67.5*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C6 PFDA	*63.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C7 PFUnA	*73.0*		*30 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C2 PFDoA	*58.2*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C2 PFTeDA	*64.5*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C3 PFBS	*81.6*		*40 - 135*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C3 PFHxS	*71.1*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C8 PFOS	*72.3*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C8 PFOSA	*67.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d3-NMeFOSAA	*66.1*		*40 - 170*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d5-NEtFOSAA	*61.1*		*25 - 135*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C2 4:2 FTS	*76.4*		*40 - 200*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C2 6:2 FTS	*72.7*		*40 - 200*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C2 8:2 FTS	*72.4*		*40 - 300*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
13C3 HFPO-DA	*68.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d7-N-MeFOSE-M	*59.6*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d9-N-EtFOSE-M	*57.4*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d5-NEtPFOSA	*59.8*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*
d3-NMePFOSA	*54.2*		*10 - 130*	*03/14/24 11:25*	*03/16/24 19:46*	*1*

Client Sample ID: FB-03112024
Lab Sample ID: 590-23660-9

Date Collected: 03/11/24 16:30
Matrix: Water

Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluoropentanoic acid (PFPeA)	ND		3.9	0.98	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
4:2 FTS	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
6:2 FTS	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
8:2 FTS	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
NMeFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
NEtFOSA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
NMeFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
NEtFOSAA	ND		2.0	0.49	ng/L		03/14/24 11:25	03/16/24 20:04	1
NMeFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 20:04	1
NEtFOSE	ND		20	4.9	ng/L		03/14/24 11:25	03/16/24 20:04	1
HFPO-DA (GenX)	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
PFMPA	ND		3.9	0.98	ng/L		03/14/24 11:25	03/16/24 20:04	1
PFMBA	ND		3.9	0.98	ng/L		03/14/24 11:25	03/16/24 20:04	1
NFDHA	ND		3.9	0.98	ng/L		03/14/24 11:25	03/16/24 20:04	1
9Cl-PF3ONS	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
11Cl-PF3OUdS	ND		7.8	2.0	ng/L		03/14/24 11:25	03/16/24 20:04	1
PFEESA	ND		3.9	0.98	ng/L		03/14/24 11:25	03/16/24 20:04	1
3:3 FTCA	ND		9.8	2.4	ng/L		03/14/24 11:25	03/16/24 20:04	1
5:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 20:04	1
7:3 FTCA	ND		49	12	ng/L		03/14/24 11:25	03/16/24 20:04	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*70.2*		*5 - 130*	*03/14/24 11:25*	*03/16/24 20:04*	*1*
13C5 PFPeA	*72.2*		*40 - 130*	*03/14/24 11:25*	*03/16/24 20:04*	*1*
13C5 PFHxA	*70.5*		*40 - 130*	*03/14/24 11:25*	*03/16/24 20:04*	*1*
13C4 PFHpA	*72.8*		*40 - 130*	*03/14/24 11:25*	*03/16/24 20:04*	*1*
13C8 PFOA	*68.6*		*40 - 130*	*03/14/24 11:25*	*03/16/24 20:04*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03112024
Lab Sample ID: 590-23660-9
Date Collected: 03/11/24 16:30
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	67.3		40 - 130	03/14/24 11:25	03/16/24 20:04	1
13C6 PFDA	71.3		40 - 130	03/14/24 11:25	03/16/24 20:04	1
13C7 PFUnA	66.2		30 - 130	03/14/24 11:25	03/16/24 20:04	1
13C2 PFDoA	55.2		10 - 130	03/14/24 11:25	03/16/24 20:04	1
13C2 PFTeDA	60.2		10 - 130	03/14/24 11:25	03/16/24 20:04	1
13C3 PFBS	79.2		40 - 135	03/14/24 11:25	03/16/24 20:04	1
13C3 PFHxS	72.9		40 - 130	03/14/24 11:25	03/16/24 20:04	1
13C8 PFOS	77.7		40 - 130	03/14/24 11:25	03/16/24 20:04	1
13C8 PFOSA	75.4		40 - 130	03/14/24 11:25	03/16/24 20:04	1
d3-NMeFOSAA	70.9		40 - 170	03/14/24 11:25	03/16/24 20:04	1
d5-NEtFOSAA	68.5		25 - 135	03/14/24 11:25	03/16/24 20:04	1
13C2 4:2 FTS	77.4		40 - 200	03/14/24 11:25	03/16/24 20:04	1
13C2 6:2 FTS	68.8		40 - 200	03/14/24 11:25	03/16/24 20:04	1
13C2 8:2 FTS	74.5		40 - 300	03/14/24 11:25	03/16/24 20:04	1
13C3 HFPO-DA	67.6		40 - 130	03/14/24 11:25	03/16/24 20:04	1
d7-N-MeFOSE-M	68.5		10 - 130	03/14/24 11:25	03/16/24 20:04	1
d9-N-EtFOSE-M	64.8		10 - 130	03/14/24 11:25	03/16/24 20:04	1
d5-NEtPFOSA	65.6		10 - 130	03/14/24 11:25	03/16/24 20:04	1
d3-NMePFOSA	62.1		10 - 130	03/14/24 11:25	03/16/24 20:04	1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-747045/1-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 747045

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
4:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
6:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
8:2 FTS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
NMeFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
NEtFOSA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/14/24 11:25	03/16/24 15:04	1
NMeFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
NEtFOSE	ND		20	5.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
PFMPA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
PFMBA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
NFDHA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
PFEESA	ND		4.0	1.0	ng/L		03/14/24 11:25	03/16/24 15:04	1
3:3 FTCA	ND		10	2.5	ng/L		03/14/24 11:25	03/16/24 15:04	1
5:3 FTCA	ND		50	13	ng/L		03/14/24 11:25	03/16/24 15:04	1
7:3 FTCA	ND		50	13	ng/L		03/14/24 11:25	03/16/24 15:04	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*71.7*		*5 - 130*	*03/14/24 11:25*	*03/16/24 15:04*	*1*
13C5 PFPeA	*74.9*		*40 - 130*	*03/14/24 11:25*	*03/16/24 15:04*	*1*
13C5 PFHxA	*75.5*		*40 - 130*	*03/14/24 11:25*	*03/16/24 15:04*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-747045/1-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 747045

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	72.9		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C8 PFOA	72.1		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C9 PFNA	71.2		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C6 PFDA	77.9		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C7 PFUnA	74.9		30 - 130	03/14/24 11:25	03/16/24 15:04	1
13C2 PFDoA	63.7		10 - 130	03/14/24 11:25	03/16/24 15:04	1
13C2 PFTeDA	70.9		10 - 130	03/14/24 11:25	03/16/24 15:04	1
13C3 PFBS	76.6		40 - 135	03/14/24 11:25	03/16/24 15:04	1
13C3 PFHxS	70.9		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C8 PFOS	75.9		40 - 130	03/14/24 11:25	03/16/24 15:04	1
13C8 PFOSA	72.0		40 - 130	03/14/24 11:25	03/16/24 15:04	1
d3-NMeFOSAA	62.3		40 - 170	03/14/24 11:25	03/16/24 15:04	1
d5-NEtFOSAA	62.2		25 - 135	03/14/24 11:25	03/16/24 15:04	1
13C2 4:2 FTS	70.6		40 - 200	03/14/24 11:25	03/16/24 15:04	1
13C2 6:2 FTS	68.8		40 - 200	03/14/24 11:25	03/16/24 15:04	1
13C2 8:2 FTS	72.0		40 - 300	03/14/24 11:25	03/16/24 15:04	1
13C3 HFPO-DA	74.8		40 - 130	03/14/24 11:25	03/16/24 15:04	1
d7-N-MeFOSE-M	66.2		10 - 130	03/14/24 11:25	03/16/24 15:04	1
d9-N-EtFOSE-M	58.1		10 - 130	03/14/24 11:25	03/16/24 15:04	1
d5-NEtPFOSA	59.3		10 - 130	03/14/24 11:25	03/16/24 15:04	1
d3-NMePFOSA	56.3		10 - 130	03/14/24 11:25	03/16/24 15:04	1

Lab Sample ID: LCS 320-747045/3-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747045

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	149		ng/L		116	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	67.1		ng/L		105	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	31.9		ng/L		100	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	33.7		ng/L		105	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	33.7		ng/L		105	70 - 150
Perfluorononanoic acid (PFNA)	32.0	32.3		ng/L		101	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	32.6		ng/L		102	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	42.4		ng/L		132	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	39.8		ng/L		124	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	35.8		ng/L		112	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	35.3		ng/L		110	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	30.1		ng/L		106	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	33.8		ng/L		112	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	31.6		ng/L		108	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	29.4		ng/L		96	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-747045/3-A
Client Sample ID: Lab Control Sample
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 748032
Prep Batch: 747045

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	31.4		ng/L		105	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	27.0		ng/L		88	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	24.4		ng/L		79	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	28.2		ng/L		91	50 - 145
4:2 FTS	120	106		ng/L		88	70 - 145
6:2 FTS	122	135		ng/L		111	65 - 155
8:2 FTS	123	140		ng/L		114	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	36.0		ng/L		112	70 - 145
NMeFOSA	32.0	31.6		ng/L		99	60 - 150
NEtFOSA	32.0	38.0		ng/L		119	65 - 145
NMeFOSAA	32.0	42.3		ng/L		132	50 - 140
NEtFOSAA	32.0	32.8		ng/L		102	70 - 145
NMeFOSE	320	342		ng/L		107	70 - 145
NEtFOSE	320	372		ng/L		116	70 - 135
HFPO-DA (GenX)	128	153		ng/L		120	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	130		ng/L		107	65 - 145
PFMPA	64.0	72.2		ng/L		113	55 - 140
PFMBA	64.0	63.9		ng/L		100	60 - 150
NFDHA	64.0	72.0		ng/L		112	50 - 150
9Cl-PF3ONS	120	127		ng/L		106	70 - 155
11Cl-PF3OUdS	121	127		ng/L		105	55 - 160
PFEESA	57.1	61.1		ng/L		107	70 - 140
3:3 FTCA	160	180		ng/L		112	65 - 130
5:3 FTCA	799	877		ng/L		110	70 - 135
7:3 FTCA	799	773		ng/L		97	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*73.6*		*5 - 130*
13C5 PFPeA	*74.0*		*40 - 130*
13C5 PFHxA	*76.6*		*40 - 130*
13C4 PFHpA	*73.3*		*40 - 130*
13C8 PFOA	*70.1*		*40 - 130*
13C9 PFNA	*73.1*		*40 - 130*
13C6 PFDA	*75.5*		*40 - 130*
13C7 PFUnA	*62.2*		*30 - 130*
13C2 PFDoA	*60.2*		*10 - 130*
13C2 PFTeDA	*71.0*		*10 - 130*
13C3 PFBS	*84.3*		*40 - 135*
13C3 PFHxS	*73.9*		*40 - 130*
13C8 PFOS	*75.3*		*40 - 130*
13C8 PFOSA	*75.8*		*40 - 130*
d3-NMeFOSAA	*64.8*		*40 - 170*
d5-NEtFOSAA	*68.1*		*25 - 135*
13C2 4:2 FTS	*77.7*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-747045/3-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747045

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*69.4*		*40 - 200*
13C2 8:2 FTS	*71.0*		*40 - 300*
13C3 HFPO-DA	*75.5*		*40 - 130*
d7-N-MeFOSE-M	*75.2*		*10 - 130*
d9-N-EtFOSE-M	*66.4*		*10 - 130*
d5-NEtPFOSA	*62.0*		*10 - 130*
d3-NMePFOSA	*60.8*		*10 - 130*

Lab Sample ID: LLCS 320-747045/2-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747045

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	13.7		ng/L		107	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	6.11		ng/L		95	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.04		ng/L		95	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	3.09		ng/L		97	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	3.33		ng/L		104	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.84		ng/L		120	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	3.13		ng/L		98	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.39		ng/L		106	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.81		ng/L		119	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.50		ng/L		109	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.40		ng/L		106	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	2.91		ng/L		102	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.73		ng/L		91	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.05		ng/L		104	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.81		ng/L		92	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	2.78		ng/L		93	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.34		ng/L		76	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.19		ng/L		71	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.29		ng/L		74	50 - 145
4:2 FTS	12.0	8.96		ng/L		75	70 - 145
6:2 FTS	12.2	12.2		ng/L		101	65 - 155
8:2 FTS	12.3	12.3		ng/L		100	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.20		ng/L		100	70 - 145
NMeFOSA	3.20	2.83		ng/L		88	60 - 150
NEtFOSA	3.20	3.38		ng/L		106	65 - 145
NMeFOSAA	3.20	3.74		ng/L		117	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-747045/2-A
Matrix: Water
Analysis Batch: 748032

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747045

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
NEtFOSAA			3.20	2.85		ng/L		89	70 - 145		
NMeFOSE			32.0	31.6		ng/L		99	70 - 145		
NEtFOSE			32.0	34.7		ng/L		108	70 - 135		
HFPO-DA (GenX)			12.8	12.2		ng/L		95	70 - 140		
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)			12.1	11.9		ng/L		98	65 - 145		
PFMPA			6.40	6.38		ng/L		100	55 - 140		
PFMBA			6.40	5.08		ng/L		79	60 - 150		
NFDHA			6.40	6.70		ng/L		105	50 - 150		
9Cl-PF3ONS			12.0	11.1		ng/L		93	70 - 155		
11Cl-PF3OUdS			12.1	10.8		ng/L		89	55 - 160		
PFEESA			5.71	5.56		ng/L		97	70 - 140		
3:3 FTCA			16.0	15.9		ng/L		99	65 - 130		
5:3 FTCA			79.9	79.3		ng/L		99	70 - 135		
7:3 FTCA			79.9	71.9		ng/L		90	50 - 145		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*69.1*		*5 - 130*
13C5 PFPeA	*70.8*		*40 - 130*
13C5 PFHxA	*71.4*		*40 - 130*
13C4 PFHpA	*69.0*		*40 - 130*
13C8 PFOA	*66.7*		*40 - 130*
13C9 PFNA	*62.9*		*40 - 130*
13C6 PFDA	*75.1*		*40 - 130*
13C7 PFUnA	*68.2*		*30 - 130*
13C2 PFDoA	*59.1*		*10 - 130*
13C2 PFTeDA	*66.2*		*10 - 130*
13C3 PFBS	*76.0*		*40 - 135*
13C3 PFHxS	*70.5*		*40 - 130*
13C8 PFOS	*75.5*		*40 - 130*
13C8 PFOSA	*70.0*		*40 - 130*
d3-NMeFOSAA	*65.4*		*40 - 170*
d5-NEtFOSAA	*63.5*		*25 - 135*
13C2 4:2 FTS	*72.8*		*40 - 200*
13C2 6:2 FTS	*64.6*		*40 - 200*
13C2 8:2 FTS	*68.4*		*40 - 300*
13C3 HFPO-DA	*71.8*		*40 - 130*
d7-N-MeFOSE-M	*65.5*		*10 - 130*
d9-N-EtFOSE-M	*57.6*		*10 - 130*
d5-NEtPFOSA	*59.9*		*10 - 130*
d3-NMePFOSA	*55.6*		*10 - 130*

Lab Chronicle

Client: Haley & Aldrich, Inc. Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MWA-N-03112024 Lab Sample ID: 590-23660-1

Date Collected: 03/11/24 08:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			250.0 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 17:07	RS1	EET SAC

Client Sample ID: SWN-MW6-N-03112024 Lab Sample ID: 590-23660-2

Date Collected: 03/11/24 10:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			250.0 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 17:25	RS1	EET SAC

Client Sample ID: SWN-MW14-N-03112024 Lab Sample ID: 590-23660-3

Date Collected: 03/11/24 11:45 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			507.5 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 17:43	RS1	EET SAC

Client Sample ID: SWN-MW13-N-03112024 Lab Sample ID: 590-23660-4

Date Collected: 03/11/24 13:15 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			516.1 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 18:36	RS1	EET SAC

Client Sample ID: SWN-MW13-FD-03112024 Lab Sample ID: 590-23660-5

Date Collected: 03/11/24 13:45 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			532.4 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 18:53	RS1	EET SAC

Client Sample ID: SWN-MW2-N-03112024 Lab Sample ID: 590-23660-6

Date Collected: 03/11/24 14:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			506.2 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 19:11	RS1	EET SAC

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW1-N-03112024
Lab Sample ID: 590-23660-7
Date Collected: 03/11/24 16:05
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			504.7 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 19:29	RS1	EET SAC

Client Sample ID: WL-EB-03112024
Lab Sample ID: 590-23660-8
Date Collected: 03/11/24 16:25
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			499.8 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 19:46	RS1	EET SAC

Client Sample ID: FB-03112024
Lab Sample ID: 590-23660-9
Date Collected: 03/11/24 16:30
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			511.3 mL	5.0 mL	747045	03/14/24 11:25	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748032	03/16/24 20:04	RS1	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue
Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: HAEY & ALDRICH	Email: wmcdonald@haleyaldrich.com	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside AVE	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane WA	Analysis Turnaround Time: ☐ CALENDAR DAYS ☐ WORKING DAYS			Sampler:
(xxx) xxx-xxxx: 509 723 5216 Phone	TAT if different from Below: ☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day			For Lab Use Only: Walk-In Client: Lab Sampling:
(xxx) xxx-xxxx: FAX				Job / SDG No.
Project Name: GEC Support				
Site: GEC				
PO# 0209800-000				

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO3, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM4500)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
SWN-MWA-N-03112024	3/11/24	08:50	G	H_2O	6			X	X	X	X	X	X	
SWN-MW6-N-03112024		10:50			6			X	X	X	X	X	X	
SWN-MW14-N-03112024		11:45			6			X	X	X	X	X	X	
SWN-MW13-N-03112024		13:15			6			X	X	X	X	X	X	
SWN-MW13-FD-03112024		13:45			2			X	X					
SWN-MW2-N-03112024		14:50			6			X	X	X	X	X	X	
SWN-MW1-N-03112024		16:05			6			X	X	X	X	X	X	
WL-EB-03112024		16:25			2			X						
FB-03112024		16:30			2			X						

590-23660 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:
1633 5-day TAT
Remaing samples on standard time

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 3.5 Corr'd: 3.6	Therm ID No.: IR009
Relinquished by:	Company: HEA	Date/Time: 3/11/24 1300	Received by:	Company: HA	Date/Time: 3/11/2024 1700
Relinquished by:	Company: HEA	Date/Time: 3/12/24 1017	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EEC888	Date/Time: 3/12/2024 9:42

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone. 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8849 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23660-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 4/1/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
SWN-MWA-N-03112024 (590-23660-1)	3/11/24	08 50 Pacific		Water			X	2	
SWN-MW6-N-03112024 (590-23660-2)	3/11/24	10:50 Pacific		Water			X	2	
SWN-MW14-N-03112024 (590-23660-3)	3/11/24	11 45 Pacific		Water			X	2	
SWN-MW13-N-03112024 (590-23660-4)	3/11/24	13.15 Pacific		Water			X	2	
SWN-MW13-FD-03112024 (590-23660-5)	3/11/24	13.45 Pacific		Water			X	2	
SWN-MW2-N-03112024 (590-23660-6)	3/11/24	14 50 Pacific		Water			X	2	
SWN-MW1-N-03112024 (590-23660-7)	3/11/24	16:05 Pacific		Water			X	2	
WL-EB-03112024 (590-23660-8)	3/11/24	16:25 Pacific		Water			X	2	
FB-03112024 (590-23660-9)	3/11/24	16:30 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements

Empty Kit Relinquished by:	Date:	Time.	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	3/12/24 1446	EET SPO		3.13.24 930	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks:
	2261246	2.2c

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23660-1

Login Number: 23660
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23660-1

Login Number: 23660
List Number: 2
Creator: Simmons, Jason C

List Source: Eurofins Sacramento
List Creation: 03/13/24 04:45 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261246
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.2c
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Tracking # 7101 4400 2807

Job ____ 590-23660 Field Sheet

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC.

Therm. ID: L-11 Corr. Factor (+ / -) - °C

Ice 1 Wet 1 Gel _____ Other _____

Cooler Custody Seal: 2261246

Cooler ID: _____

Temp Observed: 2.2 °C Corrected: 2.2 °C

From Temp Blank ☐ Sample ☐

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☐	☐
Cooler Temperature is acceptable?	☐	☐	☐
Frozen samples show signs of thaw?	☐	☐	☐

Initials: _____ Date 3.13.24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☐	☐	☐
Samples compromised/tampered with?	☐	☐	☐
COC is complete w/o discrepancies	☐	☐	☐
Sample custody seal?	☐	☐	☐
Sample containers have legible labels?	☐	☐	☐
Sample date/times are provided?	☐	☐	☐
Appropriate containers are used?	☐	☐	☐
Sample bottles are completely filled?	☐	☐	☐
Sample preservatives verified?	☐	☐	☐
Is the Field Sampler's name on COC?	☐	☐	☐
Samples w/o discrepancies?	☐	☐	☐
Zero headspace?*	☐	☐	☐
Alkalinity has no headspace?	☐	☐	☐
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☐
Multiphasic samples are not present?	☐	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials: _____ Date 3.13.24

Notes: _____

Trizma Lot #(s): _____

Ammonium Acetate Lot #(s) _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☐	☐	☐
NCM Filed?	☐	☐	☐
Samples received within hold time?	☐	☐	☐
Log Release checked in TALS?	☐	☐	☐

Initials: _____ Date 3.13.24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water
Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23660-1	SWN-MWA-N-03112024	76.3	70.1	75.1	78.9	74.2	69.3	71.4	61.2
590-23660-2	SWN-MW6-N-03112024	75.5	75.3	79.6	74.9	72.2	84.5	75.1	71.6
590-23660-3	SWN-MW14-N-03112024	76.0	78.2	79.7	81.6	71.5	70.0	67.9	63.2
590-23660-4	SWN-MW13-N-03112024	66.2	68.3	66.5	66.9	61.6	63.2	59.1	47.6
590-23660-5	SWN-MW13-FD-03112024	76.7	76.4	77.7	76.4	69.8	75.4	71.9	62.5
590-23660-6	SWN-MW2-N-03112024	79.8	74.3	77.4	81.8	76.2	72.9	77.1	74.3
590-23660-7	SWN-MW1-N-03112024	77.5	79.8	79.3	81.7	78.3	69.7	70.3	73.2
590-23660-8	WL-EB-03112024	70.3	72.2	71.0	73.0	71.9	67.5	63.9	73.0
590-23660-9	FB-03112024	70.2	72.2	70.5	72.8	68.6	67.3	71.3	66.2
LCS 320-747045/3-A	Lab Control Sample	73.6	74.0	76.6	73.3	70.1	73.1	75.5	62.2
LLCS 320-747045/2-A	Lab Control Sample	69.1	70.8	71.4	69.0	66.7	62.9	75.1	68.2
MB 320-747045/1-A	Method Blank	71.7	74.9	75.5	72.9	72.1	71.2	77.9	74.9

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23660-1	SWN-MWA-N-03112024	43.7	48.4	87.3	76.7	72.0	68.5	57.4	57.4
590-23660-2	SWN-MW6-N-03112024	52.1	55.3	86.5	75.9	72.0	68.0	66.9	59.5
590-23660-3	SWN-MW14-N-03112024	51.3	55.3	87.4	73.7	71.1	69.1	60.8	52.6
590-23660-4	SWN-MW13-N-03112024	34.4	25.4	70.8	59.9	49.8	53.6	47.0	39.3
590-23660-5	SWN-MW13-FD-03112024	48.6	44.8	87.5	74.7	72.5	72.9	64.3	53.4
590-23660-6	SWN-MW2-N-03112024	56.0	46.6	90.9	78.7	75.9	74.4	71.8	69.2
590-23660-7	SWN-MW1-N-03112024	57.2	59.0	94.9	75.7	76.6	75.4	71.2	65.1
590-23660-8	WL-EB-03112024	58.2	64.5	81.6	71.1	72.3	67.8	66.1	61.1
590-23660-9	FB-03112024	55.2	60.2	79.2	72.9	77.7	75.4	70.9	68.5
LCS 320-747045/3-A	Lab Control Sample	60.2	71.0	84.3	73.9	75.3	75.8	64.8	68.1
LLCS 320-747045/2-A	Lab Control Sample	59.1	66.2	76.0	70.5	75.5	70.0	65.4	63.5
MB 320-747045/1-A	Method Blank	63.7	70.9	76.6	70.9	75.9	72.0	62.3	62.2

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23660-1	SWN-MWA-N-03112024	133	89.8	72.4	73.8	49.7	44.0	50.9	48.7
590-23660-2	SWN-MW6-N-03112024	116	92.7	86.9	73.8	52.1	47.0	54.6	52.7
590-23660-3	SWN-MW14-N-03112024	101	79.6	78.8	78.1	52.2	46.3	55.1	55.5
590-23660-4	SWN-MW13-N-03112024	84.7	65.8	58.6	66.0	26.6	17.3	31.0	33.7
590-23660-5	SWN-MW13-FD-03112024	101	84.7	77.2	74.6	50.0	43.8	49.8	52.0
590-23660-6	SWN-MW2-N-03112024	137	109	94.3	73.2	50.5	43.2	50.5	48.5
590-23660-7	SWN-MW1-N-03112024	114	91.3	79.9	75.5	56.5	51.4	58.5	54.2
590-23660-8	WL-EB-03112024	76.4	72.7	72.4	68.2	59.6	57.4	59.8	54.2
590-23660-9	FB-03112024	77.4	68.8	74.5	67.6	68.5	64.8	65.6	62.1
LCS 320-747045/3-A	Lab Control Sample	77.7	69.4	71.0	75.5	75.2	66.4	62.0	60.8
LLCS 320-747045/2-A	Lab Control Sample	72.8	64.6	68.4	71.8	65.5	57.6	59.9	55.6
MB 320-747045/1-A	Method Blank	70.6	68.8	72.0	74.8	66.2	58.1	59.3	56.3

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-1
Project/Site: GEG Groundwater Monitoring/209800-000

C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS
M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

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JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23660-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

Job Notes

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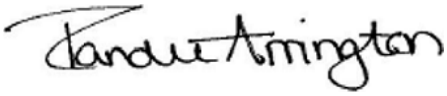

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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23660-2 Eurofins Spokane

Job Narrative
590-23660-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/12/2024 9:42 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 3.6°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46472 recovered above the upper control limit for Potassium. The samples associated with this ICVL were 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46472 recovered below the lower control limit for Sodium. The samples associated with this ICVL were 10x the spike amount for the affected analytes; therefore, the data have been reported.

Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46414 recovered above the upper control limit for Calcium. The samples associated with this ICVL were greater than 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method SM5210B_BODCalc: The method blank result associated with batch 590-46250 was higher than the method-required limit of 0.2 mg/L.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23660-1	SWN-MWA-N-03112024	Water	03/11/24 08:50	03/12/24 09:42
590-23660-2	SWN-MW6-N-03112024	Water	03/11/24 10:50	03/12/24 09:42
590-23660-3	SWN-MW14-N-03112024	Water	03/11/24 11:45	03/12/24 09:42
590-23660-4	SWN-MW13-N-03112024	Water	03/11/24 13:15	03/12/24 09:42
590-23660-6	SWN-MW2-N-03112024	Water	03/11/24 14:50	03/12/24 09:42
590-23660-7	SWN-MW1-N-03112024	Water	03/11/24 16:05	03/12/24 09:42

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
^1-	Initial Calibration Verification (ICV) is outside acceptance limits, low biased.
^1+	Initial Calibration Verification (ICV) is outside acceptance limits, high biased.

General Chemistry

Qualifier	Qualifier Description
b	Result Detected in the Unseeded Control blank (USB).
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: SWN-MWA-N-03112024
Lab Sample ID: 590-23660-1
Date Collected: 03/11/24 08:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	3200		32	17	mg/L			03/14/24 20:43	40
Nitrate as N	0.064	J	0.20	0.057	mg/L			03/12/24 14:07	1
Sulfate	18		0.50	0.13	mg/L			03/12/24 14:07	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	390		10	1.0	mg/L		03/22/24 09:45	03/26/24 13:55	5
Magnesium	140		5.0	0.66	mg/L		03/22/24 09:45	03/26/24 13:55	5
Potassium	23	^1-	2.5	1.5	mg/L		03/22/24 09:45	03/26/24 13:55	5
Sodium	900	^1-	2.5	0.98	mg/L		03/22/24 09:45	03/26/24 13:55	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	340	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	8.4	J b	12	6.0	mg/L			03/13/24 08:49	1

Client Sample ID: SWN-MW6-N-03112024
Lab Sample ID: 590-23660-2
Date Collected: 03/11/24 10:50
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	460		8.0	4.2	mg/L			03/14/24 20:53	10
Nitrate as N	ND		0.20	0.057	mg/L			03/12/24 14:17	1
Sulfate	0.19	J	0.50	0.13	mg/L			03/12/24 14:17	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	83		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 12:44	1
Magnesium	28		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 12:44	1
Potassium	46	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 12:44	1
Sodium	160	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 12:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	190	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:37	1
Biochemical Oxygen Demand (SM5210B)	120	b	60	30	mg/L			03/13/24 08:55	1

Client Sample ID: SWN-MW14-N-03112024
Lab Sample ID: 590-23660-3
Date Collected: 03/11/24 11:45
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	400		8.0	4.2	mg/L			03/14/24 21:03	10
Nitrate as N	0.11	J	0.20	0.057	mg/L			03/12/24 14:27	1
Sulfate	14		0.50	0.13	mg/L			03/12/24 14:27	1

Client Sample ID: SWN-MW14-N-03112024 Lab Sample ID: 590-23660-3

Date Collected: 03/11/24 11:45 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	150		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 12:48	1
Magnesium	49		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 12:48	1
Potassium	7.1	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 12:48	1
Sodium	37	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 12:48	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	210	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:38	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 08:55	1

Client Sample ID: SWN-MW13-N-03112024 Lab Sample ID: 590-23660-4

Date Collected: 03/11/24 13:15 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	360		8.0	4.2	mg/L			03/14/24 21:13	10
Nitrate as N	ND		0.20	0.057	mg/L			03/12/24 14:37	1
Sulfate	14		0.50	0.13	mg/L			03/12/24 14:37	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	130		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 12:52	1
Magnesium	37		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 12:52	1
Potassium	14	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 12:52	1
Sodium	58	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 12:52	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	220	B	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:38	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 08:55	1

Client Sample ID: SWN-MW2-N-03112024 Lab Sample ID: 590-23660-6

Date Collected: 03/11/24 14:50 **Matrix: Water**
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	210		8.0	4.2	mg/L			03/14/24 21:23	10
Nitrate as N	ND		0.20	0.057	mg/L			03/12/24 14:47	1
Sulfate	7.8		0.50	0.13	mg/L			03/12/24 14:47	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	57		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 12:56	1
Magnesium	18		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 12:56	1
Potassium	26	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 12:56	1
Sodium	87	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 12:56	1

Client Sample ID: SWN-MW2-N-03112024
Lab Sample ID: 590-23660-6

Date Collected: 03/11/24 14:50
Matrix: Water
Date Received: 03/12/24 09:42

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	**190**	**B**	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:38	1
Biochemical Oxygen Demand (SM5210B)	ND		4.0	2.0	mg/L			03/13/24 08:55	1

Client Sample ID: SWN-MW1-N-03112024
Lab Sample ID: 590-23660-7

Date Collected: 03/11/24 16:05
Matrix: Water
Date Received: 03/12/24 09:42

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**220**		8.0	4.2	mg/L			03/14/24 21:33	10
Nitrate as N	**2.6**		0.20	0.057	mg/L			03/12/24 14:57	1
Sulfate	**18**		0.50	0.13	mg/L			03/12/24 14:57	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	**66**		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:00	1
Magnesium	**21**		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:00	1
Potassium	**5.8**	**^1-**	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:00	1
Sodium	**50**	**^1-**	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:00	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	**65**	**B**	20	5.0	mg/L			03/13/24 17:21	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/22/24 09:38	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 08:55	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46241/1003
Matrix: Water
Analysis Batch: 46241

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/12/24 13:07	1

Lab Sample ID: LCS 590-46241/1004
Matrix: Water
Analysis Batch: 46241

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.39		mg/L		108	90 - 110

Lab Sample ID: MB 590-46242/1003
Matrix: Water
Analysis Batch: 46242

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/12/24 13:07	1
Sulfate	ND		0.50	0.13	mg/L			03/12/24 13:07	1

Lab Sample ID: LCS 590-46242/1004
Matrix: Water
Analysis Batch: 46242

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.6		mg/L		108	90 - 110
Sulfate	12.5	13.4		mg/L		107	90 - 110

Lab Sample ID: MB 590-46298/1001
Matrix: Water
Analysis Batch: 46298

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 17:43	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 17:43	1

Lab Sample ID: LCS 590-46298/1002
Matrix: Water
Analysis Batch: 46298

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.9		mg/L		103	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46414

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND	^1+	2.0	0.20	mg/L		03/22/24 09:44	03/22/24 16:45	1
Magnesium	ND		1.0	0.13	mg/L		03/22/24 09:44	03/22/24 16:45	1

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46414

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	ND		0.50	0.20	mg/L		03/22/24 09:44	03/22/24 16:45	1

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/22/24 09:44	03/28/24 13:12	1

Lab Sample ID: LCS 590-46401/1-A
Matrix: Water
Analysis Batch: 46414

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	50.8	^1+	mg/L		102	80 - 120
Magnesium	50.0	51.2		mg/L		102	80 - 120
Sodium	50.0	51.3		mg/L		103	80 - 154

Lab Sample ID: LCS 590-46401/1-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Potassium	50.0	50.9		mg/L		102	80 - 135

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46265/1
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/13/24 17:21	1

Lab Sample ID: LCS 590-46265/2
Matrix: Water
Analysis Batch: 46265

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	505		mg/L		101	90 - 110

Lab Sample ID: 590-23660-7 DU
Matrix: Water
Analysis Batch: 46265

Client Sample ID: SWN-MW1-N-03112024
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity as CaCO3	65	B	65.0		mg/L		0	10

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46398/8
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/22/24 09:37	1

Lab Sample ID: LCS 590-46398/7
Matrix: Water
Analysis Batch: 46398

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Phosphorus, Total			0.500	0.484		mg/L		97	90 - 110		

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46250/2
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 08:49	1

Lab Sample ID: USB 590-46250/1
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 08:49	1

Lab Sample ID: LCS 590-46250/3
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Biochemical Oxygen Demand			198	190		mg/L		96	85 - 115		

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MWA-N-03112024
Lab Sample ID: 590-23660-1
Date Collected: 03/11/24 08:50
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:07	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:07	NMI	EET SPK
Total/NA	Analysis	300.0		40	5 mL	5 mL	46298	03/14/24 20:43	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		5			46472	03/26/24 13:55	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	50 mL	300 mL	46250	03/13/24 08:49	JSP	EET SPK

Client Sample ID: SWN-MW6-N-03112024
Lab Sample ID: 590-23660-2
Date Collected: 03/11/24 10:50
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:17	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:17	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46298	03/14/24 20:53	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 12:44	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:37	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	10 mL	300 mL	46250	03/13/24 08:55	JSP	EET SPK

Client Sample ID: SWN-MW14-N-03112024
Lab Sample ID: 590-23660-3
Date Collected: 03/11/24 11:45
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:27	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:27	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46298	03/14/24 21:03	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 12:48	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:38	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46250	03/13/24 08:55	JSP	EET SPK

Client Sample ID: SWN-MW13-N-03112024
Lab Sample ID: 590-23660-4
Date Collected: 03/11/24 13:15
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:37	NMI	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW13-N-03112024
Lab Sample ID: 590-23660-4
Date Collected: 03/11/24 13:15
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:37	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46298	03/14/24 21:13	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 12:52	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:38	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46250	03/13/24 08:55	JSP	EET SPK

Client Sample ID: SWN-MW2-N-03112024
Lab Sample ID: 590-23660-6
Date Collected: 03/11/24 14:50
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:47	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:47	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46298	03/14/24 21:23	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 12:56	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:38	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	150 mL	300 mL	46250	03/13/24 08:55	JSP	EET SPK

Client Sample ID: SWN-MW1-N-03112024
Lab Sample ID: 590-23660-7
Date Collected: 03/11/24 16:05
Matrix: Water
Date Received: 03/12/24 09:42

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46241	03/12/24 14:57	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46242	03/12/24 14:57	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46298	03/14/24 21:33	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:00	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46265	03/13/24 17:21	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46398	03/22/24 09:38	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46250	03/13/24 08:55	JSP	EET SPK

Laboratory References:
EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23660-2
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue
Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: HALEY & ALDRICH	Email: wmcdonald@haleyaldrich.com	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside AVE	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane WA	Analysis Turnaround Time: ☐ CALENDAR DAYS ☐ WORKING DAYS			Sampler:
(xxx) xxx-xxxx: 509 723 5216 Phone	TAT if different from Below: ☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day			For Lab Use Only: Walk-In Client: Lab Sampling:
(xxx) xxx-xxxx: FAX				Job / SDG No.
Project Name: GEC Support				
Site: GEC				
PO# 0209800-000				

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, NO3, SO4 (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM4500)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
SWN-MWA-N-03112024	3/11/24	08:50	G	H_2O	6			X	X	X	X	X	X	
SWN-MW6-N-03112024		10:50			6			X	X	X	X	X	X	
SWN-MW14-N-03112024		11:45			6			X	X	X	X	X	X	
SWN-MW13-N-03112024		13:15			6			X	X	X	X	X	X	
SWN-MW13-FD-03112024		13:45			2			X	X					
SWN-MW2-N-03112024		14:50			6			X	X	X	X	X	X	
SWN-MW1-N-03112024		16:05			6			X	X	X	X	X	X	
WL-EB-03112024		16:25			2			X						
FB-03112024		16:30			2			X						

590-23660 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:
1633 5-day TAT
Remaing samples on standard time

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 3.5 Corr'd: 3.6	Therm ID No.: IR009
Relinquished by:	Company: HEA	Date/Time: 3/11/24 1300	Received by:	Company: HA
Relinquished by:	Company: HEA	Date/Time: 3/12/24 1017	Received by:	Company:	Date/Time: 3/11/2024 1700
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EEC808	Date/Time: 3/12/2024 9:42

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23660-2

Login Number: 23660
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Tracking # 7101 4400 2807

Job ____ 590-23660 Field Sheet

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC.

Therm. ID: L-11 Corr. Factor (+ / -) - °C

Ice 1 Wet 1 Gel _____ Other _____

Cooler Custody Seal: 2261246

Cooler ID: _____

Temp Observed: 2.2 °C Corrected: 2.2 °C

From Temp Blank ☐ Sample ☐

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☐	☐
Cooler Temperature is acceptable?	☐	☐	☐
Frozen samples show signs of thaw?	☐	☐	☐

Initials: _____ Date 3.13.24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☐	☐	☐
Samples compromised/tampered with?	☐	☐	☐
COC is complete w/o discrepancies	☐	☐	☐
Sample custody seal?	☐	☐	☐
Sample containers have legible labels?	☐	☐	☐
Sample date/times are provided?	☐	☐	☐
Appropriate containers are used?	☐	☐	☐
Sample bottles are completely filled?	☐	☐	☐
Sample preservatives verified?	☐	☐	☐
Is the Field Sampler's name on COC?	☐	☐	☐
Samples w/o discrepancies?	☐	☐	☐
Zero headspace?*	☐	☐	☐
Alkalinity has no headspace?	☐	☐	☐
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☐
Multiphasic samples are not present?	☐	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials: _____ Date 3.13.24

Notes: _____

Trizma Lot #(s): _____

Ammonium Acetate Lot #(s) _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☐	☐	☐
NCM Filed?	☐	☐	☐
Samples received within hold time?	☐	☐	☐
Log Release checked in TALS?	☐	☐	☐

Initials: _____ Date 3.13.24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/27/2024 4:13:04 PM

JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23681-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

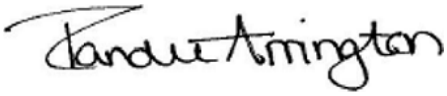
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23681-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/13/2024 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 1.2°C.

PFAS
Method 1633: The following samples in preparation batch 320-747423 were pale yellow in color prior to extraction. SWN-MW5-N-03122024 (590-23681-3)

Method 1633: The following sample in preparation batch 320-747423 was observed to have a thin layer of sediment present in the bottom of the bottle prior to extraction. SWN-MW4-N-03122024 (590-23681-2)

Method 1633: The following sample in preparation batch 320-747423 was dark yellow in color prior to extraction. SWN-MW4-N-03122024 (590-23681-2)

Method 1633: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate/sample duplicate (MS/MSD/DUP) associated with preparation batch 320-747423.

Method 1633: Due to the pale yellow coloration of these samples, the initial volumes used for the following samples SWN-MW5-N-03122024 (590-23681-3) in preparation batch 320-747423 deviated from the standard procedure. A 2x dilution was made on the samples, then fortified IDA and extracted. The reporting limits (RLs) have been adjusted proportionately.

Method 1633: Due to the presence of sediment and the dark yellow coloration of the sample, the initial volume used for the following sample SWN-MW4-N-03122024 (590-23681-2) in preparation batch 320-747423 deviated from the standard procedure. A 2x dilution was made on the sample, then fortified IDA and extracted. The reporting limits (RLs) have been adjusted proportionately.

Method 1633: During the solid phase extraction process, the following samples contained non-settable particulates which clogged the solid phase extraction column: SWN-MW4-N-03122024 (590-23681-2).

Method 1633: The concentration of one or more analytes associated with the following samples exceeded the instrument calibration range: SWN-MW321-N-03122024 (590-23681-1) and (590-23681-B-1-A DU). These analytes have been qualified; however, the peak(s) did not saturate the instrument detector. These analytes have been qualified; however, the peaks did not saturate the instrument detector. The samples were diluted within calibration range, and both sets of data were reported.

Method 1633: The continuing calibration verification (CCV) associated with batch 320-748520 recovered above the upper control limit for Isotope Dilution Analyte (IDA) 13C2 4:2 FTS. The native analyte associated with this IDA was within control in the CCVs, indicating no adverse impact on target analyte quantitation. The samples associated with this CCV were non-detects for the affected analyte; therefore, the data have been reported. The associated samples are impacted: SWN-MW321-N-03122024 (590-23681-1), (CCV 320-748520/30) and (590-23681-B-1-A DU).

Method 1633: Results for samples SWN-MW321-N-03122024 (590-23681-1) and (590-23681-B-1-A DU) were reported from the analysis of a diluted extract due to high concentration of the target analyte and high Isotope Dilution Analyte (IDA) percent recovery in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits.

Job ID: 590-23681-1 (Continued) Eurofins Spokane

Method 1633: The concentration of one or more analytes associated with the following samples exceeded the instrument calibration range: SWN-MW321-N-03122024 (590-23681-1) and (590-23681-B-1-A DU). These analytes have been qualified; however, the peaks did not saturate the instrument detector. Historical data indicate that for the isotope dilution method, dilution and re-analysis will not produce significantly different results from those reported above the calibration range. There is no sample volume remaining for re-extraction; therefore, the data have been reported.

Method 1633: Isotope Dilution Analyte (IDA) recovery is above the method recommended limit for the following samples: SWN-MW321-N-03122024 (590-23681-1) and (590-23681-B-1-A DU). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries. These samples were re-analyzed at dilution with IDA recoveries within control limits. Both sets of data are reported.

Method 1633: The following continuing calibration blank (CCB) was flagged for Isotope Dilution Analyte (IDA) recovery above the method recommended limit: (CCB 320-748038/14) and (CCB 320-748038/20). However, there are no defined IDA recovery limits for CCBs in the SOP or source method. The purpose of the CCB is to test for instrument contamination. As the CCB was non-detect for all native analytes, the bracketing continuing calibration verification (CCV) was in control, and the IDA of the associated samples recovered within limits, there is no adverse impact on data quality; therefore, the data have been reported.

(CCB 320-748038/14) and (CCB 320-748038/20)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23681-1	SWN-MW321-N-03122024	Water	03/12/24 08:20	03/13/24 09:40
590-23681-2	SWN-MW4-N-03122024	Water	03/12/24 10:05	03/13/24 09:40
590-23681-3	SWN-MW5-N-03122024	Water	03/12/24 12:20	03/13/24 09:40
590-23681-4	FGF-MW18-N-03122024	Water	03/12/24 13:55	03/13/24 09:40
590-23681-5	PD-MW1A-N-03122024	Water	03/12/24 15:50	03/13/24 09:40
590-23681-6	WL-EB-03122024	Water	03/12/24 16:10	03/13/24 09:40
590-23681-7	FB-03122024	Water	03/12/24 16:15	03/13/24 09:40

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

LCMS

Qualifier	Qualifier Description
*3	ISTD response or retention time outside acceptable limits.
*5+	Isotope dilution analyte is outside acceptance limits, high biased.
E	Result exceeded calibration range.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: SWN-MW321-N-03122024
Lab Sample ID: 590-23681-1

Date Collected: 03/12/24 08:20
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**99**		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluoropentanoic acid (PFPeA)	**240**		4.2	1.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorohexanoic acid (PFHxA)	**850**	**E**	2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluoroheptanoic acid (PFHpA)	**110**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorooctanoic acid (PFOA)	**300**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorononanoic acid (PFNA)	**18**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorodecanoic acid (PFDA)	**5.2**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluoroundecanoic acid (PFUnA)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorododecanoic acid (PFDoA)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorobutanesulfonic acid (PFBS)	**68**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluoropentanesulfonic acid (PFPeS)	**120**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluoroheptanesulfonic acid (PFHpS)	**12**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorooctanesulfonic acid (PFOS)	**170**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorononanesulfonic acid (PFNS)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
4:2 FTS	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
6:2 FTS	**4.0**	**J**	8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
8:2 FTS	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
Perfluorooctanesulfonamide (FOSA)	**14**		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
NMeFOSA	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
NEtFOSA	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
NMeFOSAA	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
NEtFOSAA	ND		2.1	0.53	ng/L		03/15/24 11:27	03/17/24 01:21	1
NMeFOSE	ND		21	5.3	ng/L		03/15/24 11:27	03/17/24 01:21	1
NEtFOSE	ND		21	5.3	ng/L		03/15/24 11:27	03/17/24 01:21	1
HFPO-DA (GenX)	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
PFMPA	ND		4.2	1.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
PFMBA	ND		4.2	1.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
NFDHA	ND		4.2	1.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
9Cl-PF3ONS	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
11Cl-PF3OUdS	ND		8.5	2.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
PFEESA	ND		4.2	1.1	ng/L		03/15/24 11:27	03/17/24 01:21	1
3:3 FTCA	ND		11	2.7	ng/L		03/15/24 11:27	03/17/24 01:21	1
5:3 FTCA	ND		53	13	ng/L		03/15/24 11:27	03/17/24 01:21	1
7:3 FTCA	ND		53	13	ng/L		03/15/24 11:27	03/17/24 01:21	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*75.8*		*5 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C5 PFPeA	*60.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C5 PFHxA	*72.5*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C4 PFHpA	*89.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*

Client Sample ID: SWN-MW321-N-03122024
Lab Sample ID: 590-23681-1
Date Collected: 03/12/24 08:20
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOA	*72.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C9 PFNA	*73.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C6 PFDA	*62.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C7 PFUnA	*61.9*		*30 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C2 PFDoA	*45.2*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C2 PFTeDA	*47.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C3 PFBS	*165*	**5+*	*40 - 135*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C3 PFHxS	*75.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C8 PFOS	*73.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C8 PFOSA	*67.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d3-NMeFOSAA	*72.9*		*40 - 170*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d5-NEtFOSAA	*70.3*		*25 - 135*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C2 4:2 FTS	*262*	**5+*	*40 - 200*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C2 6:2 FTS	*158*		*40 - 200*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C2 8:2 FTS	*132*		*40 - 300*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
13C3 HFPO-DA	*78.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d7-N-MeFOSE-M	*52.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d9-N-EtFOSE-M	*48.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d5-NEtPFOSA	*55.4*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*
d3-NMePFOSA	*55.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:21*	*1*

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanoic acid (PFHxA)	**830**		21	5.3	ng/L		03/15/24 11:27	03/19/24 08:20	10
Perfluorobutanesulfonic acid (PFBS)	**69**		21	5.3	ng/L		03/15/24 11:27	03/19/24 08:20	10
Perfluorohexanesulfonic acid (PFHxS)	**4100**	**E**	21	5.3	ng/L		03/15/24 11:27	03/19/24 08:20	10
4:2 FTS	ND		85	21	ng/L		03/15/24 11:27	03/19/24 08:20	10

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C5 PFHxA	*78.7*	**3*	*40 - 130*	*03/15/24 11:27*	*03/19/24 08:20*	*10*
13C3 PFBS	*90.5*	**3*	*40 - 135*	*03/15/24 11:27*	*03/19/24 08:20*	*10*
13C3 PFHxS	*77.4*	**3*	*40 - 130*	*03/15/24 11:27*	*03/19/24 08:20*	*10*
13C2 4:2 FTS	*155*	**3*	*40 - 200*	*03/15/24 11:27*	*03/19/24 08:20*	*10*

Client Sample ID: SWN-MW4-N-03122024
Lab Sample ID: 590-23681-2
Date Collected: 03/12/24 10:05
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**35**		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluoropentanoic acid (PFPeA)	**61**		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorohexanoic acid (PFHxA)	**58**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluoroheptanoic acid (PFHpA)	**41**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorooctanoic acid (PFOA)	**130**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorononanoic acid (PFNA)	**23**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorodecanoic acid (PFDA)	**150**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluoroundecanoic acid (PFUnA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorododecanoic acid (PFDoA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW4-N-03122024
Lab Sample ID: 590-23681-2
Date Collected: 03/12/24 10:05
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorotridecanoic acid (PFTrDA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorotetradecanoic acid (PFTeA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorobutanesulfonic acid (PFBS)	**3.0**	**J**	4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluoropentanesulfonic acid (PFPeS)	**3.0**	**J**	4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorohexanesulfonic acid (PFHxS)	**25**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorooctanesulfonic acid (PFOS)	**51**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorononanesulfonic acid (PFNS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorodecanesulfonic acid (PFDS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorododecanesulfonic acid (PFDoS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
4:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
6:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
8:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
Perfluorooctanesulfonamide (FOSA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NMeFOSA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NEtFOSA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NMeFOSAA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NEtFOSAA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NMeFOSE	ND		40	10	ng/L		03/15/24 11:27	03/17/24 01:56	1
NEtFOSE	ND		40	10	ng/L		03/15/24 11:27	03/17/24 01:56	1
HFPO-DA (GenX)	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
PFMPA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
PFMBA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
NFDHA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
9Cl-PF3ONS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
11Cl-PF3OUdS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
PFEESA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
3:3 FTCA	ND		20	5.0	ng/L		03/15/24 11:27	03/17/24 01:56	1
5:3 FTCA	ND		100	25	ng/L		03/15/24 11:27	03/17/24 01:56	1
7:3 FTCA	ND		100	25	ng/L		03/15/24 11:27	03/17/24 01:56	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*66.1*		*5 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C5 PFPeA	*65.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C5 PFHxA	*64.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C4 PFHpA	*65.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C8 PFOA	*66.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C9 PFNA	*53.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C6 PFDA	*56.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C7 PFUnA	*45.9*		*30 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C2 PFDoA	*28.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C2 PFTeDA	*28.4*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C3 PFBS	*72.6*		*40 - 135*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C3 PFHxS	*64.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*

Client Sample ID: SWN-MW4-N-03122024 Lab Sample ID: 590-23681-2

Date Collected: 03/12/24 10:05 **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C8 PFOS	*60.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C8 PFOSA	*56.9*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d3-NMeFOSAA	*43.0*		*40 - 170*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d5-NEtFOSAA	*40.6*		*25 - 135*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C2 4:2 FTS	*87.0*		*40 - 200*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C2 6:2 FTS	*69.2*		*40 - 200*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C2 8:2 FTS	*63.0*		*40 - 300*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
13C3 HFPO-DA	*61.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d7-N-MeFOSE-M	*29.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d9-N-EtFOSE-M	*26.9*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d5-NEtPFOSA	*31.9*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*
d3-NMePFOSA	*31.0*		*10 - 130*	*03/15/24 11:27*	*03/17/24 01:56*	*1*

Client Sample ID: SWN-MW5-N-03122024 Lab Sample ID: 590-23681-3

Date Collected: 03/12/24 12:20 **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**24**		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluoropentanoic acid (PFPeA)	**54**		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorohexanoic acid (PFHxA)	**72**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluoroheptanoic acid (PFHpA)	**20**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorooctanoic acid (PFOA)	**58**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorononanoic acid (PFNA)	**13**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorodecanoic acid (PFDA)	**34**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluoroundecanoic acid (PFUnA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorododecanoic acid (PFDoA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorotridecanoic acid (PFTrDA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorotetradecanoic acid (PFTeA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorobutanesulfonic acid (PFBS)	**4.2**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluoropentanesulfonic acid (PFPeS)	**3.6**	**J**	4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorohexanesulfonic acid (PFHxS)	**100**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorooctanesulfonic acid (PFOS)	**40**		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorononanesulfonic acid (PFNS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorodecanesulfonic acid (PFDS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorododecanesulfonic acid (PFDoS)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
4:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
6:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
8:2 FTS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
Perfluorooctanesulfonamide (FOSA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
NMeFOSA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
NEtFOSA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
NMeFOSAA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1

Client Sample ID: SWN-MW5-N-03122024
Lab Sample ID: 590-23681-3
Date Collected: 03/12/24 12:20
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
NEtFOSAA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
NMeFOSE	ND		40	10	ng/L		03/15/24 11:27	03/17/24 02:14	1
NEtFOSE	ND		40	10	ng/L		03/15/24 11:27	03/17/24 02:14	1
HFPO-DA (GenX)	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
PFMPA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
PFMBA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
NFDHA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
9Cl-PF3ONS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
11Cl-PF3OUdS	ND		16	4.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
PFEESA	ND		8.0	2.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
3:3 FTCA	ND		20	5.0	ng/L		03/15/24 11:27	03/17/24 02:14	1
5:3 FTCA	ND		100	25	ng/L		03/15/24 11:27	03/17/24 02:14	1
7:3 FTCA	ND		100	25	ng/L		03/15/24 11:27	03/17/24 02:14	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*75.9*		*5 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C5 PFPeA	*77.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C5 PFHxA	*76.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C4 PFHpA	*82.5*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C8 PFOA	*77.2*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C9 PFNA	*78.9*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C6 PFDA	*76.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C7 PFUnA	*79.2*		*30 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C2 PFDoA	*56.5*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C2 PFTeDA	*65.8*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C3 PFBS	*87.5*		*40 - 135*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C3 PFHxS	*79.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C8 PFOS	*75.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C8 PFOSA	*77.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d3-NMeFOSAA	*74.9*		*40 - 170*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d5-NEtFOSAA	*70.8*		*25 - 135*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C2 4:2 FTS	*110*		*40 - 200*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C2 6:2 FTS	*88.7*		*40 - 200*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C2 8:2 FTS	*86.0*		*40 - 300*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
13C3 HFPO-DA	*73.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d7-N-MeFOSE-M	*60.4*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d9-N-EtFOSE-M	*55.5*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d5-NEtPFOSA	*62.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*
d3-NMePFOSA	*58.4*		*10 - 130*	*03/15/24 11:27*	*03/17/24 02:14*	*1*

Client Sample ID: FGF-MW18-N-03122024
Lab Sample ID: 590-23681-4
Date Collected: 03/12/24 13:55
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**2.6**	**J**	7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluoropentanoic acid (PFPeA)	**6.7**		3.7	0.93	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorohexanoic acid (PFHxA)	**5.5**		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1

Client Sample ID: FGF-MW18-N-03122024
Lab Sample ID: 590-23681-4

Date Collected: 03/12/24 13:55
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluoroheptanoic acid (PFHpA)	**2.9**		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorooctanoic acid (PFOA)	**2.5**		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorobutanesulfonic acid (PFBS)	**0.91**	**J**	1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorohexanesulfonic acid (PFHxS)	**3.6**		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorooctanesulfonic acid (PFOS)	**12**		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
4:2 FTS	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
6:2 FTS	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
8:2 FTS	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
NMeFOSA	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
NEtFOSA	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
NMeFOSAA	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
NEtFOSAA	ND		1.9	0.46	ng/L		03/15/24 11:27	03/17/24 03:07	1
NMeFOSE	ND		19	4.6	ng/L		03/15/24 11:27	03/17/24 03:07	1
NEtFOSE	ND		19	4.6	ng/L		03/15/24 11:27	03/17/24 03:07	1
HFPO-DA (GenX)	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
PFMPA	ND		3.7	0.93	ng/L		03/15/24 11:27	03/17/24 03:07	1
PFMBA	ND		3.7	0.93	ng/L		03/15/24 11:27	03/17/24 03:07	1
NFDHA	ND		3.7	0.93	ng/L		03/15/24 11:27	03/17/24 03:07	1
9Cl-PF3ONS	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
11Cl-PF3OUdS	ND		7.4	1.9	ng/L		03/15/24 11:27	03/17/24 03:07	1
PFEESA	ND		3.7	0.93	ng/L		03/15/24 11:27	03/17/24 03:07	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/15/24 11:27	03/17/24 03:07	1
5:3 FTCA	ND		46	12	ng/L		03/15/24 11:27	03/17/24 03:07	1
7:3 FTCA	ND		46	12	ng/L		03/15/24 11:27	03/17/24 03:07	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*75.2*		*5 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C5 PFPeA	*68.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C5 PFHxA	*70.2*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C4 PFHpA	*69.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C8 PFOA	*75.2*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C9 PFNA	*70.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*

Client Sample ID: FGF-MW18-N-03122024 Lab Sample ID: 590-23681-4

Date Collected: 03/12/24 13:55 **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C6 PFDA	*85.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C7 PFUnA	*76.5*		*30 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C2 PFDoA	*59.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C2 PFTeDA	*60.5*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C3 PFBS	*85.0*		*40 - 135*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C3 PFHxS	*75.6*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C8 PFOS	*74.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C8 PFOSA	*74.6*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d3-NMeFOSAA	*69.6*		*40 - 170*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d5-NEtFOSAA	*70.3*		*25 - 135*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C2 4:2 FTS	*93.2*		*40 - 200*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C2 6:2 FTS	*78.5*		*40 - 200*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C2 8:2 FTS	*75.4*		*40 - 300*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
13C3 HFPO-DA	*68.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d7-N-MeFOSE-M	*53.4*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d9-N-EtFOSE-M	*48.8*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d5-NEtPFOSA	*53.7*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*
d3-NMePFOSA	*52.7*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:07*	*1*

Client Sample ID: PD-MW1A-N-03122024 Lab Sample ID: 590-23681-5

Date Collected: 03/12/24 15:50 **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**3.6**	**J**	7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluoropentanoic acid (PFPeA)	**2.5**	**J**	3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorohexanoic acid (PFHxA)	**2.4**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluoroheptanoic acid (PFHpA)	**2.8**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorooctanoic acid (PFOA)	**3.8**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorobutanesulfonic acid (PFBS)	**4.4**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluoropentanesulfonic acid (PFPeS)	**3.8**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorohexanesulfonic acid (PFHxS)	**27**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluoroheptanesulfonic acid (PFHpS)	**1.2**	**J**	1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorooctanesulfonic acid (PFOS)	**28**		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
4:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1

Client Sample ID: PD-MW1A-N-03122024
Lab Sample ID: 590-23681-5
Date Collected: 03/12/24 15:50
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
6:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
8:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
NMeFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
NEtFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:24	1
NMeFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 03:24	1
NEtFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 03:24	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
PFMPA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:24	1
PFMBA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:24	1
NFDHA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:24	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:24	1
PFEESA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:24	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/15/24 11:27	03/17/24 03:24	1
5:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 03:24	1
7:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 03:24	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*72.0*		*5 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C5 PFPeA	*74.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C5 PFHxA	*72.9*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C4 PFHpA	*72.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C8 PFOA	*71.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C9 PFNA	*69.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C6 PFDA	*73.8*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C7 PFUnA	*78.9*		*30 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C2 PFDoA	*56.8*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C2 PFTeDA	*72.5*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C3 PFBS	*79.7*		*40 - 135*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C3 PFHxS	*72.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C8 PFOS	*74.2*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C8 PFOSA	*73.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d3-NMeFOSAA	*67.5*		*40 - 170*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d5-NEtFOSAA	*68.8*		*25 - 135*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C2 4:2 FTS	*83.4*		*40 - 200*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C2 6:2 FTS	*74.5*		*40 - 200*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C2 8:2 FTS	*74.2*		*40 - 300*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
13C3 HFPO-DA	*71.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d7-N-MeFOSE-M	*67.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d9-N-EtFOSE-M	*62.2*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d5-NEtPFOSA	*66.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*
d3-NMePFOSA	*63.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 03:24*	*1*

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: WL-EB-03122024
Lab Sample ID: 590-23681-6
Date Collected: 03/12/24 16:10
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluoropentanoic acid (PFPeA)	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
4:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
6:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
8:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
NMeFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
NEtFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 03:42	1
NMeFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 03:42	1
NEtFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 03:42	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
PFMPA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:42	1
PFMBA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:42	1
NFDHA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:42	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 03:42	1
PFEESA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 03:42	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/15/24 11:27	03/17/24 03:42	1
5:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 03:42	1
7:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 03:42	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*74.3*		*5 - 130*	*03/15/24 11:27*	*03/17/24 03:42*	*1*
13C5 PFPeA	*73.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:42*	*1*
13C5 PFHxA	*71.5*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:42*	*1*
13C4 PFHpA	*71.1*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:42*	*1*
13C8 PFOA	*73.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 03:42*	*1*

Client Sample ID: WL-EB-03122024
Lab Sample ID: 590-23681-6

Date Collected: 03/12/24 16:10
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	63.2		40 - 130	03/15/24 11:27	03/17/24 03:42	1
13C6 PFDA	71.7		40 - 130	03/15/24 11:27	03/17/24 03:42	1
13C7 PFUnA	69.1		30 - 130	03/15/24 11:27	03/17/24 03:42	1
13C2 PFDoA	58.2		10 - 130	03/15/24 11:27	03/17/24 03:42	1
13C2 PFTeDA	59.2		10 - 130	03/15/24 11:27	03/17/24 03:42	1
13C3 PFBS	83.8		40 - 135	03/15/24 11:27	03/17/24 03:42	1
13C3 PFHxS	72.6		40 - 130	03/15/24 11:27	03/17/24 03:42	1
13C8 PFOS	73.1		40 - 130	03/15/24 11:27	03/17/24 03:42	1
13C8 PFOSA	64.0		40 - 130	03/15/24 11:27	03/17/24 03:42	1
d3-NMeFOSAA	70.5		40 - 170	03/15/24 11:27	03/17/24 03:42	1
d5-NEtFOSAA	69.3		25 - 135	03/15/24 11:27	03/17/24 03:42	1
13C2 4:2 FTS	82.3		40 - 200	03/15/24 11:27	03/17/24 03:42	1
13C2 6:2 FTS	79.4		40 - 200	03/15/24 11:27	03/17/24 03:42	1
13C2 8:2 FTS	82.9		40 - 300	03/15/24 11:27	03/17/24 03:42	1
13C3 HFPO-DA	68.9		40 - 130	03/15/24 11:27	03/17/24 03:42	1
d7-N-MeFOSE-M	55.7		10 - 130	03/15/24 11:27	03/17/24 03:42	1
d9-N-EtFOSE-M	52.4		10 - 130	03/15/24 11:27	03/17/24 03:42	1
d5-NEtPFOSA	56.8		10 - 130	03/15/24 11:27	03/17/24 03:42	1
d3-NMePFOSA	56.0		10 - 130	03/15/24 11:27	03/17/24 03:42	1

Client Sample ID: FB-03122024
Lab Sample ID: 590-23681-7

Date Collected: 03/12/24 16:15
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluoropentanoic acid (PFPeA)	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
4:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
6:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
8:2 FTS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1

Client Sample ID: FB-03122024
Lab Sample ID: 590-23681-7
Date Collected: 03/12/24 16:15
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
NMeFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
NEtFOSA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/15/24 11:27	03/17/24 04:00	1
NMeFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 04:00	1
NEtFOSE	ND		19	4.7	ng/L		03/15/24 11:27	03/17/24 04:00	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
PFMPA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 04:00	1
PFMBA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 04:00	1
NFDHA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 04:00	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/15/24 11:27	03/17/24 04:00	1
PFEESA	ND		3.8	0.94	ng/L		03/15/24 11:27	03/17/24 04:00	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/15/24 11:27	03/17/24 04:00	1
5:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 04:00	1
7:3 FTCA	ND		47	12	ng/L		03/15/24 11:27	03/17/24 04:00	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*74.3*		*5 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C5 PFPeA	*74.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C5 PFHxA	*73.5*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C4 PFHpA	*73.7*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C8 PFOA	*79.0*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C9 PFNA	*69.3*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C6 PFDA	*72.2*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C7 PFUnA	*77.2*		*30 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C2 PFDoA	*63.9*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C2 PFTeDA	*72.1*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C3 PFBS	*82.8*		*40 - 135*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C3 PFHxS	*74.6*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C8 PFOS	*77.5*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C8 PFOSA	*73.4*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d3-NMeFOSAA	*73.2*		*40 - 170*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d5-NEtFOSAA	*70.7*		*25 - 135*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C2 4:2 FTS	*79.2*		*40 - 200*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C2 6:2 FTS	*75.4*		*40 - 200*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C2 8:2 FTS	*74.6*		*40 - 300*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
13C3 HFPO-DA	*72.9*		*40 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d7-N-MeFOSE-M	*67.0*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d9-N-EtFOSE-M	*61.8*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d5-NEtPFOSA	*63.6*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*
d3-NMePFOSA	*55.3*		*10 - 130*	*03/15/24 11:27*	*03/17/24 04:00*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-747423/1-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 747423

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
4:2 FTS	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
6:2 FTS	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
8:2 FTS	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
NMeFOSA	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
NEtFOSA	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/15/24 11:27	03/16/24 23:35	1
NMeFOSE	ND		20	5.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
NEtFOSE	ND		20	5.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
PFMPA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
PFMBA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
NFDHA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
PFEESA	ND		4.0	1.0	ng/L		03/15/24 11:27	03/16/24 23:35	1
3:3 FTCA	ND		10	2.5	ng/L		03/15/24 11:27	03/16/24 23:35	1
5:3 FTCA	ND		50	13	ng/L		03/15/24 11:27	03/16/24 23:35	1
7:3 FTCA	ND		50	13	ng/L		03/15/24 11:27	03/16/24 23:35	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*74.3*		*5 - 130*	*03/15/24 11:27*	*03/16/24 23:35*	*1*
13C5 PFPeA	*73.5*		*40 - 130*	*03/15/24 11:27*	*03/16/24 23:35*	*1*
13C5 PFHxA	*74.9*		*40 - 130*	*03/15/24 11:27*	*03/16/24 23:35*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-747423/1-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 747423

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	73.2		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C8 PFOA	72.1		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C9 PFNA	72.3		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C6 PFDA	79.9		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C7 PFUnA	80.6		30 - 130	03/15/24 11:27	03/16/24 23:35	1
13C2 PFDoA	63.9		10 - 130	03/15/24 11:27	03/16/24 23:35	1
13C2 PFTeDA	60.7		10 - 130	03/15/24 11:27	03/16/24 23:35	1
13C3 PFBS	80.9		40 - 135	03/15/24 11:27	03/16/24 23:35	1
13C3 PFHxS	74.4		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C8 PFOS	77.7		40 - 130	03/15/24 11:27	03/16/24 23:35	1
13C8 PFOSA	66.2		40 - 130	03/15/24 11:27	03/16/24 23:35	1
d3-NMeFOSAA	69.3		40 - 170	03/15/24 11:27	03/16/24 23:35	1
d5-NEtFOSAA	66.5		25 - 135	03/15/24 11:27	03/16/24 23:35	1
13C2 4:2 FTS	77.0		40 - 200	03/15/24 11:27	03/16/24 23:35	1
13C2 6:2 FTS	74.5		40 - 200	03/15/24 11:27	03/16/24 23:35	1
13C2 8:2 FTS	77.0		40 - 300	03/15/24 11:27	03/16/24 23:35	1
13C3 HFPO-DA	71.3		40 - 130	03/15/24 11:27	03/16/24 23:35	1
d7-N-MeFOSE-M	50.0		10 - 130	03/15/24 11:27	03/16/24 23:35	1
d9-N-EtFOSE-M	44.3		10 - 130	03/15/24 11:27	03/16/24 23:35	1
d5-NEtPFOSA	48.7		10 - 130	03/15/24 11:27	03/16/24 23:35	1
d3-NMePFOSA	47.6		10 - 130	03/15/24 11:27	03/16/24 23:35	1

Lab Sample ID: LCS 320-747423/3-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747423

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	143		ng/L		112	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	61.8		ng/L		97	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	31.8		ng/L		99	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	31.2		ng/L		97	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	31.8		ng/L		99	70 - 150
Perfluorononanoic acid (PFNA)	32.0	37.7		ng/L		118	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	33.4		ng/L		105	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	33.8		ng/L		106	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	42.6		ng/L		133	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	34.8		ng/L		109	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	33.7		ng/L		105	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	30.4		ng/L		107	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	30.8		ng/L		103	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	31.0		ng/L		106	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	28.7		ng/L		94	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-747423/3-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747423

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	30.4		ng/L		102	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	25.7		ng/L		83	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.4		ng/L		73	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	20.8		ng/L		67	50 - 145
4:2 FTS	120	106		ng/L		88	70 - 145
6:2 FTS	122	130		ng/L		107	65 - 155
8:2 FTS	123	133		ng/L		108	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	34.8		ng/L		109	70 - 145
NMeFOSA	32.0	30.5		ng/L		95	60 - 150
NEtFOSA	32.0	37.3		ng/L		117	65 - 145
NMeFOSAA	32.0	39.6		ng/L		124	50 - 140
NEtFOSAA	32.0	30.0		ng/L		94	70 - 145
NMeFOSE	320	346		ng/L		108	70 - 145
NEtFOSE	320	380		ng/L		119	70 - 135
HFPO-DA (GenX)	128	148		ng/L		116	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	128		ng/L		106	65 - 145
PFMPA	64.0	65.1		ng/L		102	55 - 140
PFMBA	64.0	58.9		ng/L		92	60 - 150
NFDHA	64.0	71.5		ng/L		112	50 - 150
9Cl-PF3ONS	120	131		ng/L		109	70 - 155
11Cl-PF3OUdS	121	116		ng/L		96	55 - 160
PFEESA	57.1	58.8		ng/L		103	70 - 140
3:3 FTCA	160	171		ng/L		107	65 - 130
5:3 FTCA	799	859		ng/L		108	70 - 135
7:3 FTCA	799	806		ng/L		101	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*77.4*		*5 - 130*
13C5 PFPeA	*77.1*		*40 - 130*
13C5 PFHxA	*77.6*		*40 - 130*
13C4 PFHpA	*79.1*		*40 - 130*
13C8 PFOA	*77.8*		*40 - 130*
13C9 PFNA	*73.7*		*40 - 130*
13C6 PFDA	*78.0*		*40 - 130*
13C7 PFUnA	*82.1*		*30 - 130*
13C2 PFDoA	*60.3*		*10 - 130*
13C2 PFTeDA	*63.3*		*10 - 130*
13C3 PFBS	*84.2*		*40 - 135*
13C3 PFHxS	*78.4*		*40 - 130*
13C8 PFOS	*77.4*		*40 - 130*
13C8 PFOSA	*64.1*		*40 - 130*
d3-NMeFOSAA	*70.5*		*40 - 170*
d5-NEtFOSAA	*65.7*		*25 - 135*
13C2 4:2 FTS	*82.9*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-747423/3-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747423

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*73.8*		*40 - 200*
13C2 8:2 FTS	*80.1*		*40 - 300*
13C3 HFPO-DA	*73.7*		*40 - 130*
d7-N-MeFOSE-M	*48.2*		*10 - 130*
d9-N-EtFOSE-M	*43.7*		*10 - 130*
d5-NEtPFOSA	*48.1*		*10 - 130*
d3-NMePFOSA	*46.7*		*10 - 130*

Lab Sample ID: LLCS 320-747423/2-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747423

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	14.9		ng/L		117	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	6.33		ng/L		99	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.11		ng/L		97	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	3.41		ng/L		106	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	3.35		ng/L		105	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.46		ng/L		108	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	3.67		ng/L		115	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.67		ng/L		115	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	4.19		ng/L		131	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.36		ng/L		105	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.26		ng/L		102	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	3.02		ng/L		106	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	2.98		ng/L		99	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.49		ng/L		120	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.98		ng/L		98	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	3.14		ng/L		106	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.45		ng/L		80	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	1.88	J	ng/L		61	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	1.68	J	ng/L		54	50 - 145
4:2 FTS	12.0	11.4		ng/L		95	70 - 145
6:2 FTS	12.2	13.0		ng/L		106	65 - 155
8:2 FTS	12.3	13.0		ng/L		106	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.51		ng/L		110	70 - 145
NMeFOSA	3.20	2.69		ng/L		84	60 - 150
NEtFOSA	3.20	3.24		ng/L		101	65 - 145
NMeFOSAA	3.20	3.92		ng/L		122	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-747423/2-A
Matrix: Water
Analysis Batch: 748038

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 747423

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
NEtFOSAA			3.20	3.04		ng/L		95	70 - 145		
NMeFOSE			32.0	32.6		ng/L		102	70 - 145		
NEtFOSE			32.0	33.8		ng/L		106	70 - 135		
HFPO-DA (GenX)			12.8	12.2		ng/L		95	70 - 140		
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)			12.1	13.5		ng/L		111	65 - 145		
PFMPA			6.40	6.67		ng/L		104	55 - 140		
PFMBA			6.40	5.43		ng/L		85	60 - 150		
NFDHA			6.40	7.66		ng/L		120	50 - 150		
9Cl-PF3ONS			12.0	11.7		ng/L		98	70 - 155		
11Cl-PF3OUdS			12.1	9.23		ng/L		76	55 - 160		
PFEESA			5.71	6.13		ng/L		107	70 - 140		
3:3 FTCA			16.0	17.1		ng/L		107	65 - 130		
5:3 FTCA			79.9	88.8		ng/L		111	70 - 135		
7:3 FTCA			79.9	72.4		ng/L		91	50 - 145		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*75.0*		*5 - 130*
13C5 PFPeA	*77.3*		*40 - 130*
13C5 PFHxA	*75.6*		*40 - 130*
13C4 PFHpA	*75.3*		*40 - 130*
13C8 PFOA	*74.3*		*40 - 130*
13C9 PFNA	*77.2*		*40 - 130*
13C6 PFDA	*66.3*		*40 - 130*
13C7 PFUnA	*68.6*		*30 - 130*
13C2 PFDoA	*45.1*		*10 - 130*
13C2 PFTeDA	*53.9*		*10 - 130*
13C3 PFBS	*79.4*		*40 - 135*
13C3 PFHxS	*74.6*		*40 - 130*
13C8 PFOS	*75.3*		*40 - 130*
13C8 PFOSA	*61.8*		*40 - 130*
d3-NMeFOSAA	*57.3*		*40 - 170*
d5-NEtFOSAA	*57.8*		*25 - 135*
13C2 4:2 FTS	*76.3*		*40 - 200*
13C2 6:2 FTS	*72.4*		*40 - 200*
13C2 8:2 FTS	*76.2*		*40 - 300*
13C3 HFPO-DA	*74.1*		*40 - 130*
d7-N-MeFOSE-M	*47.8*		*10 - 130*
d9-N-EtFOSE-M	*44.5*		*10 - 130*
d5-NEtPFOSA	*49.6*		*10 - 130*
d3-NMePFOSA	*46.2*		*10 - 130*

Lab Sample ID: 590-23681-1 DU
Matrix: Water
Analysis Batch: 748038

Client Sample ID: SWN-MW321-N-03122024
Prep Type: Total/NA
Prep Batch: 747423

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	99			97.0		ng/L				2	30
Perfluoropentanoic acid (PFPeA)	240			242		ng/L				1	30

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: 590-23681-1 DU
Matrix: Water
Analysis Batch: 748038

Client Sample ID: SWN-MW321-N-03122024
Prep Type: Total/NA
Prep Batch: 747423

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Perfluorohexanoic acid (PFHxA)	850	E	820	E	ng/L		3	30
Perfluoroheptanoic acid (PFHpA)	110		104		ng/L		4	30
Perfluorooctanoic acid (PFOA)	300		288		ng/L		4	30
Perfluorononanoic acid (PFNA)	18		16.1		ng/L		9	30
Perfluorodecanoic acid (PFDA)	5.2		5.39		ng/L		3	30
Perfluoroundecanoic acid (PFUnA)	ND		ND		ng/L		NC	30
Perfluorododecanoic acid (PFDoA)	ND		ND		ng/L		NC	30
Perfluorotridecanoic acid (PFTrDA)	ND		ND		ng/L		NC	30
Perfluorotetradecanoic acid (PFTeA)	ND		ND		ng/L		NC	30
Perfluorobutanesulfonic acid (PFBS)	68		66.4		ng/L		2	30
Perfluoropentanesulfonic acid (PFPeS)	120		117		ng/L		3	30
Perfluoroheptanesulfonic acid (PFHpS)	12		12.6		ng/L		5	30
Perfluorooctanesulfonic acid (PFOS)	170		165		ng/L		3	30
Perfluorononanesulfonic acid (PFNS)	ND		ND		ng/L		NC	30
Perfluorodecanesulfonic acid (PFDS)	ND		ND		ng/L		NC	30
Perfluorododecanesulfonic acid (PFDoS)	ND		ND		ng/L		NC	30
4:2 FTS	ND		ND		ng/L		NC	30
6:2 FTS	4.0	J	3.75	J	ng/L		7	30
8:2 FTS	ND		ND		ng/L		NC	30
Perfluorooctanesulfonamide (FOSA)	14		14.5		ng/L		6	30
NMeFOSA	ND		ND		ng/L		NC	30
NEtFOSA	ND		ND		ng/L		NC	30
NMeFOSAA	ND		ND		ng/L		NC	30
NEtFOSAA	ND		ND		ng/L		NC	30
NMeFOSE	ND		ND		ng/L		NC	30
NEtFOSE	ND		ND		ng/L		NC	30
HFPO-DA (GenX)	ND		ND		ng/L		NC	30
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		ND		ng/L		NC	30
PFMPA	ND		ND		ng/L		NC	30
PFMBA	ND		ND		ng/L		NC	30
NFDHA	ND		ND		ng/L		NC	30
9Cl-PF3ONS	ND		ND		ng/L		NC	30
11Cl-PF3OUdS	ND		ND		ng/L		NC	30
PFEESA	ND		ND		ng/L		NC	30
3:3 FTCA	ND		ND		ng/L		NC	30
5:3 FTCA	ND		ND		ng/L		NC	30
7:3 FTCA	ND		ND		ng/L		NC	30

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	DU %Recovery	DU Qualifier	Limits
13C4 PFBA	75.8		5 - 130
13C5 PFPeA	59.7		40 - 130
13C5 PFHxA	75.0		40 - 130
13C4 PFHpA	94.4		40 - 130
13C8 PFOA	74.6		40 - 130
13C9 PFNA	76.0		40 - 130
13C6 PFDA	64.2		40 - 130
13C7 PFUnA	58.7		30 - 130
13C2 PFDoA	44.3		10 - 130
13C2 PFTeDA	45.4		10 - 130
13C3 PFBS	158	*5+	40 - 135
13C3 PFHxS	72.3		40 - 130
13C8 PFOS	72.1		40 - 130
13C8 PFOSA	60.7		40 - 130
d3-NMeFOSAA	65.7		40 - 170
d5-NEtFOSAA	62.3		25 - 135
13C2 4:2 FTS	252	*5+	40 - 200
13C2 6:2 FTS	160		40 - 200
13C2 8:2 FTS	125		40 - 300
13C3 HFPO-DA	81.3		40 - 130
d7-N-MeFOSE-M	44.6		10 - 130
d9-N-EtFOSE-M	40.0		10 - 130
d5-NEtPFOSA	47.1		10 - 130
d3-NMePFOSA	46.8		10 - 130

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS - DL

Lab Sample ID: 590-23681-1 DU
Client Sample ID: SWN-MW321-N-03122024
Matrix: Water
Prep Type: Total/NA
Analysis Batch: 748520
Prep Batch: 747423

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Perfluorohexanoic acid (PFHxA) - DL	830			788		ng/L				5	30
Perfluorobutanesulfonic acid (PFBS) - DL	69			69.3		ng/L				1	30
Perfluorohexanesulfonic acid (PFHxS) - DL	4100	E		4200	E	ng/L				2	30
4:2 FTS - DL	ND			ND		ng/L				NC	30

Isotope Dilution	DU %Recovery	DU Qualifier	Limits
13C5 PFHxA - DL	82.4	*3	40 - 130
13C3 PFBS - DL	89.2	*3	40 - 135
13C3 PFHxS - DL	72.6	*3	40 - 130
13C2 4:2 FTS - DL	134	*3	40 - 200

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW321-N-03122024
Lab Sample ID: 590-23681-1
Date Collected: 03/12/24 08:20
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			471 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 01:21	RS1	EET SAC
Total/NA	Prep	1633	DL		471 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633	DL	10			748520	03/19/24 08:20	GWO	EET SAC

Client Sample ID: SWN-MW4-N-03122024
Lab Sample ID: 590-23681-2
Date Collected: 03/12/24 10:05
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			250.0 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 01:56	RS1	EET SAC

Client Sample ID: SWN-MW5-N-03122024
Lab Sample ID: 590-23681-3
Date Collected: 03/12/24 12:20
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			250.0 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 02:14	RS1	EET SAC

Client Sample ID: FGF-MW18-N-03122024
Lab Sample ID: 590-23681-4
Date Collected: 03/12/24 13:55
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			539.3 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 03:07	RS1	EET SAC

Client Sample ID: PD-MW1A-N-03122024
Lab Sample ID: 590-23681-5
Date Collected: 03/12/24 15:50
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			530.3 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 03:24	RS1	EET SAC

Client Sample ID: WL-EB-03122024
Lab Sample ID: 590-23681-6
Date Collected: 03/12/24 16:10
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			531.2 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 03:42	RS1	EET SAC

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FB-03122024
Lab Sample ID: 590-23681-7
Date Collected: 03/12/24 16:15
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			530.7 mL	5.0 mL	747423	03/15/24 11:27	EWH	EET SAC
Total/NA	Analysis	Draft 1633		1			748038	03/17/24 04:00	RS1	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program: ☐DW ☐NPDES ☐RCRA ☐Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich.com	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723 5761 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx: FAX	TAT if different from Below _____			Walk-In Client:
Project Name: Spokane International Airport	☐ 2 weeks			Lab Sampling:
Site: SIA	☐ 1 week			Job / SDG No.:
PO#: C2019BC000	☐ 2 days ☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, Nitrate, Sulfate (300.0)	Ca, Mg, Na, K (200.7)	Phosphate, SM (4500)	Alkalinity (SM 2320B)	TDS (160.1)	Sample Specific Notes:
SWN MW21-N 03122024	3/12/24	0820	G	H2O	6			X	X	X	X	X	X	
SWN MW4-N 03122024		1005	G		6			X	X	X	X	X	X	
SWN MW5-N-03122024		1220			6			X	X	X	X	X	X	
FGF MW18 N-03122024		1335			6			X	X	X	X	X	X	
PD MW1A-N-03122024		1550			6			X	X	X	X	X	X	
WL-EB 03122024		1610			2			X						
FB-03122024		1615			2			X						

590-23681 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 1.1c	Corr'd: 1.2c	Therm ID No.: T1006	
Relinquished by:	Company: H&A	Date/Time: 3/12 17 02	Received by:	Company: H&A	Date/Time: 3/12/24 17 02	
Relinquished by:	Company: H&A	Date/Time: 3/13 0:36	Received by:	Company: EstAspoke	Date/Time: 3/13/24 0440	
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:	

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone. 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8853.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23681-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/19/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email.	WO #:			
Project Name: GEG Groundwater Monitoring/209800-000	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
SWN-MW321-N-03122024 (590-23681-1)	3/12/24	08:20 Pacific		Water			X	2	
SWN-MW4-N-03122024 (590-23681-2)	3/12/24	10:05 Pacific		Water			X	2	
SWN-MW5-N-03122024 (590-23681-3)	3/12/24	12:20 Pacific		Water			X	2	
FGF-MW18-N-03122024 (590-23681-4)	3/12/24	13.55 Pacific		Water			X	2	
PD-MW1A-N-03122024 (590-23681-5)	3/12/24	15.50 Pacific		Water			X	2	
WL-EB-03122024 (590-23681-6)	3/12/24	16:10 Pacific		Water			X	2	
FB-03122024 (590-23681-7)	3/12/24	16 15 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested. I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time.	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	3/13/24 1517	EEC SPO		3/14/24	EEC SPO
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23681-1

Login Number: 23681
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23681-1

Login Number: 23681
List Number: 2
Creator: Simmons, Jason C

List Source: Eurofins Sacramento
List Creation: 03/14/24 04:20 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261240
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.2c
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Tracking # 7101960002951

Job ___ 590-23681 Field Sheet

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier
GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID E11 Corr. Factor (+ / -) -1 °C

Ice 1 Wet 1 Gel ____ Other ____

Cooler Custody Seal: DBL0240

Cooler ID ____

Temp Observed: 2.2 °C Corrected: 2.2 °C

From Temp Blank ☐ Sample ☐

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials ____ Date 3/14/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials ____ Date 3.14.24

Notes:_____

Trizma Lot #(s) ____

Ammonium
Acetate Lot #(s) ____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials: ____ Date 3.14.24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Project/Site: GEG Groundwater Monitoring/209800-000

Job ID: 590-23681-1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23681-1	SWN-MW321-N-03122024	75.8	60.1	72.5	89.3	72.3	73.4	62.8	61.9
590-23681-1 - DL	SWN-MW321-N-03122024			78.7 *3					
590-23681-1 DU	SWN-MW321-N-03122024	75.8	59.7	75.0	94.4	74.6	76.0	64.2	58.7
590-23681-1 DU - DL	SWN-MW321-N-03122024			82.4 *3					
590-23681-2	SWN-MW4-N-03122024	66.1	65.7	64.4	65.0	66.1	53.3	56.8	45.9
590-23681-3	SWN-MW5-N-03122024	75.9	77.4	76.8	82.5	77.2	78.9	76.0	79.2
590-23681-4	FGF-MW18-N-03122024	75.2	68.4	70.2	69.3	75.2	70.7	85.0	76.5
590-23681-5	PD-MW1A-N-03122024	72.0	74.8	72.9	72.3	71.4	69.8	73.8	78.9
590-23681-6	WL-EB-03122024	74.3	73.0	71.5	71.1	73.7	63.2	71.7	69.1
590-23681-7	FB-03122024	74.3	74.7	73.5	73.7	79.0	69.3	72.2	77.2
LCS 320-747423/3-A	Lab Control Sample	77.4	77.1	77.6	79.1	77.8	73.7	78.0	82.1
LLCS 320-747423/2-A	Lab Control Sample	75.0	77.3	75.6	75.3	74.3	77.2	66.3	68.6
MB 320-747423/1-A	Method Blank	74.3	73.5	74.9	73.2	72.1	72.3	79.9	80.6

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23681-1	SWN-MW321-N-03122024	45.2	47.3	165 *5+	75.1	73.4	67.8	72.9	70.3
590-23681-1 - DL	SWN-MW321-N-03122024			90.5 *3	77.4 *3				
590-23681-1 DU	SWN-MW321-N-03122024	44.3	45.4	158 *5+	72.3	72.1	60.7	65.7	62.3
590-23681-1 DU - DL	SWN-MW321-N-03122024			89.2 *3	72.6 *3				
590-23681-2	SWN-MW4-N-03122024	28.6	28.4	72.6	64.4	60.7	56.9	43.0	40.6
590-23681-3	SWN-MW5-N-03122024	56.5	65.8	87.5	79.1	75.8	77.0	74.9	70.8
590-23681-4	FGF-MW18-N-03122024	59.6	60.5	85.0	75.6	74.4	74.6	69.6	70.3
590-23681-5	PD-MW1A-N-03122024	56.8	72.5	79.7	72.4	74.2	73.3	67.5	68.8
590-23681-6	WL-EB-03122024	58.2	59.2	83.8	72.6	73.1	64.0	70.5	69.3
590-23681-7	FB-03122024	63.9	72.1	82.8	74.6	77.5	73.4	73.2	70.7
LCS 320-747423/3-A	Lab Control Sample	60.3	63.3	84.2	78.4	77.4	64.1	70.5	65.7
LLCS 320-747423/2-A	Lab Control Sample	45.1	53.9	79.4	74.6	75.3	61.8	57.3	57.8
MB 320-747423/1-A	Method Blank	63.9	60.7	80.9	74.4	77.7	66.2	69.3	66.5

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23681-1	SWN-MW321-N-03122024	262 *5+	158	132	78.0	52.6	48.3	55.4	55.6
590-23681-1 - DL	SWN-MW321-N-03122024	155 *3							
590-23681-1 DU	SWN-MW321-N-03122024	252 *5+	160	125	81.3	44.6	40.0	47.1	46.8
590-23681-1 DU - DL	SWN-MW321-N-03122024	134 *3							
590-23681-2	SWN-MW4-N-03122024	87.0	69.2	63.0	61.1	29.6	26.9	31.9	31.0
590-23681-3	SWN-MW5-N-03122024	110	88.7	86.0	73.0	60.4	55.5	62.3	58.4
590-23681-4	FGF-MW18-N-03122024	93.2	78.5	75.4	68.3	53.4	48.8	53.7	52.7
590-23681-5	PD-MW1A-N-03122024	83.4	74.5	74.2	71.1	67.3	62.2	66.6	63.3
590-23681-6	WL-EB-03122024	82.3	79.4	82.9	68.9	55.7	52.4	56.8	56.0
590-23681-7	FB-03122024	79.2	75.4	74.6	72.9	67.0	61.8	63.6	55.3
LCS 320-747423/3-A	Lab Control Sample	82.9	73.8	80.1	73.7	48.2	43.7	48.1	46.7
LLCS 320-747423/2-A	Lab Control Sample	76.3	72.4	76.2	74.1	47.8	44.5	49.6	46.2
MB 320-747423/1-A	Method Blank	77.0	74.5	77.0	71.3	50.0	44.3	48.7	47.6

Surrogate Legend

PFBA = 13C4 PFBA

PFPeA = 13C5 PFPeA

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-1
Project/Site: GEG Groundwater Monitoring/209800-000

13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS
M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

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JOB DESCRIPTION

GEG Groundwater Monitoring/209800-000

JOB NUMBER

590-23681-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

myEOL

Job Notes

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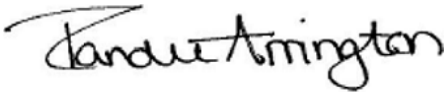

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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job ID: 590-23681-2 Eurofins Spokane

Job Narrative
590-23681-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/13/2024 9:40 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 1.2°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46472 recovered above the upper control limit for Potassium. The samples associated with this ICVL were 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46477 recovered below the lower control limit for Sodium. The samples associated with this ICVL were 10x the spike amount for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method SM5210B_BODCalc: The following sample underdepleted: SWN-MW5-N-03122024 (590-23681-3). Results have been reported and may be biased high.

Method SM5210B_BODCalc: The method blank result associated with batch 590-46250 was higher than the method-required limit of 0.2 mg/L.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23681-1	SWN-MW321-N-03122024	Water	03/12/24 08:20	03/13/24 09:40
590-23681-2	SWN-MW4-N-03122024	Water	03/12/24 10:05	03/13/24 09:40
590-23681-3	SWN-MW5-N-03122024	Water	03/12/24 12:20	03/13/24 09:40
590-23681-4	FGF-MW18-N-03122024	Water	03/12/24 13:55	03/13/24 09:40
590-23681-5	PD-MW1A-N-03122024	Water	03/12/24 15:50	03/13/24 09:40

Definitions/Glossary

Client: Haley & Aldrich, Inc. Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Qualifiers

Metals

Qualifier	Qualifier Description
^1-	Initial Calibration Verification (ICV) is outside acceptance limits, low biased.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
b	Result Detected in the Unseeded Control blank (USB).
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: SWN-MW321-N-03122024
Lab Sample ID: 590-23681-1
Date Collected: 03/12/24 08:20
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**1400**		16	8.4	mg/L			03/14/24 19:23	20
Nitrate as N	**5.4**		0.20	0.057	mg/L			03/13/24 13:02	1
Sulfate	**41**		10	2.6	mg/L			03/14/24 19:23	20

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	**200**		4.0	0.40	mg/L		03/22/24 09:45	03/26/24 22:32	2
Magnesium	**62**		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:04	1
Potassium	**7.5**	**^1-**	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:04	1
Sodium	**360**	**^1-**	1.0	0.39	mg/L		03/22/24 09:45	03/26/24 22:32	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	**30**	**B**	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 12:00	1

Client Sample ID: SWN-MW4-N-03122024
Lab Sample ID: 590-23681-2
Date Collected: 03/12/24 10:05
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**1000**		16	8.4	mg/L			03/14/24 19:33	20
Nitrate as N	ND		0.20	0.057	mg/L			03/13/24 13:12	1
Sulfate	ND		0.50	0.13	mg/L			03/13/24 13:12	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	**160**		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:09	1
Magnesium	**55**		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:09	1
Potassium	**20**	**^1-**	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:09	1
Sodium	**330**	**^1-**	1.0	0.39	mg/L		03/22/24 09:45	03/26/24 22:36	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	**330**	**B**	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	**8.9**	**J b**	12	6.0	mg/L			03/13/24 12:00	1

Client Sample ID: SWN-MW5-N-03122024
Lab Sample ID: 590-23681-3
Date Collected: 03/12/24 12:20
Matrix: Water
Date Received: 03/13/24 09:40

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**350**		8.0	4.2	mg/L			03/14/24 20:03	10
Nitrate as N	ND		0.20	0.057	mg/L			03/13/24 13:22	1
Sulfate	ND		0.50	0.13	mg/L			03/13/24 13:22	1

Client Sample ID: SWN-MW5-N-03122024 — Lab Sample ID: 590-23681-3

Date Collected: 03/12/24 12:20 — **Matrix: Water**
Date Received: 03/13/24 09:40

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	97		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:13	1
Magnesium	31		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:13	1
Potassium	26	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:13	1
Sodium	130	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	280	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	0.083		0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		75	38	mg/L			03/13/24 16:06	1

Client Sample ID: FGF-MW18-N-03122024 — Lab Sample ID: 590-23681-4

Date Collected: 03/12/24 13:55 — **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	12		0.80	0.42	mg/L			03/13/24 13:32	1
Nitrate as N	0.45		0.20	0.057	mg/L			03/13/24 13:32	1
Sulfate	15		0.50	0.13	mg/L			03/13/24 13:32	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	28		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:17	1
Magnesium	9.7		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:17	1
Potassium	2.5	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:17	1
Sodium	8.9	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	120	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	0.045	J	0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 16:06	1

Client Sample ID: PD-MW1A-N-03122024 — Lab Sample ID: 590-23681-5

Date Collected: 03/12/24 15:50 — **Matrix: Water**
Date Received: 03/13/24 09:40

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	49		0.80	0.42	mg/L			03/13/24 13:42	1
Nitrate as N	2.4		0.20	0.057	mg/L			03/13/24 13:42	1
Sulfate	22		0.50	0.13	mg/L			03/13/24 13:42	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	49		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:34	1
Magnesium	16		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:34	1
Potassium	2.3	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:34	1
Sodium	9.0	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:34	1

Client Sample Results

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: PD-MW1A-N-03122024
Lab Sample ID: 590-23681-5

Date Collected: 03/12/24 15:50
Matrix: Water
Date Received: 03/13/24 09:40

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	**140**	**B**	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	**0.043**	**J**	0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/13/24 16:06	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46248/1003
Matrix: Water
Analysis Batch: 46248

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/13/24 09:10	1

Lab Sample ID: LCS 590-46248/1005
Matrix: Water
Analysis Batch: 46248

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.27		mg/L		105	90 - 110

Lab Sample ID: MB 590-46249/1003
Matrix: Water
Analysis Batch: 46249

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/13/24 09:10	1
Sulfate	ND		0.50	0.13	mg/L			03/13/24 09:10	1

Lab Sample ID: LCS 590-46249/1005
Matrix: Water
Analysis Batch: 46249

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	13.7		mg/L		109	90 - 110
Sulfate	12.5	13.4		mg/L		107	90 - 110

Lab Sample ID: MB 590-46278/1027
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 14:42	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 14:42	1

Lab Sample ID: LCS 590-46278/1015
Matrix: Water
Analysis Batch: 46278

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.5		mg/L		100	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/22/24 09:44	03/28/24 13:12	1
Magnesium	ND		1.0	0.13	mg/L		03/22/24 09:44	03/28/24 13:12	1

Method: 6010D - Metals (ICP) (Continued)

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Potassium	ND		0.50	0.29	mg/L		03/22/24 09:44	03/28/24 13:12	1
Sodium	ND		0.50	0.20	mg/L		03/22/24 09:44	03/28/24 13:12	1

Lab Sample ID: LCS 590-46401/1-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	52.0		mg/L		104	80 - 120
Magnesium	50.0	51.4		mg/L		103	80 - 120
Potassium	50.0	50.9		mg/L		102	80 - 135
Sodium	50.0	52.8		mg/L		106	80 - 154

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46482/1
Matrix: Water
Analysis Batch: 46482

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/26/24 11:46	1

Lab Sample ID: LCS 590-46482/2
Matrix: Water
Analysis Batch: 46482

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	500		mg/L		100	90 - 110

Lab Sample ID: 590-23681-1 DU
Matrix: Water
Analysis Batch: 46482

Client Sample ID: SWN-MW321-N-03122024
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity as CaCO3	30	B	30.0		mg/L		0	10

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46433/8
Matrix: Water
Analysis Batch: 46433

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/25/24 10:34	1

Lab Sample ID: LCS 590-46433/7
Matrix: Water
Analysis Batch: 46433

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Phosphorus, Total	0.500	0.482		mg/L		96	90 - 110

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46250/2
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 08:49	1

Lab Sample ID: USB 590-46250/1
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 08:49	1

Lab Sample ID: LCS 590-46250/3
Matrix: Water
Analysis Batch: 46250

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	190		mg/L		96	85 - 115

Lab Sample ID: SCB 590-46260/2
Matrix: Water
Analysis Batch: 46260

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 16:06	1

Lab Sample ID: USB 590-46260/1
Matrix: Water
Analysis Batch: 46260

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/13/24 16:06	1

Lab Sample ID: LCS 590-46260/3
Matrix: Water
Analysis Batch: 46260

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Biochemical Oxygen Demand	198	184		mg/L		93	85 - 115

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: SWN-MW321-N-03122024
Lab Sample ID: 590-23681-1
Date Collected: 03/12/24 08:20
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46248	03/13/24 13:02	NMI	EET SPK
Total/NA	Analysis	300.0		20	5 mL	5 mL	46278	03/14/24 19:23	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:04	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		2			46477	03/26/24 22:32	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46250	03/13/24 12:00	JSP	EET SPK

Client Sample ID: SWN-MW4-N-03122024
Lab Sample ID: 590-23681-2
Date Collected: 03/12/24 10:05
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46248	03/13/24 13:12	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46249	03/13/24 13:12	NMI	EET SPK
Total/NA	Analysis	300.0		20	5 mL	5 mL	46278	03/14/24 19:33	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:09	AMB	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		2			46477	03/26/24 22:36	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	50 mL	300 mL	46250	03/13/24 12:00	JSP	EET SPK

Client Sample ID: SWN-MW5-N-03122024
Lab Sample ID: 590-23681-3
Date Collected: 03/12/24 12:20
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46248	03/13/24 13:22	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46249	03/13/24 13:22	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46278	03/14/24 20:03	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:13	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	8 mL	300 mL	46260	03/13/24 16:06	JSP	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Client Sample ID: FGF-MW18-N-03122024
Lab Sample ID: 590-23681-4
Date Collected: 03/12/24 13:55
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46248	03/13/24 13:32	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46249	03/13/24 13:32	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:17	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46260	03/13/24 16:06	JSP	EET SPK

Client Sample ID: PD-MW1A-N-03122024
Lab Sample ID: 590-23681-5
Date Collected: 03/12/24 15:50
Matrix: Water
Date Received: 03/13/24 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46248	03/13/24 13:42	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46249	03/13/24 13:42	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:34	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46260	03/13/24 16:06	JSP	EET SPK

Laboratory References:
EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc. Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Job ID: 590-23681-2
Project/Site: GEG Groundwater Monitoring/209800-000

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program. ☐DW ☐NPDES ☐RCRA ☐Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich.com	Lab Contact:	Carrier:	1 of 1 COCs
Address: 505 W Riverside Ave	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time			Sampler:
(xxx) xxx-xxxx: 509 723 5761 Phone	☐CALENDAR DAYS ☐WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx: FAX	TAT if different from Below _____			Walk-In Client:
Project Name: Spokane International Airport	☐ 2 weeks			Lab Sampling:
Site: SIA	☐ 1 week			
PO# C2019BC000	☐ 2 days			Job / SDG No.:
	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, Nitrate, Sulfate (300.0)	Ca, Mg, Na, K (200.7)	Phosphate, SM (4500)	Alkalinity (SM 2320B)	537 (HSL)	Sample Specific Notes:
SWN MW21-N 03122024	3/12/24	0820	G	H2O	6			X	X	X	X	X	X	
SWN MW4-N 03122024		1005	G		6			X	X	X	X	X	X	
SWN MW5-N-03122024		1220			6			X	X	X	X	X	X	
FGF MW18 N-03122024		1335			6			X	X	X	X	X	X	
PD MW1A-N-03122024		1550			6			X	X	X	X	X	X	
WL-EB 03122024		1610			2			X						
FB-03122024		1615			2			X						

590-23681 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample

☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐Return to Client ☐Disposal by Lab ☐Archive for _____ Months

Special Instructions/QC Requirements & Comments

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 1.1c	Corr'd: 1.2c	Therm ID No.: IR006
Relinquished by:	Company: H&A	Date/Time: 3/12 17 02	Received by:	Company: H&A	Date/Time: 3/12/24 17 02
Relinquished by:	Company: H&A	Date/Time: 3/13 0436	Received by:	Company: ESASpokane	Date/Time: 3/13/24 0440
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23681-2

Login Number: 23681
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Job ___ 590-23681 Field Sheet

Tracking # 7101960002951

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier
GSL / OnTrac / Goldstreak / USPS / Other_____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations
File in the job folder with the COC

Therm. ID 211 Corr. Factor (+ / -) -1 °C

Ice 1 Wet 1 Gel ____ Other ____

Cooler Custody Seal: Present

Cooler ID ____

Temp Observed: 2.2 °C Corrected: 2.2 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials ____ Date 3/14/24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials ____ Date 3.14.24

Notes:_____

Trizma Lot #(s) ____

Ammonium
Acetate Lot #(s) ____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials: ____ Date 3.14.24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 3/21/2024 2:25:06 PM

JOB DESCRIPTION

SIA PFAS Support

JOB NUMBER

590-23724-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

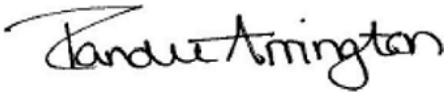
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23724-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/14/2024 10:45 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.7°C.

PFAS
Method 1633: The following samples in preparation batch 320-748091 were yellow in color following extraction. W-MW15-N-03132024 (590-23724-1), W-MW15-FD-03132024 (590-23724-2), Drum 1 -03132024 (590-23724-7), Drum 2 -03132024 (590-23724-8) and Drum 3 -03132024 (590-23724-9)

Method 1633: The following samples in preparation batch 320-748091 were observed to have a thin layer of sediment present in the bottom of the bottle prior to extraction. Drum 2 -03132024 (590-23724-8)

Method 1633: The following samples in preparation batch 320-748091 were observed to have floating particulates present in the sample bottle. Drum 1 -03132024 (590-23724-7) and Drum 3 -03132024 (590-23724-9)

Method 1633: During the solid phase extraction process, the following samples clogged the cartridge; W-MW15-N-03132024 (590-23724-1) and W-MW15-FD-03132024 (590-23724-2) As such, reporting limits (RLs) are not impacted.

Method 1633: Due to a lot of particulates, the initial volumes used for the following samples deviated from the standard procedure: Drum 2 -03132024 (590-23724-8). A [10x] dilution was made on the sample, then fortified with IDA and extracted. The reporting limits (RLs) have been adjusted proportionately

Method 1633: Due to foam and a lot of particulates, the initial volumes used for the following samples deviated from the standard procedure: Drum 1 -03132024 (590-23724-7) and Drum 3 -03132024 (590-23724-9). A [100x] dilution was made on the sample, then fortified with IDA and extracted. The reporting limits (RLs) have been adjusted proportionately

Method 1633: The continuing calibration verification (CCV) associated with batch 320-748518 recovered above the upper control limit for Isotope Dilution Analyte (IDA) 13C2 8:2 FTS. The native analyte associated with this IDA was within control in the CCVs, indicating no adverse impact on target analyte quantitation. The sample associated with this CCV was non-detect for the affected target analyte. The associated samples are impacted: Drum 3 -03132024 (590-23724-9) and (CCVIS 320-748518/3).

Method 1633: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: W-MW15-N-03132024 (590-23724-1) and W-MW15-FD-03132024 (590-23724-2). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the samples.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23724-1	W-MW15-N-03132024	Water	03/13/24 10:20	03/14/24 10:45
590-23724-2	W-MW15-FD-03132024	Water	03/13/24 10:50	03/14/24 10:45
590-23724-3	W-MW17-N-03132024	Water	03/13/24 12:10	03/14/24 10:45
590-23724-5	WL-EB-03132024	Water	03/13/24 12:55	03/14/24 10:45
590-23724-6	FB-03132024	Water	03/13/24 13:00	03/14/24 10:45
590-23724-7	Drum 1 -03132024	Water	03/13/24 13:20	03/14/24 10:45
590-23724-8	Drum 2 -03132024	Water	03/13/24 14:20	03/14/24 10:45
590-23724-9	Drum 3 -03132024	Water	03/13/24 14:25	03/14/24 10:45

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Qualifiers

LCMS

Qualifier	Qualifier Description
*5-	Isotope dilution analyte is outside acceptance limits, low biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Client Sample ID: W-MW15-N-03132024
Date Collected: 03/13/24 10:20
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-1
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluoropentanoic acid (PFPeA)	ND		3.9	0.98	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
4:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
6:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
8:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
NMeFOSA	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
NEtFOSA	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
NMeFOSAA	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
NEtFOSAA	ND		2.0	0.49	ng/L		03/18/24 04:28	03/18/24 14:46	1
NMeFOSE	ND		20	4.9	ng/L		03/18/24 04:28	03/18/24 14:46	1
NEtFOSE	ND		20	4.9	ng/L		03/18/24 04:28	03/18/24 14:46	1
HFPO-DA (GenX)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
PFMPA	ND		3.9	0.98	ng/L		03/18/24 04:28	03/18/24 14:46	1
PFMBA	ND		3.9	0.98	ng/L		03/18/24 04:28	03/18/24 14:46	1
NFDHA	ND		3.9	0.98	ng/L		03/18/24 04:28	03/18/24 14:46	1
9Cl-PF3ONS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
11Cl-PF3OUdS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 14:46	1
PFEESA	ND		3.9	0.98	ng/L		03/18/24 04:28	03/18/24 14:46	1
3:3 FTCA	ND		9.8	2.5	ng/L		03/18/24 04:28	03/18/24 14:46	1
5:3 FTCA	ND		49	12	ng/L		03/18/24 04:28	03/18/24 14:46	1
7:3 FTCA	ND		49	12	ng/L		03/18/24 04:28	03/18/24 14:46	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*29.8*		*5 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C5 PFPeA	*29.7*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C5 PFHxA	*29.4*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C4 PFHpA	*29.2*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C8 PFOA	*26.8*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*

Client Sample ID: W-MW15-N-03132024

Lab Sample ID: 590-23724-1

Date Collected: 03/13/24 10:20

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C9 PFNA	*27.3*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C6 PFDA	*33.0*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C7 PFUnA	*31.8*		*30 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C2 PFDoA	*22.9*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C2 PFTeDA	*23.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C3 PFBS	*31.0*	**5-*	*40 - 135*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C3 PFHxS	*28.7*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C8 PFOS	*31.9*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C8 PFOSA	*33.2*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d3-NMeFOSAA	*25.8*	**5-*	*40 - 170*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d5-NEtFOSAA	*26.3*		*25 - 135*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C2 4:2 FTS	*44.4*		*40 - 200*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C2 6:2 FTS	*35.3*	**5-*	*40 - 200*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C2 8:2 FTS	*57.7*		*40 - 300*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
13C3 HFPO-DA	*26.7*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d7-N-MeFOSE-M	*24.1*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d9-N-EtFOSE-M	*22.6*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d5-NEtPFOSA	*24.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*
d3-NMePFOSA	*24.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 14:46*	*1*

Client Sample ID: W-MW15-FD-03132024

Lab Sample ID: 590-23724-2

Date Collected: 03/13/24 10:50

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
4:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
6:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
8:2 FTS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Client Sample ID: W-MW15-FD-03132024
Date Collected: 03/13/24 10:50
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-2
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
NMeFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
NEtFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:04	1
NMeFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
NEtFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
HFPO-DA (GenX)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
PFMPA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:04	1
PFMBA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:04	1
NFDHA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:04	1
9Cl-PF3ONS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
11Cl-PF3OUdS	ND		7.9	2.0	ng/L		03/18/24 04:28	03/18/24 15:04	1
PFEESA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:04	1
3:3 FTCA	ND		9.9	2.5	ng/L		03/18/24 04:28	03/18/24 15:04	1
5:3 FTCA	ND		50	12	ng/L		03/18/24 04:28	03/18/24 15:04	1
7:3 FTCA	ND		50	12	ng/L		03/18/24 04:28	03/18/24 15:04	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*39.9*		*5 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C5 PFPeA	*40.7*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C5 PFHxA	*40.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C4 PFHpA	*40.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C8 PFOA	*38.5*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C9 PFNA	*37.5*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C6 PFDA	*39.4*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C7 PFUnA	*34.1*		*30 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C2 PFDoA	*29.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C2 PFTeDA	*24.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C3 PFBS	*41.5*		*40 - 135*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C3 PFHxS	*40.7*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C8 PFOS	*40.8*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C8 PFOSA	*43.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d3-NMeFOSAA	*35.8*	**5-*	*40 - 170*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d5-NEtFOSAA	*31.2*		*25 - 135*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C2 4:2 FTS	*58.0*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C2 6:2 FTS	*46.4*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C2 8:2 FTS	*72.9*		*40 - 300*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
13C3 HFPO-DA	*39.0*	**5-*	*40 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d7-N-MeFOSE-M	*30.5*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d9-N-EtFOSE-M	*27.8*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d5-NEtPFOSA	*29.8*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*
d3-NMePFOSA	*31.0*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:04*	*1*

Client Sample ID: W-MW17-N-03132024
Date Collected: 03/13/24 12:10
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-3
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**7.7**		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluoropentanoic acid (PFPeA)	**2.3**	**J**	3.8	0.94	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorohexanoic acid (PFHxA)	**2.0**		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluoroheptanoic acid (PFHpA)	**1.3**	**J**	1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorooctanoic acid (PFOA)	**2.1**		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorobutanesulfonic acid (PFBS)	**3.8**		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorohexanesulfonic acid (PFHxS)	**1.9**		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorooctanesulfonic acid (PFOS)	**3.2**		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
4:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
6:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
8:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
NMeFOSA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
NEtFOSA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:21	1
NMeFOSE	ND		19	4.7	ng/L		03/18/24 04:28	03/18/24 15:21	1
NEtFOSE	ND		19	4.7	ng/L		03/18/24 04:28	03/18/24 15:21	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
PFMPA	ND		3.8	0.94	ng/L		03/18/24 04:28	03/18/24 15:21	1
PFMBA	ND		3.8	0.94	ng/L		03/18/24 04:28	03/18/24 15:21	1
NFDHA	ND		3.8	0.94	ng/L		03/18/24 04:28	03/18/24 15:21	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:21	1
PFEESA	ND		3.8	0.94	ng/L		03/18/24 04:28	03/18/24 15:21	1
3:3 FTCA	ND		9.4	2.4	ng/L		03/18/24 04:28	03/18/24 15:21	1
5:3 FTCA	ND		47	12	ng/L		03/18/24 04:28	03/18/24 15:21	1
7:3 FTCA	ND		47	12	ng/L		03/18/24 04:28	03/18/24 15:21	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*74.5*		*5 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C5 PFPeA	*78.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C5 PFHxA	*79.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*

Client Sample ID: W-MW17-N-03132024

Lab Sample ID: 590-23724-3

Date Collected: 03/13/24 12:10

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFHpA	*83.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C8 PFOA	*75.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C9 PFNA	*68.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C6 PFDA	*76.5*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C7 PFUnA	*70.0*		*30 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C2 PFDoA	*55.6*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C2 PFTeDA	*61.9*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C3 PFBS	*78.4*		*40 - 135*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C3 PFHxS	*75.2*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C8 PFOS	*75.5*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C8 PFOSA	*79.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d3-NMeFOSAA	*65.5*		*40 - 170*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d5-NEtFOSAA	*65.5*		*25 - 135*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C2 4:2 FTS	*125*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C2 6:2 FTS	*99.2*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C2 8:2 FTS	*145*		*40 - 300*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
13C3 HFPO-DA	*72.2*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d7-N-MeFOSE-M	*65.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d9-N-EtFOSE-M	*63.8*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d5-NEtPFOSA	*63.8*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*
d3-NMePFOSA	*66.4*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:21*	*1*

Client Sample ID: WL-EB-03132024

Lab Sample ID: 590-23724-5

Date Collected: 03/13/24 12:55

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
4:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1

Client Sample ID: WL-EB-03132024
Date Collected: 03/13/24 12:55
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-5
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
6:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
8:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
NMeFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
NEtFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 15:39	1
NMeFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
NEtFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
PFMPA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:39	1
PFMBA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:39	1
NFDHA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:39	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 15:39	1
PFEESA	ND		4.0	0.99	ng/L		03/18/24 04:28	03/18/24 15:39	1
3:3 FTCA	ND		9.9	2.5	ng/L		03/18/24 04:28	03/18/24 15:39	1
5:3 FTCA	ND		50	12	ng/L		03/18/24 04:28	03/18/24 15:39	1
7:3 FTCA	ND		50	12	ng/L		03/18/24 04:28	03/18/24 15:39	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*73.8*		*5 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C5 PFPeA	*77.5*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C5 PFHxA	*77.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C4 PFHpA	*76.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C8 PFOA	*72.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C9 PFNA	*72.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C6 PFDA	*80.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C7 PFUnA	*71.8*		*30 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C2 PFDoA	*69.3*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C2 PFTeDA	*73.6*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C3 PFBS	*76.6*		*40 - 135*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C3 PFHxS	*74.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C8 PFOS	*76.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C8 PFOSA	*76.0*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d3-NMeFOSAA	*64.2*		*40 - 170*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d5-NEtFOSAA	*66.9*		*25 - 135*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C2 4:2 FTS	*108*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C2 6:2 FTS	*96.6*		*40 - 200*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C2 8:2 FTS	*150*		*40 - 300*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
13C3 HFPO-DA	*73.0*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d7-N-MeFOSE-M	*74.9*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d9-N-EtFOSE-M	*70.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d5-NEtPFOSA	*72.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*
d3-NMePFOSA	*73.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 15:39*	*1*

Client Sample ID: FB-03132024
Date Collected: 03/13/24 13:00
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-6
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluoropentanoic acid (PFPeA)	ND		3.7	0.93	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorotridecanoic acid (PFTrDA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorotetradecanoic acid (PFTeA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorononanesulfonic acid (PFNS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorodecanesulfonic acid (PFDS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorododecanesulfonic acid (PFDoS)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
4:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
6:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
8:2 FTS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
Perfluorooctanesulfonamide (FOSA)	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
NMeFOSA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
NEtFOSA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
NMeFOSAA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
NEtFOSAA	ND		1.9	0.47	ng/L		03/18/24 04:28	03/18/24 15:57	1
NMeFOSE	ND		19	4.7	ng/L		03/18/24 04:28	03/18/24 15:57	1
NEtFOSE	ND		19	4.7	ng/L		03/18/24 04:28	03/18/24 15:57	1
HFPO-DA (GenX)	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
PFMPA	ND		3.7	0.93	ng/L		03/18/24 04:28	03/18/24 15:57	1
PFMBA	ND		3.7	0.93	ng/L		03/18/24 04:28	03/18/24 15:57	1
NFDHA	ND		3.7	0.93	ng/L		03/18/24 04:28	03/18/24 15:57	1
9Cl-PF3ONS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
11Cl-PF3OUdS	ND		7.5	1.9	ng/L		03/18/24 04:28	03/18/24 15:57	1
PFEESA	ND		3.7	0.93	ng/L		03/18/24 04:28	03/18/24 15:57	1
3:3 FTCA	ND		9.3	2.3	ng/L		03/18/24 04:28	03/18/24 15:57	1
5:3 FTCA	ND		47	12	ng/L		03/18/24 04:28	03/18/24 15:57	1
7:3 FTCA	ND		47	12	ng/L		03/18/24 04:28	03/18/24 15:57	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*76.5*		*5 - 130*	*03/18/24 04:28*	*03/18/24 15:57*	*1*
13C5 PFPeA	*74.7*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:57*	*1*
13C5 PFHxA	*77.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:57*	*1*
13C4 PFHpA	*75.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:57*	*1*
13C8 PFOA	*73.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 15:57*	*1*

Client Sample ID: FB-03132024

Lab Sample ID: 590-23724-6

Date Collected: 03/13/24 13:00

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C9 PFNA	71.1		40 - 130	03/18/24 04:28	03/18/24 15:57	1
13C6 PFDA	77.0		40 - 130	03/18/24 04:28	03/18/24 15:57	1
13C7 PFUnA	76.4		30 - 130	03/18/24 04:28	03/18/24 15:57	1
13C2 PFDoA	64.0		10 - 130	03/18/24 04:28	03/18/24 15:57	1
13C2 PFTeDA	66.7		10 - 130	03/18/24 04:28	03/18/24 15:57	1
13C3 PFBS	75.6		40 - 135	03/18/24 04:28	03/18/24 15:57	1
13C3 PFHxS	77.7		40 - 130	03/18/24 04:28	03/18/24 15:57	1
13C8 PFOS	82.2		40 - 130	03/18/24 04:28	03/18/24 15:57	1
13C8 PFOSA	79.3		40 - 130	03/18/24 04:28	03/18/24 15:57	1
d3-NMeFOSAA	72.1		40 - 170	03/18/24 04:28	03/18/24 15:57	1
d5-NEtFOSAA	70.5		25 - 135	03/18/24 04:28	03/18/24 15:57	1
13C2 4:2 FTS	110		40 - 200	03/18/24 04:28	03/18/24 15:57	1
13C2 6:2 FTS	96.7		40 - 200	03/18/24 04:28	03/18/24 15:57	1
13C2 8:2 FTS	170		40 - 300	03/18/24 04:28	03/18/24 15:57	1
13C3 HFPO-DA	74.8		40 - 130	03/18/24 04:28	03/18/24 15:57	1
d7-N-MeFOSE-M	71.5		10 - 130	03/18/24 04:28	03/18/24 15:57	1
d9-N-EtFOSE-M	67.0		10 - 130	03/18/24 04:28	03/18/24 15:57	1
d5-NEtPFOSA	68.0		10 - 130	03/18/24 04:28	03/18/24 15:57	1
d3-NMePFOSA	68.3		10 - 130	03/18/24 04:28	03/18/24 15:57	1

Client Sample ID: Drum 1 -03132024

Lab Sample ID: 590-23724-7

Date Collected: 03/13/24 13:20

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluoropentanoic acid (PFPeA)	ND		400	100	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorohexanoic acid (PFHxA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluoroheptanoic acid (PFHpA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorooctanoic acid (PFOA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorononanoic acid (PFNA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorodecanoic acid (PFDA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluoroundecanoic acid (PFUnA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorododecanoic acid (PFDoA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorotridecanoic acid (PFTrDA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorotetradecanoic acid (PFTeA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorobutanesulfonic acid (PFBS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluoropentanesulfonic acid (PFPeS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorohexanesulfonic acid (PFHxS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorooctanesulfonic acid (PFOS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorononanesulfonic acid (PFNS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorodecanesulfonic acid (PFDS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
Perfluorododecanesulfonic acid (PFDoS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
4:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
6:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
8:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1

Client Sample ID: Drum 1 -03132024
Date Collected: 03/13/24 13:20
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-7
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonamide (FOSA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
NMeFOSA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
NEtFOSA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
NMeFOSAA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
NEtFOSAA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:14	1
NMeFOSE	ND		2000	500	ng/L		03/18/24 04:28	03/18/24 16:14	1
NEtFOSE	ND		2000	500	ng/L		03/18/24 04:28	03/18/24 16:14	1
HFPO-DA (GenX)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
PFMPA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 16:14	1
PFMBA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 16:14	1
NFDHA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 16:14	1
9Cl-PF3ONS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
11Cl-PF3OUdS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 16:14	1
PFEESA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 16:14	1
3:3 FTCA	ND		1000	250	ng/L		03/18/24 04:28	03/18/24 16:14	1
5:3 FTCA	ND		5000	1300	ng/L		03/18/24 04:28	03/18/24 16:14	1
7:3 FTCA	ND		5000	1300	ng/L		03/18/24 04:28	03/18/24 16:14	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*75.3*		*5 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C5 PFPeA	*75.0*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C5 PFHxA	*78.3*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C4 PFHpA	*77.3*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C8 PFOA	*73.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C9 PFNA	*70.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C6 PFDA	*76.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C7 PFUnA	*73.6*		*30 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C2 PFDoA	*63.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C2 PFTeDA	*64.2*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C3 PFBS	*78.2*		*40 - 135*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C3 PFHxS	*74.6*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C8 PFOS	*77.2*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C8 PFOSA	*91.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d3-NMeFOSAA	*77.8*		*40 - 170*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d5-NEtFOSAA	*75.3*		*25 - 135*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C2 4:2 FTS	*110*		*40 - 200*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C2 6:2 FTS	*102*		*40 - 200*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C2 8:2 FTS	*127*		*40 - 300*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
13C3 HFPO-DA	*73.3*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d7-N-MeFOSE-M	*71.5*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d9-N-EtFOSE-M	*67.3*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d5-NEtPFOSA	*69.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*
d3-NMePFOSA	*70.9*		*10 - 130*	*03/18/24 04:28*	*03/18/24 16:14*	*1*

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Client Sample ID: Drum 2 -03132024
Date Collected: 03/13/24 14:20
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-8
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	**33**	**J**	80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluoropentanoic acid (PFPeA)	**69**		40	10	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorohexanoic acid (PFHxA)	**93**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluoroheptanoic acid (PFHpA)	**34**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorooctanoic acid (PFOA)	**87**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorononanoic acid (PFNA)	**12**	**J**	20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorodecanoic acid (PFDA)	**25**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluoroundecanoic acid (PFUnA)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorododecanoic acid (PFDoA)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorotridecanoic acid (PFTrDA)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorotetradecanoic acid (PFTeA)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorobutanesulfonic acid (PFBS)	**10**	**J**	20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluoropentanesulfonic acid (PFPeS)	**6.6**	**J**	20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorohexanesulfonic acid (PFHxS)	**210**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorooctanesulfonic acid (PFOS)	**34**		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorononanesulfonic acid (PFNS)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorodecanesulfonic acid (PFDS)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorododecanesulfonic acid (PFDoS)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
4:2 FTS	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
6:2 FTS	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
8:2 FTS	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
Perfluorooctanesulfonamide (FOSA)	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
NMeFOSA	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
NEtFOSA	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
NMeFOSAA	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
NEtFOSAA	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 16:32	1
NMeFOSE	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:32	1
NEtFOSE	ND		200	50	ng/L		03/18/24 04:28	03/18/24 16:32	1
HFPO-DA (GenX)	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
PFMPA	ND		40	10	ng/L		03/18/24 04:28	03/18/24 16:32	1
PFMBA	ND		40	10	ng/L		03/18/24 04:28	03/18/24 16:32	1
NFDHA	ND		40	10	ng/L		03/18/24 04:28	03/18/24 16:32	1
9Cl-PF3ONS	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
11Cl-PF3OUdS	ND		80	20	ng/L		03/18/24 04:28	03/18/24 16:32	1
PFEESA	ND		40	10	ng/L		03/18/24 04:28	03/18/24 16:32	1
3:3 FTCA	ND		100	25	ng/L		03/18/24 04:28	03/18/24 16:32	1
5:3 FTCA	ND		500	130	ng/L		03/18/24 04:28	03/18/24 16:32	1
7:3 FTCA	ND		500	130	ng/L		03/18/24 04:28	03/18/24 16:32	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*77.3*		*5 - 130*	*03/18/24 04:28*	*03/18/24 16:32*	*1*
13C5 PFPeA	*74.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:32*	*1*
13C5 PFHxA	*74.2*		*40 - 130*	*03/18/24 04:28*	*03/18/24 16:32*	*1*

Client Sample ID: Drum 2 -03132024

Date Collected: 03/13/24 14:20
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-8
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	74.3		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C8 PFOA	71.6		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C9 PFNA	74.1		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C6 PFDA	84.9		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C7 PFUnA	83.4		30 - 130	03/18/24 04:28	03/18/24 16:32	1
13C2 PFDoA	66.4		10 - 130	03/18/24 04:28	03/18/24 16:32	1
13C2 PFTeDA	68.5		10 - 130	03/18/24 04:28	03/18/24 16:32	1
13C3 PFBS	79.1		40 - 135	03/18/24 04:28	03/18/24 16:32	1
13C3 PFHxS	76.9		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C8 PFOS	78.6		40 - 130	03/18/24 04:28	03/18/24 16:32	1
13C8 PFOSA	81.3		40 - 130	03/18/24 04:28	03/18/24 16:32	1
d3-NMeFOSAA	76.0		40 - 170	03/18/24 04:28	03/18/24 16:32	1
d5-NEtFOSAA	74.4		25 - 135	03/18/24 04:28	03/18/24 16:32	1
13C2 4:2 FTS	118		40 - 200	03/18/24 04:28	03/18/24 16:32	1
13C2 6:2 FTS	106		40 - 200	03/18/24 04:28	03/18/24 16:32	1
13C2 8:2 FTS	128		40 - 300	03/18/24 04:28	03/18/24 16:32	1
13C3 HFPO-DA	73.4		40 - 130	03/18/24 04:28	03/18/24 16:32	1
d7-N-MeFOSE-M	69.9		10 - 130	03/18/24 04:28	03/18/24 16:32	1
d9-N-EtFOSE-M	65.6		10 - 130	03/18/24 04:28	03/18/24 16:32	1
d5-NEtPFOSA	63.4		10 - 130	03/18/24 04:28	03/18/24 16:32	1
d3-NMePFOSA	68.2		10 - 130	03/18/24 04:28	03/18/24 16:32	1

Client Sample ID: Drum 3 -03132024

Date Collected: 03/13/24 14:25
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-9
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluoropentanoic acid (PFPeA)	ND		400	100	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorohexanoic acid (PFHxA)	**150**	**J**	200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluoroheptanoic acid (PFHpA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorooctanoic acid (PFOA)	**76**	**J**	200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorononanoic acid (PFNA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorodecanoic acid (PFDA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluoroundecanoic acid (PFUnA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorododecanoic acid (PFDoA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorotridecanoic acid (PFTrDA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorotetradecanoic acid (PFTeA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorobutanesulfonic acid (PFBS)	**79**	**J**	200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluoropentanesulfonic acid (PFPeS)	**110**	**J**	200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorohexanesulfonic acid (PFHxS)	**980**		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorooctanesulfonic acid (PFOS)	**450**		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorononanesulfonic acid (PFNS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorodecanesulfonic acid (PFDS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1

Client Sample ID: Drum 3 -03132024
Date Collected: 03/13/24 14:25
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-9
Matrix: Water

Method: EPA Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorododecanesulfonic acid (PFDoS)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
4:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
6:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
8:2 FTS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
Perfluorooctanesulfonamide (FOSA)	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
NMeFOSA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
NEtFOSA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
NMeFOSAA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
NEtFOSAA	ND		200	50	ng/L		03/18/24 04:28	03/18/24 19:59	1
NMeFOSE	ND		2000	500	ng/L		03/18/24 04:28	03/18/24 19:59	1
NEtFOSE	ND		2000	500	ng/L		03/18/24 04:28	03/18/24 19:59	1
HFPO-DA (GenX)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
PFMPA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 19:59	1
PFMBA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 19:59	1
NFDHA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 19:59	1
9Cl-PF3ONS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
11Cl-PF3OUdS	ND		800	200	ng/L		03/18/24 04:28	03/18/24 19:59	1
PFEESA	ND		400	100	ng/L		03/18/24 04:28	03/18/24 19:59	1
3:3 FTCA	ND		1000	250	ng/L		03/18/24 04:28	03/18/24 19:59	1
5:3 FTCA	ND		5000	1300	ng/L		03/18/24 04:28	03/18/24 19:59	1
7:3 FTCA	ND		5000	1300	ng/L		03/18/24 04:28	03/18/24 19:59	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*74.9*		*5 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C5 PFPeA	*74.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C5 PFHxA	*74.4*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C4 PFHpA	*75.7*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C8 PFOA	*69.8*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C9 PFNA	*78.3*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C6 PFDA	*78.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C7 PFUnA	*74.6*		*30 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C2 PFDoA	*65.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C2 PFTeDA	*71.0*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C3 PFBS	*74.9*		*40 - 135*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C3 PFHxS	*73.9*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C8 PFOS	*77.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C8 PFOSA	*82.7*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d3-NMeFOSAA	*74.4*		*40 - 170*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d5-NEtFOSAA	*84.2*		*25 - 135*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C2 4:2 FTS	*111*		*40 - 200*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C2 6:2 FTS	*105*		*40 - 200*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C2 8:2 FTS	*152*		*40 - 300*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
13C3 HFPO-DA	*70.5*		*40 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d7-N-MeFOSE-M	*68.0*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d9-N-EtFOSE-M	*65.3*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d5-NEtPFOSA	*62.1*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*
d3-NMePFOSA	*71.7*		*10 - 130*	*03/18/24 04:28*	*03/18/24 19:59*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Lab Sample ID: MB 320-748091/1-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 748091

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluoropentanoic acid (PFPeA)	ND		4.0	1.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorotridecanoic acid (PFTrDA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorotetradecanoic acid (PFTeA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorononanesulfonic acid (PFNS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorodecanesulfonic acid (PFDS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorododecanesulfonic acid (PFDoS)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
4:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
6:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
8:2 FTS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
Perfluorooctanesulfonamide (FOSA)	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
NMeFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
NEtFOSA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
NMeFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
NEtFOSAA	ND		2.0	0.50	ng/L		03/18/24 04:28	03/18/24 13:53	1
NMeFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
NEtFOSE	ND		20	5.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
HFPO-DA (GenX)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
PFMPA	ND		4.0	1.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
PFMBA	ND		4.0	1.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
NFDHA	ND		4.0	1.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
9Cl-PF3ONS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
11Cl-PF3OUdS	ND		8.0	2.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
PFEESA	ND		4.0	1.0	ng/L		03/18/24 04:28	03/18/24 13:53	1
3:3 FTCA	ND		10	2.5	ng/L		03/18/24 04:28	03/18/24 13:53	1
5:3 FTCA	ND		50	13	ng/L		03/18/24 04:28	03/18/24 13:53	1
7:3 FTCA	ND		50	13	ng/L		03/18/24 04:28	03/18/24 13:53	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*72.5*		*5 - 130*	*03/18/24 04:28*	*03/18/24 13:53*	*1*
13C5 PFPeA	*70.3*		*40 - 130*	*03/18/24 04:28*	*03/18/24 13:53*	*1*
13C5 PFHxA	*72.1*		*40 - 130*	*03/18/24 04:28*	*03/18/24 13:53*	*1*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: MB 320-748091/1-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 748091

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFHpA	73.1		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C8 PFOA	69.7		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C9 PFNA	68.1		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C6 PFDA	80.4		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C7 PFUnA	74.1		30 - 130	03/18/24 04:28	03/18/24 13:53	1
13C2 PFDoA	64.8		10 - 130	03/18/24 04:28	03/18/24 13:53	1
13C2 PFTeDA	62.6		10 - 130	03/18/24 04:28	03/18/24 13:53	1
13C3 PFBS	70.1		40 - 135	03/18/24 04:28	03/18/24 13:53	1
13C3 PFHxS	68.6		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C8 PFOS	75.8		40 - 130	03/18/24 04:28	03/18/24 13:53	1
13C8 PFOSA	73.1		40 - 130	03/18/24 04:28	03/18/24 13:53	1
d3-NMeFOSAA	65.0		40 - 170	03/18/24 04:28	03/18/24 13:53	1
d5-NEtFOSAA	61.0		25 - 135	03/18/24 04:28	03/18/24 13:53	1
13C2 4:2 FTS	95.6		40 - 200	03/18/24 04:28	03/18/24 13:53	1
13C2 6:2 FTS	87.0		40 - 200	03/18/24 04:28	03/18/24 13:53	1
13C2 8:2 FTS	118		40 - 300	03/18/24 04:28	03/18/24 13:53	1
13C3 HFPO-DA	66.3		40 - 130	03/18/24 04:28	03/18/24 13:53	1
d7-N-MeFOSE-M	64.4		10 - 130	03/18/24 04:28	03/18/24 13:53	1
d9-N-EtFOSE-M	60.6		10 - 130	03/18/24 04:28	03/18/24 13:53	1
d5-NEtPFOSA	61.6		10 - 130	03/18/24 04:28	03/18/24 13:53	1
d3-NMePFOSA	62.1		10 - 130	03/18/24 04:28	03/18/24 13:53	1

Lab Sample ID: LCS 320-748091/3-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 748091

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	128	139		ng/L		109	70 - 140
Perfluoropentanoic acid (PFPeA)	64.0	61.8		ng/L		97	65 - 135
Perfluorohexanoic acid (PFHxA)	32.0	30.6		ng/L		96	70 - 145
Perfluoroheptanoic acid (PFHpA)	32.0	30.8		ng/L		96	70 - 150
Perfluorooctanoic acid (PFOA)	32.0	32.7		ng/L		102	70 - 150
Perfluorononanoic acid (PFNA)	32.0	31.6		ng/L		99	70 - 150
Perfluorodecanoic acid (PFDA)	32.0	32.8		ng/L		103	70 - 140
Perfluoroundecanoic acid (PFUnA)	32.0	34.0		ng/L		106	70 - 145
Perfluorododecanoic acid (PFDoA)	32.0	36.9		ng/L		115	70 - 140
Perfluorotridecanoic acid (PFTrDA)	32.0	35.4		ng/L		111	65 - 140
Perfluorotetradecanoic acid (PFTeA)	32.0	31.3		ng/L		98	60 - 140
Perfluorobutanesulfonic acid (PFBS)	28.4	28.6		ng/L		101	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	30.1	29.5		ng/L		98	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	29.2	29.7		ng/L		102	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	30.5	27.3		ng/L		89	70 - 150

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-748091/3-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 748091

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorooctanesulfonic acid (PFOS)	29.8	30.6		ng/L		103	55 - 150
Perfluorononanesulfonic acid (PFNS)	30.8	23.9		ng/L		78	65 - 145
Perfluorodecanesulfonic acid (PFDS)	30.8	22.8		ng/L		74	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	31.0	24.6		ng/L		79	50 - 145
4:2 FTS	120	104		ng/L		87	70 - 145
6:2 FTS	122	133		ng/L		109	65 - 155
8:2 FTS	123	131		ng/L		106	60 - 150
Perfluorooctanesulfonamide (FOSA)	32.0	35.4		ng/L		111	70 - 145
NMeFOSA	32.0	31.2		ng/L		97	60 - 150
NEtFOSA	32.0	36.8		ng/L		115	65 - 145
NMeFOSAA	32.0	38.0		ng/L		119	50 - 140
NEtFOSAA	32.0	34.8		ng/L		109	70 - 145
NMeFOSE	320	323		ng/L		101	70 - 145
NEtFOSE	320	373		ng/L		117	70 - 135
HFPO-DA (GenX)	128	150		ng/L		117	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	121	129		ng/L		106	65 - 145
PFMPA	64.0	65.7		ng/L		103	55 - 140
PFMBA	64.0	57.2		ng/L		89	60 - 150
NFDHA	64.0	68.7		ng/L		107	50 - 150
9Cl-PF3ONS	120	128		ng/L		107	70 - 155
11Cl-PF3OUdS	121	132		ng/L		110	55 - 160
PFEESA	57.1	56.0		ng/L		98	70 - 140
3:3 FTCA	160	163		ng/L		102	65 - 130
5:3 FTCA	799	859		ng/L		108	70 - 135
7:3 FTCA	799	911		ng/L		114	50 - 145

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*76.0*		*5 - 130*
13C5 PFPeA	*73.8*		*40 - 130*
13C5 PFHxA	*76.9*		*40 - 130*
13C4 PFHpA	*76.2*		*40 - 130*
13C8 PFOA	*73.0*		*40 - 130*
13C9 PFNA	*78.8*		*40 - 130*
13C6 PFDA	*83.0*		*40 - 130*
13C7 PFUnA	*83.7*		*30 - 130*
13C2 PFDoA	*76.7*		*10 - 130*
13C2 PFTeDA	*77.1*		*10 - 130*
13C3 PFBS	*77.7*		*40 - 135*
13C3 PFHxS	*74.5*		*40 - 130*
13C8 PFOS	*77.7*		*40 - 130*
13C8 PFOSA	*75.7*		*40 - 130*
d3-NMeFOSAA	*66.5*		*40 - 170*
d5-NEtFOSAA	*59.6*		*25 - 135*
13C2 4:2 FTS	*103*		*40 - 200*

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LCS 320-748091/3-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 748091

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C2 6:2 FTS	*88.2*		*40 - 200*
13C2 8:2 FTS	*124*		*40 - 300*
13C3 HFPO-DA	*72.1*		*40 - 130*
d7-N-MeFOSE-M	*67.8*		*10 - 130*
d9-N-EtFOSE-M	*63.9*		*10 - 130*
d5-NEtPFOSA	*63.1*		*10 - 130*
d3-NMePFOSA	*65.1*		*10 - 130*

Lab Sample ID: LLCS 320-748091/2-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 748091

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	12.8	15.2		ng/L		119	70 - 140
Perfluoropentanoic acid (PFPeA)	6.40	6.46		ng/L		101	65 - 135
Perfluorohexanoic acid (PFHxA)	3.20	3.29		ng/L		103	70 - 145
Perfluoroheptanoic acid (PFHpA)	3.20	3.28		ng/L		103	70 - 150
Perfluorooctanoic acid (PFOA)	3.20	3.41		ng/L		106	70 - 150
Perfluorononanoic acid (PFNA)	3.20	3.87		ng/L		121	70 - 150
Perfluorodecanoic acid (PFDA)	3.20	3.75		ng/L		117	70 - 140
Perfluoroundecanoic acid (PFUnA)	3.20	3.75		ng/L		117	70 - 145
Perfluorododecanoic acid (PFDoA)	3.20	3.41		ng/L		107	70 - 140
Perfluorotridecanoic acid (PFTrDA)	3.20	3.87		ng/L		121	65 - 140
Perfluorotetradecanoic acid (PFTeA)	3.20	3.53		ng/L		110	60 - 140
Perfluorobutanesulfonic acid (PFBS)	2.84	3.02		ng/L		106	60 - 145
Perfluoropentanesulfonic acid (PFPeS)	3.01	3.00		ng/L		100	65 - 140
Perfluorohexanesulfonic acid (PFHxS)	2.92	3.28		ng/L		112	65 - 145
Perfluoroheptanesulfonic acid (PFHpS)	3.05	2.79		ng/L		91	70 - 150
Perfluorooctanesulfonic acid (PFOS)	2.98	3.18		ng/L		107	55 - 150
Perfluorononanesulfonic acid (PFNS)	3.08	2.51		ng/L		82	65 - 145
Perfluorodecanesulfonic acid (PFDS)	3.08	2.40		ng/L		78	60 - 145
Perfluorododecanesulfonic acid (PFDoS)	3.10	2.63		ng/L		85	50 - 145
4:2 FTS	12.0	11.1		ng/L		92	70 - 145
6:2 FTS	12.2	13.8		ng/L		113	65 - 155
8:2 FTS	12.3	14.2		ng/L		115	60 - 150
Perfluorooctanesulfonamide (FOSA)	3.20	3.61		ng/L		113	70 - 145
NMeFOSA	3.20	2.97		ng/L		93	60 - 150
NEtFOSA	3.20	3.83		ng/L		120	65 - 145
NMeFOSAA	3.20	4.24		ng/L		133	50 - 140

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS (Continued)

Lab Sample ID: LLCS 320-748091/2-A
Matrix: Water
Analysis Batch: 748193

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 748091

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
NEtFOSAA	3.20	3.14		ng/L		98	70 - 145
NMeFOSE	32.0	35.6		ng/L		111	70 - 145
NEtFOSE	32.0	38.0		ng/L		119	70 - 135
HFPO-DA (GenX)	12.8	14.2		ng/L		111	70 - 140
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	12.1	13.9		ng/L		115	65 - 145
PFMPA	6.40	6.89		ng/L		108	55 - 140
PFMBA	6.40	5.13		ng/L		80	60 - 150
NFDHA	6.40	6.74		ng/L		105	50 - 150
9Cl-PF3ONS	12.0	12.6		ng/L		105	70 - 155
11Cl-PF3OUdS	12.1	13.6		ng/L		113	55 - 160
PFEESA	5.71	5.88		ng/L		103	70 - 140
3:3 FTCA	16.0	17.7		ng/L		111	65 - 130
5:3 FTCA	79.9	91.3		ng/L		114	70 - 135
7:3 FTCA	79.9	88.2		ng/L		110	50 - 145

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*75.4*		*5 - 130*
13C5 PFPeA	*74.4*		*40 - 130*
13C5 PFHxA	*75.8*		*40 - 130*
13C4 PFHpA	*74.8*		*40 - 130*
13C8 PFOA	*77.6*		*40 - 130*
13C9 PFNA	*65.5*		*40 - 130*
13C6 PFDA	*79.5*		*40 - 130*
13C7 PFUnA	*84.1*		*30 - 130*
13C2 PFDoA	*74.4*		*10 - 130*
13C2 PFTeDA	*74.5*		*10 - 130*
13C3 PFBS	*76.1*		*40 - 135*
13C3 PFHxS	*72.3*		*40 - 130*
13C8 PFOS	*79.5*		*40 - 130*
13C8 PFOSA	*78.4*		*40 - 130*
d3-NMeFOSAA	*66.5*		*40 - 170*
d5-NEtFOSAA	*72.3*		*25 - 135*
13C2 4:2 FTS	*104*		*40 - 200*
13C2 6:2 FTS	*93.3*		*40 - 200*
13C2 8:2 FTS	*126*		*40 - 300*
13C3 HFPO-DA	*70.7*		*40 - 130*
d7-N-MeFOSE-M	*71.5*		*10 - 130*
d9-N-EtFOSE-M	*70.9*		*10 - 130*
d5-NEtPFOSA	*66.4*		*10 - 130*
d3-NMePFOSA	*70.7*		*10 - 130*

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Client Sample ID: W-MW15-N-03132024
Lab Sample ID: 590-23724-1
Date Collected: 03/13/24 10:20
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			509.2 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 14:46	IM	EET SAC

Client Sample ID: W-MW15-FD-03132024
Lab Sample ID: 590-23724-2
Date Collected: 03/13/24 10:50
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			503.9 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 15:04	IM	EET SAC

Client Sample ID: W-MW17-N-03132024
Lab Sample ID: 590-23724-3
Date Collected: 03/13/24 12:10
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			531.7 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 15:21	IM	EET SAC

Client Sample ID: WL-EB-03132024
Lab Sample ID: 590-23724-5
Date Collected: 03/13/24 12:55
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			502.7 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 15:39	IM	EET SAC

Client Sample ID: FB-03132024
Lab Sample ID: 590-23724-6
Date Collected: 03/13/24 13:00
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			535.4 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 15:57	IM	EET SAC

Client Sample ID: Drum 1 -03132024
Lab Sample ID: 590-23724-7
Date Collected: 03/13/24 13:20
Matrix: Water
Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			5.0 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 16:14	IM	EET SAC

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Client Sample ID: Drum 2 -03132024

Lab Sample ID: 590-23724-8

Date Collected: 03/13/24 14:20

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			50.0 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748193	03/18/24 16:32	IM	EET SAC

Client Sample ID: Drum 3 -03132024

Lab Sample ID: 590-23724-9

Date Collected: 03/13/24 14:25

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	1633			5.0 mL	5.0 mL	748091	03/18/24 04:28	F1D	EET SAC
Total/NA	Analysis	Draft 1633		1			748518	03/18/24 19:59	IM	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Laboratory: Eurofins Sacramento

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Method	Method Description	Protocol	Laboratory
Draft 1633	Per- and Polyfluoroalkyl Substances by LC/MS/MS	EPA	EET SAC
1633	Solid-Phase Extraction (SPE)	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date
Your Company Name here: Haley & Aldrich	Email:	Lab Contact:	Carrier:
Address: 505 W Riverside Ave	Tel/Fax:	Analysis Turnaround Time	COC No: 1 of 1 COCs
City/State/Zip: Spokane, WA 99201		☐CALENDAR DAYS ☐WORKING DAYS	TALS Project #:
(xxx) xxx-xxxx Phone		TAT if different from Below ____	Sampler:
(xxx) xxx-xxxx FAX		☐ 2 weeks	For Lab Use Only:
Project Name: SEA PFAS Support		☐ 1 week	Walk-In Client:
Site: Spokane International Airport		☐ 2 days	Lab Sampling:
PO# 0209800-000		☐ 1 day	Job / SDG No.

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, Nitrate, Sulfate (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500 B)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
W-MW15-N-03132024	3/13/24	10:20	G	W	6			X	X	X	X	X	X	
W-MW15-FD-03132024		10:50			6			X	X	X	X	X	X	
W-MW17-N-03132024		12 10			6			X	X	X	X	X	X	
W-MW17-FD-03132024		12:40			4				X	X	X	X	X	
WL-EB-03132024		12:55			2			X						
FB-03132024		13 00			2			X						
Drum 1-03132024		13 20			2			X						
Drum 2-03132024		14:20			2			X						
Drum 3-03132024		14:25			2			X						

590-23724 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for ____ Months

Special Instructions/QC Requirements & Comments
PFAS 5 day TAT, all others standard

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 0.6°C	Corr'd: 0.7°C	Therm ID No.: IR066
Relinquished by:	Company: H&A	Date/Time: 3/13 16:00	Received by:	Company: H&A	Date/Time: 3/12/24 16:00
Relinquished by:	Company: H&A	Date/Time: 3/14/24 1045	Received by:	Company: ESSpokane	Date/Time: 3/14 Rec 1045
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Eurofins Spokane
11922 East 1st Ave
Spokane, WA 99206
Phone: 509-924-9200 Fax: 509-924-9290

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Arrington, Randee E	Carrier Tracking No(s):	COC No: 590-8865 1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Randee.Arrington@et.eurofinsus.com	State of Origin: Washington	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note): State - Washington		Job #: 590-23724-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 3/20/2024			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: SIA PFAS Support	Project #: 59003111			
Site:	SSOW#:			

Analysis Requested

Preservation Codes.

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I Ice
J - DI Water
K - EDTA
L - EDA
M Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1633/1633_SPE EPA 1633 Method List	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
W-MW15-N-03132024 (590-23724-1)	3/13/24	10:20 Pacific		Water			X	2	
W-MW15-FD-03132024 (590-23724-2)	3/13/24	10 50 Pacific		Water			X	2	
W-MW17-N-03132024 (590-23724-3)	3/13/24	12.10 Pacific		Water			X	2	
WL-EB-03132024 (590-23724-5)	3/13/24	12.55 Pacific		Water			X	2	
FB-03132024 (590-23724-6)	3/13/24	13.00 Pacific		Water			X	2	
Drum 1 -03132024 (590-23724-7)	3/13/24	13:20 Pacific		Water			X	2	
Drum 2 -03132024 (590-23724-8)	3/13/24	14.20 Pacific		Water			X	2	
Drum 3 -03132024 (590-23724-9)	3/13/24	14:25 Pacific		Water			X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northwest, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northwest, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northwest, LLC attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northwest, LLC.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	3/14/24 15:10	EETSPO		3.15.24 900	EETSPO
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No: 2261218	Cooler Temperature(s) °C and Other Remarks: 1.7c

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23724-1

Login Number: 23724
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23724-1

Login Number: 23724
List Number: 2
Creator: Simmons, Jason C

List Source: Eurofins Sacramento
List Creation: 03/15/24 03:53 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261218
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.7c
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Job ____ 590-23724 Field Sheet

Tracking # 410196003112

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier
GSL / OnTrac / Goldstreak / USPS / Other____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID L-11 Corr. Factor (+ / -) ____ °C

Ice 1 Wet 1 Gel ____ Other ____

Cooler Custody Seal 226018

Cooler ID: ____

Temp Observed 1.7 °C Corrected: 1.7 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials: ____ Date 3.15.24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials ____ Date 3.15.24

Notes:____

Trizma Lot #(s) ____

Ammonium Acetate Lot #(s) ____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials ____ Date 3.15.24

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

Method: Draft 1633 - Per- and Polyfluoroalkyl Substances by LC/MS/MS

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (5-130)	PFPeA (40-130)	13C5PHA (40-130)	C4PFHA (40-130)	C8PFOA (40-130)	C9PFNA (40-130)	C6PFDA (40-130)	13C7PUA (30-130)
590-23724-1	W-MW15-N-03132024	29.8	29.7 *5-	29.4 *5-	29.2 *5-	26.8 *5-	27.3 *5-	33.0 *5-	31.8
590-23724-2	W-MW15-FD-03132024	39.9	40.7	40.4	40.9	38.5 *5-	37.5 *5-	39.4 *5-	34.1
590-23724-3	W-MW17-N-03132024	74.5	78.6	79.9	83.9	75.4	68.9	76.5	70.0
590-23724-5	WL-EB-03132024	73.8	77.5	77.9	76.6	72.9	72.6	80.4	71.8
590-23724-6	FB-03132024	76.5	74.7	77.4	75.6	73.6	71.1	77.0	76.4
590-23724-7	Drum 1 -03132024	75.3	75.0	78.3	77.3	73.4	70.9	76.6	73.6
590-23724-8	Drum 2 -03132024	77.3	74.1	74.2	74.3	71.6	74.1	84.9	83.4
590-23724-9	Drum 3 -03132024	74.9	74.9	74.4	75.7	69.8	78.3	78.1	74.6
LCS 320-748091/3-A	Lab Control Sample	76.0	73.8	76.9	76.2	73.0	78.8	83.0	83.7
LLCS 320-748091/2-A	Lab Control Sample	75.4	74.4	75.8	74.8	77.6	65.5	79.5	84.1
MB 320-748091/1-A	Method Blank	72.5	70.3	72.1	73.1	69.7	68.1	80.4	74.1

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFDoA (10-130)	PFTDA (10-130)	C3PFBS (40-135)	C3PFHS (40-130)	C8PFOS (40-130)	PFOSA (40-130)	d3NMFOS (40-170)	d5NEFOS (25-135)
590-23724-1	W-MW15-N-03132024	22.9	23.2	31.0 *5-	28.7 *5-	31.9 *5-	33.2 *5-	25.8 *5-	26.3
590-23724-2	W-MW15-FD-03132024	29.2	24.7	41.5	40.7	40.8	43.1	35.8 *5-	31.2
590-23724-3	W-MW17-N-03132024	55.6	61.9	78.4	75.2	75.5	79.1	65.5	65.5
590-23724-5	WL-EB-03132024	69.3	73.6	76.6	74.6	76.9	76.0	64.2	66.9
590-23724-6	FB-03132024	64.0	66.7	75.6	77.7	82.2	79.3	72.1	70.5
590-23724-7	Drum 1 -03132024	63.2	64.2	78.2	74.6	77.2	91.4	77.8	75.3
590-23724-8	Drum 2 -03132024	66.4	68.5	79.1	76.9	78.6	81.3	76.0	74.4
590-23724-9	Drum 3 -03132024	65.7	71.0	74.9	73.9	77.1	82.7	74.4	84.2
LCS 320-748091/3-A	Lab Control Sample	76.7	77.1	77.7	74.5	77.7	75.7	66.5	59.6
LLCS 320-748091/2-A	Lab Control Sample	74.4	74.5	76.1	72.3	79.5	78.4	66.5	72.3
MB 320-748091/1-A	Method Blank	64.8	62.6	70.1	68.6	75.8	73.1	65.0	61.0

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	M242FTS (40-200)	M262FTS (40-200)	M282FTS (40-300)	HFPODA (40-130)	NMFM (10-130)	NEFM (10-130)	d5NPFSA (10-130)	d3NMFSA (10-130)
590-23724-1	W-MW15-N-03132024	44.4	35.3 *5-	57.7	26.7 *5-	24.1	22.6	24.7	24.2
590-23724-2	W-MW15-FD-03132024	58.0	46.4	72.9	39.0 *5-	30.5	27.8	29.8	31.0
590-23724-3	W-MW17-N-03132024	125	99.2	145	72.2	65.7	63.8	63.8	66.4
590-23724-5	WL-EB-03132024	108	96.6	150	73.0	74.9	70.2	72.7	73.7
590-23724-6	FB-03132024	110	96.7	170	74.8	71.5	67.0	68.0	68.3
590-23724-7	Drum 1 -03132024	110	102	127	73.3	71.5	67.3	69.7	70.9
590-23724-8	Drum 2 -03132024	118	106	128	73.4	69.9	65.6	63.4	68.2
590-23724-9	Drum 3 -03132024	111	105	152	70.5	68.0	65.3	62.1	71.7
LCS 320-748091/3-A	Lab Control Sample	103	88.2	124	72.1	67.8	63.9	63.1	65.1
LLCS 320-748091/2-A	Lab Control Sample	104	93.3	126	70.7	71.5	70.9	66.4	70.7
MB 320-748091/1-A	Method Blank	95.6	87.0	118	66.3	64.4	60.6	61.6	62.1

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
13C5PHA = 13C5 PFHxA
C4PFHA = 13C4 PFHpA
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-1

PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
C3PFBS = 13C3 PFBS
C3PFHS = 13C3 PFHxS
C8PFOS = 13C8 PFOS
PFOSA = 13C8 PFOSA
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M242FTS = 13C2 4:2 FTS
M262FTS = 13C2 6:2 FTS
M282FTS = 13C2 8:2 FTS
HFPODA = 13C3 HFPO-DA
NMFM = d7-N-MeFOSE-M
NEFM = d9-N-EtFOSE-M
d5NPFSA = d5-NEtPFOSA
d3NMFSA = d3-NMePFOSA

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

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JOB DESCRIPTION

SIA PFAS Support

JOB NUMBER

590-23724-2

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

See page two for job notes and contact information.

Job Notes

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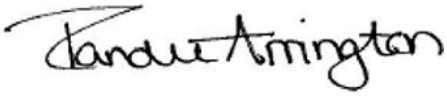

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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23724-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/14/2024 10:45 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 0.7°C.

HPLC/IC
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46472 recovered above the upper control limit for Potassium. The samples associated with this ICV were 10x the spike amount or non-detects for the affected analytes; therefore, the data have been reported.

Method 6010D - Total Recoverable: The low level initial calibration verification (ICVL) associated with batch 590-46472 recovered below the lower control limit for Sodium. The samples associated with this ICVL were 10x the spike amount for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23724-1	W-MW15-N-03132024	Water	03/13/24 10:20	03/14/24 10:45
590-23724-2	W-MW15-FD-03132024	Water	03/13/24 10:50	03/14/24 10:45
590-23724-3	W-MW17-N-03132024	Water	03/13/24 12:10	03/14/24 10:45
590-23724-4	W-MW17-FD-03132024	Water	03/13/24 12:40	03/14/24 10:45

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
^1-	Initial Calibration Verification (ICV) is outside acceptance limits, low biased.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: W-MW15-N-03132024

Lab Sample ID: 590-23724-1

Date Collected: 03/13/24 10:20

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2.9		0.80	0.42	mg/L			03/14/24 18:43	1
Nitrate as N	5.9		0.20	0.057	mg/L			03/14/24 18:43	1
Sulfate	6.9		0.50	0.13	mg/L			03/14/24 18:43	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	24		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:38	1
Magnesium	6.0		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:38	1
Potassium	1.6	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:38	1
Sodium	15	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	90	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	1.4		0.30	0.15	mg/L			03/25/24 10:34	5
Biochemical Oxygen Demand (SM5210B)	ND		12	6.0	mg/L			03/14/24 12:42	1

Client Sample ID: W-MW15-FD-03132024

Lab Sample ID: 590-23724-2

Date Collected: 03/13/24 10:50

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2.7		0.80	0.42	mg/L			03/14/24 18:53	1
Nitrate as N	5.9		0.20	0.057	mg/L			03/14/24 18:53	1
Sulfate	7.0		0.50	0.13	mg/L			03/14/24 18:53	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	25		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:42	1
Magnesium	6.1		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:42	1
Potassium	1.7	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:42	1
Sodium	15	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:42	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	80	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	1.4		0.30	0.15	mg/L			03/25/24 10:34	5
Biochemical Oxygen Demand (SM5210B)	ND		12	6.0	mg/L			03/14/24 12:42	1

Client Sample ID: W-MW17-N-03132024

Lab Sample ID: 590-23724-3

Date Collected: 03/13/24 12:10

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	300		8.0	4.2	mg/L			03/15/24 16:04	10
Nitrate as N	3.3		0.20	0.057	mg/L			03/14/24 19:03	1
Sulfate	22		0.50	0.13	mg/L			03/14/24 19:03	1

Client Sample ID: W-MW17-N-03132024

Lab Sample ID: 590-23724-3

Date Collected: 03/13/24 12:10

Matrix: Water

Date Received: 03/14/24 10:45

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	110		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:46	1
Magnesium	26		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:46	1
Potassium	7.5	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:46	1
Sodium	81	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	180	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	0.036	J	0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/14/24 12:42	1

Client Sample ID: W-MW17-FD-03132024

Lab Sample ID: 590-23724-4

Date Collected: 03/13/24 12:40

Matrix: Water

Date Received: 03/14/24 10:45

Method: EPA 300.0 - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	320		8.0	4.2	mg/L			03/15/24 16:14	10
Nitrate as N	3.2		0.20	0.057	mg/L			03/14/24 19:13	1
Sulfate	22		0.50	0.13	mg/L			03/14/24 19:13	1

Method: SW846 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	110		2.0	0.20	mg/L		03/22/24 09:45	03/26/24 13:50	1
Magnesium	26		1.0	0.13	mg/L		03/22/24 09:45	03/26/24 13:50	1
Potassium	7.6	^1-	0.50	0.29	mg/L		03/22/24 09:45	03/26/24 13:50	1
Sodium	82	^1-	0.50	0.20	mg/L		03/22/24 09:45	03/26/24 13:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 (SM 2320B)	190	B	20	5.0	mg/L			03/26/24 11:46	1
Phosphorus, Total (SM 4500 P E)	ND		0.060	0.030	mg/L			03/25/24 10:34	1
Biochemical Oxygen Demand (SM5210B)	ND		2.4	1.2	mg/L			03/14/24 12:42	1

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 590-46297/1001
Matrix: Water
Analysis Batch: 46297

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/14/24 17:43	1

Lab Sample ID: LCS 590-46297/1002
Matrix: Water
Analysis Batch: 46297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.01		mg/L		100	90 - 110

Lab Sample ID: MB 590-46298/1001
Matrix: Water
Analysis Batch: 46298

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/14/24 17:43	1
Sulfate	ND		0.50	0.13	mg/L			03/14/24 17:43	1

Lab Sample ID: LCS 590-46298/1002
Matrix: Water
Analysis Batch: 46298

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.5		mg/L		100	90 - 110
Sulfate	12.5	12.9		mg/L		103	90 - 110

Lab Sample ID: MB 590-46301/1003
Matrix: Water
Analysis Batch: 46301

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.20	0.057	mg/L			03/15/24 12:34	1

Lab Sample ID: LCS 590-46301/1004
Matrix: Water
Analysis Batch: 46301

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Nitrate as N	5.00	5.07		mg/L		101	90 - 110

Lab Sample ID: MB 590-46302/1003
Matrix: Water
Analysis Batch: 46302

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.80	0.42	mg/L			03/15/24 12:34	1
Sulfate	0.185	J	0.50	0.13	mg/L			03/15/24 12:34	1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 590-46302/1004
Matrix: Water
Analysis Batch: 46302

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	12.5	12.6		mg/L		101	90 - 110
Sulfate	12.5	12.9		mg/L		103	90 - 110

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 590-46401/2-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		2.0	0.20	mg/L		03/22/24 09:44	03/28/24 13:12	1
Magnesium	ND		1.0	0.13	mg/L		03/22/24 09:44	03/28/24 13:12	1
Potassium	ND		0.50	0.29	mg/L		03/22/24 09:44	03/28/24 13:12	1
Sodium	ND		0.50	0.20	mg/L		03/22/24 09:44	03/28/24 13:12	1

Lab Sample ID: LCS 590-46401/1-A
Matrix: Water
Analysis Batch: 46516

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 46401

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Calcium	50.0	52.0		mg/L		104	80 - 120
Magnesium	50.0	51.4		mg/L		103	80 - 120
Potassium	50.0	50.9		mg/L		102	80 - 135
Sodium	50.0	52.8		mg/L		106	80 - 154

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 590-46482/1
Matrix: Water
Analysis Batch: 46482

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3	5.00	J	20	5.0	mg/L			03/26/24 11:46	1

Lab Sample ID: LCS 590-46482/2
Matrix: Water
Analysis Batch: 46482

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO3	501	500		mg/L		100	90 - 110

Method: SM 4500 P E - Phosphorus

Lab Sample ID: MB 590-46433/8
Matrix: Water
Analysis Batch: 46433

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phosphorus, Total	ND		0.060	0.030	mg/L			03/25/24 10:34	1

Method: SM 4500 P E - Phosphorus (Continued)

Lab Sample ID: LCS 590-46433/7
Matrix: Water
Analysis Batch: 46433

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Phosphorus, Total			0.500	0.482		mg/L		96	90 - 110		

Lab Sample ID: 590-23724-4 DU
Matrix: Water
Analysis Batch: 46433

Client Sample ID: W-MW17-FD-03132024
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Phosphorus, Total	ND			ND		mg/L				NC	20

Method: SM5210B - BOD, 5 Day

Lab Sample ID: SCB 590-46280/2
Matrix: Water
Analysis Batch: 46280

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	SCB Result	SCB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/14/24 12:42	1

Lab Sample ID: USB 590-46280/1
Matrix: Water
Analysis Batch: 46280

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	USB Result	USB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Biochemical Oxygen Demand	ND		2.0	1.0	mg/L			03/14/24 12:42	1

Lab Sample ID: LCS 590-46280/3
Matrix: Water
Analysis Batch: 46280

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Biochemical Oxygen Demand			198	190		mg/L		96	85 - 115		

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Client Sample ID: W-MW15-N-03132024

Lab Sample ID: 590-23724-1

Date Collected: 03/13/24 10:20

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46297	03/14/24 18:43	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46298	03/14/24 18:43	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:38	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		5	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	50 mL	300 mL	46280	03/14/24 12:42	JSP	EET SPK

Client Sample ID: W-MW15-FD-03132024

Lab Sample ID: 590-23724-2

Date Collected: 03/13/24 10:50

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46297	03/14/24 18:53	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46298	03/14/24 18:53	NMI	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:42	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		5	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	50 mL	300 mL	46280	03/14/24 12:42	JSP	EET SPK

Client Sample ID: W-MW17-N-03132024

Lab Sample ID: 590-23724-3

Date Collected: 03/13/24 12:10

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46297	03/14/24 19:03	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46298	03/14/24 19:03	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46302	03/15/24 16:04	MRV	EET SPK
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:46	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46280	03/14/24 12:42	JSP	EET SPK

Client Sample ID: W-MW17-FD-03132024

Lab Sample ID: 590-23724-4

Date Collected: 03/13/24 12:40

Matrix: Water

Date Received: 03/14/24 10:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	5 mL	5 mL	46297	03/14/24 19:13	NMI	EET SPK
Total/NA	Analysis	300.0		1	5 mL	5 mL	46298	03/14/24 19:13	NMI	EET SPK
Total/NA	Analysis	300.0		10	5 mL	5 mL	46302	03/15/24 16:14	MRV	EET SPK

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Client Sample ID: W-MW17-FD-03132024

Date Collected: 03/13/24 12:40
Date Received: 03/14/24 10:45

Lab Sample ID: 590-23724-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			50 mL	50 mL	46401	03/22/24 09:45	AMB	EET SPK
Total Recoverable	Analysis	6010D		1			46472	03/26/24 13:50	AMB	EET SPK
Total/NA	Analysis	SM 2320B		1	100 mL	100 mL	46482	03/26/24 11:46	AMB	EET SPK
Total/NA	Analysis	SM 4500 P E		1	5 mL	5 mL	46433	03/25/24 10:34	AMB	EET SPK
Total/NA	Analysis	SM5210B		1	250 mL	300 mL	46280	03/14/24 12:42	JSP	EET SPK

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Laboratory: Eurofins Spokane

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Washington	State	C569	01-07-25

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23724-2

Method	Method Description	Protocol	Laboratory
300.0	Anions, Ion Chromatography	EPA	EET SPK
6010D	Metals (ICP)	SW846	EET SPK
SM 2320B	Alkalinity	SM	EET SPK
SM 4500 P E	Phosphorus	SM	EET SPK
SM5210B	BOD, 5 Day	SM	EET SPK
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	EET SPK

Protocol References:

EPA = US Environmental Protection Agency

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET SPK = Eurofins Spokane, 11922 East 1st Ave, Spokane, WA 99206, TEL (509)924-9200

Eurofins Spokane
11922 E 1st Avenue

Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

Chain of Custody Record

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Regulatory Program ☐DW ☐NPDES ☐RCRA ☐Other:

Eurofins Environment Testing America

Project Manager: Ward McDonald

COC No: 1 of 1 COCs

Client Contact	Email:	Site Contact:	Date	TALS Project #:
Your Company Name here: Haley & Aldrich	Tel/Fax:	Lab Contact:	Carrier:	Sampler:
Address: 505 W Riverside Ave	Analysis Turnaround Time			For Lab Use Only:
City/State/Zip: Spokane, WA 99201	☐CALENDAR DAYS ☐WORKING DAYS			Walk-In Client:
(xxx) xxx-xxxx Phone	TAT if different from Below ____			Lab Sampling:
(xxx) xxx-xxxx FAX	☐ 2 weeks			
Project Name: SEA PFAS Support	☐ 1 week			Job / SDG No.
Site: Spokane International Airport	☐ 2 days			
PO# 0209800-000	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS (1633)	Chloride, Nitrate, Sulfate (300.0)	Ca, Mg, Na, K (200.7)	Phosphate (SM 4500 B)	Alkalinity (SM2320B)	BOD (405.1)	Sample Specific Notes:
W-MW15-N-03132024	3/13/24	10:20	G	W	6			X	X	X	X	X	X	
W-MW15-FD-03132024		10:50			6			X	X	X	X	X	X	
W-MW17-N-03132024		12 10			6			X	X	X	X	X	X	
W-MW17-FD-03132024		12:40			4				X	X	X	X	X	
WL-EB-03132024		12:55			2			X						
FB-03132024		13 00			2			X						
Drum 1-03132024		13 20			2			X						
Drum 2-03132024		14:20			2			X						
Drum 3-03132024		14:25			2			X						

590-23724 Chain of Custody

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☐Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐Return to Client ☐Disposal by Lab ☐Archive for ____ Months

Special Instructions/QC Requirements & Comments
PFAS 5 day TAT, all others standard

Custody Seals Intact: ☐Yes ☐No	Custody Seal No.	Cooler Temp. (°C): Obs'd: 0.6°C Corr'd: 0.7°C	Therm ID No.: IR066
Relinquished by:	Company: H&A	Date/Time: 3/13 16:00	Received by:	Company: H&A	Date/Time: 3/12/24 16:00
Relinquished by:	Company: H&A	Date/Time: 3/14/24 1045	Received by:	Company: ESSpokane	Date/Time: 3/14 Rec 1045
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23724-2

Login Number: 23724
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Sacramento Sample Receiving Notes (SSRN)

Job ____ 590-23724 Field Sheet

Tracking # 410196003112

SO / PO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier
GSL / OnTrac / Goldstreak / USPS / Other____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC

Therm. ID L-11 Corr. Factor (+ / -) ____ °C

Ice 1 Wet 1 Gel ____ Other ____

Cooler Custody Seal 226018

Cooler ID: ____

Temp Observed 1.7 °C Corrected: 1.7 °C

From Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials: ____ Date 3.15.24

Unpacking/Labeling The Samples	Yes	No	NA
Containers are not broken or leaking?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
COC is complete w/o discrepancies	☑	☐	☐
Sample custody seal?	☐	☐	☑
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials ____ Date 3.15.24

Notes: ____

Trizma Lot #(s) ____

Ammonium Acetate Lot #(s) ____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
NCM Filed?	☐	☐	☑
Samples received within hold time?	☐	☐	☑
Log Release checked in TALS?	☐	☐	☑

Initials ____ Date 3.15.24

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ward McDonald
Haley & Aldrich, Inc.
505 W Riverside Ave
Suite 205
Spokane, Washington 99201

Generated 4/9/2024 8:10:19 PM

JOB DESCRIPTION

SIA PFAS Support

JOB NUMBER

590-23928-1

Eurofins Spokane
11922 East 1st Ave
Spokane WA 99206

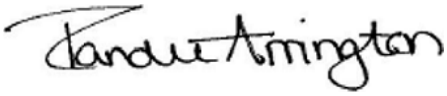
See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northwest, LLC Project Manager.

Authorization



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Authorized for release by
Randee Arrington, Business Unit Manager
Randee.Arrington@et.eurofinsus.com
(509)924-9200

Table of Contents

Job Narrative
590-23928-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 3/27/2024 9:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 2.9°C.

PFAS
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
590-23928-1	DeiceTap-N-03262024	Water	03/26/24 15:30	03/27/24 09:00
590-23928-2	DieceTap-FD-03262024	Water	03/26/24 16:00	03/27/24 09:00
590-23928-3	FB-03262024	Water	03/26/24 15:35	03/27/24 09:00

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Qualifiers

LCMS

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Client Sample ID: DeiceTap-N-03262024
Date Collected: 03/26/24 15:30
Date Received: 03/27/24 09:00

Lab Sample ID: 590-23928-1
Matrix: Water

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorobutanoic acid (PFBA)	**0.59**	**J**	1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorohexanoic acid (PFHxA)	**0.64**	**J**	1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.52	ng/L		04/05/24 07:49	04/06/24 16:23	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorooctanesulfonic acid (PFOS)	**0.98**	**J**	1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluorooctanoic acid (PFOA)	**0.56**	**J**	1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoropentanoic acid (PFPeA)	**1.1**	**J**	1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.46	ng/L		04/05/24 07:49	04/06/24 16:23	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*88*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C5 PFPeA	*89*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C3 PFBS	*111*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C2 4:2 FTS	*124*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C5 PFHxA	*86*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C3 HFPO-DA	*69*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C4 PFHpA	*89*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C2 6:2 FTS	*112*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C8 PFOA	*90*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C9 PFNA	*94*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C8 PFOS	*110*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C2 8:2 FTS	*103*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*
13C6 PFDA	*110*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:23*	*1*

Client Sample ID: DeiceTap-N-03262024

Lab Sample ID: 590-23928-1
Matrix: Water
Date Collected: 03/26/24 15:30
Date Received: 03/27/24 09:00

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C7 PFUnA	97		50 - 200	04/05/24 07:49	04/06/24 16:23	1
13C2 PFDoA	99		50 - 200	04/05/24 07:49	04/06/24 16:23	1
13C3 PFHxS	107		50 - 200	04/05/24 07:49	04/06/24 16:23	1

Client Sample ID: DieceTap-FD-03262024

Lab Sample ID: 590-23928-2
Matrix: Water
Date Collected: 03/26/24 16:00
Date Received: 03/27/24 09:00

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorobutanoic acid (PFBA)	**0.55**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorobutanesulfonic acid (PFBS)	**0.47**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorodecanoic acid (PFDA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorododecanoic acid (PFDoA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorohexanoic acid (PFHxA)	**0.69**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.52	ng/L		04/05/24 07:49	04/06/24 16:32	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorooctanesulfonic acid (PFOS)	**0.98**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluorooctanoic acid (PFOA)	**0.53**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoropentanoic acid (PFPeA)	**0.98**	**J**	1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1
Perfluoroundecanoic acid (PFUnA)	ND		1.8	0.46	ng/L		04/05/24 07:49	04/06/24 16:32	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	86		50 - 200	04/05/24 07:49	04/06/24 16:32	1
13C5 PFPeA	94		50 - 200	04/05/24 07:49	04/06/24 16:32	1

Client Sample ID: DieceTap-FD-03262024

Lab Sample ID: 590-23928-2

Date Collected: 03/26/24 16:00

Matrix: Water

Date Received: 03/27/24 09:00

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water (Continued)

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 PFBS	*100*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C2 4:2 FTS	*115*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C5 PFHxA	*90*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C3 HFPO-DA	*76*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C4 PFHpA	*91*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C2 6:2 FTS	*103*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C8 PFOA	*93*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C9 PFNA	*90*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C8 PFOS	*97*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C2 8:2 FTS	*102*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C6 PFDA	*118*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C7 PFUnA	*100*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C2 PFDoA	*99*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*
13C3 PFHxS	*105*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:32*	*1*

Client Sample ID: FB-03262024

Lab Sample ID: 590-23928-3

Date Collected: 03/26/24 15:35

Matrix: Water

Date Received: 03/27/24 09:00

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorobutanoic acid (PFBA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorohexanesulfonic acid (PFHxS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorohexanoic acid (PFHxA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.52	ng/L		04/05/24 07:49	04/06/24 16:41	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Client Sample ID: FB-03262024
Date Collected: 03/26/24 15:35
Date Received: 03/27/24 09:00

Lab Sample ID: 590-23928-3
Matrix: Water

Method: EPA 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoropentanoic acid (PFPeA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoropentanesulfonic acid (PFPeS)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1
Perfluoroundecanoic acid (PFUnA)	ND		1.9	0.47	ng/L		04/05/24 07:49	04/06/24 16:41	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*102*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C5 PFPeA	*101*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C3 PFBS	*109*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C2 4:2 FTS	*116*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C5 PFHxA	*97*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C3 HFPO-DA	*86*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C4 PFHpA	*93*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C2 6:2 FTS	*129*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C8 PFOA	*105*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C9 PFNA	*99*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C8 PFOS	*112*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C2 8:2 FTS	*110*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C6 PFDA	*118*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C7 PFUnA	*102*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C2 PFDoA	*97*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*
13C3 PFHxS	*109*		*50 - 200*	*04/05/24 07:49*	*04/06/24 16:41*	*1*

Method: 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water

Lab Sample ID: MB 320-752626/1-A
Matrix: Water
Analysis Batch: 753131

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 752626

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorobutanoic acid (PFBA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoroheptanesulfonic acid (PFHpS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorohexanesulfonic acid (PFHxS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorohexanoic acid (PFHxA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoro-3-methoxypropanoic acid (PFMPA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoro-4-methoxybutanoic acid (PFMBA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.56	ng/L		04/05/24 07:49	04/06/24 12:55	1
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoropentanoic acid (PFPeA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoropentanesulfonic acid (PFPeS)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1
Perfluoroundecanoic acid (PFUnA)	ND		2.0	0.50	ng/L		04/05/24 07:49	04/06/24 12:55	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*88*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C5 PFPeA	*91*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C3 PFBS	*101*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C2 4:2 FTS	*109*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C5 PFHxA	*84*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C3 HFPO-DA	*75*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C4 PFHpA	*87*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C2 6:2 FTS	*107*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C8 PFOA	*91*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C9 PFNA	*89*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C8 PFOS	*97*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*
13C2 8:2 FTS	*99*		*50 - 200*	*04/05/24 07:49*	*04/06/24 12:55*	*1*

Method: 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water (Continued)

Lab Sample ID: MB 320-752626/1-A
Matrix: Water
Analysis Batch: 753131

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 752626

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C6 PFDA	117		50 - 200	04/05/24 07:49	04/06/24 12:55	1
13C7 PFUnA	93		50 - 200	04/05/24 07:49	04/06/24 12:55	1
13C2 PFDoA	88		50 - 200	04/05/24 07:49	04/06/24 12:55	1
13C3 PFHxS	101		50 - 200	04/05/24 07:49	04/06/24 12:55	1

Lab Sample ID: LLCS 320-752626/2-A
Matrix: Water
Analysis Batch: 753131

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 752626

Analyte	Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	3.78	3.77		ng/L		100	50 - 150
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	3.74	3.33		ng/L		89	50 - 150
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	3.78	3.68		ng/L		97	50 - 150
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	4.00	4.26		ng/L		106	50 - 150
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	4.00	3.78		ng/L		94	50 - 150
Perfluorobutanoic acid (PFBA)	4.00	4.58		ng/L		114	50 - 150
Perfluorobutanesulfonic acid (PFBS)	3.55	3.60		ng/L		101	50 - 150
1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)	3.84	3.88		ng/L		101	50 - 150
Perfluorodecanoic acid (PFDA)	4.00	3.18		ng/L		80	50 - 150
Perfluorododecanoic acid (PFDoA)	4.00	4.33		ng/L		108	50 - 150
Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)	3.57	3.48		ng/L		97	50 - 150
Perfluoroheptanesulfonic acid (PFHpS)	3.82	3.88		ng/L		102	50 - 150
Perfluoroheptanoic acid (PFHpA)	4.00	3.83		ng/L		96	50 - 150
1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)	3.75	4.51		ng/L		120	50 - 150
Perfluorohexanesulfonic acid (PFHxS)	3.65	3.89		ng/L		107	50 - 150
Perfluorohexanoic acid (PFHxA)	4.00	3.84		ng/L		96	50 - 150
Perfluoro-3-methoxypropanoic acid (PFMPA)	4.00	4.22		ng/L		106	50 - 150
Perfluoro-4-methoxybutanoic acid (PFMBA)	4.00	4.50		ng/L		113	50 - 150
Perfluorononanoic acid (PFNA)	4.00	4.45		ng/L		111	50 - 150
1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	3.81	4.33		ng/L		114	50 - 150
Perfluorooctanesulfonic acid (PFOS)	3.72	3.80		ng/L		102	50 - 150
Perfluorooctanoic acid (PFOA)	4.00	4.08		ng/L		102	50 - 150
Perfluoropentanoic acid (PFPeA)	4.00	4.22		ng/L		106	50 - 150
Perfluoropentanesulfonic acid (PFPeS)	3.76	4.14		ng/L		110	50 - 150

Method: 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water (Continued)

Lab Sample ID: LLCS 320-752626/2-A
Matrix: Water
Analysis Batch: 753131

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 752626

Analyte			Spike Added	LLCS Result	LLCS Qualifier	Unit	D	%Rec	%Rec Limits		
Perfluoroundecanoic acid (PFUnA)			4.00	4.09		ng/L		102	50 - 150		

Isotope Dilution	*LLCS %Recovery*	*LLCS Qualifier*	*Limits*
13C4 PFBA	*86*		*50 - 200*
13C5 PFPeA	*91*		*50 - 200*
13C3 PFBS	*104*		*50 - 200*
13C2 4:2 FTS	*104*		*50 - 200*
13C5 PFHxA	*87*		*50 - 200*
13C3 HFPO-DA	*73*		*50 - 200*
13C4 PFHpA	*89*		*50 - 200*
13C2 6:2 FTS	*109*		*50 - 200*
13C8 PFOA	*89*		*50 - 200*
13C9 PFNA	*87*		*50 - 200*
13C8 PFOS	*101*		*50 - 200*
13C2 8:2 FTS	*100*		*50 - 200*
13C6 PFDA	*108*		*50 - 200*
13C7 PFUnA	*91*		*50 - 200*
13C2 PFDoA	*89*		*50 - 200*
13C3 PFHxS	*102*		*50 - 200*

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Client Sample ID: DeiceTap-N-03262024

Lab Sample ID: 590-23928-1

Date Collected: 03/26/24 15:30

Matrix: Water

Date Received: 03/27/24 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	533			269.8 mL	1.0 mL	752626	04/05/24 07:49	H1K	EET SAC
Total/NA	Analysis	533		1	1 mL	1 mL	753131	04/06/24 16:23	Y1S	EET SAC

Client Sample ID: DieceTap-FD-03262024

Lab Sample ID: 590-23928-2

Date Collected: 03/26/24 16:00

Matrix: Water

Date Received: 03/27/24 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	533			270.8 mL	1.0 mL	752626	04/05/24 07:49	H1K	EET SAC
Total/NA	Analysis	533		1	1 mL	1 mL	753131	04/06/24 16:32	Y1S	EET SAC

Client Sample ID: FB-03262024

Lab Sample ID: 590-23928-3

Date Collected: 03/26/24 15:35

Matrix: Water

Date Received: 03/27/24 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	533			267.3 mL	1.0 mL	752626	04/05/24 07:49	H1K	EET SAC
Total/NA	Analysis	533		1	1 mL	1 mL	753131	04/06/24 16:41	Y1S	EET SAC

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Laboratory: Eurofins Sacramento

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Washington	State	C581	05-05-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
533	533	Water	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)
533	533	Water	1H,1H,2H,2H-Perfluorodecane sulfonic acid (8:2 FTS)
533	533	Water	1H,1H,2H,2H-Perfluorohexane sulfonic acid (4:2 FTS)
533	533	Water	1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)
533	533	Water	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)
533	533	Water	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)
533	533	Water	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)
533	533	Water	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)
533	533	Water	Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)
533	533	Water	Perfluoro-3-methoxypropanoic acid (PFMPA)
533	533	Water	Perfluoro-4-methoxybutanoic acid (PFMBA)
533	533	Water	Perfluorobutanesulfonic acid (PFBS)
533	533	Water	Perfluorobutanoic acid (PFBA)
533	533	Water	Perfluorodecanoic acid (PFDA)
533	533	Water	Perfluorododecanoic acid (PFDoA)
533	533	Water	Perfluoroheptanesulfonic acid (PFHpS)
533	533	Water	Perfluoroheptanoic acid (PFHpA)
533	533	Water	Perfluorohexanesulfonic acid (PFHxS)
533	533	Water	Perfluorohexanoic acid (PFHxA)
533	533	Water	Perfluorononanoic acid (PFNA)
533	533	Water	Perfluorooctanesulfonic acid (PFOS)
533	533	Water	Perfluorooctanoic acid (PFOA)
533	533	Water	Perfluoropentanesulfonic acid (PFPeS)
533	533	Water	Perfluoropentanoic acid (PFPeA)
533	533	Water	Perfluoroundecanoic acid (PFUnA)

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Method	Method Description	Protocol	Laboratory
533	Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water	EPA	EET SAC
533	Extraction of Perfluorinated and Polyfluorinated Alkyl Acids	EPA	EET SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Chain of Custody Record

Eurofins Spokane
11922 E 1st Avenue
Spokane, WA 99206-5302
phone 509.924.9200 fax 509.924.9290

eurofins | Environment Testing America

Regulatory Program ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Eurofins Environment Testing America

Client Contact	Project Manager: Ward McDonald	Site Contact:	Date:	COC No:
Your Company Name here: Haley & Aldrich	Email: wmcdonald@haleyaldrich.com	Lab Contact:	Carrier:	1 of 1 COCs
Address: 905 W Riverside Ave	Tel/Fax:			TALS Project #:
City/State/Zip: Spokane, WA 99201	Analysis Turnaround Time: ☐ CALENDAR DAYS ☐ WORKING DAYS			Sampler:
(xxx) xxx-xxxx Phone	TAT if different from Below: STD			For Lab Use Only: Walk-in Client: / Lab Sampling:
(xxx) xxx-xxxx FAX	☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day			Job / SDG No.
Project Name: SEA PFAS Support				
Site: Spokane International Airport				
P O # 0209800 00				

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	PFAS Method 533	Sample Specific Notes:
DeiceTap N-03262024	03/26/24	15:30	G	H_2O	2			X	
DeiceTAP FD 03262024	1	16:00	1	1	2			X	
FB 03262024	1	15:35	1	1	2			X	

Preservation Used: 1=Ice, 2=HCl, 3=H_2SO_4, 4=HNO_3, 5=NaOH, 6=Other

590-23928 Chain of Custody

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may ... onth)
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.		Cooler Temp. (°C): Obs'd: 2.8 Corr'd: 2.9		Therm ID No.: IR001
Relinquished by: Keylin Huddleston	Company: Haley & Aldrich	Date/Time: 3/26/24 16:25	Received by:	Company: HAL	Date/Time: 3/26/24 16:25
Relinquished by:	Company: HAL	Date/Time: 3/27/24 8:58	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: EE CDD	Date/Time: 3/27/24 9:00

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23928-1

Login Number: 23928
List Number: 1
Creator: Morris, Mackenzie 1

List Source: Eurofins Spokane

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 590-23928-1

Login Number: 23928
List Number: 2
Creator: Simmons, Jason C

List Source: Eurofins Sacramento
List Creation: 03/28/24 06:05 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	2261031
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.1c
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Isotope Dilution Summary

Client: Haley & Aldrich, Inc.
Project/Site: SIA PFAS Support

Job ID: 590-23928-1

Method: 533 - Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water

Matrix: Water **Prep Type: Total/NA**

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	PFBA (50-200)	PFPeA (50-200)	C3PFBS (50-200)	M242FTS (50-200)	13C5PHA (50-200)	HFPODA (50-200)	C4PFHA (50-200)	M262FTS (50-200)
590-23928-1	DeiceTap-N-03262024	88	89	111	124	86	69	89	112
590-23928-2	DieceTap-FD-03262024	86	94	100	115	90	76	91	103
590-23928-3	FB-03262024	102	101	109	116	97	86	93	129
LLCS 320-752626/2-A	Lab Control Sample	86	91	104	104	87	73	89	109
MB 320-752626/1-A	Method Blank	88	91	101	109	84	75	87	107

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	C8PFOA (50-200)	C9PFNA (50-200)	C8PFOS (50-200)	M282FTS (50-200)	C6PFDA (50-200)	13C7PUA (50-200)	PFDoA (50-200)	C3PFHS (50-200)
590-23928-1	DeiceTap-N-03262024	90	94	110	103	110	97	99	107
590-23928-2	DieceTap-FD-03262024	93	90	97	102	118	100	99	105
590-23928-3	FB-03262024	105	99	112	110	118	102	97	109
LLCS 320-752626/2-A	Lab Control Sample	89	87	101	100	108	91	89	102
MB 320-752626/1-A	Method Blank	91	89	97	99	117	93	88	101

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
C3PFBS = 13C3 PFBS
M242FTS = 13C2 4:2 FTS
13C5PHA = 13C5 PFHxA
HFPODA = 13C3 HFPO-DA
C4PFHA = 13C4 PFHpA
M262FTS = 13C2 6:2 FTS
C8PFOA = 13C8 PFOA
C9PFNA = 13C9 PFNA
C8PFOS = 13C8 PFOS
M282FTS = 13C2 8:2 FTS
C6PFDA = 13C6 PFDA
13C7PUA = 13C7 PFUnA
PFDoA = 13C2 PFDoA
C3PFHS = 13C3 PFHxS

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Lab #: 920421 **Job #:** 58472

Sample Name: SWN-MW3-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 16:30 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-110.4‰ relative to VSMOW
$\delta^{18}O$ of water	-14.57‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

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Lab #: 920422 **Job #:** 58472

Sample Name: LA-MW11-N-03082024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/08/2024 08:30 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-117.1‰ relative to VSMOW
$\delta^{18}O$ of water	-15.26‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
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Lab #: 920423 **Job #:** 58472

Sample Name: LA-MW12-N-03082024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/08/2024 09:14 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.8‰ relative to VSMOW
$\delta^{18}O$ of water	-15.01‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
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Lab #: 920424 **Job #:** 58472

Sample Name: LA-MW9-N-03082024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/08/2024 10:22 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-116.9‰ relative to VSMOW
$\delta^{18}O$ of water	-15.13‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

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Lab #: 920425 **Job #:** 58472

Sample Name: SWN-MWA-P-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 08:50 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.3‰ relative to VSMOW
$\delta^{18}O$ of water	-14.90‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

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Lab #: 920426 **Job #:** 58472

Sample Name: SWN-MW6-N-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 10:50 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.7‰ relative to VSMOW
$\delta^{18}O$ of water	-15.07‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920427 **Job #:** 58472

Sample Name: SWN-MW14-N-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 11:45 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-113.0‰ relative to VSMOW
$\delta^{18}O$ of water	-14.53‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

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Lab #: 920428 **Job #:** 58472

Sample Name: SWN-MW13-N-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 13:15 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-113.5‰ relative to VSMOW
$\delta^{18}O$ of water	-14.64‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

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Lab #: 920429 **Job #:** 58472

Sample Name: SWN-MW2-N-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 14:50 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.4‰ relative to VSMOW
$\delta^{18}O$ of water	-15.06‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
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Lab #: 920430 **Job #:** 58472

Sample Name: SWN-MW1-03112024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/11/2024 16:05 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-110.7‰ relative to VSMOW
$\delta^{18}O$ of water	-14.54‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920431 **Job #:** 58472

Sample Name: LA-MW8-N-03052024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/05/2024 14:30 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-114.0‰ relative to VSMOW
$\delta^{18}O$ of water	-14.86‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920432 **Job #:** 58472

Sample Name: LA-MW10-N-03052024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/05/2024 16:00 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-114.2‰ relative to VSMOW
$\delta^{18}O$ of water	-14.71‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920433 **Job #:** 58472

Sample Name: EA-MW14B-N-03062024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/06/2024 13:21 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-112.1‰ relative to VSMOW
$\delta^{18}O$ of water	-14.59‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920434 **Job #:** 58472

Sample Name: SWN-MW7-N-03062024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/06/2024 16:28 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-116.2‰ relative to VSMOW
$\delta^{18}O$ of water	-15.11‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920435 **Job #:** 58472

Sample Name: EA-MW5A-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 10:10 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-121.0‰ relative to VSMOW
$\delta^{18}O$ of water	-15.64‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920436 **Job #:** 58472

Sample Name: EA-MW5B-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 11:09 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-114.5‰ relative to VSMOW
$\delta^{18}O$ of water	-14.78‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920437 **Job #:** 58472

Sample Name: EA-MW8B-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 12:20 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-121.6‰ relative to VSMOW
$\delta^{18}O$ of water	-15.64‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920438 **Job #:** 58472

Sample Name: EA-MW8A-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 12:56 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-123.0‰ relative to VSMOW
$\delta^{18}O$ of water	-15.79‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920439 **Job #:** 58472

Sample Name: EA-MW13B-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 13:40 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-111.0‰ relative to VSMOW
$\delta^{18}O$ of water	-14.19‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920440 **Job #:** 58472

Sample Name: EA-MW13A-N-03072024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/07/2024 14:45 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-120.4‰ relative to VSMOW
$\delta^{18}O$ of water	-15.57‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920441 **Job #:** 58472

Sample Name: FGF-MW18-N-03122024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/12/2024 14:00 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-112.3‰ relative to VSMOW
$\delta^{18}O$ of water	-14.67‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920442 **Job #:** 58472

Sample Name: PD-MW1A-N-03122024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/12/2024 15:50 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-118.8‰ relative to VSMOW
$\delta^{18}O$ of water	-15.29‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920443 **Job #:** 58472

Sample Name: SWN-MW321-N-03122024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/12/2024 08:20 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-116.4‰ relative to VSMOW
$\delta^{18}O$ of water	-15.28‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920444 **Job #:** 58472

Sample Name: SWN-MW-4-N-03122024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/12/2024 10:05 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-116.7‰ relative to VSMOW
$\delta^{18}O$ of water	-15.45‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920445 **Job #:** 58472

Sample Name: SWN-MW5-N-03122024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/12/2024 12:20 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.5‰ relative to VSMOW
$\delta^{18}O$ of water	-15.14‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920446 **Job #:** 58472

Sample Name: W-MW15-N-03132024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/13/2024 10:20 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-115.1‰ relative to VSMOW
$\delta^{18}O$ of water	-14.74‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920447 **Job #:** 58472

Sample Name: W-MW15-FP-03132024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/13/2024 10:50 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-114.7‰ relative to VSMOW
$\delta^{18}O$ of water	-14.71‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920448 **Job #:** 58472

Sample Name: W-MW-17-N-03132024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/13/2024 12:10 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-112.0‰ relative to VSMOW
$\delta^{18}O$ of water	-14.51‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

ISOTECH
a Stratum Reservoir brand
www.isotechlabs.com

Lab #: 920449 **Job #:** 58472

Sample Name: W-MW-17-FD-03132024

Company: GSI Environmental Inc.

Container: 1 Liter Plastic Bottle & 125ml bottle

Field/Site Name: 6982 SIA WA

Date Sampled: 03/13/2024 12:40 **Date Received:** 05/01/2024 **Date Reported:** 05/30/2024

δD of water	-111.0‰ relative to VSMOW
$\delta^{18}O$ of water	-14.47‰ relative to VSMOW
Tritium content of water	na
$\delta^{13}C$ of DIC	na
^{14}C content of DIC	na
$\delta^{15}N$ of nitrate	na
$\delta^{18}O$ of nitrate	na
δ^{34} of sulfate	na
$\delta^{18}O$ of sulfate	na
Vacuum Distilled? *	No

Remarks:

nd = not detected. na = not analyzed.
*Indicates if vacuum distillation was utilized for hydrogen and oxygen isotopic analysis of water

GSI Job No.: 6892
Issued: 13 December 2024

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX A3

Appendix A. Preliminary Groundwater Sampling (March 2024) Data

Appendix A3 – Field Sampling Forms

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GEG Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward Matsonald
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/5/24

Sampling Data:

Well ID:	MW-8	Well Depth:	25 ft	Initial Depth To Water:	11.33 ft	Purging Device:	Peristaltic pump
Start time:	14:03	Depth To Top Of Screen:	13 ft	Depth Of Pump Intake:	18 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	14:34	Depth To Bottom Of Screen	23 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/-10 %	pH +/-0.1	Sp. Conduct-ivity (us/cm) +/-3 %	Dissolved Oxygen (mg/L) +/-10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/-10 mv	Comments
14:06	11.33	~~450~~	400	1	9.6	6.26	472.2	9.15	3.98	238.7	Clear, no sheen, no odor
14:09	11.33	—	400	2	9.4	6.43	472.1	8.93	4.03	234.2	
14:12	11.33	—	400	4	9.6	6.52	472.7	8.82	4.75	231.2	
14:15	11.33	-	410	5	9.6	6.57	473.4	8.74	4.34	229.0	
14:18	11.33	—	400	6	9.8	6.61	473.4	8.66	4.46	227.2	Stable
											Sample flow rate 450 mL/min
											Bottles: 4 x 500mL unpreserved
											1 x 250 mL unpreserved
											1 x 250mL H_2SO_4
											1 x 250 mL HNO_3

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GE6 Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward McDonald
CLIENT	GE6	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/5/24

Sampling Data:

Well ID:	MW-10	Well Depth:	25 ft	Initial Depth To Water:	10.00 ft	Purging Device:	Peristaltic Pump
Start time:	15:40	Depth To Top Of Screen:	15 ft	Depth Of Pump Intake:	22.3 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	16:00	Depth To Bottom Of Screen	25 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
15:46	10.26	—	140	1.5	9.3	6.67	236.4	9.16	3.99	189.6	clear, moderate, no odor
15:49	10.26	—	140	2	9.2	6.74	236.3	9.11	3.83	186.2	
15:52	10.26	—	140	2.5	9.2	6.85	236.1	9.00	3.07	181.0	
15:55	10.26	—	140	3	9.3	6.89	235.9	8.98	2.93	178.0	
15:58	10.26	—	140	3.5	9.1	6.93	236.0	9.00	2.63	174.9	Stable.
											Bottles: 4 x 500mL unpr.
											1 x 250 mL unpr.
											1 x 250 mL H_2SO_4
											1 x 250 mL HNO_3

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: GEG Support
LOCATION: Spokane, WA
CLIENT: GEG
CONTRACTOR:

H&A FILE NO.: 0209822-000
PROJECT MGR.: Ward McDonald
FIELD REP.: Aaron
SAMPLING DATE: 3/6/24

Sampling Data:

Well ID: MW-14B
Start time: 12:55
Finish Time: 13:25
Well Depth: 28.5 ft
Depth To Top Of Screen: 9 ft
Depth To Bottom Of Screen: 18.5 ft
Initial Depth To Water: 15.23 ft
Depth Of Pump Intake: 16.5 ft
Date Well Installed:
Purging Device: Peristaltic
Tubing Present In Well: ☑ Yes ☐ No
Tubing Type: HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
12:57	15.23	—	400	1	11.3	6.66	749	8.01	5.27	96.4	no color, no sheen, no odor
13:00	15.23	—	400	2	11.3	6.73	742	8.01	8.20	95.6	
13:03	15.23	—	400	3	11.4	6.74	738	7.89	12.22	93.6	
13:06	15.23	—	400	4	11.3	6.75	737	7.81	15.22	90.6	
13:09	15.23	—	400	5	11.3	6.77	736	7.77	18.61	87.1	
13:12	15.23	—	400	6	11.3	6.78	734	7.69	21.65	84.8	Turbidity suspect, water visibly very clear, NTU reading varies between 10 and 100, but goes down after a light shake
											Sampled:
											4 x 500 mL Poly unpr.
											1 x 250 mL unpr.
											1 x 250 mL HNO_3
											1 x 250 mL H_2NO_4

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GEC Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward McDonald
CLIENT	GEC	FIELD REP.	Chen
CONTRACTOR		SAMPLING DATE	3/6/24

Sampling Data:

Well ID:	MW-14A	Well Depth:	ft	Initial Depth To Water:	17.62 ft	Purging Device:	Peristaltic
Start time:	14:10	Depth To Top Of Screen:	ft	Depth Of Pump Intake:	30 ft	Tubing Present In Well:	☑ Yes ☐ No
Finish Time:	~~14~~ 15:00	Depth To Bottom Of Screen	ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/-10 %	pH +/-0.1	Conduct-ivity (us/cm) +/-3%	Dissolved Oxygen (mg/L) +/-10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/-10 mv	Comments
14:13	18.05		100	1	6.8	7.63	208.8	9.55	167.97	27.9	Shock YSI & turbidity &
14:15	18.36		100	1.5	8.6	7.51	199.8	8.96	25.77	42.5	dropped to around 20
14:17	18.52		100	2	9.6	7.42	197.2	8.48	31.08	52.7	
14:19	18.71		100	2	10.0	7.39	196.7	8.30	62.84	56.1	
14:21	18.90		100	2.5	10.0	7.38	196.9	8.24	105.09	60.2	
14:24	19.16		100	3	9.9	7.37	197.0	8.23	33.25	64.3	
14:27	19.41		100	3	10.1	7.32	196.8	7.95	96.65	65.9	Water is visibly very clear.
14:30	19.61		100	3.5	10.1	7.33	196.3	7.91	261.75	64.0	
14:33	19.85		100	4	10.0	7.32	196.6	7.81	94.60	62.4	
14:37	20.02		100	4.5	9.7	7.31	196.9	7.90	227.20	61.1	
14:40	20.13		100	5	9.7	7.30	196.3	7.71	150.41	60.7	Stopped pump to allow
14:50	19.54										well to recharge
14:56	19.30										Turbidity while stopped = 9.64
											Unable to sample 2 x 500 mL
											poly bottles (Isotopes & other)
											sampled 2 x 500 mL unpr.
											1 each of 250 mL unpr.
											250 mL HNO_3, 250 mL H_2SO_4

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GEG Support	H&A FILE NO.	0219800.002
LOCATION	Spokane, WA	PROJECT MGR.	Ward McDonald
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/6/24

Sampling Data:

Well ID:	MW-7	Well Depth:	19 ft	Initial Depth To Water:	11.71 ft	Purging Device:	Peristaltic Pump
Start time:	16:05	Depth To Top Of Screen:	5 ft	Depth Of Pump Intake:	14.5 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	16:30	Depth To Bottom Of Screen	19 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
16:07	11.71	-	420	1	8.8	6.22	1922	8.07	1.93	146.9	clear, no sheen, no odor
16:10	11.71	-	420	2	9.0	6.13	1978	5.46	2.69	150.4	
16:13	11.71	-	420	3	8.8	6.14	2112	4.93	5.22	151.3	
16:16	11.71	-	420	4	8.8	6.13	2235	5.10	7.83	151.9	
16:19	11.71	-	420	6	8.8	6.14	2282	5.21	3.89	151.9	
16:22	11.71	-	420	8	8.8	6.15	2294	5.26	6.31	151.8	Stable
											4 x 500 mL unpr.
											1 x 250 mL HNO_3
											1 x 250 mL H_2SO_4
											1 x 250 mL unpr.

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GEG Support	H&A FILE NO.	0209800.000
LOCATION	Spokane, WA	PROJECT MGR.	Ward McDonald
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	MW-5A	Well Depth:	96 ft	Initial Depth To Water:	26.48 ft	Purging Device:	Geosub 2 ~~QED Bladder~~
Start time:	~~8:45~~ 9:20	Depth To Top Of Screen:	81 ft	Depth Of Pump Intake:	80 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	10:00	Depth To Bottom Of Screen	91 ft	Date Well Installed:		Tubing Type:	HDPE / PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 5 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
9:24	26.50		175	0.5	10.1	7.26	271.9	3.92	391.21	55.8	turbid brown, no sheen, no odor
9:27				1	10.7	7.34	246.1	3.17	171.76	22.4	
9:30				1.5	11.0	7.44	216.1	3.33	76.66	-4.2	
9:33				2	11.2	7.62	205.0	4.27	58.95	-20.1	
9:36				2.5	11.0	7.82	199.1	5.15	40.16	-33.1	
9:39				3	11.2	7.77	194.4	5.57	25.15	-35.6	← Clearing up
9:42				3.5	11.3	7.61	190.8	5.79	17.48	-30.7	
9:45				4	11.2	7.51	188.1	5.91	13.62	-26.1	
9:48				4.5	11.2	7.43	186.2	5.96	11.44	-21.2	
9:51				5	11.2	7.41	185.1	5.99	9.98	-17.6	Stable
											4 x 500 mL unpr.
											1 x 250 mL "
											" HNO_3
											" H_2SO_4

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

Page of

PROJECT	GEG Support	H&A FILE NO.	182800.000
LOCATION	Spokane, WA	PROJECT MGR.	Wendy M.
CLIENT	GEG	FIELD REP.	Unk
CONTRACTOR		SAMPLING DATE	3/17/21

Sampling Data:

Well ID:	MW-5B	Well Depth:	60 ft	Initial Depth To Water:	22.30 ft	Purging Device:	Geosub 2 ~~Grundfos Pump~~
Start time:	10:45	Depth To Top Of Screen:	23 ft	Depth Of Pump Intake:	33 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:		Depth To Bottom Of Screen	43 ft	Date Well Installed:		Tubing Type:	HDPE / PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
10:46	22.40		300	1	11.5	6.65	823	5.99	35.83	54.5	clear, no sheen, no odor
10:49				2	11.6	6.66	809	5.24	39.76	53.7	
10:52				3	11.7	6.67	787	4.91	43.90	53.0	
10:55				4	11.7	6.68	788	4.70	31.34	52.3	
10:58				5	11.9	6.68	792	4.54	17.29	51.2	
11:01				6	12.0	6.68	791	4.38	8.98	49.9	Stable
											4 x 500 mL amber
											1 x 250 mL "
											" HNO_3
											" H_2SO_4

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

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PROJECT	GEG Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward McD.
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	MW-8B	Well Depth:	ft	Initial Depth To Water:	14.20 ft	Purging Device:	Peri Pump
Start time:	11:48	Depth To Top Of Screen:	40 ft	Depth Of Pump Intake:	45 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	12:10	Depth To Bottom Of Screen	50 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate ~~(ml/min)~~ or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
11:51	14.44		250	1	10.5	7.16	291.4	6.34	2.66	37.1	no color, no sheen, no odor.
11:54	14.46			2	10.5	7.21	211.4	5.98	2.62	35.2	
11:57	14.48			2.5	10.5	7.28	170.0	6.66	3.47	34.5	
12:00	14.48			3.5	10.5	7.27	164.1	7.06	4.26	36.8	
12:03	14.48			4.5	10.3	7.26	162.6	7.24	5.00	38.6	
12:06	14.48			5	10.4	7.25	161.9	7.35	5.62	39.8	Stable
											4x 500 mL unp.
											1 x 250 mL unp.
											1 x 250 ml HNO_3
											1 x 250 ml H_2SO_4

Form 3010

LOW FLOW/MNA FIELD SAMPLING FORM

HALEY ALDRICH

PROJECT	GEG Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward M.
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	MW-8A	Well Depth:	86 ft	Initial Depth To Water:	14.75 ft	Purging Device:	
Start time:	12:40	Depth To Top Of Screen:	66.5 ft	Depth Of Pump Intake:	71.5 ft	Tubing Present In Well: ☐ Yes	☐ No
Finish Time:		Depth To Bottom Of Screen	76.5 ft	Date Well Installed:		Tubing Type:	

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
12:40	14.80		250	0.5	9.0	7.22	134.0	9.84	22.32	52.0	no color, no sheen, no odor
12:43				1.5	10.7	7.13	187.1	5.97	3.54	49.1	
12:46				2.5	10.8	7.14	173.1	5.12	2.88	44.4	
12:49				3	10.8	7.21	169.0	5.18	3.35	42.8	
12:52				4	10.8	7.22	168.7	5.15	2.74	42.2	Stable
											4 x 500 mL unpr.
											1 x 250 mL "
											" HNO_3
											" H_2SO_4

Form 3010

LOW FLOW/MNA FIELD SAMPLING FORM

HALEY ALDRICH

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PROJECT	GE6 Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward M.
CLIENT	GE	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	MW-13B	Well Depth:	20 ft	Initial Depth To Water:	13.56 ft	Purging Device:	PCri pump
Start time:	13:~~30~~ 25	Depth To Top Of Screen:	10 ft	Depth Of Pump Intake:	16 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	13:40	Depth To Bottom Of Screen	18 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/-10 %	pH +/-0.1	Conduct-ivity (us/cm) +/-3 %	Dissolved Oxygen (mg/L) +/-10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/-10 mv	Comments
13:28	13.56		250	1	10.6	6.58	725	7.94	4.48	80.4	clear, no sheen, no odor
13:31	"		"	2	10.5	6.58	726	7.65	3.82	81.2	
13:34	"		"	3	10.4	6.57	726	7.43	3.21	82.8	Stable
											4 x 500 mL Lupr.
											1 x 250 mL "
											" HNO3
											" H2SO4

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

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PROJECT	GFG Sidnaw	H&A FILE NO.	0209500-000
LOCATION	~~Ho~~ Spokane, WA	PROJECT MGR.	Wood M.
CLIENT	GFG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	~~FS~~ MW-13A	Well Depth:	42 ft	Initial Depth To Water:	15.45 ft	Purging Device:	Peri pump
Start time:	14:05	Depth To Top Of Screen:	32 ft	Depth Of Pump Intake:	37 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:		Depth To Bottom Of Screen	41 ft	Date Well Installed:		Tubing Type:	PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
14:07	16.18		120	0.5	8.4	6.79	206.0	8.10	26.35	70.9	~~no color~~ no sheen, no odor
14:10				1	9.9	6.79	192.3	4.94	15.48	72.7	slight yellow color
14:13				1.5	10.6	6.86	190.1	3.14	13.51	69.9	
14:16				2	10.5	6.89	190.6	2.28	13.20	68.5	
14:19				2	10.3	6.91	191.3	1.80	14.15	67.3	
14:22				2.5	10.2	6.92	190.8	1.55	21.66	66.7	
14:25				3	10.2	6.95	190.3	1.33	19.72	65.0	
14:28				3.5	10.2	6.97	190.4	1.20	21.85	63.5	
14:31				4	9.9	6.99	189.8	1.13	20.53	62.7	
14:34				4	10.0	7.02	188.9	1.07	18.01	60.8	
14:37				4.5	9.9	7.03	188.7	1.05	18.27	59.8	
14:40				5	10.3	7.04	187.7	1.05	17.49	58.6	Sample
											4x 500 mL unpres.
											1x250 mL unpres
											" HNO_3
											" H_2SO_4

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	GEG Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward Hill
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/7/24

Sampling Data:

Well ID:	MW-3	Well Depth:	8.5	ft	Initial Depth To Water:	3.60	ft	Purging Device:	Peri pump
Start time:	15:56	Depth To Top Of Screen:	6.5	ft	Depth Of Pump Intake:	7.5	ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	16:30	Depth To Bottom Of Screen	8.4	ft	Date Well Installed:			Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
15:57	3.60		350	0.5	4.8	6.31	4123	7.64	3.86	84.2	clear, no sheen, no odor
16:00				1	4.6	6.46	4090	3.70	12.75	-38.5	
16:03				2	4.6	6.51	3995	2.48	29.29	-71.0	
16:06				2.5	4.5	6.52	3885	1.99	12.41	-83.1	
16:09				3	4.2	6.52	3814	1.66	21.23	-90.0	
16:12				4	4.2	6.55	3731	1.53	25.90	-95.4	
16:15				4.5	4.3	6.57	3719	1.30	23.71	-100.8	
16:18				5.5	4.4	6.60	3640	1.16	27.81	-105.4	
16:21				6.5	4.4	6.62	3595	1.07	26.05	-109.9	
16:24				7	4.4	6.62	3585	0.99	24.96	-112.4	
16:27				8	4.3	6.62	3563	1.00	7.74	-114.4	Stable
											4 x 500mL unp.
											1 x 250mL unp.
											1 x 250 mL HNO_3
											1 x 250 mL H_2SO_4

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

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PROJECT	GEG Support	H&A FILE NO.	0209800.000
LOCATION	Spokane, WA	PROJECT MGR.	Wan M.
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/6/24

Sampling Data:

Well ID:	MW-11	Well Depth:	20 ft	Initial Depth To Water:	10.96 ft	Purging Device:	Peri pump
Start time:	8:10	Depth To Top Of Screen:	9 ft	Depth Of Pump Intake:	14 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	~~8:35~~ 8:35	Depth To Bottom Of Screen	19 ft	Date Well Installed:		Tubing Type:	PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
8:11	10.96		300	0.5	6.1	7.47	235.6	9.13	2.23	85.2	clear, no sheen, no odor
8:14				1.5	7.3	6.76	218.8	6.10	1.78	107.1	
8:17				2.5	7.5	6.52	215.9	4.99	1.74	119.0	
8:20				3.5	7.6	6.45	214.4	4.57	1.74	123.8	
8:23				4.5	7.5	6.43	215.0	4.37	1.87	125.7	
8:26				5.5	7.4	6.43	210.0	4.23	1.79	126.0	Stable
											4 x 500 mL unpres
											1 x 250 mL "
											" HNO3
											" H2SO4

Form 3010

LOW FLOW/MNA FIELD SAMPLING FORM

HALEY ALDRICH

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PROJECT	GEG Support	H&A FILE NO.	0209800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward M
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/18/24

Sampling Data:

Well ID:	MW-12	Well Depth:	26 ft	Initial Depth To Water:	9.39 ft	Purging Device:	Peri pump
Start time:	9:00	Depth To Top Of Screen:	6 ft	Depth Of Pump Intake:	16 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	9:20	Depth To Bottom Of Screen	26 ft	Date Well Installed:		Tubing Type:	PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
9:02	9.39		440	1	6.1	6.82	406.8	10.81	16.07	107.6	clear, no sheen, no odor
9:05	|		|	2.5	6.3	6.87	407.1	9.83	12.12	109.7	
9:08	|		|	4	6.2	6.89	407.0	9.62	14.95	110.6	
9:11	|		|	5	6.4	6.89	406.7	9.45	2.89	112.2	shook YSI, turbidity fell instantly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

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PROJECT	GEG Support	H&A FILE NO.	0205800-000
LOCATION	Spokane, WA	PROJECT MGR.	Ward M.
CLIENT	GEG	FIELD REP.	Chad
CONTRACTOR		SAMPLING DATE	3/8/24

Sampling Data:

Well ID:	MW9	Well Depth:	20.5 ft	Initial Depth To Water:	6.29 ft	Purging Device:	QED Pump
Start time:	9:45	Depth To Top Of Screen:	10.5 ft	Depth Of Pump Intake:	15.5 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:		Depth To Bottom Of Screen	20.5 ft	Date Well Installed:		Tubing Type:	PE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 5%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
9:46	6.29		480	0.5	5.2	7.01	1143	4.83	3.25	109.2	no color, no sheen, no odor
9:49				2.0	5.1	7.06	1145	3.17	2.96	105.4	
9:52				3.5	5.0	7.08	1146	2.38	7.18	100.3	
9:55				5	5.0	7.10	1143	1.93	3.72	93.7	
9:58				6.5	5.3	7.10	1146	1.66	3.83	86.1	
10:01				8	5.2	7.11	1145	1.47	4.72	77.5	
10:04				9.5	5.1	7.12	1146	1.33	7.52	69.4	
10:07				11	5.0	7.12	1147	1.21	9.17	60.6	
10:10				12	5.0	7.13	1148	1.12	4.96	52.5	
10:13				13.5	5.0	7.13	1148	1.06	2.18	48.8	
10:16				15	5.0	7.13	1148	1.01	2.78	43.1	Stable
											4 x 500mL unpr.
											1 x 250mL "
											" HNO_3
											" H_2SO_4

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: SIA PFAS Support
LOCATION: Spokane International Airport
CLIENT: SIA
CONTRACTOR: —

H&A FILE NO.: 020980-000
PROJECT MGR.: Ward. M
FIELD REP.: CD
SAMPLING DATE: 8/11/24

Sampling Data:

Well ID: MW-A
Start time: 0805
Finish Time: 0850
Well Depth: 15 ft
Depth To Top Of Screen: 5 ft
Depth To Bottom Of Screen: 15 ft
Initial Depth To Water: 8.98 BTOC ft
Depth Of Pump Intake: 10 'BGS ft
Date Well Installed: —
Purging Device: Bery
Tubing Present In Well: ☐ Yes ☒ No
Tubing Type: poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10%	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
0805	8.98 M		320		5.5	5.83	32258	6.66	8.45	219.7	No odor, No sheen
0808					5.6	6.01	34854	3.90	6.72	210.6	
0811					5.6	6.15	36234	2.47	4.96	192.2	
0814					5.7	6.21	36717	1.93	4.70	186.5	
0817					5.7	6.24	37119	1.64	4.44	181	1 H2SO4
0820					5.7	6.26	37421	1.42	4.30	87.1	1 NH3
0823					5.7	6.27	37701	1.28	4.47	64.1	1 250 mL poly
0826					5.8	6.27	37877	1.19	4.20	49.3	1 125 mL poly
0829					5.8	6.29	36281	1.09	4.20	35.8	3 500 mL poly
0832					5.8	6.33	38240	1.04	4.25	26.4	
0835					5.8	6.32	38490	0.99	4.41	20.3	
Sample at 0850											

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: SIA PFAS Support
LOCATION: Spokane International Airport
CLIENT: SIA
CONTRACTOR: —

H&A FILE NO.: 020980-000
PROJECT MGR.: Weird. M
FIELD REP.: CO
SAMPLING DATE: 3/11/24

Sampling Data:

Well ID: MW-1
Start time: 1542
Finish Time: 1615

Well Depth: 15 ft
Depth To Top Of Screen: 8.5 ft
Depth To Bottom Of Screen: 14.5 ft

Initial Depth To Water: 5.78 TOC ft
Depth Of Pump Intake: 12 ft
Date Well Installed: —

Purging Device: Par.Sqft.C
Tubing Present In Well: ☐ Yes ☒ No
Tubing Type: Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1545	5.78		240		4.5	6.54	3877	10.22	2.60	32.6	No odor
1548					4.5	6.44	3903	10.38	3.08	48.8	NO Solen
1551					4.5	6.41	3906	10.44	3.83	55.9	
1554					4.5	6.40	3908	10.48	5.35	61.5	
1557					4.5	6.39	3904	10.52	7.90	65.2	
1600					4.5	6.39	3905	10.60	9.35	67.3	
	Sampled at		1605								1 H2SO4
											1 NH3
											1 250 mL Poly
											1 125 mL Poly
											1 500 mL Poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA PFAS Support	H&A FILE NO.	070980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Ward. M
CLIENT	SIA	FIELD REP.	C. Dowell
CONTRACTOR	—	SAMPLING DATE	3/12/24

Sampling Data:

Well ID:	MW-1A	Well Depth:	83 ft	Initial Depth To Water:	12.67 ft BTOC	Purging Device:	Peristaltic
Start time:	1520	Depth To Top Of Screen:	65 ft	Depth Of Pump Intake:	70 BGS ft	Tubing Present In Well:	☐ Yes ☑ No
Finish Time:	1550	Depth To Bottom Of Screen	75 ft	Date Well Installed:	—	Tubing Type:	Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1520	12.67		240		9.8	7.75	1988	7.79	2.62	39.8	NO odor NO Sheen
1523	↓		↓		10.0	7.48	2021	6.35	3.59	42.1	
1526					10.0	7.21	2034	4.71	5.80	48.6	
1529					10.0	7.14	2031	3.82	27.30	51.2	Turbidity unstable, fluctuating
1532					10.1	7.13	2032	3.53	48.39	51.6	
1535					10.0	7.13	2031	3.37	82.38	51.5	1 H2SO4
1538					10.0	7.13	2030	3.20	93.65	51.3	1 NHS
1541	←				10.0	7.13	2028	3.15	103.57	51.2	1 250 mL poly
~~1544~~			↓								1 125 poly
	Sampled at		1550								3 500 mL poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: SIA PFAS support
LOCATION: Spokane International airport
CLIENT: SIA
CONTRACTOR: —

H&A FILE NO.: 026980-000
PROJECT MGR.: Ward. M
FIELD REP.: CD
SAMPLING DATE: 3/11/2024

Sampling Data:

Well ID: MW-2
Start time: 1410
Finish Time: 1500

Well Depth: 15 ft
Depth To Top Of Screen: 9.5 ft
Depth To Bottom Of Screen: 14.7 ft

Initial Depth To Water: 6.76 TOC ft
Depth Of Pump Intake: 12 bgs ft
Date Well Installed: —

Purging Device: Peristaltic
Tubing Present In Well: ☐ Yes ☒ No
Tubing Type: Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
2:15	6.77		300		3.2	7.27	4393	5.61	2.86	11.7	
2:18					3.2	7.3	4430	2.93	5.08	18.8	
2:21					3.2	7.09	4445	2.22	8.92	21.0	1 H2SO4
2:24					3.2	7.06	4462	1.89	11.76	22.3	1 NH3
2:27					3.1	7.05	4473	1.67	14.89	23.1	1 250 mL Poly
2:30					3.2	7.02	4492	1.47	22.36	23.7	1 125 mL Poly
2:33					3.2	7.01	4497	1.30	27.95	24.0	3 500 mL poly
2:36					3.1	7.00	4498	1.22	25.64	24.1	
2:39					3.1	7.00	4508	1.13	30.40	24.4	
2:42					3.1	6.99	4513	1.05	23.90	24.4	
2:45	—		—		3.1	6.98	4506	0.99	26.45	24.0	Parameters stable,
	Sampled at 2:50										turbidity not consistent, water visibly clear

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International airport	PROJECT MGR.	Ward. M
CLIENT	SIA	FIELD REP.	CD
CONTRACTOR	—	SAMPLING DATE	3/12/24

Page

Sampling Data:

Well ID: MW-4 | Well Depth: 12.5 ft | Initial Depth To Water: 4.65 BTOC ft | Purging Device:

Start time: 0920 | Depth To Top Of Screen: 7.5 ft | Depth Of Pump Intake: 13 BOS ft | Tubing Present In Well: ☐ Yes ☒ No

Finish Time: 0950 | Depth To Bottom Of Screen 12.5 ft | Date Well Installed: | Tubing Type:

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
0920	4.90		120		5.4	6.60	16212	4.92	7.83	198.0	NO odor
0920			120		5.3	6.63	16349	3.49	14.00	136.6	NO Sheen
0923					5.4	6.64	16312	2.91	20.10	22.85	Not Turbid
0926					5.6	6.65	16262	2.40	29.81	-23.1	1 H2SO4
0929					5.7	6.66	16245	1.92	37.85	-15.5	1 NH3
0932					5.7	6.67	16256	1.67	38.66	-35.2	1 250 mL Poly
0935					5.7	6.68	16256	1.43	33.56	-56.8	1 125 Poly
0938					5.7	6.68	16243	1.32	49.3	-66.2	3 500 mL
0941					5.7	6.68	16205	1.21	60.35	-74.7	
0944					5.9	6.69	16192	1.08	32.51	-84.1	
0947					5.9	6.69	16180	1.04	43.55	-88.6	
0950					6.0	6.69	16146	0.99	50.34	-93.4	
0953					6.0	6.70	16082	0.94	38.96	-98.1	
0956					5.8	6.70	16099	0.89	55.2	-101.1	
0959					5.8	6.70	16086	0.87	49.24	-102.8	
	Sampled at		1005								

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Ward. M
CLIENT	SIA	FIELD REP.	CD
CONTRACTOR	—	SAMPLING DATE	08/12/24

Sampling Data:

Well ID:	MW-5	Well Depth:	20 ft	Initial Depth To Water:	3.40 BTOC ft	Purging Device:	Peri
Start time:	1140	Depth To Top Of Screen:	5 bgs ft	Depth Of Pump Intake:	12.5 BGS ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	1230	Depth To Bottom Of Screen	20 bgs ft	Date Well Installed:	—	Tubing Type:	Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1140	3.41		320		6.5	6.73	7722	4.83	2.99	5.3	No odor - No Sheen
1143					6.4	6.70	7686	3.54	3.62	6.6	
1146					6.4	6.67	7623	2.45	9.31	3.1	
1149					6.4	6.64	7579	2.00	17.77	-0.2	
1152					6.4	6.58	7462	1.56	22.01	-4.3	
1155					6.4	6.56	7390	1.41	30.07	-6.1	
1158					6.4	6.54	7337	1.28	43.24	-7.7	- turbidity readings
1201					6.4	6.53	7271	1.18	2.49	-8.8	Variable
1204					6.4	6.51	7287	1.13	5.56	-9.6	
1207					6.4	6.51	7224	1.04	15.65	-11.2	1 H2SO4
1210					6.4	6.51	7230	0.96	38.94	-13.2	1 NH3
1213					6.4	6.52	7256	0.92	57.25	-14.4	1 250mL poly
1216	↓		↓		6.5	6.51	7250	0.89	26.12	-15.5	1 125 poly
	Sampled at 12:20										3 500mL poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: SIA PFAS Support
LOCATION: Spokane International Airport
CLIENT: SIA
CONTRACTOR:

H&A FILE NO. 020980-000
PROJECT MGR. Ward, M
FIELD REP. CO
SAMPLING DATE 03/11/24

Sampling Data:

Well ID: MW-6
Start time: 10:17
Finish Time: 10:55

Well Depth: 20 ft
Depth To Top Of Screen: 5 ft
Depth To Bottom Of Screen 20 ft

Initial Depth To Water: 9.10 TOC ft
Depth Of Pump Intake: 14.5 ft
Date Well Installed:

Purging Device: Peristaltic
Tubing Present In Well: ☐ Yes ☒ No
Tubing Type: Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1020	9.10		320		4.8	6.96	8746	5.21	25.83	-13.1	No odor
1023	9.10				4.8	6.89	8454	2.81	62.95	-21.7	NO Sheen
1026					4.8	6.87	8438	2.25	99.74	-26.8	
1029					4.8	6.86	8424	1.87	141.67	-31.9	
1032					4.9	6.85	8432	1.53	111.74	-38.8	
1035					4.9	6.84	8423	1.39	148.85	-42.5	
1038					4.9	6.84	8416	1.26	172.59	-45.8	Parameters Stable,
Sampled at 1050											Turbidity readings appear
											inaccurate, water clear
											1 H2SO4
											1 NH3
											1 250 mL poly
											1 125 poly
											3 500 poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA FFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Wyd. M
CLIENT	SIA	FIELD REP.	CD
CONTRACTOR	—	SAMPLING DATE	3/11/24

Sampling Data:

Well ID:	MW-13	Well Depth:	ft	Initial Depth To Water:	5.22 TOC ft	Purging Device:	perry
Start time:	1290	Depth To Top Of Screen:	5.5 ft	Depth Of Pump Intake:	8 (est) ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	1315	Depth To Bottom Of Screen	11.5 ft	Date Well Installed:	—	Tubing Type:	poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft) BTOC	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1235	5.39		200		7.6	6.78	6218	2.45	49.15	19.8	Slightly turbid
1238	5.40				7.6	6.80	6 274	2.17	45.02	20.6	NO sheen
1241					7.5	6.83	6379	2.02	31.00	20.5	No odor
1244					7.6	6.83	6 373	1.89	30.26	20.6	
1247					7.6	6.85	6 417	1.85	22.24	20.2	1 H2SO4
1250					7.6	6.86	6455	1.80	17.45	18.6	1 NH3
1253					7.6	6.86	6462	1.73	16.83	18.0	1 250 mL poly
1300	Sampled										1 125 poly
											5 500 mL poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

Page 1 of 1

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Ward M.
CLIENT	SIA	FIELD REP.	CD
CONTRACTOR		SAMPLING DATE	03/11/24

Sampling Data:

Well ID:	MW-14	Well Depth:	16.5 ft	Initial Depth To Water:	5.70 TOC ft	Purging Device:	Peristaltic
Start time:	11:20	Depth To Top Of Screen:	4.5 ft	Depth Of Pump Intake:	10 ft BGS ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	11:55	Depth To Bottom Of Screen	14.5 ft	Date Well Installed:		Tubing Type:	Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1123	5.70		320		6.5	6.95	7026	7.46	2.33	-45.1	NO odor
1126					6.6	6.82	6981	5.67	1.77	-32.0	NO Sheen
1129					6.7	6.80	6949	5.18	2.06	-28.4	
1132					6.9	6.77	6934	4.65	5.63	-23.6	
1135					6.9	6.75	6903	4.32	13.07	-19.9	
1138					7.1	6.74	6889	4.05	24.83	-16.7	
1141					7.1	6.73	6903	3.88	6.37	-14.2	Sampled at 1145
											1 H2SO4
											1 NH3
											1 250 mL Poly
											1 125 Poly
											3 500 Poly

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

Page 1 of 1

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Ward. M
CLIENT	SIA	FIELD REP.	C. Doutt, AJ
CONTRACTOR	—	SAMPLING DATE	3/13/24

Sampling Data:

Well ID:	MW-15	Well Depth:	12 ft	Initial Depth To Water:	10.16 BTOC ft	Purging Device:	PERY
Start time:	0757	Depth To Top Of Screen:	7 ft	Depth Of Pump Intake:	9.5 BGS ft	Tubing Present In Well:	☐ Yes ☑ No
Finish Time:	1052	Depth To Bottom Of Screen	12 ft	Date Well Installed:		Tubing Type:	HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temperature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conductivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
0800	10.57		200		5.8	6.54	1086	9.85	19.61	330.5	No odor, no sheen
0803	10.61				5.7	6.66	1152	9.39	15.35	299.0	Duplicate
0806	10.69				5.6	6.76	1161	9.18	14.48	296.1	
0809	" "				5.6	6.82	1140	8.97	11.41	294.2	2 H2O4
0812	" "				5.8	6.84	1138	8.89	9.45	293.6	2 NH3
0815	" "				5.8	6.86	1132	8.74	8.42	292.5	8 500mL
0818	" "				5.8	6.89	1130	8.58	7.97	292.3	2 125 mL
0821	" "				5.9	6.91	1117	8.45	7.27	291.8	
0824	10.81				5.9	6.92	1114	8.38	6.14	291.6	
0827	↓		↓		6.1	6.93	1109	8.32	6.48	290.7	
	Sampled at 0830										
1042					7.6	7.08	999	10.31	80.67	185.8	Sample recollected after purging an additional 30 min.

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT: SIA PFAS Support
LOCATION: Spokane International Airport
CLIENT: SIA
CONTRACTOR:

H&A FILE NO.: 020980-008
PROJECT MGR.: W McDonald
FIELD REP.: C. Pourtoy
SAMPLING DATE: 03/13/24

Sampling Data:

Well ID: MW-17 | Well Depth: 25 ft | Initial Depth To Water: 17.13 BTOC ft | Purging Device: Peristaltic
Start time: 1130 | Depth To Top Of Screen: 15 ft | Depth Of Pump Intake: 20 TBOS ft | Tubing Present In Well: ☐ Yes ☒ No
Finish Time: 1200 | Depth To Bottom Of Screen 25 ft | Date Well Installed: | Tubing Type: HDPE

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conduct-ivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1137	17.34		240		9.9	6.65	5861	8.64	15.48	206.3	No odor
1140	↓		↓		10.6	6.65	5893	8.35	69.73	202.4	No Sheen
1143					10.5	6.67	5895	8.27	23.11	198.7	
1146					10.6	6.69	5896	8.16	24.79	193.7	Turbidity fluctuating
1149					10.8	6.70	5892	8.09	111.69	190.6	Water appears clear
1152					10.6	6.71	5881	8.04	188.59	188.2	
1155	↓				10.9	6.71	5889	8.00	105.12	185.3	2 H2O4
1158	17.33				10.7	6.71	5880	7.99	11.51	182.8	2 HCl
1201	↓				10.5	6.72	5875	7.97	40.88	181.9	6 500 mL
1204					10.6	6.72	5878	7.96	10.33	180.1	2 125 mL
1207	↓		↓		10.8	6.72	5884	7.92	35.33	178.6	
	Sampled at 1210										

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-00
LOCATION	Spokane International Airport	PROJECT MGR.	Ward. M
CLIENT	SIA	FIELD REP.	C. Dorsett
CONTRACTOR	—	SAMPLING DATE	3/12/24

Sampling Data:

Well ID:	MW-18	Well Depth:	13 ft	Initial Depth To Water:	9.09 BTOC ft	Purging Device:	peristaltic
Start time:	1325	Depth To Top Of Screen:	8 ft	Depth Of Pump Intake:	10.5 BGS ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	1405	Depth To Bottom Of Screen	13 ft	Date Well Installed:		Tubing Type:	poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temperature (°F) or (°C) +/- 10 %	pH +/- 0.1	Conductivity (us/cm) +/- 3 %	Dissolved Oxygen (mg/L) +/- 10 %	Turbidity (NTU) <10 NTU	ORP/eH (mv) +/- 10 mv	Comments
1330	9.09		200		8.8	6.74	1306	5.60	6.11	0.6	No odor
1333					8.5	6.50	1280	3.46	5.61	25.3	NO Sheen
1336					8.3	6.46	1274	2.83	3.72	31.9	
1339					8.3	6.43	1273	2.44	3.93	35.9	1 H2SO4
1342					8.4	6.42	1269	2.20	3.67	38.1	1 NH3
1345					8.6	6.41	1271	2.06	4.02	39.1	1 250mL poly
1348					8.5	6.41	1268	1.93	4.14	40.3	3 500mL
	Sampled at		1355								

Form 3010

HALEY ALDRICH

LOW FLOW/MNA FIELD SAMPLING FORM

PROJECT	SIA PFAS Support	H&A FILE NO.	020980-000
LOCATION	Spokane International Airport	PROJECT MGR.	Ward.M
CLIENT	SIA	FIELD REP.	CB
CONTRACTOR	—	SAMPLING DATE	3/12/24

Sampling Data:

Well ID:	MW-321	Well Depth:	15 ft	Initial Depth To Water:	9.30 TDC ft	Purging Device:	Rory
Start time:	0745	Depth To Top Of Screen:	5 ft	Depth Of Pump Intake:	11 BGS ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	0830	Depth To Bottom Of Screen	15 ft	Date Well Installed:	—	Tubing Type:	Poly

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temperature (°F) or (°C) +/- 10%	pH +/- 0.1	Conductivity (us/cm) +/- 3%	Dissolved Oxygen (mg/L) +/- 10%	Turbidity (NTU) < 10 NTU	ORP/eH (mv) +/- 10 mv	Comments
0800	9.41		200		6.6	5.38	17262	7.44	2.23	193.5	No odor, no sheen
0803	9.55				6.5	3.07	17333	6.63	2.53	221.2	
0806					6.4	5.05	17347	6.08	3.11	238.1	1 H2SO4
0809					6.6	5.02	17400	5.77	3.72	244.8	1 NH3
0811					6.5	5.07	17444	5.59	4.58	249.2	1 250 mL Poly
0814					6.5	5.07	17440	5.54	5.25	250.3	1 125 mL Poly
	Sampled at		0820								3 500 mL Poly

Form 3010

GSI Job No.: 6892
Issued: 13 December 2024

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX B

Appendix B. Quality Assurance Project Plan / Sampling and Analysis Plan

Quality Assurance Project Plan / Sampling Analysis Plan, Final

Spokane International Airport

December 2024

Haley & Aldrich, Inc. Project Number 0209800-000

Publication Information

This Quality Assurance Project Plan/Sampling and Analysis Plan is available upon request from the Spokane International Airport (SIA).

Data for this project will be available on Washington State Department of Ecology's (Ecology's) Environmental Information Management (EIM) website at www.ecy.wa.gov/eim/index.htm. Search on Cleanup Site ID: 16774.

This Quality Assurance Project Plan/Sampling and Analysis Plan is valid through 6 December 2029, five years from the date of approval.

Contact Information

Breeyn Greer, P.E.
Haley & Aldrich, Inc.
505 W. Riverside Avenue, Suite #450
Spokane, Washington 99201
Phone: 612.232.7343

Tiffany Thomas, Ph.D.
Haley & Aldrich, Inc.
505 W. Riverside Avenue, Suite #450
Spokane, Washington 99201
Phone: 509.960.7447

COVER PHOTO: Aerial photo of Spokane International Airport. Photo by Spokane International Airport.

Quality Assurance Project Plan / Sampling and Analysis Plan, Final

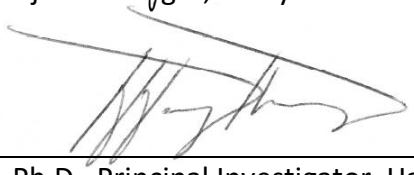
Spokane International Airport

Project Number 0209800-000

by Sarah Mass, P.E. and Tiffany Thomas, Ph.D.

13 December 2024

Approved by:

Signature: 	Date: 13 December 2024
Breeyn Greer, Project Manager, Haley & Aldrich, Inc.	
Signature: 	Date: 13 December 2024
Tiffany Thomas, Ph.D., Principal Investigator, Haley & Aldrich, Inc.	
Signature: 	Date: 13 December 2024
Sarah Mass, QA Manager, Haley & Aldrich, Inc.	

1.0 Table of Contents

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2.0 Abstract

The goal of the Initial Per- and Polyfluorinated Alkyl Substances (PFAS) Investigation (IPI) is to provide information to support the development of the Remedial Investigation Workplan. The focus of the IPI is to sample existing groundwater wells and collect soil samples from investigative soil borings at the Spokane International Airport (SIA; Site). The sampling will focus on the areas of potential or known concern as identified in the Site Assessment Report (GSI Environmental Inc. [GSI Environmental], 2024a). This work is in adherence to the Enforcement Order (Order; No. DE 22584) issued by the Washington State Department of Ecology (Ecology) and satisfies the requirements of Task 1B.

Groundwater samples collected from existing wells will be analyzed for PFAS via U.S. Environmental Protection Agency (EPA) Method 1633 and other parameters, including alkalinity, major cations and anions, and stable isotopes for water. Prior to groundwater sampling, water levels will be gauged to determine depth to water and the hydraulic gradient across SIA. During groundwater sampling, field parameters including pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), turbidity, and specific conductance (SC) will be measured to inform understanding of aquifer conditions and to indicate when water quality parameters have stabilized prior to sample collection. Soil samples from forthcoming investigations will be submitted to Eurofins Spokane for analysis of total organic carbon, percent moisture, and pH; Eurofins Spokane will subcontract soil analysis of PFAS using EPA Method 1633 to Eurofins Sacramento. Groundwater samples will be submitted to Eurofins Spokane for analysis of cations (calcium, magnesium, potassium, and sodium), anions (chloride, bromide, nitrate, and sulfate), and alkalinity; Eurofins Spokane will subcontract groundwater analysis of PFAS using EPA Method 1633 to Eurofins Sacramento. Groundwater samples will also be submitted to Isotech Laboratories Inc. (Isotech) for analysis of stable isotopes.

The results of these sampling events will facilitate the development of the work plan for the Remedial Investigation.

3.0 Background

3.1 Introduction and Purpose

Haley & Aldrich prepared this Quality Assurance Project Plan/Sampling Analysis Plan (QAPP/SAP) for SIA in association with the Site. The Site is generally located at 9000 West Airport Drive in Spokane, Washington. The Site is being investigated under Order No. DE 22584 with Ecology. The purpose of this QAPP/SAP is to document sampling procedures, analytical procedures, and the quality assurance/quality control (QA/QC) criteria that will be adhered to during the IPI at SIA as required by the Order.

The IPI of the Site will focus on PFAS in groundwater sampled from existing monitoring wells and soils. Groundwater and soil samples for PFAS will be collected in accordance with the *Guidance for Investigating and Remediating PFAS Contamination in Washington State* (Ecology PFAS Guidance; Ecology, 2023) and references therein, and analyzed for PFAS in accordance

with EPA Method 1633 (EPA, 2024) by Eurofins Sacramento. In addition to PFAS, groundwater samples will also be analyzed for magnesium, calcium, sodium, and potassium by EPA Method 200.7; sulfate, bromide, chloride, and nitrate by EPA Method 300.1; carbonate alkalinity by Standard Method (SM) 2320B; and stable isotopes for water (oxygen-18/oxygen-16, deuterium/hydrogen); soil samples will also be analyzed for total organic carbon (TOC) by EPA Method 9060A, pH by EPA Method 9045D, and moisture content. During groundwater sampling activities, synoptic measurements of groundwater levels will be used to define the current groundwater flow direction and gradient within the monitored aquifer layer(s).

3.2 Study Area and Surroundings

The study area for this project is currently defined within the property boundaries of SIA. The study area and immediate surroundings are displayed on Figure 1. SIA is a roughly 6,000-acre commercial airport served by six airlines and three air cargo carriers (Spokane Airport, 2024). SIA is located in Spokane, Washington, approximately 7 miles west-southwest of downtown Spokane. The topography of the Site area gently sloping downward from the south Site area to northeast. The landscape consists of mixed semi-arid shrub steppe grasslands, sparse mixed conifer forest and shrub steppe, barren rock surfaces, agricultural land, and urban-semi urban uses (GSI Water Solutions, Inc. et al., 2015). The landscape around the Site also includes stormwater infrastructure and impermeable surfaces due to outcrops. Based on a preliminary assessment of hydrogeologic conditions, groundwater flow is assumed to be to the northeast in the shallow groundwater intersected by the current monitoring well network.

The Site area lies in the West Plains in the northeast corner of the Columbia Basin. The West Plains (Figure 1) is a hydrogeologically isolated physiographic region. The regional geology of the northeast Columbia Basin consists of faulted Precambrian metasediment and intrusive basement rock. Above the basement rock sits Miocene flood basalts which filled around the upland buttes of basement rock. Pleistocene glaciolacustrine and glacial flood deposits and Holocene alluvium overly the flood basalts that onlap the steptoes. Please see the Spokane International Airport Geology and Hydrogeology Report (Haley & Aldrich, 2024) for references and additional geologic information.

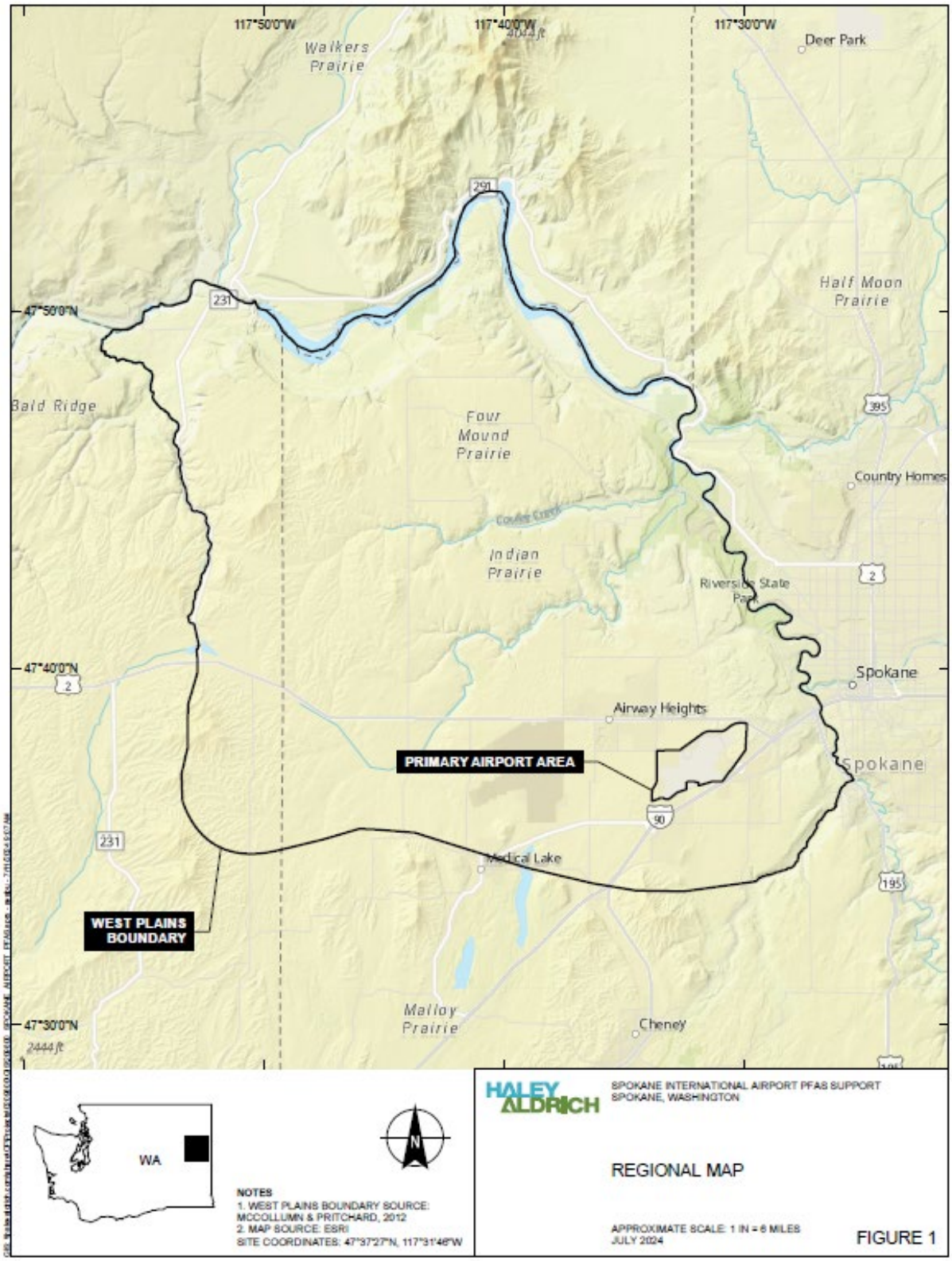

Figure 1. Regional Map

3.2.1 History of Study Area

The SIA study area is an active commercial airport located in Spokane County, Washington. The airport is jointly owned by City and County of Spokane. SIA is the second largest airport in the State of Washington, previously known as Sunset Field. A detailed accounting of the history of the airport is provided in the Site Assessment Report (GSI Environmental, 2024a).

3.2.2 Summary of Previous Studies and Existing Data

Historical data for PFAS in groundwater was collected in 2017 – 2019, the results of which are detailed in the Site Assessment Report (GSI Environmental, 2024a). A more recent sampling event occurred in March 2024 and was conducted by Haley & Aldrich and GSI Environmental. Samples were collected from 29 existing monitoring wells and analyzed for PFAS, biological oxygen demand, major cations and anions, and field parameters, including pH, DO, ORP, SC, turbidity, and stable isotopes for water (oxygen-18/oxygen-16, deuterium/hydrogen). See Section 3 of the IPI Work Plan (GSI Environmental, 2024b) for the results of the sampling event. The sampling procedures, quality assurance practices, and collection details for the March 2024 sampling event followed those detailed in this QAPP/SAP.

3.2.3 Parameters of Interest and Potential Sources

The primary parameters of interest in soil and groundwater in this project QAPP/SAP are PFAS. Additional parameters of interest in soil include TOC, pH, and moisture content; additional parameters of interest in groundwater include cations, anions, alkalinity, stable isotopes, and field parameters. Analytes of interest, abbreviations, and Chemical Abstract Service (CAS) numbers for aqueous and solids samples are included as Tables 9 and 10, respectively. Method detection limits and reporting limits for analytes of interest are included as Table 12.

The potential sources of PFAS impacts at SIA were evaluated in the Site Assessment Report (GSI Environmental, 2024a).

There are also potential impacts at SIA from aqueous film-forming foam (AFFF) or other PFAS releases at neighboring facilities, the nature and extent of which is unknown at this time.

3.2.4 Regulatory Criteria or Standards

Regulatory criteria are detailed in the Work Plan. Comparisons made between observed PFAS concentrations in groundwater samples and Ecology's current criteria levels for PFAS in potable groundwater serve as an initial evaluation. Ecology has made recent changes to its PFAS screening levels, as presented in the Cleanup Levels and Risk Calculation (CLARC) tables' most recent update in July 2024. The regulatory process for these updates and the applicability of the various criteria levels is unclear. Therefore, the use of Ecology's Method B potable groundwater criteria in this investigation is meant as a starting basis for comparison. Similarly, the use of soil criteria protective of groundwater (Method B) for the vadose zone supports the decision process for analyzing samples collected from additional depths in the soil cores. PFAS criteria values for both groundwater and soil are presented in the IPI Work Plan in Exhibits 3.1 and 4.3.2, respectively.

4.0 Project Description

The IPI focuses on the investigation of 40 PFAS analytes in groundwater samples in existing groundwater monitoring wells at SIA and in soil samples to be collected from soil cores advanced via sonic drilling methodology. During the preliminary groundwater sampling event, the sampled groundwater was analyzed for biological oxygen demand (BOD), major cations and anions, stable isotopes for water (oxygen-18/oxygen-16, deuterium/hydrogen), and field parameters, including pH, DO, ORP, turbidity, and SC. Groundwater samples collected from existing monitoring wells during the IPI will be analyzed for PFAS, field parameters (pH, DO, SC, turbidity, and ORP), cations, anions, alkalinity, and stable isotopes. Soil samples collected during the IPI will be analyzed for PFAS, total organic carbon, moisture content, and pH.

4.1 Project Goals

The IPI objective is to provide Site data to support the development of the Remedial Investigation Work Plan. The IPI will provide updated information on the concentrations of PFAS in groundwater and in vadose zone soils. A preliminary monitoring event was conducted in March 2024 in accordance with a draft version of this QAPP/SAP. Soil sampling and groundwater monitoring events will be conducted in accordance with the Order. In addition to PFAS, general groundwater characteristics will be monitored as determined by measurements of water levels and field parameters (including pH, DO, SC, turbidity, and ORP), which will inform the understanding of groundwater flow direction (gradient) and aquifer conditions.

4.2 Project Objectives

The primary objective of the IPI is to obtain synoptic groundwater elevations and concentrations of PFAS in existing monitoring wells and to investigate the nature and extent of PFAS in vadose zone soil. In addition, measurements of water quality as determined by the field parameters and major ions will be used to support the development of a conceptual site model of the underlying aquifer system. In addition to groundwater measurements, soils in the areas of potential or known concern as identified in the Site Assessment Report will also be sampled (GSI Environmental, 2024a).

4.3 Information Needed and Sources

As described in Section 3.2.2, limited PFAS data, with only perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) being reported, were collected at SIA prior to 2024 and an initial groundwater monitoring event for PFAS was conducted in March 2024. Existing environmental information available for this project includes the locations and construction summaries for existing monitoring wells. This information has been sourced from the Ecology's Well Construction and Licensing online portal and historical reports shared by SIA. There is currently no information on PFAS concentrations in Site soils.

4.4 Project Tasks

The following tasks were conducted for the preliminary groundwater sampling study:

- Identified and contracted with analytical laboratories accredited for EPA Method 1633 for the analysis of 40 PFAS analytes; BOD by EPA Method 405.1; magnesium, calcium, sodium, and potassium by EPA Method 200.7; nitrate, sulfate, phosphate, and chloride by EPA Method 300.1; carbonate alkalinity by SM 2320B, and stable isotopes for water (oxygen-18/oxygen-16, deuterium/hydrogen).
- Measured groundwater elevations in 29 accessible and usable monitoring wells (Figure 2).
- Collected groundwater samples from the 29 accessible and usable monitoring wells using low-flow groundwater sampling procedures and submersible and peristaltic pumps. Collected field parameters including pH, DO, SC, turbidity, and ORP.
- Submitted the collected samples to Eurofins Spokane for analysis of PFAS (subcontracted to Eurofins Sacramento), BOD, and major cations and anions, and to Isotech for oxygen isotopes.
- Submitted the PFAS analytical data to Pyron Environmental, a third-party data validator, for stage 2B data validation on 100 percent of data and stage 4 data validation on 10 percent of data.
- Transmitted validated data to GSI Environmental and SIA under a field summary report.

The following required tasks will be conducted for the IPI:

- Measure groundwater elevations in 52 accessible and usable monitoring wells (Figure 2).
- Perform a Site-wide survey of top of casing and top of monument elevations for existing monitoring wells, as well as latitudes/longitudes for any wells not previously horizontally surveyed.
- Replace any dedicated tubing or pumps with PFAS-free sampling equipment prior to sampling. Any wells with PFAS-containing dedicated tubing or pumps installed will be redeveloped prior to sampling.
- Collect groundwater samples from the 52 accessible and usable monitoring wells using low-flow groundwater sampling procedures and bladder and peristaltic pumps. Collect field parameters including pH, DO, SC, turbidity, and ORP.
- Advance 51 soil borings using sonic drilling methodology (Figure 3).
- Collect soil samples from the sonic cores following the procedure set forth in Section 4.3 of the IPI Work Plan. A minimum of two soil samples from each boring will be submitted for laboratory analysis, for a minimum of 102 analyzed samples.
- Collect six shallow soil samples using hand augers.
- Submit the collected soil and groundwater samples to Eurofins Spokane, who will subcontract to Eurofins Sacramento for analysis of PFAS by EPA Method 1633.

- Submit groundwater samples to Eurofins Spokane for analysis of major cations and anions and alkalinity and Isotech for oxygen isotopes.
- Additionally, submit soil samples to Eurofins Spokane for analysis of TOC by EPA Method 9060A, moisture content, and pH by SW846 Method 9045D.
- Submit the PFAS analytical data to Pyron Environmental for data validation.
- EDDs from laboratories will be sent to both Haley & Aldrich and GSI. Haley & Aldrich will check the electronic data deliverables (EDDs) for completeness.
- Submit raw and validated laboratory data to GSI, to submit to Ecology via EIM.

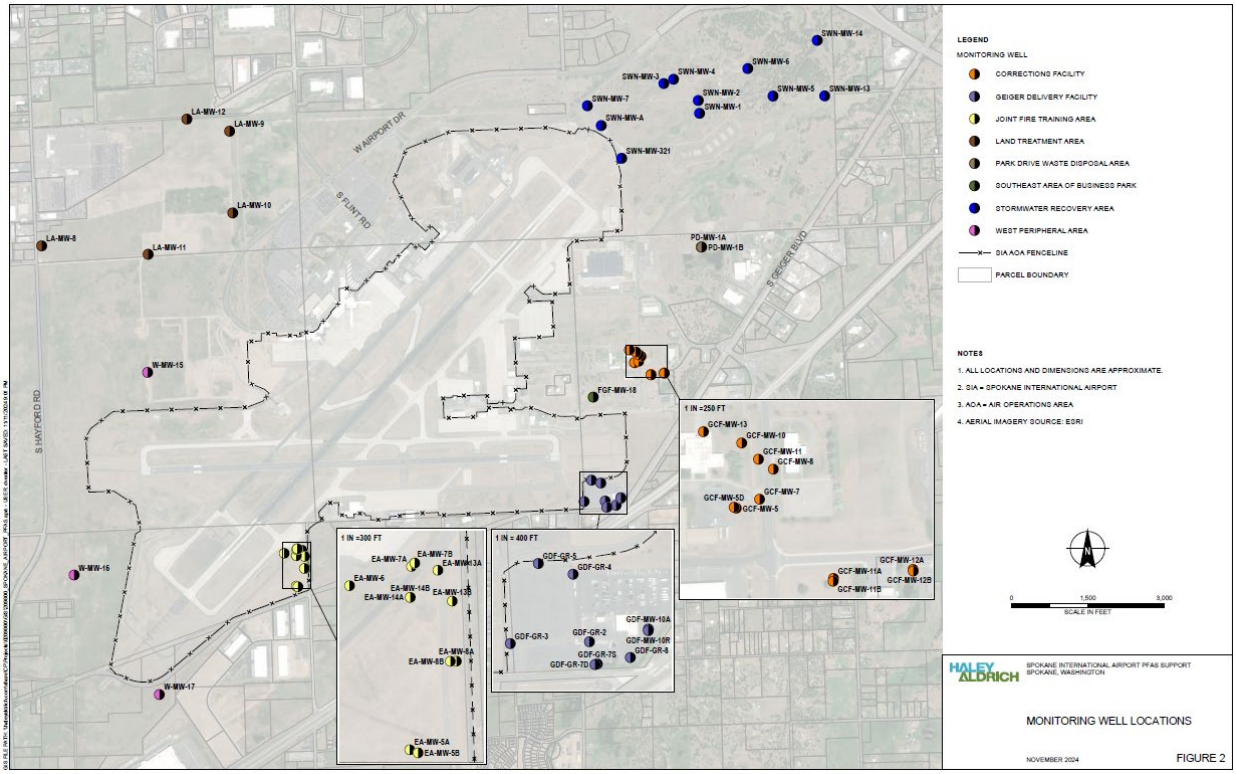

Figure 2. Monitoring Well Locations

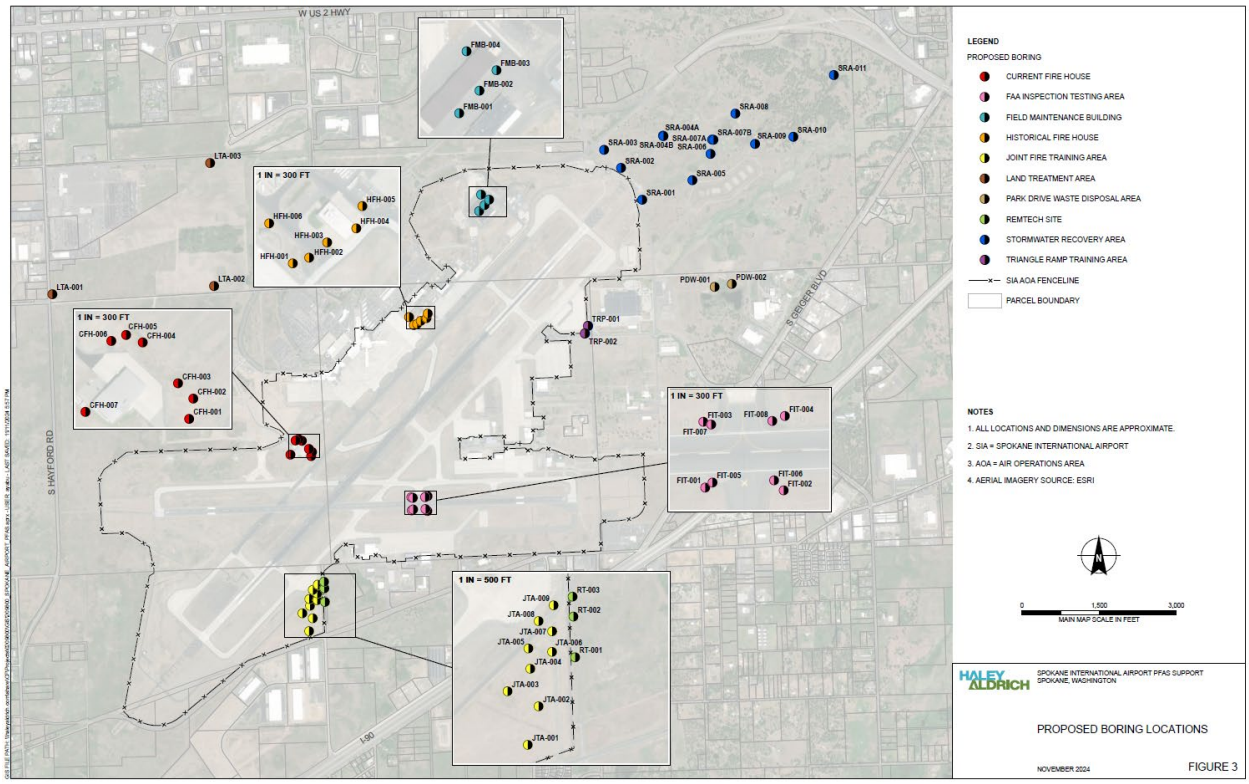

Figure 3. Proposed Soil Boring Locations

4.5 Systematic Planning Process

Preparation of this QAPP/SAP and the attending SAP (GSI Environmental, 2024c) satisfies the requirements for a systemic planning process for groundwater and soil sampling for this investigation.

5.0 Organization and Schedule

5.1 Key Individuals and Their Responsibilities

Table 1 shows the responsibilities of those who will be involved in this project.

Table 1: Organization of Project Staff and Responsibilities

Staff	Title	Responsibilities
Lisa Corcoran SIA Phone: 504-455-6406	Client	Clarifies scope of the project. Provides internal review of the QAPP/SAP and approves the final.
Dr. Kenia Whitehead GSI Environmental Phone: 564-999-5192	Project Lead	Provides internal review of the QAPP/SAP, provides general technical oversight, and approves final.
Dr. Tiffany Thomas Haley & Aldrich Phone: 978-379-3169	Principal Investigator	Provides internal review of the QAPP/SAP, provides general technical oversight, and approves the final.
Breeyn Greer, P.E. Haley & Aldrich Phone: 509-960-7422	Project Manager	Provides internal review of the QAPP/SAP, approves the budget, and approves the final.
Sarah Mass, P.E. Haley & Aldrich Phone: 510-844-8460	QA Manager	Oversees QAPP/SAP preparation. Coordinates field sampling and transportation of samples to the laboratory. Conducts QA review of data. Reviews the **draft** and final field summary report.
Ward McDonald, L.G. Haley & Aldrich Phone: 509-960-7424	Field Manager	Oversees field events. Helps collect samples and records field information.
Randee Arrington Eurofins Spokane Phone: 509-924-9200	Lab Director	Coordinates with Haley & Aldrich QA manager and field manager. Coordinates with subcontract laboratories.
Jeremy Schmidt, P.E. Ecology Phone: 509-724-1164	Site Manager	Reviews and approves the QAPP/SAP and the final.

5.2 Special Training and Certifications

Project personnel who will be conducting the sampling have up-to-date 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response certifications. In addition, project personnel who will be conducting the sampling have received specialized training for conducting PFAS sampling provided by Haley & Aldrich and based the Haley & Aldrich Operating Procedure (OP) 3032: Collection of Environmental Samples for the Analysis of PFAS.

5.3 Organization Chart

See Table 1.

5.4 Proposed Project Schedule

Tables 2 through 4 list key activities, due dates, and lead staff for the Initial Investigation.

Table 2: Schedule for Completing Field and Laboratory Work for the Initial PFAS Investigation

Task	Due Date	Lead Staff
Field work	December 2024	Breeyn Greer, Sarah Mass
Laboratory analyses	December 2024 – January 2025	Randee Arrington
Contract lab data validation	January – February 2025	Sarah Mass
Draft Initial PFAS Investigation Report	60 calendar days after data validation is complete	Kenia Whitehead

Table 3: Schedule for Data Entry

Task	Due Date	Lead Staff
EIM data loaded	60 calendar days after data validation is complete	Kenia Whitehead

5.5 Budget and Funding

A thorough description of funding sources and budget will be included in subsequent QAPP/SAP iterations.

6.0 Quality Objectives

6.1 Data Quality Objectives

The main data quality objectives (DQO) are to collect a minimum of 104 representative soil samples from vadose zone borings advanced with sonic drilling methods, six representative shallow soil samples from hand auger borings, and one groundwater sample from each of the 52 existing groundwater monitoring wells (52 groundwater samples total) and to have them analyzed by a certified laboratory to provide a preliminary assessment of the magnitude and extent of the different potential PFAS areas outlined in Task 1A. The analysis will use standard methods to obtain concentration data of PFAS that meet the measurement quality objectives (MQOs) described below.

6.2 MQOs

MQOs for the data to be collected include quantitative indicators of precision, bias, sensitivity, comparability, and completeness. MQOs are based on standard analytical method requirements, laboratory standard operating procedures (SOPs; Attachment A), and the Ecology PFAS Guidance.

6.2.1 Targets for Precision, Bias, and sensitivity

The MQOs for project results, expressed in terms of acceptable precision, bias, and sensitivity, are described in this section and summarized in Tables 4 through 6, below.

Table 4: Measurement Quality Objectives for Laboratory Analysis and Field Measurement of Groundwater and Soil Samples

Parameter	Matrix	Duplicate (RPD)	Lab Control Standard (%Recovery)	Method Blanks	Field Blanks and Equipment Blanks	Method Detection Limits (MDLs), Reporting Limits (RLs), or Range
PFAS	Aqueous	30% (field)	Varies by analyte; see Table 5	No target analytes >RL or 1/10 the amount measured in any sample (whichever is greater)	No target analytes >RL or 1/10 the amount measured in any sample (whichever is greater)	Varies by analyte; see Table 12
PFAS	Solid	30% (field)	Varies by analyte; see Table 6	No target analytes >RL or 1/10 the amount measured in any sample (whichever is greater)	No target analytes >RL or 1/10 the amount measured in any sample (whichever is greater)	Varies by analyte; see Table 12
Cations	Aqueous	30% (field)	85-115%	No target analytes ≥ RL or > 1/10 the amount measured in any sample (whichever is greater)	No target analytes ≥ RL or > 1/10 the amount measured in any sample (whichever is greater)	Varies by analyte; see Table 12
Anions	Aqueous	30% (field)	90-110%	No target compounds >RL	No target compounds >RL	Varies by analyte; see Table 12
Alkalinity	Aqueous	10% (lab)	90-110%	No target compounds >RL	No target compounds > RL	See Table 12
TOC	Solid	20% (lab)	85-115%	No target compounds >RL	No target compounds >RL	See Table 12
pH	Solid	20% (field)	+/- 0.05 pH units	NA	NA	0.1 standard units
Temperature	Aqueous	NA	NA	NA	NA	Range 0 to 40 degrees Celsius (°C) (32 to 104 degrees Fahrenheit [°F])
pH	Aqueous	NA	NA	NA	NA	Range 0 to 14 standard units
ORP	Aqueous	NA	NA	NA	NA	Range -1,999 to 1,999 millivolts
SC	Aqueous	NA	NA	NA	NA	Range 0 to 200 milliSiemens per centimeter
Turbidity	NA	NA	NA	NA	NA	Range 0 to 4,000 nephelometric turbidity units

Notes:

RPD = relative percent difference

ng/L = nanograms per liter

Table 5: Measurement Quality Objectives for PFAS Laboratory Control Samples (Eurofins Sacramento)

	Aqueous		Soil	
Parameter[1]	**Lab Control Standard (%Recovery)**	**LCS %R High**	**LCS %R Low**	**LCS %R High**
PFBA	70	140	70	140
PFPeA	65	135	60	150
PFHxA	70	145	65	140
PFHpA	70	150	65	145
PFOA	70	150	70	150
PFNA	70	150	70	155
PFDA	70	140	70	155
PFUnA	70	145	70	155
PFDoA	70	140	70	150
PFTrDA	65	140	65	150
PFTeA	60	140	60	150
PFBS	60	145	65	145
PFPeS	65	140	55	160
PFHxS	65	145	60	150
PFHpS	70	150	65	155
PFOS	55	150	65	160
PFNS	65	145	55	140
PFDS	60	145	40	155
PFDoS	50	145	25	160
4:2 FTS	70	145	60	150
6:2 FTS	65	155	55	200
8:2 FTS	60	150	70	150
FOSA	70	145	70	140
NMeFOSA	60	150	70	155
NEtFOSA	65	145	70	140
NMeFOSAA	50	140	65	155
NEtFOSAA	70	145	65	165
NMeFOSE	70	145	70	140
NEtFOSE	70	135	70	135
HFPO-DA (GenX)	70	140	70	145
(ADONA)	65	145	70	160
PFMPA	55	140	30	140
PFMBA	60	150	60	150
NFDHA	50	150	60	155
9Cl-PF3ONS	70	155	70	150
11Cl-PF3OUdS	55	160	45	160
PFEESA	70	140	70	140
3:3 FTCA	65	130	45	130
5:3 FTCA	70	135	60	130
7:3 FTCA	50	145	60	150

Notes:

[1]Complete analyte names and CAS numbers are included in Table 10.

LCS = Laboratory Control Sample

Table 6: Acceptance Limits for Extracted Internal Standards (EIS) and Non-Extracted Internal Standards (NIS) Compounds in Primary and QC Samples (Eurofins Sacramento)

EIS Compound	Recovery (%)
13C4-PFBA	54 - 130
13C5-PFPeA	40 - 130
13C5-PFHxA	40 - 130
13C4-PFH A	40 - 130
13C8-PFOA	40 - 130
13C9-PFNA	40 - 130
13C6-PFDA	40- 130
13C7-PFUnA	30- 130
13C2-PFDoA	10 - 130
13C2-PFTeDA	10 - 130
13C3-PFBS	40 - 135
13C3-PFHxS	40 - 130
13C8-PFOS	40 - 130
13C2-4:2FTS	40 - 200
13C2-6:2FTS	40 - 200
13C2-8:2FTS	40 - 300
13C8-PFOSA	40 - 130
D3-NMeFOSA	10 - 130
D5-NEtFOSA	10 - 130
D3-NMeFOSAA	40 - 170
D5-NEtFOSAA	25 - 135
D7-NMeFOSE	10 - 130
D9-NEtFOSE	10 - 130
13C3-HFPO-DA	40- 130
NIS Compound	**Recovery (%)**
13C3-PFBA	50 - 200
13C2-PFHxA	50 - 200
13C4-PFOA	50 - 200
13C5-PFNA	50 - 200
13C2-PFDA	50 - 200
18C2-PFHxS	50 - 200
13C4-PFOS	50 - 200

6.2.1.1 Precision

Precision is a measure of variability among replicate measurements due to random error. It is usually assessed using duplicate field measurements or laboratory analysis of duplicate samples. PFAS precision will be measured by collecting and analyzing field duplicates at a rate of one per 10 field samples as required by the Ecology PFAS Guidance.

Precision is evaluated by calculating relative percent difference ("RPD") using the following equation:

$$RPD = \frac{2|(D_1 - D_2)|}{D_1 + D_2} x100$$

Where:

D_1 = original sample concentration
D_2 = replicate sample concentration
RPD = relative percent difference

6.2.1.2 Bias

Bias is the difference between the sample mean and the true value. Bias is usually addressed by calibrating field and laboratory instruments, and by analyzing laboratory control samples (LCSs, referred to as Ongoing Precision and Recovery samples in EPA Method 1633), matrix spikes, and/or standard reference materials (extracted and non-extracted internal standards). PFAS bias will be measured through proper calibration of laboratory instruments and analysis of LCSs. LCS recovery acceptance criteria are indicated in Table 8. Per EPA Method 1633, matrix spike and matrix spike duplicate sample analysis are not required for methods that employ isotope dilution quantification because any deleterious effects of the matrix should be evident in the recoveries of the EIS compounds spiked into every sample (EPA, 2024). Bias will be expressed mathematically as accuracy, expressed in percent recovery using the following equation:

$$\%R = 100 \times \frac{C_m}{C_{sm}}$$

Where:

C_m = measured concentration
C_{sm} = actual concentration

6.2.1.3 Sensitivity

Laboratory-provided MDLs and RLs for groundwater are included in Table 12. MDLs and RLs may vary based on matrix interference, high concentrations of target or non-target analytes, dilutions, or other factors.

6.2.2 Targets for Comparability, Representativeness, and Completeness

6.2.2.1 Comparability

Comparability is a qualitative indicator of the confidence with which one dataset can be compared to another dataset. The objective is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results

to standard conditions, and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms shall support the assessment of comparability. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project. Assessment of comparability is primarily subjective, and results should be interpreted by experienced environmental professionals with a clear knowledge of the DQOs and project decisions.

Sampling and laboratory SOPs are included in Attachment A and listed in Section 8.2.

6.2.2.2 Representativeness

Representativeness is a qualitative term that refers to the degree to which data accurately and precisely depicts the characteristics of a population, whether referring to the distribution of contaminants within a sample, a sample within a matrix, or the distribution of a contaminant at a site. Representativeness is determined by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, operations process locations, and sampling locations. Assessment of representativeness shall be achieved through use of the standard field, sampling, and analytical procedures. Stringent QA/QC procedures will be implemented according to OP 3032: Collection of Environmental Samples for the Analysis of PFAS (Haley & Aldrich, 2024; Attachment A) so that samples collected for PFAS in groundwater and soil are not impacted by cross-contamination from sampling materials or procedures. The sample strategy will include collecting samples from each existing monitoring well that is determined to be acceptable and usable. Low-flow groundwater sampling procedures will be used according to the EPA's Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (EPA, 2017), which includes slow purging of stagnant water and minimizing mixing and aeration of water compared to conventional sampling procedures. Low-flow groundwater sampling is believed to increase representativeness of grab groundwater samples compared to conventional sampling procedures. Representative soil samples will be collected by using dedicated sampling equipment to the extent possible and minimizing sample handling.

6.2.2.3 Completeness

The completeness goal for project is for 90 percent of samples to meet acceptability criteria.

6.3 Acceptance Criteria for Quality of Existing Data

As described in Section 3, only a subset of monitoring wells at SIA have been sampled for PFAS, and the samples analyzed for PFAS historically included only two analytes. In addition, soil samples for PFAS have not been collected. This study aims to address these data gaps.

7.0 Study Design

7.1 Study Boundaries

Groundwater samples will be collected from existing groundwater monitoring wells within the SIA boundaries, as illustrated in Figure 2. Soil samples will be collected from soil borings proposed locations are shown in Figure 3.

7.2 Field Data Collection

The proposed monitoring wells for groundwater sampling are listed in Table 7, below. Groundwater will be collected by low-flow groundwater sampling procedures. Low-flow sampling uses a pump to purge groundwater from a specific depth within a monitoring well. At the surface, groundwater field-screening equipment are used to monitor the water in real-time, so the field representative can evaluate whether sufficient groundwater has been purged and confirm that water is being drawn from the formation (i.e., groundwater in the subsurface surrounding the well). Samples are then collected in sample containers provided by the laboratory.

Table 7: Groundwater Monitoring Wells and Locations

Monitoring Well No.	Latitude	Longitude	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
GCF-MW-10	47.62220564	-117.5135945	3	15
GCF-MW-11	47.62205397	-117.5133814	3	15
GCF-MW-13	47.62232192	-117.5140949	3	15
GCF-MW-5	47.62162497	-117.513704	3.5	13.5
GCF-MW-5D	47.62163425	-117.5137325	25	45
GCF-MW-7	47.62169601	-117.51339	25	45
GCF-MW-8	47.62195931	-117.5131908	25	45
GCF-MW-11A	47.62095913	-117.5124567	84.5	97
GCF-MW-11B	47.62093401	-117.512463	24.7	44.7
GCF-MW-12A	47.62100914	-117.5113989	68.1	78.1
GCF-MW-12B	47.62099443	-117.5113972	24	45
GDF-MW-10A	47.61441599	-117.5152703	73	83
GDF-MW-10R	47.61439359	-117.5152736	6	16
GDF-GR-2	47.61427058	-117.516531	5	15
GDF-GR-3	47.61429337	-117.5182089	5	15
GDF-GR-4	47.61524712	-117.5168148	10	20
GDF-GR-5	47.6154222	-117.5175409	10	25
GDF-GR-7D	47.61394015	-117.5164313	48	63
GDF-GR-7S	47.61394805	-117.5163849	25	35
GDF-GR-8	47.61402012	-117.5156784	8	18
FGF-MW-18	47.619878	-117.517124	8	13
EA-MW-5A	47.635614	-117.501806	81	91
EA-MW-5B	47.63584127	-117.501913	23	43

Monitoring Well No.	Latitude	Longitude	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
EA-MW-6B	47.61220195	-117.5421894	10.5	30.5
EA-MW-7A	47.61240863	-117.5412161	58	68
EA-MW-7B	47.61243137	-117.5411622	7.5	27.5
EA-MW-8A	47.611349	-117.540558	66.5	76.5
EA-MW-8B	47.61135	-117.540654	13	33
EA-MW-13A	47.61233376	-117.5407898	32	42
EA-MW-13B	47.61199539	-117.5405826	10	20
EA-MW-14A	47.61205499	-117.5412469	25	35
EA-MW-14B	47.61205499	-117.5412469	9	19
LA-MW-8	47.629261	-117.560433	12	22
LA-MW-9	47.634982	-117.545114	10	20
LA-MW-10	47.63059	-117.545143	15	25
LA-MW-11	47.628564	-117.552003	9	19
LA-MW-12	47.635731	-117.548471	6	26
PD-MW-1A	47.627678	-117.508036	65	75
SWN-MW-1	47.634858	-117.507706	8.5	14.5
SWN-MW-2	47.63555	-117.507761	9.5	14.7
SWN-MW-3	47.636539	-117.510444	6.5	8.4
SWN-MW-4	47.636744	-117.509656	7.5	12.4
SWN-MW-5	47.635614	-117.501806	5	20
SWN-MW-6	47.637147	-117.503717	5	20
SWN-MW-7	47.635522	-117.516594	5	19
SWN-MW-13	47.6355	-117.4977	5.5	11.5
SWN-MW-14	47.6385	-117.4981	4.5	14.5
SWN-MW-A	47.63442805	-117.5155589	5	15
SWN-MW-321	47.632625	-117.514047	5	15
W-MW-15	47.622229	-117.552446	7	12
W-MW-16	47.611527	-117.558968	6	8.5
W-MW-17	47.604917	-117.552602	15	25

Notes:

ft bgs = feet below ground surface

Proposed soil boring locations are presented below in Table 8. After verifying the absence of subsurface structures and/or utilities at each location, the soil borings will be advanced from ground surface until groundwater is encountered using sonic drilling methods. The IPI Work Plan provides additional details on the drilling and depths sampled.

Table 8: Soil Boring Locations

Boring Location Name	Latitude	Longitude
CFH-001	47.619593	-117.5408
CFH-002	47.619807	-117.540721
CFH-003	47.619977	-117.540951
CFH-004	47.620427	-117.54148
CFH-005	47.620514	-117.541736
CFH-006	47.620457	-117.541973
CFH-007	47.619715	-117.542428
FIT-001	47.616474	-117.533071
FIT-002	47.616409	-117.531837
FIT-003	47.617174	-117.533056
FIT-004	47.617198	-117.531768
FIT-005	47.616518	-117.532938
FIT-006	47.616513	-117.531967
FIT-007	47.617135	-117.53292
FIT-008	47.617145	-117.531955
FMB-001	47.632226	-117.526747
FMB-002	47.632534	-117.526301
FMB-003	47.632813	-117.525926
FMB-004	47.6331	-117.526537
HFH-001	47.626319	-117.532276
HFH-002	47.626372	-117.532014
HFH-003	47.626526	-117.53172
HFH-004	47.626662	-117.531252
HFH-005	47.626896	-117.531141
HFH-006	47.626755	-117.532621
JTA-001	47.610293	-117.541548
JTA-002	47.610967	-117.54122
JTA-003	47.611258	-117.542018
JTA-004	47.611639	-117.541396
JTA-005	47.6120	-117.541423
JTA-006	47.611922	-117.540806
JTA-007	47.612286	-117.540781
JTA-008	47.612477	-117.541124
JTA-009	47.612745	-117.540713
RT-001	47.611808	-117.540207
RT-002	47.612531	-117.540207
RT-003	47.612885	-117.540207
PDW-001	47.627659	-117.508458
PDW-002	47.627779	-117.507098
SRA-001	47.63246	-117.513865

Boring Location Name	Latitude	Longitude
SRA-002	47.6342	-117.515425
SRA-003	47.635197	-117.516701
SRA-004A	47.635816	-117.512017
SRA-004B	47.635792	-117.51198
SRA-005	47.63338	-117.509847
SRA-006	47.634738	-117.508331
SRA-007A	47.635494	-117.50816
SRA-007B	47.635482	-117.508054
SRA-008	47.636822	-117.506239
SRA-009	47.635167	-117.504791
SRA-010	47.635456	-117.501748
SRA-011	47.638644	-117.498351
LTA-001	47.628781	-117.560635
LTA-002	47.629597	-117.548586
LTA-003	47.635116	-117.546936
TRP-001	47.625864	-117.518565
TRP-002	47.625472	-117.518839

7.2.1 Sampling Locations and Frequency

A preliminary groundwater sampling event was conducted in March 2024; additional groundwater sampling events will be conducted in accordance with the Order. Fifty-two (52) accessible and usable wells were included in the preliminary sampling event (Figure 2, Table 8). The IPI will include collecting groundwater samples from each of the 52 accessible and usable monitoring wells, advancing 51 soil borings with sonic drilling methods, advancing six shallow soil borings with hand augers, and collecting 108 soil samples.

7.2.2 Field Parameters and Laboratory Analytes to be Measured

Table 9, below, indicates the environmental parameters to be measured in groundwater. Parameters in italics were analyzed in the preliminary groundwater monitoring event and will not be measured in the IPI.

Table 9: Groundwater Analytes and Parameters to be Measured and Analyzed

Parameter	Acronym	CASRN
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4
Perfluorooctanesulfonamide	FOSA	754-91-6
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)	13252-13-6
4,8-Dioxa-3H-perfluorononanoic acid	(ADONA)	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7
3-Perfluoropropyl propanoic acid	3:3 FTCA	356-02-5
2H,2H,3H,3H-Perfluorooctanoic acid	5:3 FTCA	914637-49-3
3-Perfluoroheptyl propanoic acid	7:3 FTCA	812-70-4
Calcium	Ca^{2+}	7440-70-2

Parameter	Acronym	CASRN
Magnesium	Mg^{2+}	7439-95-4
Potassium	K^{+}	7440-09-7
Sodium	Na^{+}	7440-23-5
Chloride	Cl^{-}	16887-00-6
Bromide	Br^{-}	24959-67-9
Nitrate	NO_3^{-}	14797-55-8
Sulfate	SO_4^{2-}	14808-79-8
Phosphate	*PO_4^{3-}*	*14265-44-2*
Carbonate Alkalinity	CO_3^{2-}	Not applicable
Biological Oxygen Demand	*BOD*	*Not applicable*
Dissolved Oxygen	DO	Not applicable
Oxidation-reduction potential	ORP	Not applicable
Turbidity	None	Not applicable
Specific Conductance	SC	Not applicable
Stable isotopes for water	$d^{18}O$ and dD	Not applicable

Table 10, below, indicates the environmental parameters to be measured in soil.

Table 10: Soil Analytes and Parameters to be Measured and Analyzed

Parameter	Acronym	CASRN
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
1H,1H, 2H, 2H-Perfluorohexane sulfonic acid	4:2 FTS	757124-72-4
1H,1H, 2H, 2H-Perfluorooctane sulfonic acid	6:2 FTS	27619-97-2
1H,1H, 2H, 2H-Perfluorodecane sulfonic acid	8:2 FTS	39108-34-4

Parameter	Acronym	CASRN
Perfluorooctanesulfonamide	FOSA	754-91-6
N-methyl perfluorooctanesulfonamide	NMeFOSA	31506-32-8
N-ethyl perfluorooctanesulfonamide	NEtFOSA	4151-50-2
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
N-methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)	13252-13-6
4,8-Dioxa-3H-perfluorononanoic acid	(ADONA)	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7
3-Perfluoropropyl propanoic acid	3:3 FTCA	356-02-5
2H,2H,3H,3H-Perfluorooctanoic acid	5:3 FTCA	914637-49-3
3-Perfluoroheptyl propanoic acid	7:3 FTCA	812-70-4
Total Organic Carbon	TOC	7440-44-0
Moisture Content	% moisture	Not Applicable
pH	pH	Not Applicable

Not applicable.

7.3 Assumptions of Study Design

This study design assumes that 52 existing monitoring wells at SIA will be accessible and usable.

7.4 Possible Challenges and Contingencies

Possible logistical problems and practical constraints are discussed in the following sections.

7.4.1 Logistical Problems

SIA is an active airport, and access to sampling wells may be restricted due to flight traffic and airport security regulations. Prior arrangements and agreements will be made with airport officials to select a date and time for sampling at restricted locations. Additionally, some wells are located on SIA-owned, externally leased land. Wells located at the Geiger Delivery Facility require tenant notification for access and wells on the Geiger Correctional Facility require special permission for access.

7.4.2 Practical Constraints

Water availability in wells may be subject to seasonal variability; some wells may be dry at the time of sampling during some seasons. Otherwise, there are no physical constraints known at this time at SIA.

7.4.3 Schedule Limitations

Sampling schedule for the IPI is set by the Order.

8.0 Field Procedures

8.1 Invasive Species Evaluation

Not applicable.

8.2 Measurement and Sampling Procedures

Standard operating procedures for sampling and analysis are as follows.

The SOPs to be referenced for sampling include:

- OP 3032: Collection of Environmental Samples for the Analysis of PFAS. Haley & Aldrich, 2024.
- OP 3012: Low-Flow Groundwater Sampling. Haley & Aldrich, 2021.

The SOPs to be referenced for analysis include:

- SOP No. WS-LC-0039, Rev. 1.3: Analysis of PFAS in Water, Solid, Biosolids, and Tissue (Method 1633). Eurofins Sacramento, 2022.
- SOP No. SP-MTL-003, Rev. 13.1: Determination of Total and Dissolved Trace Elements in Liquids, Solids and Wastes (Inductively Coupled Plasma) EPA 200.7, 6010C and 6010D. Eurofins Spokane, 2021.
- SP-T-WET-SOP48719, Rev. 1.1: Analysis of Anions by Ion Chromatography EPA Method 300.0. Eurofins Spokane, 2023.
- SP-T-WET-SOP48159, Rev. 2: Biological Oxygen Demand (EPA 405.1 and SM 5210B). Eurofins Spokane, 2022.
- SP-T-WET-SOP65776, Rev. 14: Determination of Alkalinity by Titration Standard Method 2320B. Eurofins Spokane, 2023.

8.2.1 PFAS Cross-Contamination Considerations

Due to low analytical reporting limits for PFAS and the potential for cross-contamination, field staff will be required to complete training on PFAS sampling techniques prior to performing the field work outlined in this Work Plan. This training includes up-to-date information on allowable clothing, personal protective equipment (PPE), personal care products, and drilling/sampling equipment to minimize or eliminate the potential for cross-contaminating field samples. In addition, field work will be performed in accordance with the Ecology PFAS Guidance. For materials that may be used in the sampling vicinity that do not directly contact samples (such as writing instruments, field notebooks, field clothing, PPE, personal care products, or food

packaging), a combination of two or three of the following options should be used to minimize cross-contamination:

1. Obtain information from the manufacturer to assure that the materials are PFAS-free.
2. Implement a QA/QC program to determine if materials could have introduced PFAS into the samples.
3. Limit the use of materials in the sampling area that cannot be documented as PFAS-free.

A summary of the acceptability of materials for use in the PFAS sampling environment is provided below, based on the general PFAS sampling guidance and cited in the Ecology PFAS Guidance.

Sampling equipment: Any sampling equipment containing known fluoropolymers should be avoided, including polytetrafluoroethylene (PTFE), polyvinylidene fluoride (PVDF), polychlorotrifluoroethylene (PCTFE), ethylene-tetrafluoroethylene (ETFE), and fluorinated ethylene propylene (FEP). Low-density polyethylene (LDPE), which does not itself contain PFAS but may contain PFAS cross-contamination from the manufacturing process, should also be avoided in materials that come in direct contact with the sample. LDPE bags (e.g., Ziploc®) that do not come in direct contact with the samples are acceptable. Preferred sampling materials which are known to not contain PFAS include high-density polyethylene (HDPE), polypropylene, silicone, stainless-steel, and acetate. Glass may also be used, provided that samples are not stored for long periods of time in glass containers, due to the possibility of PFAS adsorption to glass surfaces.

Field clothing and personal protective equipment (PPE): Field clothing and PPE advertised as having waterproof, water-repellant, or dirt- and/or stain-resistant characteristics or which has been chemically treated for insect resistance or ultraviolet protection should be avoided. Powderless nitrile gloves, polyvinyl chloride (PVC) or wax-coated fabrics, neoprene, and well-laundered synthetic or natural fibers are acceptable. PPE that may contain PFAS may not always be avoided without sacrificing health and safety of field staff. For example, if sample collection occurs during inclement weather, field staff may wear water-resistant rain gear, which may contain PFAS. In cases where PPE that may result in cross-contamination cannot be avoided, deviations from this Work Plan should be documented in field notes and discussed in the final report. Additional field blanks may be collected to control for cross-contamination introduced by field clothing or PPE.

Personal care products and food packaging: Personal care products and food packaging should not be handled in the sampling area nor handled while wearing PPE that will be present during sampling. Application of personal care products or handling of food or food packing should be performed in a staging area outside of the immediate sampling area with PPE removed. Field staff must wash hands thoroughly and don a new pair of powderless nitrile gloves after handling personal care products or food packaging and prior to collecting any samples.

Given the cross-contamination considerations, field staff will wash hands thoroughly prior to sample collection and will don powderless nitrile gloves prior to collecting samples, handling sample containers, or handling sampling equipment. Manufacturers of writing instruments and field notebooks will be contacted to determine if the materials are PFAS-free. If writing

instruments and field notebooks cannot be confirmed to be PFAS-free, these materials will only be handled in a staging area separate from the sampling location and will not be used in proximity to the sample collection area. If writing instruments cannot be confirmed to be PFAS-free, sample containers will be labeled in the staging area. Application of personal care products and handling of food packaging will occur in the staging area, as needed. If sample collection occurs during inclement weather, field staff may wear water-resistant rain gear or other PPE, as needed, which may contain PFAS. In such cases, the use of PPE that cannot be confirmed to be PFAS-free will be documented in field notes, extreme care will be taken to ensure PPE will not come in direct contact with samples, and additional field blanks may be collected to control for cross-contamination.

8.2.2 Groundwater Sampling Procedures

Low-flow groundwater sampling will be used. YSI Professional Plus Multi-Parameter Water Quality Meter (YSI Pro Plus) or similar will be used to measure time sensitive field parameters such as pH, temperature, DO, SC, turbidity, and ORP. Groundwater samples will be collected from 52 existing monitoring wells after the static water levels are collected using a water level meter. Measured field parameters will include temperature, pH, specific conductivity, turbidity, DO, and ORP. The groundwater samples will be also analyzed for the following constituents:

- PFAS using USEPA Method 1633
- Cations (calcium, magnesium, potassium, sodium) using EPA Method 200.7
- Anions (chloride, bromide, nitrate, sulfate) using EPA Method 300.0
- Alkalinity by titration (SM 2320 B)
- Stable isotopes (d^2H-H_20, d^{18}-H_2O) reported as percent relative to Vienna Standard Mean Ocean Water.

8.2.3 Soil Sampling Procedures

The investigation proposes collecting soil samples from 51 boring locations, as summarized in Table 4.2 of the IPI Work Plan, using sonic drilling methods. The proposed boring locations are shown in Figures 4.2 through 4.10 of the IPI Work Plan. The boreholes will be advanced in 5-foot increments until first encounter with groundwater or a basalt layer is reached, whichever comes first. An additional six samples for shallow soil from 0 to 6 inches will also be collected from two areas via hand auger.

Once the cores have been logged and the soil types catalogued, samples will be collected from specific depth intervals. Table 4.3 of the IPI Work Plan provides the target depth intervals for sampling. While specific depth intervals are targeted, a sample at the deepest point of the vadose zone (capillary fringe just above groundwater) will be collected at each of the locations bored. The analysis of the soil sampled follows an iterative process wherein samples from two shallow depths at 1 and 3 feet are analyzed at every location bored in the initial round of testing for the constituents listed in Table 10. Continued analysis of samples within the boring

will be dependent upon the PFAS results. If all PFAS are below detection and/or relevant soil criteria in both samples, no further analysis at that location will be conducted. If the PFAS results indicate detected concentrations above relevant soil criteria then a subsequent round of analysis will be conducted in for the next proximal depth interval. This process will occur iteratively until either PFAS results are reported below the relevant soil criteria within the boring, or the entire bore has been analyzed. Given current turnaround times for the analytical laboratory, this iterative process can be completed within the holding times for PFAS in soil (90 days from collection; EPA Method 1633). Should delays in analysis occur, remaining soil samples will be extracted to provide an additional 90 days of hold time (EPA Method 1633)

8.3 Containers, Preservation Methods, Holding Times

Containers, preservation requirements, and holding times are indicated in Table 11, below. The preliminary groundwater monitoring event analyzed the analytes shown in italics, below. These will not be measured in the IPI.

Table 11: Sample Containers, Preservation, and Holding Times

Parameter	Matrix	Minimum Quantity Required	Container	Preservative	Holding Time
PFAS	Groundwater	3x125 mL	Laboratory-provided HDPE with linerless HDPE caps	6°C during transportation 0-6°C or <-20°C until sample preparation	0-6°C – 28 days from collection ≤-20°C up to 90 days
PFAS	Soil	1x 8-ounce	Laboratory-provided HDPE with linerless HDPE caps	6°C during transportation 0-6°C or <-20°C until sample preparation	90 days from collection and 90 days from extraction
Total Organic Carbon	Soil	1x 4-ounce	Laboratory-provided HDPE with linerless HDPE caps	6°C during transportation	28 days
Moisture Content	Soil	1x 4-ounce	Laboratory-provided HDPE with linerless HDPE caps	None	None
Chloride	Groundwater	100 mL	Plastic or glass bottles	Cool to 4°C	28 days
Bromide	Groundwater	250 mL	Plastic or glass bottles	Cool to 4°C	28 days
Nitrate	Groundwater	250 mL	Plastic or glass bottles	Cool to 4°C	48 hours
Sulfate	Groundwater	300 mL	Plastic or glass bottles	Cool to 4°C	28 days
Phosphate	*Groundwater*	*100 mL*	*Plastic or glass bottles*	*Cool to 4°C*	*48 hours*
Calcium, magnesium, sodium, and potassium	Groundwater	250mL	Plastic	Acidified pH <2	Up to 6 months
Alkalinity	Groundwater	250 mL	Polyethylene or borosilicate glass bottle	Store at 4°C±2	14 days
BOD	*Groundwater*	*500 mL*	*500 mL or 1L polyethylene bottles*	*None*	*48 hours*
Stable Isotopes	Groundwater	60 mL	Plastic (HDPE) or glass bottles	None	Up to 1 year

8.4 Equipment Decontamination

Dedicated and disposable equipment will be used for sample collection where possible, negating the need for equipment decontamination. For any small non-dedicated, non-disposable equipment, potable water will be used to rinse the equipment, followed by triple rinsing with laboratory prepared PFAS-free deionized water. Decontamination procedure will adhere to the protocols as detailed in Attachment A.

Large equipment (drilling tooling) will be steam-pressure washed with an Ashoka brand, 4,500 pounds per square inch, 4.5 gallons per minute steam-pressure washer (or similar). Rinse

water will be collected in a pan and containerized as investigation-derived waste. Tooling will also be washed with Alconox and steam-pressure rinsed. Decontamination water will be from a potable source. The potable water source used for both non-dedicated small and large equipment will be sampled for the same analytes as groundwater samples.

8.5 Sample ID

Field samples will contain a label. The sample ID will use the site areas, the monitoring well identification number, sample type (N for primary samples, FD for field duplicate samples), and date in MMDDYYYY format. The labeling system for groundwater is as follows:

- A primary groundwater sample collected from MW-7, located in the area of Park Drive on 6 March 2024 would be labeled "PD-MW1-N-03062024."
- A groundwater field duplicate sample collected from MW-7 on 6 March 2024 would be labeled "PD-MW1-FD-03062024."

For soil, the sample ID will use the site area abbreviations, indicate the boring number as shown in Table 4.2 in the IPI Work Plan, label the matrix is soil (S), and indicate the depth then the collection date. Examples are as follows:

- A primary soil sample collected in the Joint Training Area at a depth of 3 feet, on 5September 2024 would be labeled "JTA-005-N-S003-09052024."
- A field duplicate soil sample collected from the same area would be labeled "JTA-005-FD-S003-09052024."

Quality control samples will be labeled using acronyms for the quality control sample type (where FB is field blank, and EB is equipment blank) followed by the date in MMDDYYYY format. Two examples are as follows:

- A field blank sample collected on 6 March 2024 would be labeled "FB-03062024."
- An equipment blank sample collected on 6 March 2024 would be labeled "EB-03062024."

8.6 Chain of Custody

Chain of custody will be maintained for all the groundwater samples throughout this study. Each sample will be identified and record for personnel handling the sample will be recorded. The field personnel with custody will have full control of the samples at all times.

8.7 Field Log Requirements

Field log notebooks and/or field forms will be used for logging the relevant field information such as:

- Name and location of project
- Field personnel

- Sequence of events
- Any changes or deviations from the QAPP, SAP, or SOPs
- Environmental conditions
- Date, time, location, ID, and description of each sample
- Field instrument calibration procedures
- Field measurement results
- Inspections of monitoring well conditions
- Identity of QC samples collected
- Unusual circumstances that might affect interpretation of results, including GPS location of relevant physical conditions as appropriate.

Examples of associated field forms are provided in Attachment B.

9.0 Laboratory Procedures

9.1 Lab Procedures Table

Table 12, below, presents the laboratory measurements that will occur in support of this project. Analytes in italics were analyzed for in the preliminary groundwater monitoring event and will not be measured in the IPI. Reporting limits and method detection limits for PFAS analytes were provided by Eurofins Sacramento; reporting limits and method detection limits for other methods were provided by Eurofins Spokane.

Table 12: Measurement Methods (Laboratory)

Analyte	Sample Matrix	Samples[1]	Reporting Limit	Method Detection Limit	Sample Prep Method	Analytical (Instrumental) Method
PFBA	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
PFPeA	Groundwater	52	4.00 ng/L	1.00 ng/L	SPE	EPA 1633
PFHxA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFHpA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFOA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFNA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFDA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFUnA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFDoA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFTrDA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFTeA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFBS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFPeS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFHxS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633

Analyte	Sample Matrix	Samples[1]	Reporting Limit	Method Detection Limit	Sample Prep Method	Analytical (Instrumental) Method
PFHpS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFOS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFNS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFDS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
PFDoS	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
4:2 FTS	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
6:2 FTS	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
8:2 FTS	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
FOSA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
NMeFOSA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
NEtFOSA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
NMeFOSAA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
NEtFOSAA	Groundwater	52	2.00 ng/L	0.500 ng/L	SPE	EPA 1633
NMeFOSE	Groundwater	52	20.0 ng/L	5.00 ng/L	SPE	EPA 1633
NEtFOSE	Groundwater	52	20.0 ng/L	5.00 ng/L	SPE	EPA 1633
HFPO-DA (GenX)	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
(ADONA)	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
PFMPA	Groundwater	52	4.00 ng/L	1.00 ng/L	SPE	EPA 1633
PFMBA	Groundwater	52	4.00 ng/L	1.00 ng/L	SPE	EPA 1633
NFDHA	Groundwater	52	4.00 ng/L	1.00 ng/L	SPE	EPA 1633
9Cl-PF3ONS	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
11Cl-PF3OUdS	Groundwater	52	8.00 ng/L	2.00 ng/L	SPE	EPA 1633
PFEESA	Groundwater	52	4.00 ng/L	1.00 ng/L	SPE	EPA 1633
3:3 FTCA	Groundwater	52	10.0 ng/L	2.50 ng/L	SPE	EPA 1633
5:3 FTCA	Groundwater	52	50.0 ng/L	12.5 ng/L	SPE	EPA 1633
7:3 FTCA	Groundwater	52	50.0 ng/L	12.5 ng/L	SPE	EPA 1633
Ca^{2+}	Groundwater	52	2.0 mg/L	0.20 mg/L	Acid Digestion	EPA 200.7
Mg^{2+}	Groundwater	52	1.0 mg/L	0.13 mg/L	Acid Digestion	EPA 200.7
K^{+}	Groundwater	52	0.50 mg/L	0.29 mg/L	Acid Digestion	EPA 200.7
Na^{+}	Groundwater	52	0.50 mg/L	0.20 mg/L	Acid Digestion	EPA 200.7
Br^{-}	Groundwater	52	1.0 mg/L	0.120 mg/L	None	EPA 300.0
Cl^{-}	Groundwater	52	0.8 mg/L	0.42 mg/L	None	EPA 300.0
SO_4^{2-}	Groundwater	52	0.5 mg/L	0.13 mg/L	None	EPA 300.0
CO_3^{2-}	Groundwater	52	20 mg/L	5.0 mg/L	Titration	SM 2320B
NO_3^{-}	Groundwater	--	0.2 mg/L		None	EPA 300.0
Stable Isotopes for water	Groundwater	52	% relative to VSMOW	--	None	NA
PFBA	Soil	108	0.400 µg/kg	0.100 µg/kg	SPE	EPA 1633
PFPeA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFHxA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFHpA	Soil	108	0.200 µg/kg	0.100 µg/kg	SPE	EPA 1633

Analyte	Sample Matrix	Samples[1]	Reporting Limit	Method Detection Limit	Sample Prep Method	Analytical (Instrumental) Method
PFOA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFNA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFDA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFUnA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFDoA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFTrDA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFTeA	Soil	108	0.200 µg/kg	0.0580 µg/kg	SPE	EPA 1633
PFBS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFPeS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFHxS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFHpS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFOS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFNS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFDS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFDoS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
4:2 FTS	Soil	108	0.400 µg/kg	0.100 µg/kg	SPE	EPA 1633
6:2 FTS	Soil	108	0.400 µg/kg	0.100 µg/kg	SPE	EPA 1633
8:2 FTS	Soil	108	0.400 µg/kg	0.100 µg/kg	SPE	EPA 1633
FOSA	Soil	108	0.200 µg/kg	0.0630 µg/kg	SPE	EPA 1633
NMeFOSA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
NEtFOSA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
NMeFOSAA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
NEtFOSAA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
NMeFOSE	Soil	108	1.00 µg/kg	0.250 µg/kg	SPE	EPA 1633
NEtFOSE	Soil	108	1.00 µg/kg	0.250 µg/kg	SPE	EPA 1633
HFPO-DA (GenX)	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
(ADONA)	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFMPA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
PFMBA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
NFDHA	Soil	108	0.200 µg/kg	0.0620 µg/kg	SPE	EPA 1633
9Cl-PF3ONS	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
11Cl-PF3OUdS	Soil	108	0.200 µg/kg	0.0750 µg/kg	SPE	EPA 1633
PFEESA	Soil	108	0.200 µg/kg	0.0500 µg/kg	SPE	EPA 1633
3:3 FTCA	Soil	108	0.400 µg/kg	0.100 µg/kg	SPE	EPA 1633
5:3 FTCA	Soil	108	1.00 µg/kg	0.250 µg/kg	SPE	EPA 1633
7:3 FTCA	Soil	108	1.00 µg/kg	0.250 µg/kg	SPE	EPA 1633
TOC	Soil	108	2000 mg/Kg	96.7 mg/Kg	None	EPA 9060A
% moisture	Soil	108	0.01 %	0.01 %	None	Moisture
pH	Soil	108				SW-846 9045D

Analyte	Sample Matrix	Samples[1]	Reporting Limit	Method Detection Limit	Sample Prep Method	Analytical (Instrumental) Method
PO_4^{3-}	*Groundwater*	*--*	*0.12 mg/L*		*Persulfate Digestion; Colorimetry*	*SM 4500P B.5 & E*
BOD	*Groundwater*	*--*	*2.4 mg/L*		*None*	*EPA 405.1*

Notes:

SPE = Solid phase extraction

VSMOW = Vienna Standard Mean Ocean Water

mg/L = milligrams per liter (parts per million)

[1]For groundwater the number of samples will include one per location plus the field duplicates. For soil, the number of samples analyzed is dependent on the depth of the boring and the results of the initial round of analyses for the shallow depths at 1 and 3 ft (see Section 4 of the IPI Work Plan). Field duplicates will be collected for PFAS at 10 percent of the locations sampled.

9.2 Sample Preparation Method(s)

Parameters will be analyzed in accordance with the methods listed above in Table 12 and the SOPs included in Attachment A.

A summary of sample preparation methods is included below:

- PFAS: Water samples are extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an ammonium hydroxide/methanol solution. Soil samples are extracted with an ammonium hydroxide/methanol solution using agitation for one hour; extract is then cleaned using an SPE cartridge, and PFAS are eluted from the cartridge with an ammonium hydroxide/methanol solution.
- Anions: Small volume of water sample is directly injected into an ion chromatography system. The anions are separated by an analytical column containing mobile phase and the ions are measured by conductivity detector.
- Cations: An aliquot of acidified water sample is directly injected into ICP-OES system for the measurement of cations.
- *BOD: The samples are incubated for five days at 20 degrees Centigrade (^{o}C) in dark. The difference in dissolved oxygen concentration before and after incubation yields a measure of BOD.*
- DO, pH, temperature, turbidity, and ORP are measured in the field using YSI Pro Plus.

9.3 Special Method Requirements

Not applicable.

9.4 Laboratories Accredited for Methods

Samples will be submitted to Eurofins Spokane who will subcontract analysis of PFAS to Eurofins Sacramento. Both laboratories are accredited by Ecology for analysis of samples via the specified methods.

10.0 Quality Control Procedures

The QC procedures used in this study will include collection of field quality control samples, analysis of laboratory quality control samples, use of analytical surrogate compounds, adherence to the Haley & Aldrich OP for collection of environmental samples for the analysis of PFAS (OP 3032; see Attachment A), and PFAS data validation by Pyron Environmental.

10.1 Table of Field and Laboratory Quality Control

Table 13, below, includes the types and frequencies of field and laboratory QC samples.

Table 13: Quality Control Samples, Types, and Frequency

Parameter	Field Blanks	Equipment Blanks	Field Duplicates	Laboratory Method Blanks	Laboratory Control Samples
PFAS	1 per day	1 per day	1 per 10 samples or 1 per sampling day, whichever is greater	1 per 20 samples	1 per 20 samples
All other analytes	*None*	*None*	*1 per 10 samples*	*1 per 20 samples*	*1 per 20 samples*

Each type of QC sample listed above will have MQOs associated with it (Section 6.2) that will be used to evaluate the quality and usability of the results.

10.2 Corrective Action Processes

Corrective action procedures for laboratory analysis are detailed in the SOPs included in Attachment A and in the Tables 14 and 15, below.

Table 14: Quality Control and Corrective Actions for PFAS Analysis in Water

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
EIS or (Isotope Dilution Analyte (IDA), added prior to extraction)	Every field sample, QC sample and standard	EIS/IDA within Table 6 of the reference method. Prelim limits of 20 to 150% if not within Method 1633.	If EIS out, check for errors and correct. Re-analyze sample if needed. If EIS out high: ND samples, report and narrate; if detections, but EIS <200% (FTS <350%) report and narrate; if detections and EIS >200% (FTS >350%), dilute 10X, re-analyze, report and narrate. If EIS low, but >5% and S/N> 10:1, narrate and report. If EIS <5%, then contact client to re-extract at smaller aliquot (billable).	Lab Manager / Analyst	Accuracy / Bias	Project or laboratory statistically derived control limits
Non-extracted Internal Standards (NIS) added following extraction and prior to analysis.	Every sample, spiked sample, standard, and method blank	NIS areas must be 50 to 200% of the mean area of the NIS in the most recent initial calibration in undiluted sample extracts and sample	If fails high, check for errors and report. If fails low, re-analyze fresh aliquot of sample. If in control, report. If the failure confirms report the initial analysis and narrate.	Lab Manager / Analyst	Accuracy/ Bias	Results within acceptance limits.

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
		extracts that require NIS to be added.				
Method Blank	One per preparation batch	No target analytes > RL or >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank and samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Lab Manager / Analyst	Accuracy/ Bias Contamina-tion	No target analytes > RL
Low-level LCS (LLCS)	One LLCS per preparation batch	Recoveries within Table 5 of the reference method. Prelim limits of 40 to 150% until in-house limits are generated if analyte not listed in Method 1633.	Reanalyze LLCS once. If acceptable, report. Evaluate samples for detections, and LLCS for high bias. If LLCS has high bias, and samples non-detect, report with case narrative comment. If LLCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprepare and reanalyze the LLCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Lab Manager / Analyst	Precisions and Accuracy/ Bias	Project or laboratory statistically derived control limits
LCS	One LCS per preparation batch	Recoveries within Table 5 of the reference method. Prelim limits of 40 to 150% until in-house limits are generated if analyte not listed in Method 1633.	Reanalyze LCS once. If acceptable, report. Evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment. If LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprepare and reanalyze the LCS and all samples in the associated prep batch	Lab Manager / Analyst	Precisions and Accuracy/ Bias	Project or laboratory statistically derived control limits

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
			for failed analytes, if sufficient sample material is available.			
Ion Ratio	Each detected analyte (except PFBA, PFPeA, NMeFOSE, NEtFOSE, PFMPA and PFMBA)	Acceptance window of 50 to 150% of the ratio in the mid-point calibration standard or daily Continuing Calibration Verification (CCV) standard.	Check for error, if none found, report as outlined below. 1) If outside limits and value < RL report as ND at RL. 2) If outside limits, but within 2X rule flag, report and narrate. 3) If ratio outside 2X rule, then report as ND at elevated RL, apply G flag and narrate. 4) If ratio out due to branched isomer contribution, report as positive with narration. 5) If outside limits (and RT window) due to matrix report as ND at elevated RL, apply G flag and narrate.	Lab Manager / Analyst	Accuracy/ Contamination	50-150% of daily CCV or ICAL mid-point for compounds with sufficient secondary transitions.

Table 15: Quality Control and Corrective Actions for PFAS Analysis in Soil

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
EIS or IDA, added prior to extraction)	Every field sample, QC sample and standard	EIS/IDA within Table 8 of the reference method. Prelim limits of 20 to 150% if not within Method 1633.	If EIS out, check for errors and correct. Re-analyze sample if needed. If EIS out high: ND samples, report and narrate; if detections, but EIS <200% (FTS <350%) report and narrate; if detections and EIS >200% (FTS >350%), dilute 10X, re-analyze, report and narrate. If EIS low, but > 5% and S/N> 10:1, narrate and report. If EIS <5%, then contact client to re-extract at smaller aliquot (billable).	Lab Manager / Analyst	Accuracy/ Bias	Project or laboratory statistically derived control limits

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
NIS added following extraction and prior to analysis.	Every sample, spiked sample, standard, and method blank	NIS areas must be 50 to 200% of the mean area of the NIS in the most recent initial calibration in undiluted sample extracts and sample extracts that require NIS to be added.	If fails high, check for errors and report. If fails low, re-analyze fresh aliquot of sample. If in control, report. If the failure confirms report the initial analysis and narrate.	Lab Manager / Analyst	Accuracy/ Bias	Results within acceptance limits.
Method Blank	One per preparation batch	No target analytes > RL or >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Lab Manager / Analyst	Accuracy/ Bias Contamin-ation	No target analytes > RL
Low-level LCS (LLCS)	One LLCS per preparation batch	Recoveries within Table 7 of the reference method. Prelim limits of 40 to 150% until in-house limits are generated if analyte not listed in Method 1633.	Reanalyze LLCS once. If acceptable, report. Evaluate samples for detections, and LLCS for high bias. If LLCS has high bias, and samples non-detect, report with case narrative comment. If LLCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprepare and reanalyze the LLCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Lab Manager / Analyst	Precisions and Accuracy/ Bias	Project or laboratory statistically derived control limits
LCS	One LCS per preparation batch	Recoveries within Table 7 of the reference method. Prelim limits of 40 to 150% until in-house limits are generated if	Reanalyze LCS once. If acceptable, report. Evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment. If	Lab Manager / Analyst	Precisions and Accuracy/ Bias	Project or laboratory statistically derived control limits

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Person(s) responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
		analyte not listed in Method 1633.	LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprepare and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.			
Ion Ratio	Each detected analyte (except PFBA, PFPeA, NMeFOSE, NEtFOSE, PFMPA & PFMBA)	Acceptance window of 50 to 150% of the ratio in the mid-point calibration standard or daily CCV standard.	Check for error, if none found report as outlined below. 1) If outside limits and value <RL, report as ND at RL. 2) If outside limits, but within 2X rule flag, report and narrate. 3) If ratio outside 2X rule, then report as ND at elevated RL, apply G flag and narrate. 4) If ratio out due to branched isomer contribution, report as positive with narration. 5) If outside limits (and RT window) due to matrix, report as ND at elevated RL, apply G flag and narrate.	Lab Manager / Analyst	Accuracy/ Contamin-ation	50-150% of daily CCV or ICAL mid-point for compounds with sufficient secondary transitions.

11.0 Data Management Procedures

11.1 Data Recording and Reporting Requirements

Analytical data will be transmitted electronically as EDDs in the format specified by GSI Environmental, minimizing any potential for transcription errors as data is loaded into the project database. EDDs are to be transmitted to the QA Manager at Haley & Aldrich and the Project Lead at GSI Environmental.

11.2 Laboratory Data Package Requirements

The analytical laboratory will provide results in standard laboratory reports including project narratives, detection summaries, sample results, and relevant quality control data. Any deviations from analytical SOPs will be documented in the project narrative.

11.3 Electronic Transfer Requirements

Along with laboratory reports, laboratories will provide data electronically as EDDs.

11.4 Data Upload Procedures

Not applicable.

11.5 Model Information Management

Not applicable.

12.0 Audits and Reports

12.1 Audits

Because this study consists of straightforward soil and groundwater sampling events for PFAS, audits are not warranted.

12.2 Responsible Personnel

Not applicable.

12.3 Frequency and Distribution of Reports

Brief field summary reports to document the field procedures and transmit analytical and field data will be submitted to GSI Environmental electronically within 30 days of receipt of the validated analytical data for each monitoring event.

12.4 Responsibility for Reports

Authors of the report may include field personnel or the field manager, and/or QA manager identified in Section 5.

13.0 Data Verification

Data verification will be performed using the procedures described in the following sections.

13.1 Field Data Verification, Requirements, and Responsibilities

The field manager will review recorded field data at the end of each day to verify that data are recorded completely and legibly.

13.2 Laboratory Data Verification

The QA manager will review COC forms at the end of each day to verify that the correct number of samples QC samples were collected and that the forms are complete and accurate.

13.3 Validation Requirements, if necessary

Data validation for PFAS analytical data will be performed by Pyron Environmental. Because the EPA National Function Guidelines do not apply to PFAS, data validation will be performed using the U.S. Department of Defense (DOD) Data Validation Guidelines Module 6: Data Validation Procedure for PFAS Analysis by Quality Systems Manual Table B-24 (DOD, 2019). Validation qualifiers will be applied based on the MQOs described in Section 6. Level 2 data validation will be performed on 100 percent of PFAS data and level 4 data validation will be performed on 10 percent of PFAS data.

14.0 Data Quality (Usability) Assessment

14.1 Process for Determining Project Objectives Were Met

The data validation process will be used to evaluate the usability of the PFAS data. Pyron Environmental will evaluate the data, apply validation qualifiers to data that are estimated or rejected based on MQOs, and will provide Haley & Aldrich with one or more data usability summary reports to describe where and why validation qualifiers were applied. The Haley & Aldrich QA Manager will review data usability summary reports and advise GSI Environmental on overall data usability.

14.2 Treatment of Non-detects

Data will be reported to the MDLs. Detections between the MDL and RL will be flagged “J” as estimated. Non-detects (NDs) will be reported in summary tables as “ND <” followed by the analyte’s MDL.

14.3 Data Analysis and Presentation Methods

Data will be compiled by GSI Environmental, and summary tables will be generated. No statistical treatment is anticipated.

14.4 Sampling Design Evaluation

The objective of this study is to conduct the IPI. The study design includes collecting samples from soil cores and existing groundwater wells. Therefore, the study design is adequate to meet the objective.

14.5 Documentation of Assessment

The data usability assessment will be documented by Pyron Environmental in one or more data usability summary reports. Validation qualifiers will be electronically transmitted in EDDs.

15.0 References

Environmental Protection Agency (EPA), 2017. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. Revision Number 4. EQASOP-GW4. September 19.

Environmental Protection Agency (EPA), 2024. Method 1633, Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. EPA 821-R-24-001, January 2024.

GSI Environmental, Inc., 2024a. Site Assessment Report, Spokane International Airport, Spokane, WA.

GSI Environmental, Inc., 2024b. Draft Initial PFAS Investigation Work Plan, Spokane International Airport, Spokane WA.

GHI Environmental, Inc., 2024c. Sampling and Analysis Plan, Spokane International Airport, Spokane WA.

GSI Water Solutions Inc., INTERA Inc., GeoEngineers Inc., and Carlstad Consulting, 2015. Hydrogeologic Framework and Conceptual Groundwater Flow Model, Review of Groundwater Conditions in the West Plains Area, Spokane County.

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Spokane Airport, 2024. http://spokanesirports.net.

United States Department of Defense (DOD), 2019. General Data Validation Guidelines Revision 1, Environmental Data Quality Workgroup.

Washington State Department of Ecology, Olympia, WA. http://app.leg.wa.gov/WAC/default.aspx?cite=173.

Washington State Department of Ecology, 2023. Guidance for Investigating and Remediating PFAS Contamination in Washington State. Olympia, WA: Washington State Department of Ecology (Publication No. 22-09-058). https://apps.ecology.wa.gov/publications/documents/2209058.pdf.

16.0 Attachments

Attachment A. Standard Operating Procedures (SOPs)

eurofins	Always check on-line for validity. **Analysis of Anions by Ion Chromatography EPA Method 300.0**	Level: **Standard Operating Procedure**
Document number: **SP-T-WET-SOP48719**		
Old Reference: **SP-WET-004**		
Version: **1.1**		Organisation level: **4-Business Unit**
Approved by: **KAB4** Effective Date: **24-MAR-2023**	Document users: **General Chemistry, Semivolatiles**	Responsible: **General Chemistry**

1) Revision Log:

Revision: 1	**Effective Date:** April 15, 2022	
Section	**Justification**	**Changes**
throughout	Required	Updated SOP references to current versions.
Confidential Statement and Section 9.3	Update	Updated for Owner change
Section 15.5	Update	Updated to reference the review checklist in TALS
Section 19	Deletion	Removed manual checklist
Section 12.1 and 15	Update	Updated equipment, gas used, and columns.
Revision: 2	**Effective Date:** This version	
Section	**Justification**	**Changes**

2) References:

2.1 EPA Method 300.0, "Determination of Inorganic Anions by Ion Chromatography", Revision 2.1, August 1993.

3) Cross References:

Document	Document Title
SP-Q-QAP-R07	QA Manual
NDSC-US EHS-QP46060	NDSC Environmental Health and Safety Manual
SP-QAG-026	Basic Employee Training
SP-S-HS-SOP45376	Sample Disposal and Chemical Waste
SP-Q-QS-SOP47375	Data Review and Reporting of Analytical Results
SP-Q-QS-SOP43978	Glassware Washing - Organic and Inorganic Sample Preparation

4) Scope:

This standard operating procedure has been established to provide techniques and procedures for the analysis of anions in a water matrix. The applicable analytes are found below with the current reporting limits which will vary depending on sample volume, dilutions and MDL studies.

Analyte	Reporting Limits
Fluoride	0.5 mg/L
Chloride	0.8 mg/L
Nitrate	0.2 mg/L
Nitrite	0.2 mg/L
Sulfate	0.5 mg/L

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in the Quality Assurance Manual.

5) Basic Principles:

An aliquot of sample is introduced into a column. Anions of interest bind to the column.

As eluent rinses through the column, the anions (if present) elute according to their affinity for the column and pass through a conductivity detector where they are measured. Reduction of the conductivity data is performed by the instrumental software and validated by both the analyst and a peer reviewer.

6) Reference Modifications:

NA

7) Definitions:

7.1 Ion Chromatography (IC): A form of liquid chromatography in which ionic constituents are separated by ion exchange followed by a suitable detection means.

7.2 Eluent: The ionic mobile phase used to transport the sample through the chromatographic system.

7.3 IC Column: An ion exchange column used to bind the ions of interest according to their retention characteristics prior to their detection.

7.4 Guard Column: A column used before the IC column to protect it from contaminants, such as particulate matter or irreversibly retained materials.

7.5 Suppressor Device: A device that is placed between the column and the detector. Its purpose is to inhibit detector response to the ionic constituents in the eluent, so as to lower the detector background. At the same time, it will enhance detector response to the ions of interest.

7.6 Resolution: The ability of an analytical column to separate constituents under specific test conditions.

7.7 Batch: A group of 20 or less samples prepared and/or processed together within the same shift using the same reagents. Each batch must contain a minimum QC of one method blank, one laboratory control sample, one duplicate, one matrix spike, and one matrix spike duplicate.

7.8 Method Blank (MB): An analytical control consisting of all reagents and surrogate standard which is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background contamination. When fluoride is an analyte of concern, concentrated eluent may be added to the method blank. The water ICB may also be used as a method blank.

7.9 Laboratory Control Spike (LCS/LCSD): A blank matrix that is spiked with a known amount of analytes. The recoveries of these analytes are measured against the true values and the percent difference is calculated. The laboratory control standard measures the accuracy of the analytical system. When fluoride is an analyte of concern, concentrated eluent may be added to the LCS. Analytes are spiked at levels near the midpoint of the calibration range. A CCV maybe used as an LCS.

Method exception: The second source is not used to prepare the working standard used to spike the LCS and MS/MSD samples.

7.10 Matrix Spike/Matrix Spike Duplicate (MS/MSD): Two aliquots of sample are spiked prior to sample extraction or digestion and analysis with the same known quantities of specific compounds are subjected to the analytical procedure. The spike solution is the same source as the calibration standards. Percent recoveries are calculated for each compound and the relative percentage difference between the MS and MSD is used to evaluate analytical precision. When fluoride is an analyte of concern, concentrated eluent may be added to the MS. The spike levels are near the midpoint of the calibration range.

7.11 Sample Duplicate (DUP): Split samples taken either from the same sampling container or from another client-submitted container of the same sample are analyzed separately with identical procedures. The analysis of the laboratory duplicates gives a measure of the precision associated with laboratory procedures.

7.12 Initial Calibration Verification (ICV): Standards run after the calibration, to verify the accuracy of the initial calibration curve. These standards are made from a secondary source different than that used to make the calibration standard.

7.13 Continuing Calibration Verification (CCV): A standard run at the beginning of each sequence once every 10 samples, and at the end of every sequence to ensure the continuing validity of the initial calibration curve. This standard is made from the primary source used to produce the initial calibration standards.

8) Interferences:

8.1 In order to eliminate contaminates from glassware, all glassware must be cleaned in accordance with *SP-Q-QS-SOP43978* prior to being utilized for sample preparation.

8.2 Interferences may be caused by substances with retention times that are similar to and overlap those of the anion of interest. Large amounts of an anion may interfere with the peak resolution of an adjacent anion. Sample dilution and/or spiking may be employed to solve most interference problems.

8.3 The water dip or negative peak that elutes near, and can interfere with, the fluoride peak can usually be eliminated by the addition of 50:1 concentrated eluent to a 5 mL vial containing a sample.

9) Safety Precautions, Pollution Prevention and Waste Handling:

Employees must abide by the policies and procedures in the NDSC Safety Manual, Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

9.1 Specific Safety Concerns or Requirements

Note: Exercise caution when using syringes with attached filter assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

9.2 Primary Materials Used

None.

9.3 Pollution Control

It is Eurofins Spokane's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

9.4 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to *SP-S-HS-SOP45376*. The following waste streams are produced when this method is carried out:

- Aqueous waste generated by the analysis: discharged down the drain.
- Materials such as IC syringes, filters, caps and vials utilized for sample preparation: disposed of in the trash.

10) Personnel Training and Qualifications:

See SP-QAG-026 for general training requirements.

11) Sample Collection, Preservation and Handling:

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time
Waters	Glass or Plastic	250 mL	Cool 4 + 2oC	48 Hours for Nitrate/Nitrite, 28 Days for others

12) Apparatus and Equipment:

12.1 Instrumentation

- Dionex Integrion HPIC IC System or equivalent
- Dionex Auto sampler, AS40 or equivalent
- Sample injector with 25 µL loop or equivalent
- Guard column, Dionex part # AG22-Fast-4um or equivalent
- Ion Exchange Column, Dionex part # AS22-Fast-4um or equivalent
- Anion Suppression Component, Dionex Model # AERS 500 Carbonate – 4mm or equivalent
- Conductivity Detector, Dionex Model # DS4-1 or equivalent
- Dionex Chromeleon Software

12.2 Supplies

- Dionex sample vials with 0.45 µm filter caps or equivalent
- 10mL and 50mL graduated cylinders
- Fisherbrand 25mm syringe filters 0.45um

13) Reagents and Standards:

13.1 ASTM Type I reagent water, anion free

13.2 AS22 Eluent Concentrate Product # 063965

13.3 Eluent

Eluent concentrate is purchased prepared from Dionex. 10 mLs of *AS22* Eluent Concentrate is added to a 1000 ml volumetric flask and filled with ASTM Type I reagent water and inverted a minimum of 3 times. The freshly prepared Eluent is degassed by purging with Helium for 15 minutes and stored under He pressure or in the sealed volumetric flask.

13.4 IC Calibration Standards (3-point minimum linearity)

The standards are prepared from stock (purchased & certified) standards. Nitrite must be purchased separately. The CCV's and ICV's must be prepared daily for Nitrite and weekly for Fl, Cl, NO3 and SO4. The standards contain NO2, NO3 and Fl at 2000ppm and Chloride and Sulfate at 5000ppm. Curve is prepared with a minimum of 3 standards. A suggested curve is as follows: 0.05/.125ppm, 0.2/.5ppm, 1.0/2.5ppm, 5/12.5ppm, 10/25ppm and 20/50ppm (Fl, NO2, NO3/Cl, SO4 Respectively). A 100ppm working standard can be made by diluting 10mls of parent standards into a 100ml volumetric flask of DI water. See chart below for the calibration curve.

Final Conc. of Calibration Standards **Nitrate, Nitrite, Fluoride/Chloride, Sulfate**	**Prep Instructions**
.05/.125 ppm	2000x (125ul of 100ppm STD/250ml volumetric with DI water)
.2/.5 ppm	500x (200ul of 100ppm STD/100ml volumetric with DI water)
1.0/.5 ppm	100x (100ul of 100ppm STD/10ml volumetric with DI water)
5/12.5 ppm	20x (500ul of 100ppm STD/10ml volumetric with DI water)
10/25 ppm	10x (1ml of 100ppm STD/10ml volumetric with DI water)
20/50 ppm	5x (2ml of 100ppm STD/10ml volumetric with DI water)

13.4 Initial / Continuing Calibration Verification Standards (ICV/CCV)

The CCV Standard is prepared from the same source standards as the Calibration Standards in Section 13.4. The ICV is prepared from second source (purchased & certified) standards at the same concentration as the CCV. CCV's and ICV's must be prepared daily for Nitrite and weekly for Fl, Cl, NO3 and SO4. A 100ppm working standard can be made by diluting 10mls of parent standards into a 100ml volumetric flask of DI water.

Concentration **Nitrate, Nitrite, Fluoride/Chloride, Sulfate**	**Prep Instructions**
5/12.5 ppm CCV	20x (500ul of 100ppm STD/10ml volumetric with DI water)
5/12.5 ppm ICV	20x (500ul of 100ppm STD/10ml volumetric with DI water)

14) Calibration:

Before any instrument is used as a measurement device, the instrument response to known reference materials must be determined. The manner in which various instruments are calibrated depends on the particular type of instrument and its intended use. All sample measurements must be made within the calibration range of the instrument. Preparation of all reference materials used for calibration must be documented.

14.1 The instrument is calibrated for the analytes of interest by fitting the responses of at least three calibration points to a linear model. The calibration standards should be prepared at

0.05/.125ppm, 0.2/.5ppm, 1.0/2.5ppm, 5/12.5ppm, 10/25ppm and 20/50ppm (Fl, NO2, NO3/Cl, SO4 Respectively).

14.1 Process a rinse blank prior to calibration. Evaluate the baseline of the blank.

14.1 Analyze each standard, beginning with the lowest, according to the operating conditions specified in Section 15.1.

14.1 Use the instrument data system to set up and calculate the calibration curves. Acceptance criteria for the initial calibration are summarized above.

14.1 If the calibration fails to meet the above criteria, the reason for the failure shall be investigated and measures taken to correct, minimize, or eliminate the problem. If recalibration does not result in meeting the acceptance criteria, consult your supervisor.

14.1 The calibration is verified by a second-source initial calibration verification (ICV) directly after calibration and by both a CCV and a CCB run every ten analytical samples and at the end of the run. Sample results must be bracketed by passing CCBs and CCVs, defined by the criteria stated below to be valid. Samples bracketed by failing CCBs and CCVs must be re-analyzed.

14.1 Samples with anion concentrations exceeding the highest calibration standard are diluted to within the curve (preferably to the mid point of the curve or higher) and reanalyzed.

15) Procedure:

15.1 Instrument Startup

15.1.1 If necessary, fill up the eluent containers with appropriate reagent.

15.1.2 Make sure the valve on the Nitrogen tank is open.

15.1.3 Turn the instrument on.

15.1.4 Push the ON buttons on the instrument Tab in the software to turn on the Eluent pressure, pump, and SRS.

15.1.5 Bleed the pump using the bleed valve inside the front of the instrument. The pressure should stabilize near 1800 psi. If it doesn't or if it exceeds 2500 psi, notify your supervisor.

15.1.6 The conductivity should read between 15.0 and 20.0 µS. If it doesn't, notify your supervisor.

System Parameters (recommended, parameters may change depending on circumstances)

Parameter	Setting
Number of Detectors	1
Run Time (minutes)	15
Sampling Rate (seconds)	5 Hz
Detector 1 Type	COND conductivity detector
Detector 1 real time plot scale maximum	30uS
Detector 1 real time plot scale minimum	-3uS

Detector 1 Output Equivalent to 1 Volt (in mV)	1000 mV = 1000.000 mV

Integration Parameters

Parameter	Setting
Starting Peak Width (seconds)	10
Peak Threshold	0.2
Peak Area Reject	1000.0

Data Events

Parameter	Setting
@ Time 0.00	Stop peak detection
@ Time 2.35	Start peak detection
@ Time 11.00	Stop peak detection

Calibration Parameters

Parameter	Setting
Number of levels for Calibration	6
Force Calibration Curve Through Origin	No
Calibration Fit Type	Quadratic
Replace Calibration	Yes
Calculate Unknowns by	Area
Default Sample Volume	1.00
Default Dilution Factor	1.00
Default Response Factor for Unknown Peaks	0
Calibration Standard Volume	1
Amount Units	ppm

Retention time windows (subject to change, depending on the column)

Analyte	Setting
Fluoride	2.39 ± 0.50 min
Chloride	2.97 ± 0.25 min
Nitrite	3.43 ± 0.25 min
Nitrate	4.25 ± 0.50 min
Sulfate	6.13 ± 0.*25 min*

15.1.7 Retention time and Anion Identification

15.1.7.1 Each sample or QC standard analyte is identified by comparing the peak retention time to the established retention time and retention time window. The retention time for each analyte will be set using the midpoint standard on the calibration curve or on days when a calibration is not performed an initial CCVRT will be used.

15.1.7.2 Retention time window widths are calculated for each analyte after a major maintenance event (i.e., column change). Using the data obtained from the analysis of at least five continuing calibration verification standards over a 24-hour period, calculate the mean retention time and standard deviation for each analyte. Assign a retention time window of + 3 standard deviations around the mean for each analyte. If the

standard deviation is 0.00, use the default retention time window. Each analyte's peak window is set in Chromeleon software in the component table by the analyst.

15.1.7.3 The Chromeleon software can chart and calculate the retention time mean and standard deviation using the charting program described in the software manual.

15.1.7.4 The retention time study must be recorded in the instrument maintenance logbook.

15.1.7.5 The width of each window remains the same until new windows are generated following the installation of a new column, or in response to an RT failure.

15.2 Sample Preparation

15.2.1 Water

15.2.1.1 Transfer ~ 5 mL of the sample into a Dionex sample container. One duplicate is analyzed with every batch. Determine if site specific QC is required of any sample. If no site specific QC was requested, select a sample at random for the duplicate.

15.2.1.2 Insert 0.45 µm filter cap into the Dionex sample container till the tip of the cap is flush with the top of the vial. Some samples may require pre-filtering through a 25mm/0.45um syringe filter.

15.3 Sample Analysis

15.3.1 On the main menu, double click "Schedule". Double click a schedule from a prior run.

15.3.2 Verify that the schedule begins with a blank and the continuing calibration verification sample (CCV).

15.3.3 Input the sample IDs onto the schedule. Insert a continuing calibration verification (CCV) and a continuing calibration blank (CCB) at the beginning of the run, every ten samples thereafter and at the end of the run.

15.3.4 Save the schedule to reflect the date and worklist.

15.3.5 Samples may be added to or deleted from the schedule.

15.4 Manual Integration Policy

In each case where the file has been edited or manual integrations have been performed, the following guidelines apply:

- Manual integrations should be consistent between all files integrated.
- Manual integrations should not be performed to meet QC criteria.
- Excessive manual integrations may reflect an instrumental or methodological problem that should be addressed.
- Manual integrations shall follow the NDSC SOP for manual integrations (SP-M-MC-SOP48480).

Manual integrations are most often performed for the following reasons:

- Assignment of correct peak that was mis-identified by the data system.
- Incomplete auto-integration due to high level of target compound detected.

- Incomplete auto-integration due to background interference.
- Incorrect auto-integration due to co-elution or near co-elution of compounds.
- Missed peaks.

All integrations are reviewed by the analyst.

Manual integrations may be documented in the narrative if so required, however, references to our NDSC Manual Integration SOP (SP-M-MC-SOP48480) will be used for explanations, and any further documentation beyond initials and dates will not be done.

15.5 Data Review

Upon completion of the analytical run, the primary analyst must review all data for compliance with QC criteria. The primary reviewer initiates the review checklist using Data Review Checker in TALS.

Upon completion of the primary review, the Department Manager (or designate) must perform a secondary peer review (see *SP-Q-QS-SOP47375*). The secondary reviewer completes the review checklist using Data Review Checker in TALS.

15.6 Instrument Maintenance

The column and/or suppressor should be cleaned periodically when peaks degrade (flatten out), carryover becomes a problem, the instrument pressure become too high (>2500 psi), or any other reason as determined by the analyst.

The following checks are completed as necessary to ensure efficient operation of the instrument.

- Periodically check for leaks or spills within the valve compartments. Isolate and repair any leaks.
- Clean up any spills.
- Rinse any dried eluents or reagents off the system components with DI water.
- Check all air and liquid lines for discoloration or crimping. Relocate pinched lines and replace damaged lines.
- Change eluent reservoir filter and in-line filters as needed.
- Some sample matrices will degrade the IC components over time. Placing one to three vials containing concentrated eluent in the schedule after the final CCB may help to prevent the degradation.
- Clean the columns periodically as needed following the Dionex manual. Be sure to place the guard column after the separator column for this procedure.

16) Calculations:

16.1 Waters Concentrations (mg/L) = instrument reading x dilution factor

16.2
$$\text{Recovery} = \left(\frac{\text{Observed spike concentration} - \text{Sample concentration}}{\text{Spike level}} \right)$$

16.3
$$\%\text{Recovery} = \text{Recovery} \times 100\%$$

16.4

$$RPD = \left(\frac{|original\ sample\ value - duplicate\ sample\ value|}{(original\ sample\ value + duplicate\ sample\ value)/2} \right) \times 100$$

17) Statistical Information and Method Performance:

17.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20.7 of the QA Manual. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency or whenever there is a significant change in instrumentation or analytical methodology.

17.2 Demonstration of Capabilities

An initial demonstration of capability shall be performed before a new instrument or analytical method is brought into production.

Initial demonstrations of capability and annual demonstrations of capability or passing annual PE results are required for each analyst.

18) Quality Assurance/Quality Control:

18.1 Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Calibration Curve	Every 6 months or as necessary.	y-int < Reporting Limit; Corr. Coeff. > 0.995
Method Blank (MB)	1 in 20 or fewer samples	< MDL
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	90-110%
Matrix Spike (MS)[1]	1 in 20 or fewer samples	80-120%
Matrix Spike Duplicate (MSD)[1]	1 in 20 or fewer samples	80-120%
MS/MSD RPD		< 20 RPD
Sample Duplicate (DUP)	1 in 20 or fewer samples	25%

[1] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client.

18.2 Suggested Corrective Actions

Listed below are steps that must be taken when an out-of-control situation occurs:

- Demonstrate that all the problems creating the out-of-control situation were addressed
- Document the problem and the action which was taken to correct the problem in an NCM in TALS.
- Document in the NCM that an in-control situation has been achieved and receive approval of the supervisor, QA Manager or the Laboratory Director prior to the release of any analytical data associated with the problem.

18.2.1 Calibration Curve – if the criteria above is not met,
- reanalyze the standard curve;
- prepare a new stock and/or working standards;
- check the reagents/solutions and prepare fresh if necessary.
- 6-month LRS outside 95-105% recovery requires re-calibration.

18.2.2 Method Blank (MB) is greater than the limit, investigate the source of contamination and measures taken to correct, minimize, or eliminate the problem.
- Re-prepare and reanalyze all associated samples.

Exception: If the samples are non-detect the data may be reported with qualification.

18.2.3 LCS or LCSD recovery is outside the limit, check to be sure there are no errors in calculations and that the concentration of the analyte solution is correct.
- Check instrument performance to determine if it is within acceptable guidelines.
- Recalculate the data and/or reanalyze the extract if necessary.
- Re-prepare and reanalyze the samples if none of the above resolves the problem.

Exception: It the BS/BSD fails high and the samples are non-detect the data may be reported with qualification.

Note: The LCS is used as a CCV throughout the run and so may be listed as CCV-LCS every 10 samples. Thus, the percent recovery control limits (90-110%) for the LCS are the same as those specified for the CCV.

18.2.4 LCS/LCSD RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set.
- If the LCS/LCSD percent recoveries were within limits, the RPD failure may be qualified.

18.2.5 MS or MSD recovery is greater than the limit, check to be sure there are no errors in calculations and that the concentration of the analyte solution is correct.
- Check instrument performance to determine if it is within acceptable guidelines.
- Recalculate the data and/or reanalyze the extract if any of the above checks reveals a problem.
- If none of the above resolves the problem and the LCS is acceptable, narrate as a possible matrix effect.

18.2.6 MS/MSD RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set.
- If the MS/MSD percent recoveries were within limits, the RPD failure may be qualified.

18.2.7 Sample Duplicate RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set. If the LCS is acceptable, narrate as a possible matrix effect.

Anomalous situations occurring during sample preparation and analysis must be documented on the bench sheet, and an NCM must be issued if necessary. Possible anomalous situations resulting in non-conformance reports include loss of a sample or batch QC through spillage or breakage.

18.3 Instrument QC - The following quality control samples are prepared with each batch of samples.

Calibration Controls	Control Limit	Frequency
Init. Calib. Verification (ICV)	90-110%	After Calibration
Initial Calibration Blank (ICB)	< MDL	After ICV
Cont. Calib. Verif. (CCV)	90-110%	At the beginning of a run and after every 10 samples
Cont. Calib. Blank (CCB)	< MDL	After each CCV

18.3.1 Suggested Corrective Actions

18.3.1.1 Initial Calibration Verification (ICV) - If the ICV does not meet the acceptance criteria,

- Re-prepare and re-analyze a new ICV standard from the stock to verify proper preparation;
- Check for instrument base-line drift;
- Restandardize the instrument with existing standards, reanalyze;
- Check the reagents/solutions and prepare fresh if necessary;
- Prepare a new stock and/or working standards and recalibrate.
- If the re-prepared standard does not meet the acceptance criteria, consult your supervisor.

18.3.2 Continuing Calibration Verification (CCV) - If the CCV does not meet the acceptance criteria,

- Re-prepare and re-analyze a new CCV standard from the stock to verify proper preparation;
- Report non-detect sample results if the CCV bias is high; write an NCR
- Prepare a new CCV from the original stock;
- Check for instrument base-line drift;
- Check the reagents/solutions and prepare fresh if necessary;
- Recalibrate with a new standard curve and repeat all detected if CCV is biased high)samples since the previous in-control CCV;

18.3.3 Initial / Continuing Calibration Blank (ICB /CCB) –

- Prepare a new ICB or CCB to verify proper preparation;
- Verify that the instrument base-line is stable and/or perform necessary maintenance, cleaning, etc... to achieve stability;
- Determine the source of contamination by the process of elimination, correct the problem and reanalyze. For the CCB, reanalyze all the sample since the previous in-control CCB. (Carry over from a previous analysis or reagent contamination are two common sources).
- Report only non-detects and samples >10X the contamination level. Write an NCM.

19) Attachments:

None

NDSC-US-EHS-QP46060 NDSC HSE Manual
SP-Q-QS-SOP43978 Glassware Washing - Organic and Inorganic Sample Preparation
SP-Q-QS-SOP47375 Data Review and Reporting of Analytical Results
SP-S-HS-SOP45376 Sample Disposal and Chemical Waste

End of document

Version history

Version	Approval	Revision information	
1	30.MAR.2022		
1.1	24.MAR.2023		

eurofins	Always check on-line for validity. **Biological Oxygen Demand (EPA 405.1 and SM 5210 B)**	Level: **Standard Operating Procedure**
Document number: **SP-T-WET-SOP48159**		
Old Reference: **SP-WET-015**		
Version: **2**		Organisation level: **4-Business Unit**
Approved by: **KAB4** Effective Date: **28-NOV-2022**	Document users: **General Chemistry**	Responsible: **General Chemistry**

1) Revision Log:

Revision: 1	**Effective Date:** This version	
Section	**Justification**	**Changes**
throughout	Required	Updated SOP references to current versions.
Confidential Statement and Section 9.3	Updated	Updated for Owner change
Section 16.10.1.1	Updated	Replaced Element Flags with TALS NCMs
Section 16.4.2.1	updated	Corrected the amount of seed solution added into the LCS from 6.0 mL to 5.0 mL
16.4.2	updated	run Triplicate from Duplicate.

2) Reference:

2.1 SM 5210B, Standard Methods for the Examination of Water and Wastewater, 18th Edition, American Water Works Association, 1992.

2.2 EPA Method 405.1, Methods for Chemical Analysis of Water and Wastes, USEPA rev1974.

2.3 YSI Dissolved Oxygen Probe Users Manual.

3) Cross Reference:

Document	Document Title
SP-Q-QAP-R07	QA Manual
NDSC-US EHS-QP46060	NDSC Environmental Health and Safety Manual
SP-Q-QS-SOP43978	Glassware Washing - Organic and Inorganic Sample Preparation
SP-QAG-026	Basic Employee Training
SP-S-HS-SOP45376	Sample Disposal and Chemical Waste
SP-Q-QS-SOP47375	Data Review and Reporting of Analytical Results
SP-T-WET-SOP48122	pH in Water by SM 4500-H+ B and Soil by EPA 9045D

4) Scope:

The Biological Oxygen Demand (BOD) test is an empirical bioassay for waters and wastewaters. This test measures the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter in the sample (carbonaceous demand) and the oxygen used to oxidize reduced inorganic compounds such as sulfide and ferrous iron. Oxidation of reduced inorganic compounds is referred to as Immediate Dissolved Oxygen Demand (IDOD). It will also measure the oxygen required to oxidize reduced nitrogen compounds (nitrogenous demand) due to microbial processes (nitrification) unless such processes are inhibited. If nitrification is inhibited, the test measures carbonaceous demand (CBOD). The biological oxidation rate is dependent upon temperature, time, presence of microbes and the concentration or organic substrate. In order to normalize the test, it is run under standard conditions of time (5 days) and temperature (20^{o}C).

The test is conducted in the dark in order to prevent photosynthesis by any algae which might be present in the sample being tested; photosynthesis will contribute oxygen to the sample and must be avoided.

Actual environmental conditions cannot be duplicated for each sample in the laboratory. However, consistent conditions are produced well enough to allow collected data to be used by engineers to adjust and design waste water systems to achieve the desired results.

5) Basic Principles:

The test consists of introducing a sample, or dilution thereof, into an airtight BOD bottle and incubating the bottle in the dark for a specified time (5 days) and temperature (20^{o}C). Dissolved oxygen (DO) is measured at the beginning and at the end of the incubation period and 5-day BOD is calculated as the difference between the two expressed as milligrams oxygen per liter. BOD is a biological process and a sufficient population of bacteria must be present in the sample being analyzed. To insure this, samples or dilutions are seeded with a known amount of bacterial inoculum. Critical factors in the test are:

5.1 The sample must not exert a demand sufficient to reduce the dissolved oxygen to less than 1 mg/L after five days incubation. Valid results are considered to be those that produce a depletion of at least 2 mg/L with a residual of at least 1 mg/L. In order to achieve this, samples are diluted and multiple dilutions (at least two) are analyzed.

5.2 Samples are to be at room temperature prior to beginning analysis. Cold samples can be supersaturated with dissolved oxygen and hence produce false high depletion values.

5.3 The sample should be as homogeneous as possible and blending may be required to break up particulates and thoroughly mix them prior to sub-sampling for dilutions.

5.4 It takes a little experience to arrive at the appropriate dilutions. Rough guidelines are given below.

5.5 The pH of the sample should be adjusted to the range of 6.5–7.5 using either sodium hydroxide or sulfuric acid.

5.6 The dilution water used must be free from contaminants, saturated with DO at 20^{o}C and contain sufficient nutrients and buffering to allow for microbial growth. Saturation concentrations for dissolved oxygen over the temperature range approximating room temperature are given in the table below. You should verify that all initial DO's are within this range.

Temp (ºC)	Dissolved Oxygen (mg/L)
17	9.66
18	9.47
19	9.28
20	9.09
21	8.92
22	8.74
23	8.58

6) Reference Modifications:

None

7) Definitions:

7.1 Seed: A microbial population capable of decomposing the organic material contained in the sample/dilution must be present. In order to insure the presence of such a population, the prepared sample is seeded with bacteria (Polyseed BOD Inoculum).

7.2 Dissolved Oxygen (DO) depletion: The difference in the dissolved oxygen between the initial and final readings.

7.3 Un-seeded blank (USB): To determine possible contamination of dilution water.

7.4 Seed control blank (SCB): To determine depletion of DO per mL of seed.

8) Interferences:

8.1 Chlorine and chlorine compounds, toxic substances, oxygen super-saturated samples, and nitrogen containing compounds can interfere with BOD results. Samples should be free of residual chlorine and chlorinated samples must be dechlorinated with sodium sulfite prior to analysis.

8.2 Discard reagents if there is any sign of biological growth in the stock bottles. Signs of biological growth include sediment present in the bottles or discoloration.

8.3 To prevent contamination, laboratory glassware must be cleaned in accordance with *SP-Q-QS-SOP43978* prior to being utilized and rinsed with an acid wash. This particularly applies to the BOD bottles which must be free of organic residues and any toxic constituents which could possibly inhibit microbial growth during the test.

8.4 The laboratory analyst will perform the method in accordance with this SOP. The analyst will resolve non-conformances in methods and data, either individually or with the assistance of the department supervisor or operations manager. Deviations from this SOP must be documented. Bench sheets and raw data must capture information related to a deviation. The laboratory analyst or supervisor will report deviations or non-conforming events to the operations, project and/or QA manager via a non-conformance report.

8.5 The Department Supervisor, Operations Manager, and/or QA Manager will assist the laboratory analyst in resolving non-conformances.

8.6 The Department Supervisor will review and approve data, data qualifiers, nonconformance reports, methodology, and final reports for all analyses performed in his/her department.

8.7 The QA Manager shall verify adherence to this SOP through annual audits, nonconformance reports, and performance evaluation studies.

9) Safety Precautions, Pollution Prevention and Waste Handling:

Employees must abide by the policies and procedures in the NDSC Safety Manual, Radiation Safety Manual and this document.

9.1 Specific Safety Concerns or Requirements

There are no specialized safety concerns associated with this method.

9.2 Primary Materials Used

There are no materials used in this method that have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

9.3 Pollution Control

It is Eurofins Environment Testing Northwest's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the NDSC Safety Manual for "Waste Management and Pollution Prevention."

9.4 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are

incorporated by reference to *SP-S-HS-SOP45376*. The following waste streams are produced when this method is carried out:

- There are no special wastes produced by this method.

11) Personnel Training and Qualifications:

See SP-QAG-026 for general training requirements.

12) Sample Collection, Preservation and Handling:

12.1 Samples should be collected in 500mL or 1L polyethylene bottles and are not preserved.

12.2 Samples are stored at 4 ± 2°C. If the analysis can begin within 2 hours of collection, cold storage is not necessary. The sample must be allowed to come to room temperature before analysis.

12.3 The holding time is 48 hours.

Note: BOD analysis is often done on time-composited samples. Eurofins Spokane counts the 48 hours from the time provided by the client.

13) Apparatus and Equipment:

13.1 300 mL BOD bottles and stoppers. These bottles are specially made for the analysis of BOD or dissolved oxygen. They have a flared neck reservoir and a tapered glass stopper. Bottles should be filled with minimum agitation, making sure there are no trapped air bubbles. During incubation, there should always be excess water contained in the neck flare.

13.2 Plastic BOD bottle caps. These are plastic capes placed over the neck of the bottle during incubation. Their purpose is to prevent evaporative loss from the neck flare during incubation.

13.3 BOD incubator at 20°C±1°C

13.4 ISE/pH meter (Orion Model SA720, or equivalent)

13.5 DO probe (YSI 50B, or equivalent)

13.6 Miscellaneous
- Magnetic stirrer
- Stir bars
- Pipettes and syringes, assorted sizes.
- Graduated cylinders
- Dilution Water Carboys

14) Reagents and Standards:

Note: All standards are prepared in Class A volumetric flasks.

Document the preparation and lot numbers of all reagents and standards in TALS. Record all the standard and reagent identification numbers on the BOD bench sheet.

14.1 Dilution Water: Prepare a volume of dilution water sufficient to handle all samples being analyzed within a batch, assuming 2500 mLs for QC and a minimum of 1 liter for each sample to be analyzed. The volume required is dependent on the number and strength of the dilutions used in analyzing each sample. The dilution water will be enriched by addition of the stock nutrient and buffer solutions.

Note: Dilution water is to be made fresh on day of use.

14.1.1 Prepare individual nutrient/buffers as follows:

14.1.1.1 Magnesium Sulfate Solution: Dissolve 22.5 g of MgSO4*7H20 in DI water and dilute to 1 L.

14.1.1.2 Calcium Chloride Buffer Solution: Dissolve 27.5 g of anhydrous CaCl2 in DI water and dilute to 1 L

14.1.1.3 Ferric Chloride Buffer Solution: Dissolve 0.25 g of FeCl2*6H20 in DI water and dilute to 1 L.

14.1.1.4 Phosphate Buffer Solution: Dissolve 8.5 g of KH2PO4, 21.75 g of K2HPO4, 33.4 g of Na2HPO4*7H20, and 1.7 g of NH4Cl in DI water and dilute to 1 L. Measure pH with the pH meter. See SP-T-WET-SOP48122 for instructions on calibrating the pH meter. The pH should be 7.2 without further adjustment. If the pH is not 7.2, check with your supervisor. If necessary, remake the solution.

14.1.2 Add 1 mL of each of the 4 nutrient solutions in Section 14.1.1 per liter of DI water in the following sequence **(the sequence is important, be sure to mix after each addition)**:

- Magnesium Sulfate
- Calcium Chloride
- Ferric Chloride
- Phosphate Buffer

Mix very well – The nutrient salts are difficult to dissolve and complete dissolution is necessary for consistent results

14.1.2.1 As an alternative, use Hach Nutrient Buffer Pillows, which are a ready-to-use mixture of buffer solutions that are added directly to deionized water to create dilution water.

14.1.2.2 Inspect the rinsed out carboy used for making the dilution water before making the dilution water. Water should bead on the inside surfaces, if not the carboy must be scrubbed with soap and water, and thoroughly rinsed.

14.1.3 Aerate the prepared water by shaking. Allow the dilution water to equilibrate to approximately 20° C prior to use. The dilution water should be saturated with oxygen (DO in the range of 8.7 – 9.5 mg/L). The quality of the dilution water will be evaluated as a "un-seeded blank" during the 5-day test. It should return a depletion of less than 0.2 mg/L. Run the 5-day test on one 300 mL aliquots of the dilution water (without the added seed) and evaluate the BOD.

It should be in the range of 0.1 to 0.2 mg/L. Depletion values greater than 0.2 mg/L indicate contamination of glassware or reagents.

14.2 Bacterial Seed Solution: The purpose of seeding is to insure that a sufficient population of microbes is present in the test solution to degrade the organic material present in the sample. For the purposes of consistency, we use a commercially prepared inoculum (i.e., InterBio Polyseed Fisher Catalog #13-297-200). Follow the manufacturer's directions for use:

14.2.1 Open one or more gelatin capsule and place the contents into 500 mL of the prepared dilution water. The number of gelatin capsules used and the final volume of dilution water may vary based on analysts discretion. The seed preparation for each batch is recorded on the BOD worksheet. The goal is to achieve a depletion of greater than 2mg/L in the SCB. Aerate the Polyseed solution, with stirring, for at least 60 minutes to re-hydrate the bacteria.

14.2.2 Allow particulate matter to settle for 15 minutes prior to use. Return to the magnetic stirrer and continuing aerating during any break in the analysis.

14.2.3 Add 10mL of seed to the seed control blank and 5.0 mL of seed to each sample and/or dilution being analyzed. The seed material itself exerts a demand. Samples must be corrected for the BOD attributable to the added seed. Volumes maybe adjusted to meet QC requirements.

14.2.4 The seed solution is good for only six hours. Plan accordingly.

14.3 Glucose/Glutamic Acid Solution: This solution is a check on the effectiveness of the seeding procedure. Add 150 mg glutamic acid and 150 mg glucose to a flask and dissolve into 1000 ml DI water. Mix well. Prepare fresh for each use. This solution can also be purchased or pre-prepared.

14.4 1 N NaOH for pH adjustment. Prepare by adding 40 g NaOH to 1000 mL.

14.5 1 N H2SO4 for pH adjustment. Prepare by adding 28 mL H2SO4 to 1000 mL.

14.6 Chlorine Test Strips (Hach AquaChek).

14.7 Nitrification Inhibitor: 2-chloro-6-(trichloromethyl) pyridine (TCMP) (available as Hach Nitrification Inhibitor 2533). This is a special reagent that we do not use on a routine basis. It is used for the analysis of carbonaceous demand (CBOD) or inhibited BOD.

15) Calibration:

15.1 Calibration / Standardization Use a BOD bottle pre-filled 1/3 to ½ way with DI water. Do not allow the probe tip to come in contact with DI water as the meter is calibrated on air.

- Autocalibrate: Press the Calibrate button, allow reading to stabilize, press AutoCal.
- Press Mode to return to the main screen.

16) Procedure:

16.1 Glassware Preparation

16.1.1 BOD Bottles Wash bottles according to *SP-Q-QS-SOP43978*. Rinse all bottles with a 5% HNO3 solution and then tap water. Follow this with 3 rinses of distilled water. Air dry on rack.

16.1.2 Dilution Water Carboys Rinse with tap water followed by a 5% HNO3 solution. Rinse again with tap water and then 3 times with distilled water.

16.2 Preventive Maintenance

16.2.1 Dissolved Oxygen Probe

Membrane module replacement and/or refilling are required at scheduled intervals or if the probe does not function properly (due to damage or contamination). The recommended interval between filling solution changes is 1-2 months.

Prior to replacing the membrane cap, disconnect the probe from the meter, and rub the outer metallic stem (anode) with the supplied polishing cloth to remove deposits that may interfere with probe function. Rinse the anode with DI or Milli-Q water, then with a little membrane filling solution. Fill the membrane cap ~ ½ to 2/3 with filling solution, and holding the probe upright, gently screw on the new membrane cap. Some filling solution should over-flow and be wiped off gently. Examine the membrane. It should be slightly pushed out by the electrode tip, but otherwise look clear and smooth. Be especially sure to exclude bubbles.

16.2.2 Incubator

The external coils on the incubators must be cleaned at least yearly for proper function. The incubator should be defrosted every 2 months for optimum performance.

16.2.3 BOD Bottles

Dirty BOD bottles are a common source of laboratory error. Bottles must never be allowed to dry with sample residue in them. The bottles must be emptied then rinsed in clean, hot tap water. The entire inside of each bottle must be brushed until visibly clean, then rinsed 3 times with tap water and 3 times with DI water, emptying the bottle completely between rinses. The stoppers must be rinsed well with Milli-Q water or DI water and stored in a clean location between uses. If oily samples have soiled the bottles or stoppers, then solvent, acid, or soap may be used to clean the bottles, but then extra rinsing may be necessary. It is critically important that no traces of organic residue or soap remain in the BOD bottles.

Eurofins Spokane also keeps EPA-Approved disposable BOD bottles on hand for single use in certain projects where the sample load is high.

16.3 Sample Pretreatment

16.3.1 Take the pH of the sample at room temperature and adjust to within a range of 6.5-7.5 with 1N H2SO4 or 1N NaOH. The volume of acid or base added should not dilute the sample by more than 0.05%. Use an acid or base of appropriate strength. Record the initial and final, if necessary, pH on the BOD worksheet.

16.3.2 Test the sample for the presence of residual chlorine using a Hach test strip. Record the result of the test on the BOD worksheet. If the result is negative, proceed to step 17.3. If the result is positive, the result must be qualified and the sample must be dechlorinated by the following steps:

16.3.2.1 Add 10 mL 1+50 H2SO4 100 ml aliquot of sample. Add 10 mL of potassium-iodide (sample should turn yellow), add 1 mL starch indicator (sample will turn will blue), mix and titrate with sodium sulfite solution (0.025N) to starch-iodine endpoint (clear). Note the amount of sodium sulfite required on the BOD worksheet.

16.3.2.2 Add an equivalent volume of sodium sulfite to a fresh, known volume of sample. Test the sample for residual chlorine again after approximately 10 minutes.

16.3.2.3 If the sample no longer shows a chlorine residual, proceed with the BOD analysis. If not, repeat the dechlorination steps until the sample tests negative for residual chlorine.

16.4 QC Samples Required for each batch of 20 or less samples

16.4.1 One Dilution Water Blank

16.4.1.1 Fill 1 bottle with only buffered dilution water to use as a reagent blank.

16.4.1.2 The average of the D.O. uptake on the blanks for 5 days should not be more than 0.2 mg/L. If the D.O. uptake is more than 0.2 mg/L, qualify the data and take steps to sterilize the dilution water and/or sample containers or otherwise purify the dilution water.

16.4.1.3 If the D.O. uptake is considerably higher than 0.2 mg/L, contact the supervisor. An NCM may be issued at the discretion of the supervisor.

16.4.2 Glucose-Glutamic Acid Standard (Laboratory Control Sample) run in triplicate

16.4.2.1 Add 6 mL of glucose/glutamic acid solution to 3 bottles and 5.0 mL of seed solution and fill with dilution water.

16.4.2.2 The LCS should be 198 mg/L +30.5. The control limits in TALS are 85-115%. If they are outside the control limits, flag the data with a qualifier and investigate the source of the problem.

16.4.3 Seed Controls Set up 2 bottles as seed controls by adding 10 mL of seed solution to each bottle and filling with dilution water. The seed control should deplete by > 2.0mg/L and produce an average drop of 0.60 to 1.0 mg/L per mL of seeding solution. If it does not, qualify the data. Issue an NCM if necessary.

16.5 Add 5.0 mLs of seed to the BOD bottles for all samples and QC Samples except the dilution water blank. Document the number of each BOD bottle on the worksheet.

16.6 Sample Dilutions

16.6.1 Sample dilution is one of the most critical aspects of this analysis and is largely a judgment call on the part of the analyst. In general, you will want to use the maximum amount of sample that will provide a result with the acceptable limits. Sample additions should not be greater than 250 mL. As a result samples that are highly organic (colored, smelly, foamy when shaken) may require pre-dilution with dilution water prior to determining the volumes to be added to the bottles. Clean surface waters may not require much dilution. The number and concentrations of the dilutions will vary for each sample based on analyst experience and client history where available. Historical sample results are significantly valuable in determining the appropriate dilutions. When in doubt, prepare extra dilutions.

Suggested dilutions are:

- Sample Characteristics % Addition Sample Volume (mL)
- Highly Organic Wastes 1% or pre –dilute 3 mL
- Raw or Settled Wastewaters 1-5% 3 ml – 15 mL
- Treated Effluents 5-25% 15-45 mL
- Surface Waters 25-100% 45-300 mL

16.6.2 For samples where there is no indication of what the BOD might be, it may be necessary to set up more dilutions. Record the dilutions selected on the BOD worksheet.

16.7 Add the appropriate volume of sample for each dilution. Pour the dilution water into the bottles (making sure not to add air bubbles in the water). Fill the bottle well up into the neck.

16.7.1 **Nitrification** Samples which are submitted for the analysis of inhibited BOD or carbonaceous demand (CBOD) should be treated with nitrification inhibitor. Add the Hach powder (3.33 mg TCMP per bottle, or follow the manufacturers recommended amount if different) directly to each bottle before topping off the bottles with the dilution water. The Hach powder should also be added to all associated quality control samples.

16.8 Take and record the initial D.O. readings. Document the temperature, air pressure, date and time the samples were placed in the incubator on the BOD worksheet.

16.8.1 Samples with an initial DO above 9.47 mg/L may have been too cold for analysis. Allow chilled samples to warm prior to analysis and aerate as the samples warm to room temperature. Vigorously shaking the samples, as they warm, may be sufficient to remove supersaturated DO.

16.9 Place stoppers in all bottles, making sure that there is a water seal around the stopper, and place plastic caps on bottles. Place all bottles in the incubator in the dark at 20^{o}C for 5 days.

16.10 After the incubation period read the D.O. of each bottle making sure to leave the stoppers in the bottles until the probe is placed in the bottle. Document the temperature, air pressure, date and time the bottles were removed in the place provided on the BOD worksheet. Record the final DO on the worksheet.

16.10.1 Acceptance criteria: For a dilution to be valid the final DO should be no less than 1.0 mg/L (the DO probes are not as accurate below this level). The DO uptake (Initial –final DO) must be at least 2.0mg/L.

16.10.1.1 Dilutions that do not meet these criteria should not be used to calculate the 5-day BOD average. Exceptions:

- If all dilutions do not meet the requirement of a DO uptake of at least 2.0mg/L for a given sample set, the result should be narrated. The NCM should state that the sample dilution set set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2.0 mg/L. Therefore the reported result is an estimate only.

- If the only useable dilutions have residual (final) DO less than 1.0mg/L then the report must be narrated. This NCM should states that the residual oxygen depletion criteria was not met and therefore the reported result can be considered an estimated value only.

16.10.1.2 If the BOD difference is less than 2.0ml/L for the 100% dilution (250ml sample used) then the sample is ND for BOD.

16.11 Data Review

Upon completion of the analytical run, the primary analyst must review all data for compliance with criteria documented in Section 19.0.

Upon completion of the primary review, the Department Supervisor (or designate) must perform a secondary peer review (refer to SOP *SP-Q-QS-SOP47375*).

17) Calculations:

17.1 BOD Calculation where sample is not seeded

BOD = (D1 – D2) x Sample Volume (ml)

where: D1 = Initial Sample DO (mg/l)
D2 = Final Sample DO (mg/L)
Sample Volume = mLs sample (generally 300 mLs)

17.2 BOD Calculation where sample is seeded

BOD = (D1 – D2) – (B1-B2)*f X Sample Volume (mL)

where: D1 = Initial Sample DO (mg/l)
D2 = Final Sample DO (mg/L)
B1 = Initial DO of seed control (mg/L)
B2 = Final DO of seed control (mg/L)
Sample Volume = mLs sample
f = volume of seed in sample/volume of seed in control

Note: Use the BOD spreadsheet, and calculate all sample dilutions.

17.3 Dilution Criteria

- Residual DO (final DO measurement): > 1 mg/L
- DO depletion: > 2 mg/L

If more than one sample dilution meets the criteria of a residual DO of at least 1 mg/L and a DO depletion of at least 2 mg/L and there is no evidence of toxicity at higher sample concentrations or the existence of an obvious anomaly, average all dilution results in the acceptable range.

If no sample dilution meets the criteria, qualify the data as appropriate (see Section 17.3, Bullet Item 1).

18) Statistical Information and Method Performance:

18.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in the QA Manual. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency or whenever there is a significant change in instrumentation or analytical methodology (see *SP-M-MC-SOP45356*).

18.2 Demonstration of Capabilities

An initial demonstration of capability shall be performed before a new instrument or analytical method is brought into production.

Initial demonstrations of capability and annual demonstrations of capability or passing annual PE results are required for each analyst.

19) Quality Assurance/Quality Control:

Note: Separate batches must be set up, including the following QC checks, for carbonaceous BOD samples. All the samples and standards must contain nitrification inhibitor in those batches.

Quality Controls	Frequency	Control Limit
Unseeded Control Blank	1 in 20 or fewer samples	< 0.2 mg/L
Seed Control Blank[2]	1 in 20 or fewer samples	> 2.0 mg/L
LCS [1]	1 in 20 or fewer samples	BOD and cBOD 198+ 30.5 (84.6-115.4%)

[1] The control limits are referenced from SM 5210B

[2] The average O2 depletion per mL seed in these bottles will be used as the seed correction to calculate the BODs of all the samples and the LCS(s).

19.1 Suggested Corrective Actions

Due to short hold-time and 5-day BOD incubation period, out-of-control QC situations will not be discovered until after the sample hold times have expired. **The analyst must notify the Supervisor or Laboratory Director immediately when out-of-control QC situations occur.**

Steps that MUST be taken when an out of control situation occurs:

- demonstrate that all the problems creating the out of control situation were addressed;
- document the problem and the action which was taken to correct the problem in an NCM (Non-Conformance Memo).
- receive approval (signature) of the Supervisor and/or Project Manager prior to the release of any analytical data associated with the problem.

Anomalous situations occurring during sample preparation and analysis must be documented on the bench sheet, and non-conformance reports must be issued if necessary.

20) List of Attachments:

20.1 Table 1: BOD Dilutions
20.2 Attachment 1: Example of BOD Spreadsheet

Table 1
BOD Dilutions

BOD DILUTION SERIES

DEPLETIONS (ASSUMING 9.0 INITIAL)		
2.0	5.0	8.0

CALCULATED BODS WITH ABOVE DEPLETIONS

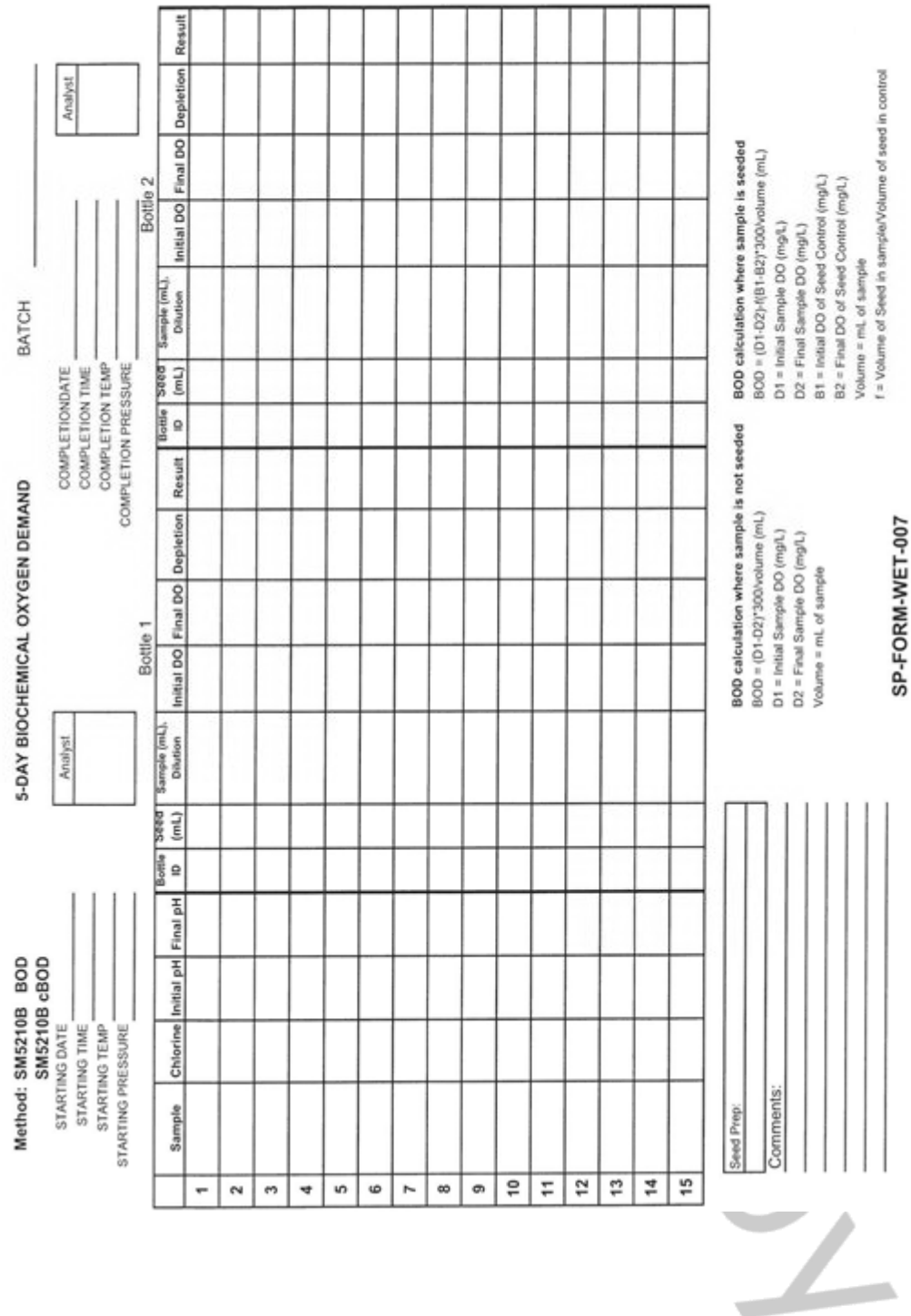
ALIQUOT	RANGE FOR EACH DILUTION			DILUTION FACTOR
300	2	5	8	1.0
250	2	6	10	1.2
100	6	15	24	3.0
75	8	20	32	4.0
60	10	25	40	5.0
40	15	38	60	7.5
25	24	60	96	12
10	60	150	240	30
7.5	80	200	320	40
6	100	250	400	50
4	150	375	600	75
2.5	240	600	960	120
1	600	1,500	2,400	300
0.75	800	2,000	3,200	400
0.6	1,000	2,500	4,000	500
0.4	1,500	3,750	6,000	750
0.25	2,400	6,000	9,600	1,200
0.1	6,000	15,000	24,000	3,000
0.075	8,000	20,000	32,000	4,000
0.06	10,000	25,000	40,000	5,000
0.04	15,000	37,500	60,000	7,500
0.025	24,000	60,000	96,000	12,000
0.01	60,000	150,000	240,000	30,000
0.0075	80,000	200,000	320,000	40,000
0.006	100,000	250,000	400,000	50,000
0.004	150,000	375,000	600,000	75,000
0.0025	240,000	600,000	960,000	120,000
0.001	600,000	1,500,000	2,400,000	300,000
0.00075	800,000	2,000,000	3,200,000	400,000
0.0006	1,000,000	2,500,000	4,000,000	500,000
0.0004	1,500,000	3,750,000	6,000,000	750,000
0.00025	2,400,000	6,000,000	9,600,000	1,200,000
0.0001	6,000,000	15,000,000	24,000,000	3,000,000

TO USE: USE CENTER COLUMN (5.0 DEPLETION) TO LOCATE CLOSEST VALUE TO A KNOWN OR ESTIMATED BOD - FOR A FIVE BOTTLE SERIES USE THAT ALIQUOT AS THE CENTER AND GO UP 2 AND DOWN 2 ALIQUOTS

EXAMPLE: BOD OF 500 - CLOSEST VALUE IS 600 FOR AN ALIQUOT OF 2.5
USE FIVE BOTTLE SERIES OF 6, 4, 2.5, 1, 0.75

Attachment 1.

Example of BOD Spreadsheet (Page 1 of 2)



5-DAY BIOCHEMICAL OXYGEN DEMAND

BATCH

Method: SM5210B BOD
SM5210B cBOD

STARTING DATE
STARTING TIME
STARTING TEMP
STARTING PRESSURE

COMPLETIONDATE
COMPLETION TIME
COMPLETION TEMP
COMPLETION PRESSURE

Analyst

Analyst

	Sample	Chlorine	Initial pH	Final pH	Bottle ID	Seed (mL)	Sample (mL), Dilution	Bottle 1 Initial DO	Bottle 1 Final DO	Depletion	Result	Bottle ID	Seed (mL)	Bottle 2 Sample (mL), Dilution	Initial DO	Final DO	Depletion	Result
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Seed Prep:

Comments:

BOD calculation where sample is not seeded
BOD = ((D1-D2)*300/volume (mL)
D1 = Initial Sample DO (mg/L)
D2 = Final Sample DO (mg/L)
Volume = mL of sample

BOD calculation where sample is seeded
BOD = ((D1-D2)-f(B1-B2)*300/volume (mL)
D1 = Initial Sample DO (mg/L)
D2 = Final Sample DO (mg/L)
B1 = Initial DO of Seed Control (mg/L)
B2 = Final DO of Seed Control (mg/L)
Volume = mL of sample
f = Volume of Seed in sample/Volume of seed in control

SP-FORM-WET-007

Attachment 1.

Example of BOD Spreadsheet (Page 2 of 2)

5-DAY BIOCHEMICAL OXYGEN DEMAND

	Sample	Bottle 3 Bottle ID	Seed (mL)	Sample (mL), Dilution	Initial DO	Final DO	Depletion	Result	Bottle 4 Bottle ID	Seed (mL)	Sample (mL), Dilution	Initial DO	Final DO	Depletion	Result
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															

BOD calculation where sample is not seeded

BOD = (D1-D2)*300/volume (mL)
D1 = Initial Sample DO (mg/L)
D2 = Final Sample DO (mg/L)
Volume = mL of sample

BOD calculation where sample is seeded

BOD = (D1-D2)-f(B1-B2)*300/volume (mL)
D1 = Initial Sample DO (mg/L)
D2 = Final Sample DO (mg/L)
B1 = Initial DO of Seed Control (mg/L)
B2 = Final DO of Seed Control (mg/L)
Volume = mL of sample
f = Volume of Seed in sample/Volume of seed in control

Comments: _____

SP-FORM-WET-004
Page 2

NDSC-US-EHS-QP46060 NDSC HSE Manual
SP-M-MC-SOP45356 Detection and Quantitation Limits
SP-Q-QS-SOP43978 Glassware Washing - Organic and Inorganic Sample Preparation
SP-Q-QS-SOP47375 Data Review and Reporting of Analytical Results
SP-S-HS-SOP45376 Sample Disposal and Chemical Waste
SP-T-WET-SOP48122 pH in Water by SM 4500-H+ B and in Soil by EPA 9045D

End of document

Version history

Version	Approval	Revision information	
1	25.FEB.2022		
2	14.NOV.2022		

eurofins	Always check on-line for validity. **Determination of Alkalinity by Titration Standard Methods 2320B**	Level: **Standard Operating Procedure**
Document number: **SP-T-WET-SOP65776**		
Old Reference: **SP-WET-002-R13**		
Version: **14**		Organisation level: **4-Business Unit**
Approved by: **KAB4** Effective Date: **23-AUG-2023**	Document users: **General Chemistry**	Responsible: **General Chemistry**

1) Revision Log:

Revision: 14	**Effective Date:** This version	
Section	**Justification**	**Changes**
Updated to D4		

REVISION HISTORY

Revision 4, dated June 15, 2007

Revision 5, dated February 1, 2008
- Section 9.0 – Implemented the use of default control limits for the LCS & Sample Duplicate. Discontinued the use of Statistical Control Limits.

Revision 6, dated March 10, 2010

Revision 7, dated April 30, 2012
- Eliminated LCSD. Changed criteria for titrant usage. Added requirement to dilute sample if titrant volume is greater than 50mLs.

Revision 8, dated April 24, 2014

- Changed amount of bromocresol green indicator from 0.2 mL to 1.0 mL

Revision 9, dated 10/24/2014.
- Changed signature page to reflect current positions. Updated revision number.

Revision 10, Dated 2/5/2015
- Removed Element references and replaced them with TALS references
- Updated requirements for low level Alkalinity

Revision 11, Dated 4/29/2016
- Updated LCS preparation to reflect actual volume made

Revision 12, Dated 7/10/2018
- Added CCV and CCV requirements, sections 3.7, 7.6, 9.0 and 9.1.2
- Removed stir bar, throughout
- Clarified current procedure, section 3.2 and 10.4
- Added method modification, section 16.0
- Updated attachments

Revision 13, dated 1/4/2021
- Rebranded
- Updated approvers
- Added that current reporting limits for all components can be found in TALs, section 1.0
- Updated LCS prep, section 7.4 and 10.4.4
- Updated references to 22nd Edition

2) Reference/Cross Reference:

2.1 SP-Q-QM-QM49786, Quality Assurance Manual (QAM)

2.2 Health & Safety Manual

2.3 SM 2320 B, Alkalinity – Titration Method. Standard Methods for the Examination of Water and Wastewater. 22nd Ed.

2.4 SP-Q-QS-SOP49040, Basic Employee Training

2.5 SP-S-HS-SOP45376, Sample Disposal

2.6 SP-Q-QS-SOP47375, Data Review and Reporting of Analytical Results

Method Modifications

Item	Method 310.1	Modification
1	5.1	Using a 0.1N solution of Na2CO3 instead of a 0.05N solution

3) Scope:

This method is used to determine alkalinity (acid-neutralizing capacity) of environmental water samples. Alkalinity is primarily a function of the bicarbonate/carbonate buffering system of natural waters but will include contributions from other titratable bases. The described procedure complies with Standard Methods for the Examination of Water and Wastewater (SM),

22nd Edition, Method 2320B for partitioning Total Alkalinity. See TALs for current reporting limits of all components (total, bicarbonate, carbonate, and hydroxide.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in the Quality Assurance Manual.

4) Summary:

The bicarbonate buffering system (CO_2, HCO_3^-, CO_3^{2-}, OH^-) of most natural waters controls pH and since the neutralization of carbonate and equivalence between bicarbonate and carbonic acid is complete at pH of approximately 4.5, this pH is used as an arbitrary end-point pH for total alkalinity. The Alkalinity value is calculated from the volume and normality of titrant required to reach the specified end-point pH. This value is reported in terms of mg/L $CaCO_3$.

The bicarbonate buffering system may be partitioned into its various components (CO_2, HCO_3^-, CO_3^{2-}, OH^-) following SM 2320B. Samples of high pH (>8.3) indicate the presence of carbonate and hydroxide alkalinity and titration to pH 8.3 is referred to as "Phenolphthalein Alkalinity". Continued titration to pH 4.5 provides Total Alkalinity as described above. All results are expressed in units of mg $CaCO_3$ / liter with the exception of carbon dioxide which is expressed in units of mg/L CO_2. For a determined Phenolphthalein alkalinity (P = mL to pH 8.3) and Total alkalinity (T), the calculations follow the table below:

Observed	HCO_3^-	CO_3^{2-}	OH^-
P = 0	T	0	0
P < 0.5 T	T – 2 P	2 P	0
P = 0.5 T	0	2 P	0
P > 0.5 T	0	2 (T – P)	2 T - P
P = T	0	0	T

These numbers are approximations only and assume the total alkalinity can be attributed entirely to bicarbonate, carbonate and hydroxide. Expression in units of the species of interest may be derived by multiplying the mg/L $CaCO_3$ by the ratio of equivalent weight $CaCO_3$ to equivalent weight species (for HCO_3^- the ratio is 61/50 = 1.22, and for CO_3= the ratio is 30/50 = 0.6).

4.1 A standard unpreserved and unfiltered aliquot of sample is titrated with Sulfuric Acid to a predetermined end-point. As previously stated, the value of Alkalinity is determined based on volume titrant required and is reported in terms of mg/L $CaCO_3$.

4.2 In general, direct titration to an end-point pH of 4.5 is appropriate for most "natural" surface water samples. If the sample is an industrial effluent or is unusual for some reason, a full titration curve should be used.

5) Definitions:

5.1 The result from the titration to pH 4.5 is termed "Total Alkalinity". Sample of high pH (>8.3) indicate the presence of carbonate and hydroxide alkalinity and titration to pH 8.3 is referred to as "Phenolphthalein Alkalinity”.

5.2 Low-level Alkalinity: Alkalinity at a concentration <20 mg/L $CaCO_3$ requires a less concentrated titrant, an additional titration step and a different calculation.

5.3 Batch: A group of 20 or less samples extracted and/or processed together within the same shift using the same reagents. Each batch must contain a minimum QC of one method blank, one laboratory control sample and one sample duplicate.

5.4 Method Blank: An interference-free matrix (reagent water) to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analysis and is processed one per batch.

5.5 Laboratory Control Sample (LCS): An interference-free matrix (reagent water) spiked with the Sodium Carbonate run one per batch. The LCS is used to assess laboratory performance. A LCS is analyzed using the same sample preparation and analytical methods used for samples at a frequency of one per 20 samples or batch.

5.6 Sample Duplicate: A replicate aliquot of a sample processed individually with the same methodology.

5.7 Continuing Calibration Verification (CCV): An Interference-free matrix (reagent water) spiked with Sodium Carbonate solution from a second source. The CCV is used to verify instrument calibration. A CCV is analyzed using the same sample preparation and analytical methods used for samples at a frequency of one per 10 samples.

6) Interferences:

6.1 Oils and greases may coat the pH electrode and result in slow response of the electrode to changes in pH. Allow additional time between titrant additions to let the electrode come to equilibrium or clean the electrodes occasionally.

6.2 Use caution when approaching pH end-points during the titration. Changes in pH will be gradual while the individual components (carbonate and bicarbonate) are being titrated and quite rapid as those components become exhausted. It can be very easy to overshoot an end-point.

6.3 Other titratable bases (borate, phosphate, silicate, ammonium) will also contribute to alkalinity, but they are generally not significant in comparison to bicarbonate and carbonate.

6.4 While total alkalinity is generally a conservative characteristic, partitioning into bicarbonate and carbonate is dependent upon carbonic acid in solution. Atmospheric gas exchange can influence precipitation and redox reactions in solution hence care must be taken to minimize atmospheric contact during the titration (there should be no vortex created by the stirrer and do not shake samples).

6.5 Samples containing soil particles or insoluble carbonates may be difficult to analyze due to shifting end points as acid is added to the test solution.

7) Safety Precautions, Pollution Prevention and Waste Handling:

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

7.1 Specific Safety Concerns or Requirements

Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table**. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material	Hazards	Exposure Limit (1)	Signs and symptoms of exposure
Sulfuric Acid (H_2SO_4)	Corrosive, Health Hazard	1 mg/m3 TWA	Liquid and mist cause severe burns to all body tissue. May be fatal if swallowed or contacted with skin. Harmful if inhaled. Affects teeth. Cancer Hazard.
pH buffer solns	Low Hazard	NA	Harmful if swallowed. May irritate eyes and skin.
Sodium Carbonate (Na_2CO_3)	Irritant	NA	May cause eye burns. Harmful if inhaled or swallowed. Causes irritation to skin and respiratory tract.
Bromocresol Green	Flammable	NA	Characteristic ethyl alcohol odor. Keep away from sparks and open flames.
1 – Exposure limit refers to the OSHA regulatory exposure limit.			

POLLUTION CONTROL

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability).

WASTE MANAGEMENT

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to SP-SPL-006.

8) Equipment and Supplies:

8.1 Instrumentation

- pH meter (Accumet Basic pH Meter, or equivalent) with automatic temperature compensation

8.2 Supplies

- Pyrex 50 mL buret or equivalent
- Pyrex 125 mL flasks
- 50- or 100-mL graduated cylinders, Class A
- Alkalinity worksheet

8.3 REAGENTS AND STANDARDS

8.3.1 Standardized Sulfuric Acid (0.10 N): Purchased certified acid at known normality from vendor.

8.3.2 Standardized Sulfuric Acid (0.02 N): Purchased certified acid at known normality from vendor.

8.3.3 Reference pH buffer solutions (pH 4.00, 7.00, and 10.00): A high (13.0) pH buffer will occasionally be required to bracket readings for unusually basic samples.

8.3.4 Laboratory Control Standard: Purchase already made 25000 mg/L solution from vender.

Dilute 10ml LCS Stock Solution (25000 mg/L) to 500ml with DI water to make your LCS Working Standard (500 mg/L).

Standard must be prepared weekly.

8.3.5 Bromcresol green indicator (pH 4.5 indicator): Dissolve 0.1g bromcresol green, sodium salt, in 100 mL DI water.

8.3.6 CCV: Purchased already made solution from vendor.

8.4 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Plastic or Glass	250 mL	Cool 4 ± 2°C	14 Days	NA

9) Procedure:

9.1 Sample Preparation - Allow the samples to equilibrate to room temperature.

9.2 Calibration - Calibrate the pH meter according to manufacturer's specifications.

9.3 Preventive Maintenance

Occasionally, the pH probe should be thoroughly cleaned according to manufacturer's recommendations.

9.4 Sample Analysis

9.4.1 Select a group of samples, not to exceed 20, for the analytical batch. Determine if site specific QC is required for any specific client or sample. If no site-specific QC was requested, select a sample at random for the batch duplicate.

9.4.2 Fill the burette with the appropriate sulfuric acid titrant (0.02N for alkalinities < 20 mg/L and 0.1N, if > 20 mg/L).

9.4.3 Begin the batch run by determining a method blank. Prepare the method blank using 100 mL of de-ionized water. Verify a clean method blank.

9.4.4 Determine the LCS by pipetting 100 mL of the 500 ppm LCS Working Standard and approximately 1.0 mL of the bromcresol green indicator.

Record the initial volume of sulfuric acid on the logbook and titrate the LCS until the endpoint is reached (pine green color). Record the final volume of the titrant and final pH.
Rinse the pH electrode with DI water, place the electrode in the sample and allow the pH reading to equilibrate.

9.4.5 Record the initial pH in your logbook. Any sample having a pH less than 4.5 would not contain alkalinity and should be reported as a non-detect.

9.4.6 Add approximately 1.0 mL of bromcresol green to sample and titrate to end-point using 0.1N sulfuric acid reagent. Record the beginning and ending level of titrant on the worksheet. Use less sample when titrant volume is greater than 50mLs. If less than 0.4mL of 0.1N sulfuric acid was used refer to section 10.4.8: Low Level Alkalinity.

9.4.7 Calculate the alkalinity as: mg/L $CaCO_3$ = (mL titrant X Normality titrant X 50,000) / mL sample titrated

9.4.8 Low Level Alkalinity: if the sample was < 20mg/L (<0.4mL of 0.1N titrant), notify the project manager and add the sample to a new low level alkalinity batch. Perform the determination using a fresh sample using the lower normality acid (0.02N). Stop the titration at a pH in the range 4.3 to 4.5 and record volume and exact pH. Carefully add additional titrant to reduce the pH exactly 0.30 pH unit and again record volume. Low level alkalinity is calculated as:

mg/L $CaCO_3$ =[(2 B – C) X Normality titrant X 50,000] / mL sample titrated

where:
B = mL of titrant to pH 4.5 and
C = mL titrant to pH 4.2

9.4.9 Take a final pH reading to be sure pH < 4.2 and record in logbook.

9.4.10 Alkalinity Relationships

When alkalinity relationships are requested, the sample aliquot must first be titrated to an endpoint of pH 8.3. Record the titrant used. Then the titration is continued to pH 4.5. From the phenolphthalein alkalinity (to pH 8.3) and the total alkalinity, the various forms are calculated using the following table. Again, this is done for every sample by the PC Titrate. The analyst need only report what the client requests.

Relationship	Hydroxide Alkalinity	Carbonate Concentration	Bicarbonate Concentration
P = 0	< 5	< 5	T
P < 1/2 T	< 5	2P	T – 2P
P = 1/2 T	< 5	2P	< 5
P > 1/2 T	2P – T	2(T-P)	< 5
P = T	T	< 5	< 5

P = Phenolphthalein alkalinity (as CaCO3 titrated to pH 8.3)
T = Total alkalinity (as CaCO3 titrated to pH 4.5)

9.5 Data Review

9.5.1 Upon completion of the analytical run, the primary analyst must review all data for compliance. The primary analyst will enter the data into TALS upon completion of their initial review.

9.5.2 The Supervisor (or designate) must perform a secondary peer review of the data as entered into TALS (see SP-QAG-023). Upon satisfactory completion of this review, the Supervisor (or designate) will transfer the data to the reviewed status indicating the data is ready for reporting to the client.

9.6 CALCULATIONS / DATA REDUCTION

9.6.1 Calculations for Total Alkalinity are done by the LIMS system using either the standard or low level formulas is shown above (Sec. 10.4). Make sure to enter the correct normality into TALS (LIMS system) depending on the titrant used (0.1N or 0.02N for low-level).

9.6.2 Partitioning into the various forms of alkalinity (HCO_3^-, CO_3^{2-}, OH^-) follows Standard Methods (2320 B), as described above. These numbers are approximations only and assume thetotal alkalinity can be attributed entirely to bicarbonate, carbonate and hydroxide. Expression in units of the species of interest may be derived by multiplying the mg/L CaCO3 by the ratio of equivalent weight CaCO3 to equivalent weight species (for HCO_3^- the ratio is 61/50 = 1.22, and for CO_3= the ratio is 30/50 = 0.6).

9.6.3 **Relative Percent Difference (RPD)** = { |X1 – X2| / [(X1 + X2)/2] } X 100

where: X1 = Concentration of sample analyte
X2 = Concentration of duplicate analyte

9.6.4 Percent Recovery = Cs / Ca X 100

where: Cs = Calculated sample concentration
Ca = Theoretical sample concentration

10) Quality Assurance:

The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< RL
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	90 – 110%
Sample Duplicate (DUP)	1 in 20 or fewer samples	75 – 125%
Continuing Calibration Verification (CCV)	1 in 20 or fewer samples	90-110%

METHOD PERFORMANCE

10.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20.7 of the QA Manual. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for
analyses performed; these are verified at least annually unless method requirements require a greater frequency or whenever there is a significant change in instrumentation or analytical methodology.

10.2 Demonstration of Capabilities

An initial demonstration of capability shall be performed before a new instrument or analytical method is brought into production.

Initial demonstrations of capability and annual demonstrations of capability or passing annual PE results are required for each analyst.

10.3 Training Requirements

See SP-Q-QS-SOP49040 for general training requirements

11) Corrective Actions:

Listed below are steps that must be taken when an out-of-control situation occurs:

- Demonstrate that all the problems creating the out-of-control situation were addressed
- Document the problem and the action which was taken to correct the problem in a NCM in TALS.
- Document in the NCM that an in-control situation has been achieved and receive approval of the supervisor, QA Manager or the Laboratory Director prior to the release of any analytical data associated with the problem.

11.1 <u>Method Blank</u> is greater than the limit, investigate the source of contamination.

- Re-prepare and reanalyze all associated samples.

Exception: if the samples are non-detect the data may be reported with qualification.

11.2 <u>LCS/CCV</u> recovery is outside the limit, check to be sure there are no errors in calculations and that the concentration of the analyte solution is correct.

- Check instrument performance to determine if it is within acceptable guidelines.

- Recalculate the data and/or reanalyze the extract if necessary.
- Re-prepare and reanalyze the samples if none of the above resolves the problem.

Exception: If the LCS fails high and the samples are non-detect the data may be reported with qualification.

11.3 Sample Duplicate RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set. If the LCS is acceptable, narrate as a possible matrix effect.

12) List of Attachments:

Attachment 1: Alkalinity Worksheet.

Attachment:
1, Alkalinity Worksheet (.pdf)

End of document

Version history

Version	Approval	Revision information	
14	23.AUG.2023		

OPERATING PROCEDURE: OP3012

LOW STRESS/LOW FLOW GROUNDWATER SAMPLE COLLECTION PROCEDURE

PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
Ver. 0.0	SLB/GMW / 05-02	NVD/ 12-01-02	GJM/ 6-5-02		JAK/ 6-10-03

Total Pages: 22

HALEY & ALDRICH

TABLE OF CONTENTS

OPERATING PROCEDURE: OP3012

LOW STRESS/LOW FLOW GROUNDWATER SAMPLE COLLECTION PROCEDURE

1. PURPOSE

This document describes procedures for collection of groundwater samples for laboratory analysis utilizing the "Low Stress/Low Flow Method". This method should be employed when it is critical to collect groundwater samples not impacted by over-purging, aeration, and sediment/colloid presence. Although the procedures described in this document are generally appropriate for obtaining groundwater samples as part of Monitored Natural Attenuation (MNA) programs, a more complete procedure for MNA programs is described in a separate document (Monitored Natural Attenuation Sample Collection Procedure).

The method described herein is most appropriate for wells that can accept a submersible pump and have a screened interval of ten feet or less. However, the procedure is flexible and can be modified for a variety of well construction and groundwater yield situations. The low-flow purging and sampling method is not appropriate for use in all hydrogeologic regimes, and certain groundwater monitoring well designs may make the method unsuitable (e.g. open hole and long screen monitoring wells in bedrock and stratified sand and clay where the water bearing zones have not been characterized).
This procedure does not address wells that contain Non-Aqueous Phase Liquids (NAPLs).

Note: The methods described in this document are provided for training use and general information. Depending upon regulatory agency and other project specific requirements, appropriate field procedures may differ from those described herein. These procedures should be confirmed with the Haley & Aldrich Project Manager prior to implementation.

1.1 BACKGROUND

Research conducted by Puls et al. (1992), Puls and Powell (1992), and Powell and Puls (1993) has shown that high-volume purging and sampling cause significant turbidity and suspended particulate artifacts that can result in an overestimation of certain analytes of interest (e.g., metals or hydrophobic organic compounds). Additionally, standard purging procedures can cause pressure changes and bailing can cause aeration that can strip volatile organic compounds from groundwater samples (Pennino, 1988) and provide misrepresentative data on aquifer conditions (such as dissolved oxygen and redox). Overpurging of a well can cause water to cascade down the well screen, causing undesirable aeration and volatilization.

The use of low-flow pumping devices for purging and sampling minimizes both the disturbance of water in well casing and the potential for mobilization of colloidal material (Barcelona et al., 1994). Low-flow purging with maintenance of water level in the well and stabilization of indicator parameters (especially turbidity) allows collection of groundwater samples that are more representative of conditions without filtering (U.S. EPA, 1993; Backhus et al., 1993). In many cases, use of a low-flow pump to purge and sample monitoring

wells decreases sampling time, reduces the need to handle large volumes of purge water and lowers the cost associated with its disposal, and may allow collection of samples for without filtering.

Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface that can be affected by flow regulators or restriction. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practicable taking into account established site sampling objectives (USEPA, Puls and Barcelona, April 1996).

2. EQUIPMENT & SUPPLIES

1. Adjustable rate, positive displacement pumps (e.g. low flow-rate submersible centrifugal or bladder pumps constructed of stainless steel or Teflon). The pump should be easily adjustable and capable of operating reliably at lower flow rates. An example is QED MicroPurge bladder pump (available for purchase or rental at US Environmental 781-899-6969, among others).

   Under most regulatory programs, peristaltic pumps may be used for collection of inorganic samples only – they are NOT appropriate for collection of VOCs. Bailers are inappropriate for use in this procedure. Waterra tubing purging and sampling is also not recommended for low-flow sampling by the USEPA.

2. Tubing: Tubing used in purging and sampling each well must be dedicated to the individual well. Once properly located, moving the pump in the well should be avoided. Consequently, the same tubing should be used for purging and sampling. The tubing wall thickness should be maximized (3/8 to ½ inch) and the tubing length should be minimized (i.e. do not have excess tubing outside of the well)

   - **Organic analysis**: Teflon or Teflon-lined polyethylene tubing must be used to collect samples.
   - **Inorganic analysis**: Teflon or Teflon lined polyethylene, PVC, Tygon or polyethylene tubing may be used to collect samples.

3. Polyethylene sheeting and sampling gloves.

4. Water level measuring device, 0.01 feet accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

5. Flow measurement supplies (e.g. graduated cylinder and stopwatch).

6. Interface probe, if needed.

7. Power source (e.g. generator, located downwind; nitrogen tank, etc). The generator should not be oversized for the pump.

8. In-line flow-through cell containing purge criteria parameter monitoring instruments for pH, turbidity, specific conductance, temperature, Eh and dissolved oxygen (DO). The in-line device should be bypassed or disconnected during sample collection. An example is the Horiba U-22 which is a flow-through cell that comes with probes capable of measuring pH, dissolved oxygen, conductivity, salinity, TDS, temperature, turbidity and oxidation-reduction potential. Available from Ashtead Technologies, 800.242.3910, www.ashtead-technology.com or Pine Environmental, 800-301-9663, www.pine-environmental.com, among others.

9. Photoionization detector (PID), or flame ionization detector (FID) or equivalent.

10. Nylon stay-ties

11. Decontamination supplies

12. Field book or well sampling form

13. Sample Bottles. It is recommended that preservatives be added to sample bottles prior to field activities to reduce potential error or introduction of contaminants.

14. Sample preservation supplies (as required by the analytical method; see previous item)

15. Sample tags or labels, and chain of custody.

16. Well construction data, location map, field data from last sampling event.

17. Sampling Plan or Work Plan

18. Health & Safety Plan

19. pH meter

20. Conductivity meter

21. Dissolved Oxygen (DO) meter

22. Oxidation -reduction (REDOX) reaction potential (ORP) meter

23. Nephlometer (turbidity)

24. Temperature gauge

25. Field test kits (such as Hach kits for measurement of dissolved iron (Fe^{+2}), carbon dioxide, and alkalinity). See the document "Monitored Natural Attenuation Groundwater Sample Collection Procedure" for specifications and ordering information for these types of kits.

26. Field filtration units (if required)

3. PROCEDURE

3.1 Sampling Preparatory Activities

Prior to entering the field there are several activities that should be conducted. The activities are as follows:

- Obtain and review a copy of the Sampling or Work Plan and Health & Safety Plan.
- Obtain and review previous groundwater sampling data (if available), previous water level measurements and well construction details (total depth and length of well screen).
- Locate a site map denoting the wells to be sampled.
- Obtain well wrenches, well keys and any other equipment needed to access the wells.
- Coordinate site access.
- Coordinate with laboratory to obtain sample bottles and necessary quality assurance samples.
- Perform an inventory of necessary purging, sampling, and field measurement equipment. Certain equipment may need to be purchased or rented for the sampling event. Check field measurement probes for proper calibration and ensure that the probes and kits are complete (i.e., contain calibration and analytical solutions) for the entire sampling event.

3.2 Preliminary Site Activities

Once on site the following activities should be conducted prior to beginning sampling.

- Verify well identification and location using borehole log details and location site map. Check the condition of the well and record any evidence of damage or need for repair in the field book or field sampling form. Following field activities inform the Project Manager of any necessary repair work required.
- Lay out sheet of clean polyethylene around the well for monitoring and sampling equipment.

- Prior to opening the well cap, measure the breathing space above the well casing with a PID or FID to establish baseline levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the health and safety plan, field personnel should adjust their PPE accordingly.

- If the well does not have a water level reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the field book or sampling form.

- Collect a round of synoptic water level measurements and well depth (in the shortest possible time) before any purging or sampling activities begin. Water levels and well depths should be measured and reported to 0.01 ft. The water levels should be obtained from the denoted reference point on the well.

- Water level and total depth measurements must be obtained to determine the well volume for hydraulic purposes. In some settings it maybe necessary to allow the water level time to equilibrate. This condition exists if a watertight seal exists at the well cap and the water level has fluctuated above the top of screen thereby creating a vacuum or pressurized area in this air space. Three water level checks will verify static water level conditions or changing conditions.

- Check newly constructed wells for the presence of light or dense aqueous phase liquids before sampling.

3.3 Sampling Procedure

It is preferable to sample the wells in order of increasing chemical concentrations (known or anticipated). The following describes the procedure for the low-flow purging and sampling method. Equipment calibration, logbook documentation, sample bottle filling and preservation, and shipping will be conducted in accordance with the site-specific Quality Assurance Project Plan (QAPjP). Personal protective equipment will be donned in accordance with the requirements of the site-specific Health and Safety Plan.

1. Attach and secure the polyethylene tubing to the low-flow pump. See the equipment and materials section for recommended pump types. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties. It is recommended that the pump be placed in the well 12 to (preferably) 48 hours prior to purging/sampling to minimize the effects of turbidity and mixing in the well from introducing the pump.

2. Pump, safety cable, tubing and electrical lines should be lowered slowly into the well to a depth corresponding to the center of the saturated screen section of the well, or at a location determined to either be a preferential flow path or zone where contamination is present. The pump intake should be kept above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well.

3. Before starting the pump, measure the water level again with the pump in the well. Start pumping water from the well at a rate of **100 to 500 milliliters per minute (mL/min) which correlates to 0.03**

to 0.13 gallons per minute. Avoid surging. Observe air bubbles displaced from discharge tube to assess progress of steady pumping until water arrives at the surface. The pumping rate should cause little or no water level drawdown in the well (less than 0.2 ft) and the water level should stabilize.

Water level measurements should be made every three to five minutes. Precautions should be taken to avoid pump suction loss or air entrainment. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and ensure stabilization of indicator parameters. If the recharge rate of the well is very low, purging should be interrupted so as not to cause the drawdown within the well to advance below the pump intake but the operator should attempt to maintain a steady flow rate with the pump to the extent practicable. Record adjustments made to the pumping rates and water levels immediately after each adjustment.

In low-yielding wells, where 100 mL/min exceeds the entrance rate of groundwater into the well, it is important to avoid dewatering the well screen interval and purging the well dry should be avoided to the extent possible. In these cases, the pump should remain in place and the water level should be allowed to recover repeatedly until there is sufficient volume in the well to permit collection of samples. Under these low-yield conditions, it may become difficult to maintain an adequate water volume in the flow-through cell described in the next step. An alternative means of sample collection may be necessary under these conditions and should be discussed with the Project Manager.

4. While purging the well, measurements of water quality indicator parameters utilizing an in-line flow-through cell (or similar equipment) should be collected every three to five minutes until all of the parameters have stabilized. See the Equipment and Materials section for recommendations. Stabilization is achieved when three successive readings are within the following tolerances noted in the table below.

Parameter	Stabilization Level (3 successive readings within)
Turbidity	+10% and final value between 5 and 10 NTU
Specific conductance	+3%
pH	±0.1
Dissolved oxygen (DO)	±10%
Redox potential (Eh)	±10mv

In general, the order of stabilization is pH, temperature and specific conductance, followed by redox potential, dissolved oxygen, and turbidity (USEPA, 1996). A minimum subset of these parameters that can be used to determine stabilization during purging in this procedure are pH, specific conductivity and turbidity or DO. Turbidity and DO are typically the last parameters to stabilize. If the parameters have stabilized, but the turbidity is not in the range of 10 NTU, then follow step 6. For informational purposes, the following table provides typical ranges of the various field parameters. Field data collected during purging and sampling should be compared against these values and, if substantial differences exist, the accuracy of the meter should be verified to rule out potential operational problems with the equipment.

Parameter	Typical Range of Values
Turbidity	10 – 500 NTU
Specific conductance	50 – 500 mS
pH	6 - 9
Dissolved oxygen (DO)	ND – 9 mg/L
Redox potential (Eh)	-250 - +400 mV

5. Once stabilization has been documented, go to step 8.

6. Should stabilization not be achieved for all field parameters (or turbidity only as described in Step 4), purging is continued until a maximum of 20 well screen volumes have been purged from the well. Since low-flow purging (LFP) likely will not draw groundwater from a significant distance above or below the pump intake, the screen volume is based upon a 5-foot (1.4 m) screen length. After purging 20 well screen volumes, purging is continued if the purge water remains visually turbid and appears to be clearing, or if stabilization parameters are varying slightly outside of the stabilization criteria listed above and appear to be approaching stabilization.

   - If low-turbidity samples are critical to the project goals, purging will be extended until turbidity has been reduced to 5 NTU or less.

   - The pump must not be removed from the well between purging and sampling.

7. If the turbidity measurements do not approach the range of that of natural groundwater (10 NTU), both filtered and unfiltered samples should be collected for analysis of compounds such as metals or hydrophobic compounds[1]. Filtered metal samples are to be collected with an in-line filter. A high capacity, in-line 0.45 micron particulate filter must be pre-rinsed according to the manufacturers recommendations, or with approximately 1 liter of groundwater following purging and prior to sampling. After the sample is filtered it must be preserved immediately.

8. Collect groundwater samples. All sample containers should be filled by allowing the pump discharge to gently flow down inside the container with minimal turbulence. The flow-through cell, or similar equipment, should be bypassed during sampling. As each sample bottle is collected, the bottle should be labeled with the following information then place into a cooler with the proper temperature control.

   - Sample number/ID
   - Date and time
   - Parameters to be analyzed
   - Project Reference ID
   - Samplers initials

[1] Filtering of samples for analysis is a project-specific requirement and should be confirmed with the Project Manager prior to filtration.

After collection of the samples, the tubing from the pump should be properly discarded or dedicated to the well for re-sampling (by hanging the tubing inside the well). Avoid handling the interior of the bottle or bottle cap and don new gloves for each well sampled to avoid contamination of the sample.

VOC and gas sensitive (e.g. Fe^{+2}, CH_4, H_2S/HS) parameter samples should be collected first. Refer the project sampling and analysis plan to determine which analytes will be measured in the field (wellhead) and which will be submitted to a fixed-base laboratory. The order of sample collection is as follows:

1. Volatile organic compounds
2. Gas sensitive parameters (e.g. Fe^{+2}, CH_4, H_2S/HS)
3. Semi-volatile organic compounds
4. Total organic carbon (TOC)
5. Total organic halogens (TOX)
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide
11. Sulfate and chloride
12. Nitrate and ammonia
13. Radionuclides

*Note: **The pumping rate used to collect a sample for VOCs should not exceed 100 mL/min.** Samples should be transferred directly to the final container 40 mL glass vials completely full and topped with a Teflon cap. Once capped the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present the sample vial will be discarded, and re-collected until free of air. Field filtration will be performed if dictated by the project Work Plan.*

9. Measure and record final water level and well depth.

10. Secure the well (close and lock).

3.4 Decontamination

Decontaminate sampling equipment prior to use in the first well and following sampling of each subsequent well. Pumps will not be removed from well between purging and sampling operations. The pump and tubing (including support cable and electrical wires that are in contact with the well) will be decontaminated by one of the procedures listed below.

3.4.1 Procedure 1

Decontamination solutions can be pumped from buckets through the pump, or the pump can be disassembled and flushed with the decontamination solutions. It is recommended that the detergent

and isopropyl alcohol be used sparingly in the decontamination process and that water-flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

1. Flush the equipment/pump with potable water.

2. Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

3. Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

4. Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event shows that the level of contamination is low, then this step may be skipped.

5. Flush with distilled/deionized water. The final water rinse must not be recycled.

6. Decontaminate the in-line flow-through cell and other sampling equipment with similar procedures, as appropriate.

3.4.2 Procedure 2

1. Steam clean the outside of the submersible pump.

2. Pump hot potable water from the steam cleaner through the outside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

3. Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

4. Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.
5. Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

6. Decontaminate the in-line flow-through cell and other sampling equipment with appropriate procedures.

3.5 Field Documentation

Field notes must document all the events, equipment used, and measurements collected during the sampling activities. The logbook or sampling form (see Appendix C Forms) should document the following for each well sampled:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Sounded well depth
- Presence of immiscible layers and detection/collection method
- Well yield - high or low
- Purge volume and pumping rate
- Time well purged
- Measured field parameters - record measurements obtained every 3-5 minutes to monitor for stabilization, see attached example record log.
- Purge/sampling device used
- Well sampling sequence
- Sampling appearance
- Sample odors
- Sample volume
- Types of sample containers and sample identification
- Preservative(s) used
- Parameters requested for analysis
- Field analysis data and method(s)
- Sample distribution and transporter

- Laboratory shipped to
- Chain of custody number for shipment to laboratory
- Field observations on sampling event
- Name collector(s)
- Climatic conditions including air temperature
- Problems encountered and any deviations made from the established sampling protocol.

3.6 Groundwater/Decontamination Fluid Disposal

Groundwater disposal methods will vary on a case-by-case basis and field personnel should consult the Project Manager for site-specific requirements. Disposal options may include:

- Off-site treatment at private treatment/disposal facilities or public owned treatment facilities.
- On-site treatment at Facility operated facilities.
- Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime.
- Direct discharge to impervious pavement surfaces, allowing evaporation to occur
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers. Often small volumes of solvents used during the day can be allowed to evaporate if left in an open pail. In the event evaporation is not possible or practical, off-site disposal arrangements must be made.

APPENDIX A
REFERENCES

- USEPA Low-flow (minimal drawdown) groundwater sampling procedures (EPA/540/S-95/504), April 1996.
- USEPA Ground-Water Sampling-A Workshop Summary, Dallas, Texas, November 30 - December 2, 1993. EPA/600/R-94/205.
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- USEPA Region 3. 1997. Recommended Procedure for Low-Flow Purging and Sampling of Groundwater Monitoring Wells. Waste and Chemicals Management Division - Low Flow Sampling. Bulletin No. QAD023.
- USEPA Region 1. 1996. Low Stress (Low Flow) Purging and Sampling for the Collection of Groundwater Samples from Monitoring Wells. SOP #: GW 001. Revision 2. pp.13.
- USEPA Region 2. 1998. Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling. GW Sampling SOP, Final.

APPENDIX B
RELATED HALEY & ALDRICH PROCEDURES

- OP3000 General Environmental Field Procedures and Protocol
- OP3001 Preservation and Shipment of Environmental Samples
- OP3008 Manual Water Level Measurement Procedure
- OP3009 Monitoring Well Development Procedure
- OP3010 Groundwater Quality Sampling Procedure
- OP3013 Monitored Natural Attenuation Groundwater Sample Collection Procedure
- OP3014 NAPL Monitoring and Sampling Procedure

APPENDIX C
FORMS

- Form 3001 Sampling Labels (Environmental)
- Form 3003 Chain of Custody
- Form 3004 Sampling Record
- Form 3005 Groundwater Sampling Record
- Form 3006 Monitoring Well Development Report

OPERATING PROCEDURE: OP 3032

COLLECTION OF ENVIRONMENTAL SAMPLES FOR THE ANALYSIS OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
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2				J. Scott/04-2020	D. Conley/04-2020
3					D. Conley/01-2021
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Total Pages: 15

HALEY ALDRICH

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LIST OF TABLES

Version Date: Feb. 2024

1. INTRODUCTION

This Haley & Aldrich, Inc. (Haley & Aldrich) Operating Procedure 3032: Collection of Environmental Samples for the Analysis of Per- and Polyfluoroalkyl Substances (PFAS; Procedure) provides guidance for the collection of environmental samples for the analysis of PFAS in accordance with the current state-of-the-science and various state and federal guidance documents.

This Procedure includes guidance for the collection of surface and subsurface soils, sediment, surface water, groundwater, porewater, and drinking water.

The sampling team must review this Procedure in its entirety prior to collecting samples for PFAS. In addition, all project staff should review the applicable State guidance documents to ensure compliance with the most recent guidance provided by regulatory authorities and the current standard of practice.

Note that the health and safety of Haley & Aldrich staff and any other staff on site always supersedes the need to avoid the potential for cross-contamination of samples. Please consult with Corporate and/or Local Health & Safety Coordinators for guidance on proper personal protective equipment (PPE). Staff are expected to avoid unacceptable items in the sampling area to the extent practicable but may make exceptions if needed to maintain appropriate health and safety protections. For example, if samples are collected during inclement weather, field staff should don appropriate and available water-resistant rain gear, even though it may contain PFAS. For sampling events where PPE or other items that may result in cross-contamination cannot be avoided, deviations from this Procedure should be documented in the field notes and Daily Field Report (DFR). Extreme care must be taken to ensure PPE will not come in direct contact with samples and additional field blanks (FB) may be collected to evaluate the potential for PFAS cross-contamination introduced by field clothing or PPE (see Section 4 for guidance on collecting Quality Assurance/Quality Control [QA/QC] samples).

2. FIELD SAMPLING GUIDELINES

Note: Requirements may vary by state; consult individual state procedures and PFAS sampling guidance prior to sampling event.

Table 1 indicates which materials are generally considered acceptable for PFAS sampling and which materials are generally considered prohibited. Table 1 should be used as a general guide for selecting appropriate sample materials. It is not guaranteed that using "allowable" materials will prevent cross-contamination as manufacturing processes, locations, and lots may vary. Materials that directly contact samples and materials that do not directly contact samples should be evaluated separately and with different levels of scrutiny.

The following guidelines apply to materials that will come in direct contact with samples (such as tubing or sample bottles):

- Appropriate sample bottles must be ordered from the analytical laboratory and lot-certified to be PFAS free.
- Table 1 must be consulted to determine which materials of construction are generally considered acceptable for PFAS sampling.

- Information regarding the materials of construction should be obtained from the manufacturer to document that the materials are PFAS-free. Perform an evaluation based on the stated materials of construction rather than basing the evaluation on broad statements made by the manufacturer.
- When feasible, use single-use, disposable equipment constructed from acceptable material as indicated in Table 1 for purging and sampling.
- For single-use, disposable equipment or dedicated, reusable equipment constructed from acceptable material indicated in Table 1, collect at least one equipment blank (EB) according to Section 4 prior to beginning a sampling event to document that the equipment was PFAS-free prior to use.
- When reuse of materials or sampling equipment across sampling locations is necessary, follow decontamination procedures in Section 2.2. Collect at least one EB per day according to Section 4 after decontaminated equipment to document that the equipment was decontaminated effectively.

The following guidelines apply to materials that may be used in the sampling vicinity that do not directly contact samples (such as writing instruments, field notebooks, field clothing, PPE, personal care products, or food packaging):

- Table 1 must be consulted to determine which materials of construction are generally considered acceptable for PFAS sampling.
- Obtain information from the manufacturer on whether the materials are PFAS-free, as needed.
- Implement a QA/QC program with a sufficient number of FB samples to determine if materials used in the sampling vicinity could have introduced PFAS into samples (See Section 4).
- Limit the use of materials in the sampling area that cannot be documented as PFAS-free; these materials must only be handled in a staging area separate from the sampling location and must not be used in proximity to the sample collection area.
- If writing instruments cannot be confirmed to be PFAS-free, sample containers must be labeled in the staging area.
- Application of personal care products (PCPs), handling of food packaging, and consumption of food or beverages may occur in the staging area, as needed.
- Field staff must not wear sampling PPE while applying PCPs, handling food packaging, or eating or drinking. Hands should be washed thoroughly after applying PCPs or handling food packaging.
- PPE that is not listed in the “allowable” column may be used as necessary to protect the health and safety of field staff. Use of PPE listed in the “items to avoid” column should be documented in the field notes and Daily Field Report (DFR). Extreme care must be taken to ensure PPE will not come in direct contact with samples and additional field blanks (FB) may be collected to evaluate the potential for PFAS cross-contamination introduced by field clothing or PPE.

Table 1. List of Acceptable Items and Items to Avoid in Immediate Proximity to Sample Collection Area

Category	Acceptable items	Items to avoid
PPE	• Half or Full-Face Air Purifying Respirators (as needed) • ANSI A2 Cut-Resistant Gloves • New, disposable, non-powdered nitrile gloves • PVC and leather steel-toe safety boots • Insect repellants that are labeled "PFAS free" (see: EGLE Quick Reference Guide for Allowable Products) • Sunscreens that are labeled "PFAS free" (see: EGLE Quick Reference Guide for Allowable Products)	• Latex gloves • Sunscreen that contains PFAS[1] • Insect repellant that contains PFAS[1] • Tyvek®[1]
Pumps, Tubing, and Sampling Equipment	• HDPE or polypropylene materials (i.e., tubing, bailers, and Hydrasleeves™) • Silicone tubing • Peristaltic pump or stainless-steel submersible pump – Acetate liners – Other stainless-steel equipment – LDPE (e.g., Ziploc bags) may contain pfas due to cross-contamination during the manufacturing process. LDPE bags may be used for bagging sample containers or ice, provided that the bags do not come in direct contact with samples.	• PTFE (Teflon® or Hostaflon®; e.g., Teflon® fittings or tubing) • PVDF (Kynar®) • PCTFE (Neoflon®) • ETFE (Tefzel®) • FEP • Any fluoropolymers
Decontamination	• Deionized and PFAS-free water from an analytical laboratory or certified source • Alconox®, Liquinox®, or Citrinox® • Standard paper towels (not from recycled paper products)	• Decon 90® detergent • Recycled paper products (e.g., post-consumer paper towels)
Sample Storage and Preservation	• HDPE or polypropylene materials • Regular ice (double-bagged using individual sealed plastic bags (Ziploc®) • Glass containers may be used provided that the samples are not stored in glass for longer periods of time, due to the potential for PFAS to adsorb to the glass surface	• Chemical freezer packs (blue ice®) • Glass containers • PTFE (Teflon® or Hostaflon®; e.g., Teflon-lined lids) • PVDF (Kynar®) • PCTFE (Neoflon®) • ETFE (Tefzel®) • FEP • PFA tubing
Field documentation	• Fine-tip sharpies® • Ball-point pens • Metal or Masonite field clipboards • Mon-recycled standard printer paper, or uncoated notebooks	• Regular/thick tip sharpies® • Waterproof notebooks or treated paper (e.g., rite in rain®) • Post-it notes® or other adhesive paper products • Plastic clipboards or binders • Recycled paper products (e.g., notebook paper)

Table 1. List of Acceptable Items and Items to Avoid in Immediate Proximity to Sample Collection Area

Category	Acceptable items	Items to avoid
Clothing	• Well-laundered (washed six or more times) natural fiber (e.g., cotton) or synthetic fiber (e.g., polyester) clothing	• Synthetic water/stain/dirt-resistant treated clothing (E.G., Gore-Tex®, Scotchgard™, Ruco®)[1] • Flame-resistant clothing (Nomex)[1], • New or unwashed clothing or clothing laundered with fabric softener • Tyvek®[1]
PCP (on day of sample collection)	• PFAS-free cosmetics	• Any cosmetics, nail polish, fluoride mouth wash/toothpaste, moisturizers, shaving cream, shampoo, or conditioners that are not certified PFAS-free. Items may be used outside of the immediate sampling vicinity, with appropriate precautions.
Food and beverage	• Bottled drinking water and hydration fluids (e.g., Gatorade® and Powerade®) allowed only outside of exclusion zone	• Paper plates, pre-packaged food, food containers, or wrappers • Glass containers • Aluminum foil

Notes:

[1] Items may be used if necessary for health and safety of staff. Use of these items should be recorded in field notes, care should be taken to ensure items do not come into direct contact with samples, and extra blank samples should be collected to control for potential cross-contamination.

ETFE = Ethylene-tetrafluoroethylene
FEP = fluorinated ethylene propylene
HDPE = high-density polyethylene
LDPE =low-density polyethylene
PCP = personal care products
PCTFE = Polychlorotrifluoroethylene
PFA = perfluoroalkoxy alkanes
PPE = personal protective equipment
PTFE = Polytetrafluoroethylene
PVC = Poly vinyl chloride
PVDF = Polyvinylidene fluoride

2.1 Sampling Procedure

Collect PFAS samples first before collecting samples for any other parameters to prevent contact with other sample containers, bottles, or packing materials. The following represents a general PFAS sampling approach:

1. Samples must be collected in laboratory-supplied polypropylene or high-density polyethylene (HDPE) bottles with liner-less polypropylene or HDPE screw caps.
2. PFAS-free deionized (DI) water should be purchased from the laboratory for equipment decontamination and handwashing during sampling events.
3. Collect QA/QC samples according to the guidance in Section 4.
4. Wash hands thoroughly prior to sample collection, rinse hands with PFAS-free DI water, and don powderless nitrile gloves prior to collecting samples, handling sample containers, or handling sampling equipment. New, disposable, powderless nitrile gloves must be used at each sampling location. Do not touch the sample containers or any sampling equipment with

ungloved hands. Sample containers should not be placed on the ground surface or clothing/cloth surfaces, wrapped with aluminum foil, or placed within plastic bags not provided by the laboratory.

5. DO NOT overfill bottles to the point of overflowing. Allow room for expansion if the samples are frozen.
6. Seal the coolers with custody tape and submit all samples with a completed Chain of Custody (COC) for receipt within 48 hours of the time that the first sample was collected. Ensure that enough double-bagged ice is present to meet temperature requirements according to the method (see Table 2). More double-bagged ice should be added if samples are held for more than 24 hours. Bagged block ice is also recommended and can be used to limit melting.

2.1.1 Aqueous Media – Groundwater/Surface Water/Porewater/Stormwater/Landfill Leachate

If dedicated sampling equipment has been installed within existing wells, the equipment should be removed and inspected for components that could contain PFAS (e.g., Teflon® tubing or bailers, and/or pumps with Teflon® or Viton® O-rings or seals). If found, this equipment should be removed and the well re-developed to remove potentially PFAS-contaminated water. If new, dedicated tubing is to be installed, tubing should be collected from the list of "allowable" materials provided in Table 1. At least one equipment blank should be collected from a section of tubing to document that the material is PFAS-free, regardless of the materials of construction. No preservative is used for aqueous environmental samples. Note that composite samples are not recommended.

Aqueous environmental samples may be obtained using one of the following techniques:

- Purging and sampling with dedicated polypropylene or HDPE bailers and PFAS-free polypropylene rope.
- Low flow-low stress sampling using a PFAS-free submersible bladder pump equipped with polypropylene or HDPE bladder and tubing with stainless steel or PFAS-free O-rings and seals. Examples include the QED Sample Pro® pump or Geotech Low Flow Bladder. Consult the Haley & Aldrich Low-Flow Groundwater Sampling Guide available on the Haley & Aldrich Field Services Intranet Directory.
- Hydrasleeve™ grab sampling using PFAS-free sleeves constructed with HDPE liners and polypropylene rope (the Hydrasleeve™ brand tether is NOT recommended).
- Peristaltic pump sampling (for sample collection at depths of less than 25 feet below ground surface) using HDPE or polypropylene tubing interfaced with flexible silicone tubing at the pump head.

2.1.2 Aqueous Media – Drinking Water/Residential Well Sampling

Drinking water and residential well samples may be obtained by purging the sampling location (i.e., tap or spigot) for a minimum of 20 minutes prior to sample collection. FB samples are required for each sample set, defined as samples collected from the same site per U.S. Environmental Protection Agency (USEPA) Method 537.1 and Method 533.

Aqueous drinking water samples may be obtained using the following procedures:

- Consult the sampling guidance and acceptable materials listed above for approved fittings, tubing, or connection pieces, as applicable.
- If the sample bottle is pre-preserved with Trizma® or ammonium acetate, fill to the bottom of the neck of the bottle to make sure that the preservative is not lost.
- For preserved drinking water samples, invert the securely capped container five times to distribute the preservative. Place samples in bags provided by the laboratory and place in a sample cooler containing only PFAS samples with double-bagged ice to preserve all samples to the required temperature as indicated in Table 2.

2.1.3 Solid Matrices Soil/Sediment

Soil sediment coring and grab sampling devices must be constructed of stainless steel and may include an HDPE sleeve or acetate liner (when sampling with a Geoprobe®) inserted in the core barrel to retain the sample. If PPE such as waders are required to access the sampling location, confirm whether these materials contain water-resistant coatings (i.e., Gore-Tex®) that may contain PFAS. If PFAS-free PPE cannot be avoided, deviations from this Procedure should be documented in field notes and DFRs. Extreme care must be taken to ensure PPE will not come in direct contact with samples and additional field blanks (FB) may be collected to evaluate the potential for PFAS cross-contamination introduced by field clothing or PPE.

Samples to be composited must be placed in a pre-washed stainless-steel bowl, mixed with pre-washed stainless-steel or polyvinyl chloride (PVC)/HDPE utensils, and transferred directly to the appropriate sample containers.

If drilling equipment is used to collect soil samples, field staff must confirm with the drilling subcontractor prior to mobilization that PFAS-free hydraulic fluids are used.

2.1.4 Waste Characterization Sampling

PFAS should be considered as possible constituents of concern during sampling for waste disposal characterization in accordance with state and federal regulations and guidance, and disposal facility requirements. Sampling protocol should be consistent with investigation sampling procedures described above.

2.2 Decontamination Procedures

Any non-dedicated field sampling equipment used must be decontaminated between sampling locations using PFAS-free water for the final rinse of the decontaminated equipment. Potable water sources should be analyzed for PFAS (prior to mobilization, if possible). The decontamination procedure should include the following steps:

1. Remove loose soils and particulate matter, if applicable.
2. Brush using a polypropylene brush with potable water and Alconox® or Liquinox® soap.
3. Rinse with potable water.
4. Rinse a final time with PFAS-free water.

Decontaminate larger equipment (hollow-stem augers and Geoprobe® soil sampling tooling) with potable water using a high-pressure washer or steam with a final rinse of equipment parts that are in direct contact with samples using PFAS-free water.

3. LABORATORY ANALYSIS PROCEDURES

The following guidelines may be used to select an appropriate analytical method and laboratory for targeted PFAS analysis (i.e., analyzing for known PFAS with a defined analyte list) using standard methods. Analyte lists and CAS numbers for the three most used standard analytical methods (USEPA 1633, USEPA 533, and USEPA 537.1) are summarized in Table 2. Note that Sample bottles, preservation, and holding time criteria for commonly used standard analytical methods are summarized in Table 2. Non-specific methods (e.g., total organic fluorine or total oxidizable precursor) and/or non-targeted methods (e.g., suspect screening or non-targeted analysis) may also be desired, depending on the project objectives. Contact a member of the Haley & Aldrich PFAS team for guidance on selecting non-standard, non-specific, or non-targeted methods.

Table 2. Analyte Lists and CAS Numbers for Standard PFAS Analytical Methods

Analyte	CAS Number	USEPA 533	USEPA 537.1	USEPA 1633
Perfluorobutanoic acid (PFBA)	375-22-4	X		X
Perfluoropentanoic acid (PFPeA)	2706-90-3	X		X
Perfluorohexanoic acid (PFHxA)	307-24-4	X	X	X
Perfluoroheptanoic acid (PFHpA)	375-85-9	X	X	X
Perfluorooctanoic acid (PFOA)	335-67-1	X	X	X
Perfluorononanoic acid (PFNA)	375-95-1	X	X	X
Perfluorodecanoic acid (PFDA)	335-76-2	X	X	X
Perfluoroundecanoic acid (PFUnA)	2058-94-8	X	X	X
Perfluorododecanoic acid (PFDoA)	307-55-1	X	X	X
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8		X	X
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	X		X
Perfluoro-3-methoxypropanoic acid (PFMPA)	377-73-1	X		X
Perfluoro-4-methoxybutanoic acid (PFMBA)	863090-89-5	X		X
Perfluorotetradecanoic acid (PFTeDA)	376-06-7		X	X
Perfluorobutanesulfonic acid (PFBS)	375-73-5	X	X	X
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	X		X
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	X	X	X
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	X		X
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	X	X	X
Perfluorononanesulfonic acid (PFNS)	68259-12-1			X
Perfluorodecanesulfonic acid (PFDS)	335-77-3			X
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5			X
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	113507-82-7	X		X
Perfluorooctanesulfonamide (PFOSA)	754-91-6			X
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9		X	X
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6		X	X
1H, 1H, 2H, 2H-Perfluorohexane sulfonic acid (4:2FTS)	757124-72-4	X		X
1H, 1H, 2H, 2H-Perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	X		X

Table 2. Analyte Lists and CAS Numbers for Standard PFAS Analytical Methods

Analyte	CAS Number	USEPA 533	USEPA 537.1	USEPA 1633
1H, 1H, 2H, 2H-Perfluorodecane sulfonic acid (8:2FTS)	39108-34-4	X		X
N-Methyl perfluorooctane sulfonamidoethanol (NMeFOSE)	24448-09-7			X
N-Ethyl perfluorooctane sulfonamidoethanol (NEtFOSE)	1691-99-2			X
N-Methyl perfluorooctane sulfonamide (NMeFOSA)	31506-32-8			X
N-Ethyl perfluorooctane sulfonamide (NEtFOSA)	4151-50-2			X
3-perfluoroheptyl propanoic acid (7:3FTCA)	812-70-4			X
Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6	X	X	X
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	X	X	X
11-Chloroeicosafluoro-3-oxaundecane-1- sulfonic acid (11Cl- PF3OUdS)	763051-92-9	X	X	X
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	X	X	X
3-Perfluoropropyl propanoic acid (3:3FTCA)	356-02-5			X
2H, 2H, 3H, 3H-Perfluorooctanoic acid (5:3FTCA)	914637-49-3			X

Table 3. Sample Bottles, Preservation, and Holding Time Criteria for Standard PFAS Analytical Methods

Method	Matrix	Sample Bottles and Sample Volume	Preservation	Holding Time
USEPA Method 537.1	Finished drinking water	250-mL polypropylene bottle with polypropylene cap	Trizma® 5 g/L. Samples must not exceed 10°C during the first 48 hours after collection. Sample temperature must be below 10°C upon receipt by the laboratory. Samples must be stored below 6°C by the laboratory until extraction. Samples must not be frozen.	14 days extraction/ 28 days analysis
USEPA Method 533	Finished drinking water	100- to 250-mL polypropylene or polyethylene bottles with polypropylene screw-on caps. Contact laboratory for sample volume guidance.	Sufficient solid ammonium acetate to achieve a 1 g/L concentration in solution (dependent on sample volume). Samples are valid if any ice remains in the cooler when it is received at the laboratory or if bottles are received within two days of collection and below 10°C. Samples must not be frozen.	28 days extraction/ 28 days analysis

Table 3. Sample Bottles, Preservation, and Holding Time Criteria for Standard PFAS Analytical Methods

Method	Matrix	Sample Bottles and Sample Volume	Preservation	Holding Time
USEPA Method 1633	Surface water, groundwater, wastewater, stormwater, landfill leachate, soil, sediment, biosolids, tissues	For aqueous sources other than leachates: 2x 500-mL HDPE with liner-less HDPE or polypropylene caps plus 1x 250-mL or 125-mL for pre-screening (three bottles total per sample) For landfill leachates: 3x 100-mL HDPE with liner-less HDPE or polypropylene caps (three bottles total per sample) For soil, sediment, or biosolids samples with more than 50 mg solids: Wide-mouth 500-mL HDPE jars with liner-less HDPE or polypropylene caps, fill no more than ¾ full For tissue samples: Wide-mouth 100-mL HDPE jars with liner-less HDPE or polypropylene caps. For sources that are known or expected to contain levels of target analytes above the calibration range: smaller sample sizes may be collected, provided that the volume analyzed is sufficient to meet any regulatory limits.	Protect from light from the time of collection until receipt at the laboratory. Ship with sufficient ice to maintain temperature below 6°C for at least 48 hours. Laboratory must confirm sample temperature is 0 to 6°C upon receipt.	For aqueous samples: Holding time is storage temperature dependent. 28 days extraction when stored at 0 to 6°C and protected from light. Note that issues have been observed with certain analytes (e.g., FOSEs and FOSAAs) after seven days. OR 90 days extraction when stored at ≤-20°C and protected from light. For solid samples: Holding time is storage temperature dependent. 90 days extraction if stored in the dark at either 0° to 6°C or ≤-20°C / 90 days analysis is stored in the dark at ≤0°C

3.1 "Method 537 Modified"

Environmental samples for PFAS have historically been analyzed using laboratory-specific, non-standard methods referred to by an umbrella term "Method 537 modified" or "537M." These methods and the QA/QC criteria vary from laboratory to laboratory. The USEPA recently published USEPA Method 1633, which was finalized in January 2024. Laboratory-specific methods referred to as "Method 537 modified" or "537M" should be avoided where possible to increase data defensibility and reproducibility, unless they are specifically requested or approved by the regulatory agency overseeing the project. In cases where PFAS samples are collected voluntarily, laboratory-specific methods should be avoided, unless expanded analyte lists (i.e., Eurofins' method for 72 analytes) are desired for forensic purposes.

3.2 Method 1633 for Environmental Samples

USEPA Method 1633 must be used for the analysis of aqueous or solid environmental samples (groundwater, surface water, stormwater, wastewater, sediment, soil, biosolids, and tissues) unless alternative methods are specifically requested or approved by the regulatory agency overseeing the project. USEPA Method 1633 is applicable to 40 analytes (see Table 2).

Note that there are additional QA/QC requirements for analytical laboratories when samples are collected from DOD sites or for DOD projects. In such cases, project teams must request laboratory analysis by "EPA Method 1633 in compliance with the Quality Systems Manual (QSM) Version 6.0 Table B-24."

3.3 Methods 533 and 537.1 for Finished Drinking Water

Two USEPA standard methods exist for analysis of finished (i.e., treated and/or chlorinated) drinking water. USEPA Method 537.1 is applicable for 18 analytes and USEPA Method 533 is applicable for 25 analytes (see Table 2). There are 14 analytes that can be analyzed by either method, 11 analytes that are unique to USEPA Method 533, and four analytes that are unique to USEPA Method 537.1. For the most comprehensive analysis (29 analytes), both methods must be used.

3.3 Laboratory Selection Guidance

To select an appropriate laboratory for PFAS analysis, the following criteria should be used:

- Verify the analytical method of analysis (e.g., USEPA 537.1, USEPA 533, USEPA 1633, compliant with DOD QSM 6.0).
- Verify laboratory accreditation for PFAS analysis (National Environmental Laboratory Accreditation Program [NELAP], DOD QSM, and/or State).
- Confirm the laboratory reporting limits and PFAS target compound list meet the project requirements and current state guidance/requirements.
- If applicable, request current QA/QC criteria for laboratory control samples (LCS), Matrix Spike and Matrix Spike Duplicate (MS/MSD), and surrogate compound recoveries to evaluate laboratory precision and accuracy performance.

4. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

The following sections provide a summary of the types of field QA/QC samples that may be collected for PFAS analysis along with a summary of the recommendations for QA/QC types and collection frequencies according to different methods and different federal and state guidelines.

4.1 Types of Field Quality Assurance/Quality Control Samples

The following sections describe the types of field QA/QC samples that may be collected for PFAS analysis. The frequency of field QA/QC sample collection according to different methods and different federal and state guidelines is provided in Section 4.2.

4.1.1 Field Duplicates

Field duplicates (FDs) are two field samples collected at the same time and in the same location. They are intended to represent the same population and are taken through all steps of the analytical procedure in an identical manner. These samples are used to assess precision of the entire data collection activity, including sampling, analysis, and site heterogeneity. FD samples are collected simultaneously or in immediate succession, using identical recovery techniques, and are treated in an identical manner during storage, transportation, and analysis. The samples may be either co-located samples or subsamples (replicates) of a single sample collection. The sample containers are assigned a unique identification number in the field. Specific locations should be designated for the collection of FD samples prior to the beginning of sample collection.

4.1.2 Equipment Blanks

An EB is a sample of laboratory-provided PFAS-free deionized water poured into, over, or pumped through a previously decontaminated sampling device, collected in a sample container, and transported to the laboratory for analysis. These may be called rinse blanks or rinsate blanks. EBs are used to assess contamination from materials that directly contact samples and to assess the effectiveness of equipment decontamination procedures. **It is best practice to include EBs in the field QA/QC program any time non-dedicated or non-disposable sample equipment is used or prior to the first use of dedicated sample equipment.**

4.1.3 Field Blanks

A FB, also known as a field reagent blank (FRB), consists of a sample container filled by the laboratory with PFAS-free deionized water and transported to the sampling site. For each FB shipped, one empty sample container must also be provided. At the sampling site, the sampler must open the shipped FB and pour the PFAS-free deionized water into the empty sample bottle provided by the laboratory, which will be sealed and labeled as the FB. The FB is shipped back to the laboratory along with the project samples and analyzed to ensure that PFAS were not introduced into the sample during collection/handling. FBs are required for analysis by standard drinking water methods USEPA 533 and USEPA 537 but are not required for analysis using other standard methods. **It is best practice to include one FB per day in the field QA/QC program.**

4.1.4 Trip Blanks

A trip blank (TB) consists of a sample container filled in the laboratory with PFAS-free deionized water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. TBs are not opened in the field. TBs are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. TBs are more typically used for analysis of volatile organic compounds and are not typically used for PFAS analysis; however, they may be required by certain state regulatory agency guidance documents.

4.1.5 Matrix Spikes/Matrix Spike Duplicates

MS and MSD samples are not required for standard drinking water analytical methods (USEPA 537.1 or USEPA 533) or for USEPA 1633 but may be required for specific projects and/or by applicable state regulatory agency guidance documents. Review the project-specific work plan and/or consult with the Project Manager to confirm project-specific requirements**.** MS/MSD is an aliquot of samples collected in the field and spiked in the laboratory with known concentrations of all target analytes. The spiking occurs in the laboratory before sample preparation and analysis. The MS/MSD analysis is used to evaluate the potential effects associated with the sample matrix. For aqueous MS/MSDs, additional bottles of the full sample volume must be collected for samples selected for MS/MSDs, and the laboratory will use those samples to prepare the appropriate MS/MSDs. For solid MS/MSDs, no additional sample volume is typically required.

4.2 Quality Assurance/Quality Control Requirements by Method and Location

The required type and frequency of QA/QC samples varies by method, by type of site, and by location. Staff should review Table 4 first to determine what the required QA/QC sample types and frequencies are for the selected analytical method. Then, Table 5 should be reviewed to determine if any additional QA/QC sample types or frequencies are required or recommended by state-specific guidelines. In cases where PFAS-containing PPE or field clothing cannot be avoided due to health and safety considerations, or in cases where significant atmospheric deposition of PFAS is possible (e.g., samples collected during periods of rain), additional QA/QC samples should be collected.

Table 4. Summary of Field QA/QC Requirements for Standard Methods

Method	Matrix	Location/Site Type	Field QA/QC Sample Requirements and Frequency
USEPA Method 533	Finished drinking water	General	One FB per sample set, defined as samples collected from the same site and at the same time. The same lot preservative must be used for FBs.
USEPA Method 537	Finished drinking water	General	One FB per sample set, defined as samples collected from the same site and at the same time. The same lot preservative must be used for FBs.
USEPA Method 1633	Solids or aqueous	General	None required – see Section 4.3
USEPA Method 1633 in compliance with DOD QSM v 6.0 Table B-24	Solids or aqueous	Specific requirements for DOD sites	One MS/MSD pair per 20 samples

Table 5. Summary of State-Specific Field QA/QC Requirements

State	Method	Matrix	Field QA/QC Sample Requirements and Frequency
California	Any	Any	• FDs recommended but not required; no specified frequency • One FB per sampling event • One EB per sample event • TBs not required

Table 5. Summary of State-Specific Field QA/QC Requirements

State	Method	Matrix	Field QA/QC Sample Requirements and Frequency
Michigan	Any	Any	• Field QC sample frequency for FDs, FBs, EBs, and MS/MSDs should be described in the project QAPP
New Hampshire	Any	Any	• One EB per 20 samples recommended • One FD per 20 samples recommended if more than 10 samples collected • One FB per 20 samples recommended
New York	USEPA Method 1633	Soil, sediments, solids	• One FD per 20 samples • One MS/MSD per 20 samples
		Groundwater and surface water	• One FD per 20 samples • One MS/MSD per 20 samples • One EB per day per site, minimum one EB per 20 samples
	USEPA Methods 533, 537.1	Drinking water	• One FD per 20 samples • One MS/MSD per 20 samples • One EB per day per site, one EB per 20 samples • One FB per 20 samples
Washington State	Any	Any	• One TB per cooler • One EB per day for each type of sampling equipment for each matrix • One FD per 10 samples • One FB per day

Notes:

This table is not an exhaustive list; other state-specific requirements may apply.

Sample types and frequencies listed are required unless noted otherwise.

QAPP = Quality Assurance Project Plan

4.3 QA/QC Recommendations

Tables 4 and 5 should be consulted to determine whether any method-specific or state-specific QA/QC requirements apply. In the absence of any method-specific or state-specific requirements (e.g., when using USEPA Method 1633 where state-specific requirements are not applicable), the following best practices are recommended to ensure that some measurements of precision, bias, and background contamination are included in the sampling program:

- One FD per 20 samples;
- One EB per day for each type of sampling equipment for each matrix; and
- One FB per day.

REFERENCES

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4. Haley & Aldrich, Inc., 2003. "Operating Procedure 3012 Low Stress/Low Flow Groundwater Sample Collection Procedure." June.
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6. Interstate Technology and Regulatory Council, 2018. "Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS)." March.
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10. New Hampshire Department of Environmental Services, 2022. Per – and Polyfluoroalkyl Substance (PFAS) Field Sample Collection Guidance for Waste Sites. September.
11. New Jersey Department of Environmental Protection, 2021 "PFNA/PFAS Sampling Information for Water Systems Performing Sample Collection Rev.1". November.
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Determination of Total and Dissolved Trace Elements in Liquids, Solids and Wastes (Inductively Coupled Plasma) EPA 200.7, 6010C and 6010D

Approvals (Signature/Date):

Randee Arrington Date	Terri Torres Date
Laboratory Manager	Quality Assurance Manager

Facility Distribution No. _____ **Distributed To:_____**

1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

This method has been established to provide guidance for the analysis of water, waste and soils for total, dissolved and total recoverable metals listed below. Criterion documented within this standard operating procedure (SOP) is in compliance with both NPDES and RCRA requirements. Current reporting limits for each analyte can be found in TALS.

Element	Symbol	CAS No.	ICP-1 Wavelength (nm)	ICP-2 Wavelength (nm)
Aluminum	Al	7429-90-5	308.215	308.215
Antimony	Sb	7440-36-0	206.833	206.838
Arsenic	As	7440-38-2	193.696	189.042
Barium	Ba	7440-39-3	493.409	493.409
Beryllium	Be	7440-41-7	313.042	313.042
Bismuth	Bi	7400-69-9	190.171	-
Boron	B	7440-42-8	249.678	-
Cadmium	Cd	7440-43-9	228.802	226.502
Calcium	Ca	7440-70-2	315.887	317.933
Chromium	Cr	7440-47-3	267.716	267.716
Cobalt	Co	7440-48-4	228.616	228.616
Copper	Cu	7440-50-8	324.754	324.754
Iron	Fe	7439-89-6	259.940	271.441
Lead	Pb	7439-92-1	220.353	220.353
Lithium	Li	7439-93-2	6703784	-
Magnesium	Mg	7439-95-4	279.079	279.079
Manganese	Mn	7439-96-5	257.610	257.610
Molybdenum	Mo	7439-97-6	202.030	-
Nickel	Ni	7440-02-0	231.604	231.604
Phosphorous	P	7723-14-0	178.287	-
Potassium	K	7440-09-7	766.491	766.491
Selenium	Se	7782-49-2	196.026	196.026
Silicon	Si	7440-21-3	251.611	-
Silver	Ag	7440-22-4	328.068	328.068
Sodium	Na	7440-23-5	588.995	330.231
Strontium	Sr	7440-24-6	460.733	-
Thallium	Tl	7440-28-0	190.864	190.864
Tin	Sn	7440-31-5	189.980	-
Titanium	Ti	7440-32-6	334.941	-
Vanadium	V	7440-62-2	292.402	292.402
Zinc	Zn	7440-66-6	213.856	206.200

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in the Quality Assurance Manual.

The sample preparation procedures associated with this technique are summarized in the table below.

Matrix	Tests	Preparation Method	SOP
Aqueous	Total Recoverable & Dissolved Metals	EPA 3005A, EPA 3010A, EPA 200.7	SP-MTL-004
Soil and Waste	Total Recoverable Metals	EPA 3050B	SP-MTL-006

2.0 Summary of Method

Emission spectroscopy is the measurement of specific wavelengths of light that are characteristic of specific elements. These elements are carried by argon and are transformed into an aerosol and ionized by inductively coupled plasma. The energy from the plasma excites the electrons within the orbital shells of the elements. In order to reach their previously stable state, the elements release the absorbed energy at a specific wavelength. This light is filtered by a spectrometer that has been set up to detect this specific wavelength of light characteristic to the target element.

Samples are prepared by one of several procedures to produce a digestate or prepared sample for analysis. The prepared sample is introduced into the ICP-OES as an aerosol produced by a nebulizer. Raw data from the instrumental analysis is subjected to reduction and review in compliance with the procedures outlined within this SOP.

3.0 Definitions

3.1 ICP-OES: Inductively Coupled Plasma Optical Emission Spectrometer

3.2 Batch: A blank, laboratory control sample (LCS), matrix spike, sample duplicate and matrix spike duplicate are analyzed with each preparation batch or at a 5% frequency, whichever is greater. For Method 200.7 a matrix spike is analyzed at a 10% frequency (a MSD is not an acceptable substitute for another MS).

3.3 Dissolved metals: Solubilized metals in an aqueous acid medium that will pass through a 0.45 µm membrane filter when filtered.

3.4 Suspended metals: Unsolubilized metal particulates in a liquid medium that will not pass through a 0.45 µm membrane filter when filtered.

3.5 Total metals: The concentration determined from an unfiltered sample following vigorous digestion, or the sum of the dissolved plus suspended concentrations.

3.6 Total Recoverable metals: The concentration determined from an unfiltered sample following treatment with hot, dilute nitric and hydrochloric acids.

3.7 Instrumental detection limit: The concentration equivalent to a signal, due to the analyte, which is equal to three times the standard deviation of a series of ten replicate measurements of a reagent blank signal at the same wavelength.

3.8 Method Reporting Limit/Low Limit of Quantification (MRL/LLOQ): The minimum concentration of analyte required to report a non zero value.

3.9 Sensitivity: The slope of the analytical curve, i.e. the functional relationship between emission intensity and concentration.

3.10 Interference Check Sample (ICS-A+B): A solution containing both interfering and analyte elements of known concentrations that can be used to verify background and inter-element correction factors.

3.11 Quality Control Sample/ Initial Calibration Verification (QCS/ICV) – A solution obtained from an outside source having known concentration values to be used to verify the calibration standards.

3.12 Calibration Standards: A series of known standard solutions used by the analyst for calibration of the instrument.

3.13 Continuing Calibration Verification (CCV) or Instrument Performance Check (IPC) Solution: A solution having known concentration values to be used to verify the calibration standards and made from the same source as the calibration standards.

3.14 Linear Dynamic Range (LDR): The concentration range over which the analytical curve remains linear.

3.15 Method/Reagent blank(MB): An analyte-free matrix (DI water for a batch of aqueous samples or boiling chips for a batch of soil samples) to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analysis. The method blank is used to assess contamination resulting from the analytical process.

3.16 Calibration Blank: A volume of deionized distilled water acidified with HNO3 and HCl.

3.17 Method of Standard Addition – The standard addition technique which involves the use of the unknown and the unknown plus a known amount of standard.

3.18 Sample Duplicate (DUP):Two second aliquot of a given sample taken in the laboratory and analyzed separately with the same procedures. The duplicate indicates precision associated with the lab procedure itself.

3.19 Laboratory Control Sample (LCS): The LCS is prepared by adding a known amount of target analytes to an analyte free matrix (DI water for a batch of aqueous samples). Reagents are added in the same volumes or proportions as used in sample processing. The LCS is carried through the complete sample preparation and analysis to assess laboratory performance or accuracy.

3.20 Matrix Spike/Matrix Spike Duplicate (MS/MSD): An aliquot of an environmental sample to which known quantities of the method analytes are added. Its purpose is to determine whether the sample matrix contributes bias to the analytical results. The matrix spike (MS) and matrix spike duplicate (MSD) are prepared by adding a known amount of target analytes to two separate aliquots of sample. Reagents are added in the same volumes or proportions as used in sample processing. The MS and MSD are carried through the complete sample preparation and analysis process to assess the bias and precision of a method in a given sample matrix.

3.21 Post Digestion Spike (PDS): The same sample from which the MS/MSD is prepared should be spiked with a post-digestion spike. An analyte spike is added to a portion of a prepared sample or its dilution, and should be recovered to within 80-120% of its known value. The spike addition should be within 10-100X the MDL. If the post-digestion spike test fails, the dilution test should be run on the sample. If both the MS/MSD and post-digestion spike test fail, matrix effects on sample results are confirmed.

3.22 Dilution test (SD): If analyte concentration is sufficiently high, a 5X dilution of the sample should agree within 20% of the original determination, otherwise interference should be suspected.

3.23 Spectral Interference Check (SIC) Solution(ICS-A): A solution of selected method analytes of higher concentrations which is used to evaluate the procedural routine for correcting known inter-element spectral interferences with respect to a defined set of method criteria.

3.24 Internal Standards: Compounds used in the quantitation of target analytes. The compound used as an internal standard is Yttrium.

3.25 Linear Range Check (LRC): A sample containing an amount of analyte above the highest calibration point and either at or below the upper linear range point.

4.0 Interferences

4.1 Spectral Interference: Spectral Lines are selected for their sensitivity and selectivity in the detection of target elements. Optimally chosen spectral lines will be sensitive to the emissions of an individual element. However, most spectral lines have varies sensitivity for a selected group of elements. (For example: Spectral line 308.215nm is sensitive for Aluminum emissions but also for Manganese, Vanadium and Calcium to a lesser degree. Thus if there are large concentration of these latter three elements, there may be a false positive for Aluminum. A solution is to determine Al by using a less sensitive but less interfered with spectral line (396.152nm). To correct for this:

4.2 Apply interelement correction factors (IEC) to the experimentally determined concentrations of affected target analytes. An IEC is determined by analyzing a pure solution of the interfering element. The false concentration caused by an interfering element at a specific concentration on a specific wavelength (analyte) is divided by the concentration of the interfering element present in the solution. The check performed to detect this interference is the interference check standard. IECs must be evaluated within the linear range of the instrument. Whether or not an analyte is reported, it must be analyzed within the linear range of the instrument so that its influence on other elements is properly corrected by the IEC.

4.3 Matrix Matching: Samples and standards should be as closely matched as possible in terms of acid content and concentration. Standards for analysis of soil and sediment sample should contain 10% Hydrochloric and 5% Nitric acid in order to match the matrix of the digestates. If the instrument is set up for analysis using Internal Standards, matrix matching is still necessary, but not as critical.

4.4 Physical Interferences: Effects associated with the sample nebulization and transport process. Inaccuracies can be caused by changes in viscosity and surface tension. These can be reduced by high-solids nebulizer, diluting sample, or peristaltic pump.

4.5 Chemical Interferences: These include molecular-compound formation, ionization effects, and solute-vaporization effects. Although not usually a problem with the ICP-OES technique, these interferences can be minimized by buffering sample matrix, matrix matching, and standard-addition procedures.

4.6 Memory Interferences: Result when analytes in a previous sample contribute to the signals measured in the new sample. Memory effects can occur from sample deposition on the uptake tubing to the nebulizer, and from sample build up in the spray chamber and on plasma torch. Flushing the system with a rinse blank will help to minimize the effects from memory interference.

4.7 High salt concentrations can cause analyte signal suppression and confuse the interference tests. If the instrument does not display negative values, fortify the interference check solution with the elements of interest at 0.5 to 1 mg/L and measure the added standard concentration accordingly (ICS A+B). Concentrations should be within 20% of the true spike value or dilution of the sample would be necessary.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

5.1.1 The ICP plasma emits strong UV light and is harmful to vision. All analysts must avoid looking directly at the plasma.

5.1.2 Acidifications of samples containing reactive materials may results in the release of harmful toxic gases, such as cyanides and sulfides. Acidification should be performed in a hood.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1 *Thermofisher iCAP 6500 DUO*

6.1.2 *ESI SC4 DX*

6.2 Supplies

6.2.1 Pump tubing

6.2.2 Analytical balance, capable of weighing to 0.001 g

6.2.3 Digestion 70 mL Tubes with caps, accurate to ±1%

6.2.4 Computer and printer: PC Compatible with Win 2000 Professional

6.2.5 *Thermofisher iTEVA Software*

7.0 Reagents and Standards

7.1 Liquid Argon, >99.998% pure, 4,800 cuft

7.2 Concentrated Nitric Acid, 16N (HNO3), trace metals grade

7.3 Concentrated Hydrochloric Acid, 12N (HCl), trace metals grade

7.4 Hydrogen Peroxide, 30%

7.5 For the Following Standard Solutions please refer to SP-MTL-001 (Operation of the ICP-OES):

7.5.1 Calibration Set and CCV

7.5.2 ICV Set

7.5.3 Primary Interferent Stock and Interferent Target Analyte Stock

7.5.4 Single Element Stocks

7.5.5 ICB/CCB

7.5.6 Internal Standard (Yttrium)

7.6 DI water - high purity water suitable for trace metal analysis

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Analysis	Sample Container	Field Filtered	Min. Sample Size	Preservation	Holding Time
Water	Dissolved	Glass or Plastic	Yes; 0.45µm membrane filter within 48 hours of collection[1]	500 mL	HNO_3, pH < 2; Cool 4 ± 2°C	6 Months
Water	Suspended	Glass or Plastic	Yes; 0.45µm membrane filter within 48 hours of collection[1]	500 mL	HNO_3, pH < 2; Cool 4 ± 2°C	6 Months
Water	Total Recoverable	Glass or Plastic	No[2]	500 mL	HNO_3, pH < 2; Cool 4 ± 2°C	6 Months
Soils	Total Recoverable	Glass	NA	50 grams	Cool 4 ± 2°C	6 Months

[1] The laboratory must filter samples that are received unfiltered within 48 hours or the results of the test must be qualified as estimated.
[2] Direct Analysis of drinking water may be done after checking the turbidity is less than 1 NTU. If greater than 1 NTU proceed with an acid digestion.

9.0 Quality Control

9.1 **Sample QC** - The following quality control samples are prepared with each batch of samples. All associated QC samples (i.e., method blank, LCS and MS/MSD) must undergo the same filtration and acidification procedures as their representative samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< ½ MRL(6010) <2.2xMDL (200.7)
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	80-120% for 6010C/D 85-115% for 200.7

Quality Controls	Frequency	Control Limit
Matrix Spike (MS)[1]	1 in 20 or fewer samples	75-125% for 6010C/D 70-130% for 200.7
DUP/MSD RPD		< 20% RPD
Serial Dilution (SD) %D	1 in 20 or fewer samples	< 20%
Post Digestion Spike	1 in 20 or fewer samples	80 – 120 for 6010C 75-125%for 6010D 85-115% for 200.7
Linear Range Check (LRC)	1 per calibration	90-110% for 6010D

[1] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client.
[2] For Method 200.7 a matrix spike is analyzed at a 10% frequency (a MSD is not an acceptable substitute for another MS).
[3] For Method 6010C or 6010D a sample replicate may be used in lieu of a matrix spike duplicate.
[4] Statistical control limits are updated annually and are updated into LIMS.

9.1.1 If the method blank is greater than the limit, Re-run the sample once then investigate the source of contamination. For a method blank with contamination to be acceptable, the concentration of the target analyte in the blank should not be higher than the highest of either: one-half of the method reporting limit (MRL); five percent of the applicable regulatory limit; or five percent of the measured concentration in the sample. If the contamination is higher, re-prepare and reanalyze all associated samples. Exception: if the samples are non-detect or the concentration present in the samples is 10x greater than the concentration found in the blank, the data may be reported with qualification.

9.1.2 If the LCS recovery is outside the limit, check to be sure there are no errors in calculations and that the concentration of the analyte solution is correct. Check instrument performance to determine if it is within acceptable guidelines. Recalculate the data and/or reanalyze the extract if necessary. Re-prepare and reanalyze the samples for the specific element(s) if none of the above resolves the problem. Exception: if the LCS fails high and the samples are non-detect the data may be reported with qualification.

9.1.2.1 Silver and Antimony Recoveries: the loss of silver or antimony in the LCS and matrix spikes may be due to precipitation during the digestion. The analyst may choose to re-digest and analyze immediately to limit the chance of precipitation.

9.1.3 If the MS or MSD recovery is greater than the limit, check to be sure there are no errors in calculations and that the concentration of the analyte solution is correct. Check instrument performance to determine if it is within acceptable guidelines. Recalculate the data and/or reanalyze the extract if any of the above checks reveals a problem. If none of the above resolves the problem and the LCS is acceptable, perform a post digestion spike test and a serial dilution test.

9.1.4 Perform a post-digestion spike on the sample used for the MS/MSD by adding a small (1ml into 9ml) amount of the LCS spike to an aliquotof sample after all sample prep is completed, adjusting for the resulting dilution factor. If the post-digestion spike does not recover within limits, and the MS/MSD recovery also fails,

matrix interference is confirmed. Sample results must be reported as estimated values.

9.1.5 Perform a serial dilution on the sample used for the MS/MSD by making a dilution of the sample at at least 5x. If target analyte concentrations are not 25x their LLOQ then disregard this test. The matrix spike itself may be used as the diluion sample if other samples are suspected to not have a high concentration of target analyte. Elements that fail this test are reported as estimatted values.

9.1.6 If the MS/MSD RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set. If the MS/MSD percent recoveries were within limits, the RPD failure may be qualified.

9.1.7 If the Sample Duplicate RPD is greater than the limit, check to be sure that there are no errors in calculations, and that the same amount and source of analyte solution, solvent and water were used for both samples in the set. If the LCS is acceptable, narrate as a possible matrix effect.

9.1.8 Anomalous situations occurring during sample preparation must be documented on the bench sheet, and non-conformance reports must be issued if necessary. Possible anomalous situations resulting in non-conformance reports include loss of a sample or batch QC through spillage or breakage. Please see the SOP for Non-Conformances, SP-QAG-012.

10.0 Procedure

10.1 Sample Preparation

10.1.1 Sample preservation check is done at the time of sample login per SP-SPL-005.

10.1.2 Water/Aqueous samples are prepared according to SP-MTL-004 (EPA 3005A, EPA 3010A or EPA 200.7).

10.1.3 Soil, sludges and waste samples are prepared according to SP-MTL-006 (EPA 3050B).

10.2 Calibration and Instrument QC

Before any instrument is used as a measurement device, the instrument response to known reference materials must be determined. The manner in which various instruments are calibrated depends on the particular type of instrument and its intended use. All sample measurements must be made within the calibration range of the instrument. Preparation of all reference materials used for calibration must be documented. The ICP-OES must be calibrated daily. For 6010D, the ICV and ICVL must be prepared **daily**.

Calibration Controls	Frequency	Control Limit
Calibration Blank	Once per run or daily	NA
Calibration Standards	Once per run or daily	NA
Init. Cal. Verif. (ICV) from a second source	After calibration	90-110% for 6010/D 95-105% for 200.7

Low Level Init. Cal. Verif. (ICVL) from second source (6010C or D use primary source)	After calibration and after ICV	70-130 for 6010C 80-120% for 6010D Not required for 200.7
Init. Cal. Blank (ICB)	After calibration, ICV, and ICVL	< ½ MRL
Cont. Cal. Verif. (CCV) from primary source	Every 10 samples and end of run	90-110% for 6010C/D 95-105% for 200.7
Low Level Cont. Cal. Verf (CCVL) from primary source	Every 10 samples and end of run	6010C only
Cont. Cal. Blank (CCB)	Every 10 samples and end of run	< ½ MRL

Internal Standard (Yttrium) All standards and samples 50-150%

10.2.1 Prepare Calibration Standards and Blanks as described in SP-MTL-001, Operation of the ICP-OES. Standards are to be stored in an enclosed, dark place, such as the ICP standards cabinet.

10.2.2 Calibrate the instrument for the analytes of interest, according to the manufacturer's recommendations, using a calibration blank and a single initial calibration standard. Use the average of at least three integrations for calibration and sample analysis. Record the identifications of the calibration standards on the raw data.

10.2.3 Analyze the calibration controls as required in the table above. For a suggested analysis queue, see Section 10.3.

10.2.4 If the ICV's or ICB do not meet these criteria for target analytes, the instrument must be re-calibrated and the ICV's and ICB re-analyzed. If re-calibration does not yield acceptable results for the ICV's and ICB, notify the supervisor.

10.2.5 If the ICS A does not meet these criteria the analysis is stopped, the problem is investigated and resolved and if necessary, the instrument is recalibrated. However, this criteria does not apply to an element of interest if it is an interferent as they might have been spiked at a level above the linear dynamic range (LDR).

10.2.6 If the CCV's do not meet these criteria for target analytes the sample analysis must be discontinued and the problem investigated. As necessary, an additional CCV may be run or the instrument may be recalibrated. Samples must be bracketed by both acceptable CCB and CCV solutions. Samples that are not bracketed by CCB and CCV solutions within acceptance criteria must be reanalyzed. Sample results can only be reported with acceptable bracketing CCBs and CCVs.

10.2.7 If the internal standard does not meet these criteria, the sample or standard should be re-prepared and re-analyzed. If it is not possible to re-prepare a sample or if the internal standard fails again it must be qualified.

10.3 Sample Analysis

10.3.1 Process all samples using the same operating parameters used to acquire data for the calibration and check standards. See the example analysis queue below.

Example Analysis Queue

Instrument Counter	Sample ID	Comments
1	Calibration Blank	
2	Calibration Standard	
3	*ICS-A*	
4	*ICS-A+B*	
5	*ICV*	
6	*ICVL*	*6010D Only*
7	*ICB*	
8	*10 Samples*	
9	*CCV*	
10	*CCB*	
11	*10 Samples*	
12	*CCV*	
13	*CCB*	

10.3.2 For 200.7: Samples with analyte concentrations greater than their respective linear ranges (or species needed for correction) must be diluted and reanalyzed.

10.3.3 For 6010D: Samples with reportable analyte concentrations greater than the highest calibration point must be diluted, unless a Linear Range Check (LRC) sample is ran with an analyte concentration greater than or equal to the sample, but less than or equal to the LDR. LRC verification can be ran at any point during the analysis and is valid for all samples ran with that calibration.

10.3.4 Solid samples should be reported on a dry-weight basis. See SP-SPL-003 for percent moisture determination.

10.3.5 For 200.7, the total recoverable sample digestion procedure given in this method is suitable for the determination of silver in aqueous samples containing concentrations up to 0.1 mg/L. Samples suspected or confirmed to contain more than this must be pre-diluted and re-digested.

10.4 Data Review

10.4.1 Upon completion of the analytical run, the primary analyst must review all data for compliance with criteria and acknowledge any Data Review Checker (DRC) findings in TALS. The primary reviewer initiates the ICP Data Review Checklist.

10.4.2 Upon completion of the primary review, the Department Manager (or designate) must perform a secondary peer review (see SP-QAG-023). The secondary reviewer completes the ICP Data Review Checklist.

11.0 Calculations / Data Reduction

11.1 Concentration

$$Concentrat\ ion(mg/kg) = \frac{C \times V}{W \times S}$$

Where: C = digest concentration (mg/L)
V = volume of extract (L)
W = weight of wet sample (kg)
S = % solids/100

11.2 Relative Percent Difference (RPD)

$$= \frac{|V_1 - V_2|}{\frac{(V_1 + V_2)}{2}} \times 100$$

Where: V1 = Concentration of sample analyte
V2 = Concentration of duplicate analyte

11.3 % Recovery

$$\%\,\mathrm{Re\,cov}\,ery = \mathrm{Re\,cov}\,ery \times 100$$

12.0 Method Performance

12.1 Linear Range Study (LRS)

A linear range study should be performed every 6 months. The linear dynamic range limit (LDR) is defined by the highest concentration standard with an observed signal no more than 10% below the level extrapolated from lower standards. The LRS should be verified every 6 months or when a change in the hardware or operating conditions would dictate they be redetermined.

12.2 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in the QA Manual. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are performed annually unless method requirements require a greater frequency or whenever there is a significant change in instrumentation or analytical methodology (see SP-QAG-0028). MDL verification studies (MDLV) are ran twice quarterly, and their data can be used to calculate the annual MDL study.

12.3 Lower Limit of Quantitation Verification (LLOQV)

The lower limits of quantitation should be established for all wavelengths utilized for each type of matrix analyzed and for each preparation method used and for each instrument. These limits are considered the lowest reliable laboratory reporting concentrations and should be established from the lower limit of quantitation check sample and then confirmed using either the lowest calibration point or from a low-level calibration check standard.

The lower limit of quantitation verification (LLOQV) sample should be analyzed after performing the MDL study and establishing the lower laboratory reporting limits and on an as needed basis to demonstrate the desired detection capability. Ideally, this check sample and the low-level initial calibration verification (ICVL) standard will be prepared at the MRL with the only difference being the LLOQV sample is carried through the entire preparation and analytical procedure. Lower limits of quantitation are verified when all analytes in the LLOQV sample are detected within ± 30% of their true value. This check should be used to both establish and confirm the lowest quantitation limit (MRL). A LLOQV study must be performed quarterly.

12.4 Demonstration of Capabilities

An initial demonstration of capability shall be performed before a new instrument or analytical method is brought into production.

Initial demonstrations of capability and annual demonstrations of capability or passing annual PE results are required for each analyst.

12.5 Training Requirements

See SP-QAG-026 for general training requirements.

13.0 Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.0 Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to SP-SPL-006. The following waste streams are produced when this method is carried out:

- Acid waste consisting of sample and rinse solution: bulked in acid/RCRA 8 waste barrel and sent out for disposal.
- Water sample waste: bulked in acid/RCRA 8 waste barrel and sent out for disposal.
- Soil sample waste: Bulked in RCRA 8 soil waste barrel and set out for disposal.

15.0 References / Cross-References

15.1 Test America Quality Assurance Manual

15.2 Test America Health & Safety Manual

15.3 Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846), Method 6010C, "Inductively Coupled Plasma – Atomic Emission Spectrometry", Revision 3, February 2007.

15.4 Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846 Update V), Method 6010D, "Inductively Coupled Plasma – Optical Emission Spectrometry", Revision 5, July 2018.

15.5 Environmental Monitoring Systems Laboratory, Office of Research and Development, US EPA, Cincinnati, Ohio 45268, Method 200.7, "Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma - Atomic Emission Spectroscopy", Revision 4.4, EMMC version.

15.6 SP-MTL-001, Operation of the ICP-OES

15.7 SP-MTL-004, Acid Digestion of Aqueous Samples for Total Recoverable or Dissolved Metals for Analysis by FLAA, ICP or ICPMS (EPA 3005A)

15.8 SP-MTL-006, Acid Digestion of Solid Samples for Recoverable Metals for Analysis by ICP or ICPMS (EPA 3050B).

15.9 SP-MTL-009, Preparation of Aqueous Samples for Dissolved, Suspended, Total and Total Recoverable Metals (EPA 200.2).

15.10 SP-SPL-005, Sample Control and Storage

15.11 SP-QAG-026, Basic Employee Training

15.12 SP-SPL-006, Sample Disposal

15.13 SP-QAG-023, Data Review and Reporting of Analytical Results

15.14 SP-SPL-003, Percent Moisture Determination

16.0 Method Modifications

None

17.0 Attachments

17.1 none

18.0 Revision History

Revision 4: 6/15/07

Reasons for Change, Revision 5:

- Annual Review:
  - Updated format
  - Added CAS numbers and symbols to table in scope
  - Added batch definition
  - Removed instructions for preservation checks – referenced SP-SPL-005 instead
  - Added references to ICP QCAR, and the QCAR itself as Attachment 1
  - Updated from 6010B to 6010C:
    - Added section 12.3, Lower Limit of Quantitation Check
    - Added Low Level ICV in Section 10
    - Added Low Level CCV in Section 10
    - Specified that all QC must undergo the same filtration and acidification procedures as their associated samples
    - Specified method-required limits for MS/MSD RPD and DUP RPD
    - Removed method modifications since wavelengths specified in 200.7 and 6010C are only recommended
    - Specified that solid samples should be reported on a dry-weight basis

Reasons for Change, Revision 6:

- Annual Review – No Changes

Revision 7: 3/22/11

- Annual Review. No changes.

Revision 8: 1/29/13

- Annual Review. Added references to post-digestion spike and dilution test as required by the method.

Revision 9: 2/10/14

- Annual Review. Changed criteria for ICV to 70-130% from 70-125%.

Revision 10: 1/18/16

- Annual Review. Removed and replaced Element references with TALS
- Updated LRS frequency
- Updated IS acceptance %
- Updated 200.7 RSD%
- Updated Attachment 1

Revision 11: 5/9/17

- Updated storage requirements for metals standards, section 10.2.1
- Added reference to Data Review Checker (DRC), section 10.4.1
- Formatting throughout

Revision 12, 8/1/18:

- Updated from 6010C to 6010D:
- Updated linear range requirements
- Updated instrument QC requirements
- Updated Sample QC requirements

Revision 13: 04/01/19

- Updated SOP for 2017 WA Audit
- added 200.7 digestion referenced
- added PDS and SD requirements, procedure, and failure procedures
- Clarified ICVL and CCVL for 6010C and D
- Updated RPD calculations
- Updated procedure for Ag sample concentration for 200.7
- Updated 200.7 MB limits

Revision 13.1: 04/28/21

- Updated approvers
- Updated instrument to Thermofisher iCAP, section 6

Title: Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Water, Solid, Biosolids and Tissue

[Method 1633]

Approvals (Signature/Date):

Robert Hrabak — 10/07/2022
Robert Hrabak — Date
Technical Manager

Joe Schairer — 10/12/2022
Joe Schairer — Date
Health & Safety Manager / Coordinator

Lisa Stafford — 10/07/2022
Lisa Stafford — Date
Quality Assurance Manager

Chris Williams — 10/06/2022
Chris Williams — Date
Laboratory Manager

Facility Distribution No. Uncontrolled **Distributed To:** Sacramento QA

1. SCOPE AND APPLICATION

1.1. This procedure describes the analysis of water, soil, solids, biosolids, and tissue samples for the following compounds using liquid chromatography / tandem mass spectrometry (LC/MS/MS).

Table 1.1
PFAS Supported

Compound Name	Abbreviations	CAS #
Perfluoroalkylcarboxylic acids (PFCAs)		
Perfluoro-n-butanoic acid	PFBA	375-22-4
Perfluoro-n-pentanoic acid	PFPeA	2706-90-3
Perfluoro-n-hexanoic acid	PFHxA	307-24-4
Perfluoro-n-heptanoic acid	PFHpA	375-85-9
Perfluoro-n-octanoic acid	PFOA	335-67-1
Perfluoro-n-nonanoic acid	PFNA	375-95-1
Perfluoro-n-decanoic acid	PFDA	335-76-2
Perfluoro-n-undecanoic acid	PFUnA	2058-94-8
Perfluoro-n-dodecanoic acid	PFDoA	307-55-1
Perfluoro-n-tridecanoic acid	PFTrDA	72629-94-8
Perfluoro-n-tetradecanoic acid	PFTeDA	376-06-7
Perfluorinated sulfonic acids (PFSAs)		
Perfluoro-1-butanesulfonic acid	PFBS	375-73-5
Perfluoro-1-pentanesulfonic acid	PFPeS	2706-91-4
Perfluoro-1-hexanesulfonic acid	PFHxS	355-46-4
Perfluoro-1-heptanesulfonic acid	PFHpS	375-92-8
Perfluoro-1-octanesulfonic acid	PFOS	1763-23-1
Perfluoro-nonanesulfonic acid	PFNS	68259-12-1
Perfluoro-1-decanesulfonic acid	PFDS	335-77-3
Perfluoro-1-dodecansulfonic acid	PFDoS	79780-39-5
Perfluorinated sulfonamides (FOSAs)		
Perfluoro-1-octanesulfonamide	PFOSA, (FOSA)	754-91-6
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA (Et-FOSA)	4151-50-2
N-methylperfluoro-1-octanesulfonamide	NMeFOSA (Me-FOSA)	31506-32-8
Perfluorinated sulfonamide ethanols (FOSEs)		
2-(N-ethylperfluoro-1-octanesulfonamido) ethanol	NEtFOSE (Et-FOSE)	1691-99-2
2-(N-methylperfluoro-1-octanesulfonamido) ethanol	NMeFOSE (Me-FOSE)	24448-09-7

Table 1.1 PFAS Supported		
Compound Name	**Abbreviations**	**CAS #**
Perfluorinated sulfonamidoacetic acids (FOSAAs)		
N-ethylperfluoro-1-octanesulfonamidoacetic acid	NEtFOSAA (EtFOSAA)	2991-50-6
N-methylperfluoro-1-octanesulfonamidoacetic acid	NMeFOSAA (MeFOSAA)	2355-31-9
Fluorotelomer sulfonic acids (FTS)		
1H,1H,2H,2H-perfluorohexane sulfonic acid *(4:2)*	4:2 FTS	757124-72-4
1H,1H,2H,2H-perfluorooctane sulfonic acid *(6:2)*	6:2 FTS	27619-97-2
1H,1H,2H,2H-perfluorodecane sulfonic acid *(8:2)*	8:2 FTS	39108-34-4
Fluorotelomer carboxylic acids (FTCAs)		
3-Perfluoropropylpropanoic acid	3:3 FTCA	356-02-5
3-Perfluoropentylpropanoic acid	5:3 FTCA	914637-49-3
3-Perfluoroheptylpropanoic acid	7:3 FTCA	812-70-4
Per-and Polyfluoroether carboxylic acids		
Perfluoro(2-propoxypropanoic) acid or Hexafluoropropylene oxide dimer acid	HFPO-DA, GenX	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	ADONA(1) (DONA)	919005-14-4
Perfluoro-3-methoxypropanoic acid (PFMPA)	PFMPA, (PFECA F)	377-73-1
Perfluoro-4-methoxybutanoic acid (PFMBA)	PFMBA,(PFECA A)	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	NFDHA (PFECA B)	151772-58-6
Ether sulfonic acids		
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA (PES)	113507-82-7

***Note**: Abbreviations in parenthesis are the abbreviations used by the laboratory's LIMS where they differ from the abbreviation listed in Method 1633.*

(1) In some literature, the acronym ADONA refers to the ammonium salt, CAS 958445-44-8, and DONA refers to the parent acid. In Method 1633, ADONA refers to the parent acid. DONA is the acronym present on the laboratory raw data. This analyte should be reported as ADONA for the MLVS.

1.2. The working range of the method is listed below. The linear range can be extended by diluting the extracts. Note that all compounds are reported in their acid form.

Reporting limits and Method Detection Limits for individual compounds are stored in the laboratory's LIMS.

Table 1.2
Reporting Limits and Working Range

Matrix	Nominal Sample Size	Reporting Limit	Working Range
Water	500 mL	1.6 ng/L – 40 ng/L	1.6 ng/L - 1560 ng/L
Leachate	100 mL	8 ng/L – 200 ng/L	8 ng/L – 7800 ng/L
Solid	5 g	0.2 ng/g – 5.0 ng/g	0.2 ng/g - 156 ng/g
Biosolids	0.5 g	2 ng/g – 50 ng/g	2 ng/g – 1560 ng/g
Tissue	2 g	0.5 ng/g – 12.5 ng/g	0.4 ng/g – 625 ng/g

2. SUMMARY OF METHOD

2.1. Water samples are extracted using a solid phase extraction (SPE) cartridge. PFAS are eluted from the cartridge with an ammonium hydroxide (NH4OH)/methanol solution.

2.2. Solid/biosolids samples are extracted with a NH4OH/methanol solution using agitation for 1 hour. The mixture is centrifuged and the solvent filtered.

2.3. Tissue samples are extracted with a potassium hydroxide (KOH)/methanol and acetonitrile solutions using agitation for 16 hours and sonication for 30 minutes. The mixture is centrifuged and the solvent filtered.

2.4. The final extracts are analyzed by LC/MS/MS. PFAS are separated from other components on a C18 column with a solvent gradient program using 20 mM ammonium acetate/water and methanol. The mass spectrometer detector is operated in the electrospray (ESI) negative ion mode for the analysis of PFAS.

2.5. An isotope dilution technique is employed with this method for the compounds of interest. The isotope dilution analytes (IDA) consist of carbon-13 labeled analogs or deuterated analogs of the compounds of interest, and they are fortified into the samples at the time of extraction. This technique allows for the correction for analytical bias encountered when analyzing more chemically complex environmental samples. The isotopically labeled compounds are chemically similar to the compounds of concern and are therefore affected by sample-related interferences to the same extent as the compounds of concern. Compounds that do not have an identically labeled analog are quantitated by the IDA method using a closely related labeled analog.

2.6. Quantitation by the internal standard method is employed for the IDA analytes/recoveries. Peak response is measured as the area of the peak.

3. DEFINITIONS

3.1. PFCAs: Perfluorocarboxylic acids

3.2. PFSAs: Perfluorinated sulfonic acids

3.3. FOSA: Perfluorinated sulfonamide

3.4. PFOA: Perfluorooctanoic acid

3.5. PFOS: Perfluorooctane sulfonic acid

3.6. PTFE: Polytetrafluoroethylene (e.g. Teflon®)

3.7. SPE: Solid phase extraction

3.8. PP: Polypropylene

3.9. PE: Polyethylene

3.10. HDPE: High density polyethylene

3.11. AFFF: Aqueous Film Forming Foam

3.12. TDCA: Taurodeoxycholic acid

3.13. TCDA: Taurochenodeoxycholic acid

3.14. TUDCA: Tauroursodeoxycholic acid

3.15. IDA: Isotope dilution analyte (equivalent to EIS in reference method)

3.16. IS: Internal Standard (equivalent to NIS in reference method)

3.17. LCS: Laboratory control sample (equivalent to OPR in reference method)

3.18. MLVS: Multi-Laboratory Validation Study

3.19. Further definitions of terms used in this SOP may be found in the glossary of the Laboratory Quality Assurance Manual (QAM).

4. INTERFERENCES

4.1. PFAS have been used in a wide variety of manufacturing processes, and laboratory supplies should be considered potentially contaminated until they have been tested and shown to be otherwise. The materials and supplies used during the method validation process have been tested and shown to be clean (i.e., no contribution greater than ½ the quantitation (reporting) limit. These items are listed below in Section 6.

4.2. To avoid contamination of samples, standards are prepared in a ventilation hood in an area separate from where samples are extracted.

4.3. PTFE products can be a source of PFOA contamination. The use of PTFE in the procedure should be avoided or at least thoroughly tested before use. Polypropylene (PP) or polyethylene (PE, HDPE) products may be used in place of PTFE products to minimize PFOA contamination.

4.3.1. Standards and samples are injected from polypropylene autosampler vials with polypropylene screw caps once. Multiple injections may be performed on Primers when conditioning the instrument for analysis.

4.3.2. Random evaporation losses have been observed with the polypropylene caps causing high IDA recovery after the vial was punctured and sample re-injected. For this reason, it is best to inject standards and samples once in the analytical sequence.

4.3.3. Teflon-lined screw caps have detected PFAS at low concentrations. Repeated injection from the same Teflon-lined screw cap have detected PFNA at increasing concentration as each repeated injection was performed, therefore, it is best to use polypropylene screw caps.

4.4. Volumetric glassware and syringes are difficult to clean after being used for solutions containing high levels of PFOA. These items should be labeled for use only with similarly concentrated solutions or verified clean prior to re-use. To the extent possible, disposable labware is used.

4.5. Both branched and linear PFAS isomers can potentially be found in the environment. Linear and branched isomers are known to exist for PFOS, PFOA, PFHxS, PFBS, Et-FOSAA, and Me-FOSAA based upon the scientific literature. If multiple isomers are present for one of these PFAS they might be adjacent peaks that completely resolve or not, but usually with a deflection point resolved during peak integration. The later of these peaks matches the retention time of its labeled linear analog. In general, earlier peaks are the branched isomers and are not the result of peak splitting.

As of this writing, only PFOS, PFOA, PFHxS, Et-FOSAA and Me-FOSAA are commercially available as technical mixtures. These reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration.

4.6. In an attempt to reduce PFOS bias, it is required that m/z 499>80 transition be used as the quantitation transition.

4.7. Aluminum foil should not be used for this analysis due to the potential interferences from the PFAS used as release agents.

5. SAFETY

Employees must abide by the policies and procedures in the NDSC Safety Manual, Sacramento Supplement to the HSEM, and this document. All work must be stopped in the event of a known or potential compromise to the health or safety of an associate. The situation must be reported **immediately** to a supervisor, the EH&S Staff, or a senior manager.

5.1. Specific Safety Concerns

5.1.1. Preliminary toxicity studies indicate that PFAS could have significant toxic effects. In the interest of keeping exposure levels as low as reasonably achievable, PFAS and PFAS samples must be handled in the laboratory as hazardous and toxic chemicals.

5.1.2. The use of a filtering syringe with the SPE cartridge, if and when needed, presents an extreme risk of ergonomic injury due to the force needed to push the sample through the cartridge, and the set-up and body geometry of the individual using the syringe/SPE cartridge. Use step boxes to position yourself above the syringe and manifold so that your body weight can be carefully applied to pushing the syringe plunger down, rather than just using your arm and shoulder muscles. Ensure that this task is rotated amongst staff members so that no one has to do it repeatedly for weeks or months. Ensure that routine breaks are taken, and that muscles and joints involved with this task are routinely stretched to offset this hazard.

5.1.3. Exercise caution when using syringes with attached filter disc assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process.

5.1.4. Laboratory procedures such as manual use of Vortex mixers or similar equipment, hand shaking samples beyond several inversions, repetitive use of pipets, repetitive transferring of extracts and manipulation of filled separatory funnels and other glassware represent a significant potential for repetitive motion or other ergonomic injuries. Laboratory associates performing these procedures are in the best position to realize when they are at risk for these types of injuries. Whenever a situation is found in which an employee is performing the same repetitive motion, the employee shall immediately bring this to the attention of their supervisor, manager, or the EH&S staff. The task will be analyzed to determine a better means of accomplishing it. This specifically includes identification and use of mechanical options that reduce the amount of manual handling required to perform extraction procedures such as Vortex mixing and shaking.

5.1.5. Eye protection that satisfies ANSI Z87.1 (as per the NDSC Safety Manual), laboratory coat, and nitrile gloves must be worn while handling samples, standards, solvents, and reagents. Disposable gloves that have been

contaminated will be removed and discarded; other gloves will be cleaned immediately.

5.1.6. Perfluorocarboxylic acids are acids and are not compatible with strong bases.

5.1.7. The use of vacuum systems presents the risk of imploding glassware. All glassware used during vacuum operations must be thoroughly inspected prior to each use. Glass that is chipped, scratched, cracked, rubbed, or marred in any manner must not be used under vacuum. It must be removed from service and replaced.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material[1]	**Hazards**	**Exposure Limit[2]**	**Signs and Symptoms of Exposure**
Acetic Acid (3-2-1)	Corrosive Poison Flammable	10 ppm-TWA 15 ppm-STEL	Contact with concentrated solution may cause serious damage to the skin and eyes. Inhalation of concentrated vapors may cause serious damage to the lining of the nose, throat, and lungs. Breathing difficulties may occur.
Acetonitrile (2-3-0)	Flammable Poison	20 ppm-TWA	Early symptoms may include nose and throat irritation, flushing of the face, and chest tightness. Prolonged exposure to high levels of vapors may cause formation of cyanide anions in the body.
Ammonium Hydroxide (3-1-0)	Corrosive Poison	50 ppm-TWA	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage to the upper respiratory tract. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent damage, including blindness. Brief exposure to 5000 PPM can be fatal.

Material[1]	Hazards	Exposure Limit[2]	Signs and Symptoms of Exposure
Formic Acid (3-2-1)	Flammable Corrosive Toxic Irritant	5 ppm TWA 10 ppm STEL	Extremely destructive on contact with skin, mucous membranes, eyes, upper respiratory tract. Inhalation may result in spasms, inflammation and edema. Symptoms include burning sensation, coughing, wheezing, shortness of breath, headache, nausea, vomiting, and depression.
Methanol (2-3-0)	Flammable Poison Irritant	200 ppm PEL 250 ppm STEL	Harmful if swallowed, or absorbed through the skin. Causes eye, skin and respiratory tract irritation, and may cause central nervous system depression. A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Potassium Hydroxide (3-0-1)	Corrosive Poison	2 mg/m^3 (Ceiling)	Symptoms of inhalation may include coughing, sneezing, damage to the nasal or respiratory tract. High concentrations can cause lung damage. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes with tearing, redness, and swelling.
(1) Always add acid to water to prevent violent reactions. (2) Exposure limit refers to the OSHA regulatory exposure limit.			

6. EQUIPMENT AND SUPPLIES

Due to the ubiquitous nature of PFAS, all disposable equipment (including, but not limited to vials, pipet tips, and SPE manifold parts) that directly contacts a sample or extract is subject to QC checks on a by-lot basis prior to use. At a minimum, the QC checks include either a rinse with DI water or an extraction with basic methanol to mimic the usage encountered during sample preparation. QC check data is kept on file for reference as needed. Processes for cleaning extraction manifolds and associated components are described in WS-OP-0011, "Glassware Cleaning".

6.1. 15 mL polypropylene test tubes with polypropylene screw caps.

6.2. 50 mL graduated plastic centrifuge tubes.

6.3. 500, 250 and HDPE bottles with HDPE screw caps. The average weight of the HDPE bottles with HDPE screw caps are calibrated once per year. The calibration is

performed by weighing 10 bottles with caps and dividing by 10 to get the average weight. The average weight is used in Section 11.3.6.1 Step 4.

6.3.1. The MLVS requires 500 mL aliquots for water and Section 11.3.6.1 is not applicable to the MLVS.

6.4. Analytical balance capable of accurately weighing to the nearest 0.0001g, and checked for accuracy each day it is used in accordance with WS-QA-0041.

6.5. Extract concentrator or nitrogen manifold with water bath heating to 65°C.

6.6. Syringe filter, PALL/Acrodisc 0.2 um Nylon membrane, 25 mm, or equivalent. Do not use PTFE type filters.

6.7. 300 µL autosampler vials, polypropylene, with polypropylene screw caps, Waters PN 1860004112, or equivalent.

6.8. SPE columns

6.8.1. Waters Oasis WAX 150 mg/6 cc (PN 186002493) or equivalent for DoD/DOE QSM and MLVS samples.

6.8.2. Phenomenex Strata PFAS WAX/GCB, 500mg/50mg/6cc (PN DZPRO-SPE) or equivalent. This cartridge incorporates a graphitized carbon.

6.9. Graphitized carbon (Envi-Carb™ or equivalent) for DoD/DOE QSM and MLVS samples.

6.10. Silanized glass wool, Sigma-Aldrich PN 20411. Rinse with methanol 2 times and store in clean glass jar prior to use. Pack to half the high of WAX SPE cartridge barrel.

6.11. Vacuum manifold for Solid Phase Extraction (SPE).

6.12. Miscellaneous laboratory apparatus (beakers, test tubes, volumetric flasks, pipettes, etc.). These should be disposable where possible, or marked and segregated for high-level versus low-level use.

6.13. pH indicator paper, JT Baker Baker-pHIX pH 2.0-9.0, or equivalent.

6.14. Centrifuge (Thermo Scientific Sorvall Legend X1, or equivalent), capable of reaching at least 4500 rpm.

6.15. Vortex Mixer (Scientific Industries model SI-0236 or equivalent)

6.16. Shaker table (Eberbach model 6010, or equivalent) for soil extractions

6.17. Desiccator, part # B002VBW9XW or equivalent

6.18. Drierite desiccant, part # 23005-UOM-EA or equivalent

6.19. Oven, capable of maintaining a temperature of 110°C (+ 5°C), Symphony part # 15-103-0503, or equivalent

6.20. Pre-weighed 47 mm filters, Environmental Express part # F93447MM or equivalent

6.21. Vacuum pump, CPS Products VP2D Pro-set 2 State, part # UX-07164-83 or equivalent

6.22. Liquid Chromatography/Tandem Mass Spectrometer (LC/MS/MS) –The instrument described below, or equivalent, may be used for this method. The HPLC is equipped with a refrigerated autosampler, an injection valve, and a pump capable of variable flow rate. The use of a column heater is required to maintain a stable temperature throughout the analytical run. Data is processed using Chrom Peak Review, version 2.3 or equivalent. The MS/MS is capable of running in the NI-ESI mode at the recommended flow rate with a minimum of 10 scans per peak.

6.22.1. SCIEX LC/MS/MS

This system consists of a Shimadzu HPLC interfaced with a SCIEX 5500 Triple Quad MS, or equivalent. The instrument control and data acquisition software is SCIEX Analyst, version 1.6.3 or equivalent.

6.22.1.1. Shimadzu CTO-20AC HPLC equipped with 3 LC-20AD pumps and one DGU-20 degassing unit or equivalent.

6.22.1.2. Phenomenex Gemini C_{18} 3 µm, 3.0 mm x 100 mm, Part No. 00D-4439-Y0, or equivalent.

6.22.1.3. PFAS Isolator column, Phenomenex Luna C_{18} 5 µm, 50 mm x 4.6 mm, part no. 00B-4252-E0 or equivalent. This is plumbed between the UPLC pumps and autosampler valve to minimize PFAS background from the UPLC solvent lines and filters.

6.23. Preventive and routine maintenance is described in the table below

Table 6.23
HPLC/MS/MS Preventative Maintenance

As Needed:	**Daily (When in use)**
Change pump seals.	Check solvent reservoirs for sufficient level of solvent.
Change in-line filters in autosampler (HPLC).	Verify that pump is primed, operating pulse free.
Check/replace in-line frit if excessive pressure or poor performance.	Check needle wash reservoir for sufficient solvent.
Replace column if no change following in-line frit change.	Verify capillary heater temperature functioning.
Clean corona needle.	Verify vaporizer heater temperature.
Replace sample inlet tube in APCI (10.1 cm).	Verify rough pump oil levels.
Replace fused silica tube in ESI interface.	Verify turbo-pump functioning.
Clean lenses.	Verify nitrogen pressure for auxiliary and sheath gasses.

Table 6.23 HPLC/MS/MS Preventative Maintenance	
Clean skimmer. Ballast rough pump 30 minutes. Create all eluents in Reagent module, label eluent containers with TALS label and place 2nd label into maintenance log when put into use.	Verify that corona and multiplier are functioning.
Semi-Annually Replace rough-pump oil (4-6 months). Replace oil mist and odor elements. Replace activated alumina filter if applicable	**Annually** Vacuum system components including fans and fan covers. Clean/replace fan filters, if applicable.

7. REAGENTS AND STANDARDS

7.1. Reagent grade chemicals shall be used in all tests whenever available. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on the Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.1.1. Acetic acid, glacial

7.1.2. Acetonitrile, HPLC Grade

7.1.3. Ammonium acetate (solid salt).

7.1.4. Ammonium acetate (20 mM in water): Prepared by weighing 1.54 g of ammonium acetate and dissolving in 1 L of water. This solution has volatile components, thus it should be replaced every 7 days or sooner.

7.1.5. Ammonium hydroxide (NH_4OH), 30% in water, ACS reagent grade

7.1.6. Ammonium hydroxide (NH_4OH), 3% in water: Prepared by diluting 10 mL of ammonium hydroxide (30%) with 90 mL of reagent water for a total volume of 100 mL. Replace after 3 months.

7.1.7. Ammonium hydroxide (NH_4OH), 0.3% in methanol (v/v): Prepared by diluting 10 mL of ammonium hydroxide (30%) into 990 mL of methanol for a total of 1 L.

7.1.8. Ammonium hydroxide (NH4OH), 1% in methanol (v/v): Prepared by diluting 33 mL of ammonium hydroxide into 967 mL of methanol for a total of 1 L.

7.1.9. Formic Acid, greater than 96% purity or equivalent, ACS reagent grade

7.1.10. Formic Acid, 0.1 M, in water: Prepared by dissolving 4.6 g of formic acid into 1 L of reagent water. Replace after 2 years.

7.1.11. Formic Acid, 0.3 M, in water: Prepared by dissolving 13.8 g of formic acid into 1 L of reagent water. Replace after 2 years.

7.1.12. Formic Acid, 5% in water(v/v): Prepared by diluting 5 mL of formic acid with 95 mL of reagent water for a total volume of 100 mL. Replace after 2 years.

7.1.13. Formic Acid, 50% in water(v/v): Prepared by diluting 50 mL of formic acid with 50 mL of reagent water for a total volume of 100 mL. Replace after 2 years.

7.1.14. 1:1 0.1 M formic acid:methanol (v/v); Prepared by mixing equal volumes of methanol and 0.1 M formic acid. Replace after 2 years.

7.1.15. Methanol (MeOH)

7.1.16. Potassium Hydroxide (KOH) (solid, reagent grade).

7.1.17. Potassium hydroxide, 0.4% in methanol (w/v): Prepared by weighing 16 g of potassium hydroxide and dissolving in 4 L of methanol.

7.1.18. Ottawa Sand (blank matrix for solid samples)

7.1.19. Store bought chicken breast or tilapia (blank matrix for tissue samples)

7.1.20. Water, Nanopure or Millipore, must be free of interference and target analytes.

7.1.21. Nitrogen, Ultra High Purity, used for the ESI interface, collision cell, and concentration of extracts.

7.1.22. Air, Ultra-Pure, used for vacuum and source gas.

7.1.23. 30:70 methanol:water (v/v), prepared by diluting 30 mL methanol with 70 mL HPLC reagent water or equivalent volume in respect to the ratio.

7.1.24. Instrument Blanks solution (94.375% MeOH, 4% H2O, 1% NH_4OH, 0.625% acetic acid): Prepare by combining 18.848 mL of MeOH, 0.348 mL reagent water, 0.128 mL glacial acetic acid and 0.676 mL 30% Ammonium Hydroxide in water.

7.2. Standards

7.2.1. PFAS are purchased as high purity solids (96% or greater) or as certified solutions. Standard materials are verified compared to a second source

material at the time of initial calibration. The solid stock material is stored at room temperature or as specified by the manufacturer or vendor.

7.2.2. As of this writing, only PFOS, PFOA, PFHxS, NEtFOSAA and NMeFOSAA are commercially available as technical mixtures. These reference standards of the technical mixtures for these specific PFAS are used to ensure that all appropriate peaks are included during peak integration.

7.2.3. If solid material is used for preparing a standard, stock standard solutions are prepared from the solids and are stored at 0 - 6°C. Stock standard solutions should be brought to room temperature before using. Standards are monitored for signs of degradation or evaporation. Standard solutions must be replaced at least annually from the date of preparation.

7.2.4. PFBS, PFHxS, PFHpS, PFOS, PFDS, and many other PFAS are not available in the acid form, but rather as their corresponding salts, such as sodium or potassium. The standards are prepared and corrected for their salt content according to the equation below.

$$Mass_{acid} = Measured\ Mass_{salt} \times MW_{acid} / MW_{salt}$$

Where: MW_{acid} is the molecular weight of PFAA

MW_{salt} is the molecular weight of the purchased salt.

For example, the molecular weight of PFOS is 500.1295 and the molecular weight of NaPFOS is 523.1193. Therefore, the amount of NaPFOS used must be adjusted by a factor of 0.956.

7.2.5. For the primary source calibration solutions, individual solutions for each PFAS (both native and isotopically labelled) are purchased from Wellington Laboratories, or other reputable vendors, and are predominantly at a concentration of 50 ug/mL in basic methanol. In the case of the sulfonic compounds, the concentration is 50ug/mL of the alkali (potassium or sodium) salt. The laboratory uses the concentration of the acid form when determining the concentration of individual sulfonic acids in solution (See Section 7.2.4 above).

7.2.6. While PFAS standards commercially purchased are supplied in glass ampoules, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene or HDPE containers. Vortex all standard solutions prior to removing aliquots.

7.3. 1633 /LCS (LCS/Matrix PFC Spike Solution), 14-400 ng/mL (nominal) in

250 ml of a mixed stock solution in methanol at a nominal concentration listed below. This mixed stock is used as the spiking solution during sample preparation, as well an intermediate for the calibration curve, using the recipe below:

Table 7.3
1633 IM/LCS Solution Recipe
The solutions below are combined and diluted to 250 mL in methanol

Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	1633 IM/LCS Conc. (µg/mL)	Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	1633 IM/LCS Conc. (µg/mL)
PFBA	50	0.320	0.064	6:2 FTS	47.4	0.320	0.061
PFPeA	50	0.160	0.032	8:2 FTS	47.9	0.320	0.061
PFHxA	50	0.080	0.016	FOSA	50	0.080	0.016
PFHpA	50	0.080	0.016	Me-FOSA	50	0.080	0.016
PFOA	50	0.080	0.016	Et-FOSA	50	0.080	0.016
PFNA	50	0.080	0.016	Me-FOSAA	50	0.080	0.016
PFDA	50	0.080	0.016	Et-FOSAA	50	0.080	0.016
PFUdA	50	0.080	0.016	Me-FOSE	50	0.080	0.016
PFDoA	50	0.080	0.016	Et-FOSE	50	0.080	0.016
PFTrDA	50	0.080	0.016	HFPO-DA	50	0.320	0.064
PFTeDA	50	0.080	0.016	4,8-dioxa-3H-PFNA (DONA)	47.1	0.320	0.060
PFBS	44.2	0.080	0.014	PFMPA (PFECA F)	50	0.160	0.032
PFPeS	46.9	0.080	0.015	PFMPA (PFECA A)	50	0.160	0.032
PFHxS	45.5	0.080	0.015	NFDHA (PFECA B)	50	0.160	0.032
PFHpS	47.6	0.080	0.015	9Cl-PF3ONS	46.6	0.320	0.060
PFOS	46.6	0.080	0.015	11Cl-PF3OUdS	47.1	0.320	0.060
PFNS	48	0.080	0.015	PFEESA (PES)	44.5	0.160	0.028
PFDS	48.2	0.080	0.015	3:3 FTCA	50	0.400	0.080
PFDoS	48.4	0.080	0.015	5:3 FTCA	50	2.000	0.400
4:2 FTS	46.7	0.320	0.015	7:3 FTCA	50	2.000	0.400

7.4. 1633 Isotope Dilution Analyte Solution (Extracted Internal Standards), 25-500 ng/mL

The 1633-IDA solution is added to all samples prior to extraction and used as an intermediate solution for preparation of the instrument calibration standards. 200 mL of the solution at a nominal concentration of 0.025-0.5 ug/mL (25-500 ng/mL) is prepared from the individual solutions described in Section 7.2.5. using the recipe below:

Table 7.4
1633-IDA Recipe
The solutions below are combined and diluted to 200 mL with Methanol.

IDA	Stock Conc. (µg/mL)	Aliquot (mL)	IDA Mix Conc. (µg/mL)	IDA	Stock Conc. (µg/mL)	Aliquot (mL)	IDA Mix Conc. (µg/mL)
13C4-PFBA	50	1.200	0.20	13C8-PFOS	47.8	0.300	0.0478
13C5-PFPeA	50	0.600	0.10	13C2-4:2FTS	46.7	0.600	0.0934
13C5-PFHxA	50	0.300	0.050	13C2-6:2FTS	47.5	0.600	0.0950
13C4-PFHpA	50	0.300	0.050	13C2-8:2FTS	47.9	0.600	0.0958
13C8-PFOA	50	0.300	0.050	13C8-FOSA	50	0.300	0.050
13C9-PFNA	50	0.150	0.025	d3-MeFOSA	50	0.300	0.050
13C6-PFDA	50	0.150	0.025	d5-EtFOSA	50	0.300	0.050
13C7-PFUdA	50	0.150	0.025	d3-MeFOSAA	50	0.600	0.10
13C2-PFDoA	50	0.150	0.025	d5-EtFOSAA	50	0.600	0.10
13C2-PFTeDA	50	0.150	0.025	d7-Me-FOSE	50	3.000	0.50
13C3-PFBS	46.5	0.300	0.0465	d9-Et-FOSE	50	3.000	0.50
13C3-PFHxS	50	0.300	0.050	13C3-HFPO-DA	50	1.200	0.20

7.5. 1633 Internal Standard Solution, 100-400 ng/mL

The 1633 IS solution is added to all extracts prior to analysis and used as an intermediate solution for preparation of the instrument calibration standards. 20 mL of the solution at a nominal concentration of 0.1-0.4 ug/mL (100-400 ng/mL) is prepared from the individual solutions described in Section 7.2.5 using the recipe below.

Table 7.5
1633-IS Recipe
The solutions below are combined and diluted to 60 mL with Methanol.

IDA	Stock Conc. (µg/mL)	Aliquot (mL)	IDA Mix Conc. (ug/mL)	IDA	Stock Conc. (µg/mL)	Aliquot (mL)	IDA Mix Conc. (ug/mL)
13C3-PFBA	50	0.48	0.400	13C2-PFDA	50	0.12	0.100
13C2-PFHxA	50	0.24	0.200	18O2-PFHxS	47.3	0.24	0.189
13C4-PFOA	50	0.24	0.200	13C4-PFOS	47.8	0.24	0.191
13C5-PFNA	50	0.12	0.100				

7.6. Calibration Standards

Calibration solutions are prepared from the standards described in Sections 7.3, 7.4, and 7.5, above. For each level, a 100 mL volumetric flask is filled with 4 mL of water, and methanol added. The appropriate amount (see table below) of the solutions are

added, and then the flask is filled to the mark with methanol to achieve the ratio of 96% methanol to 4% water, v/v.

Table 7.6
1633 Calibration Solution Recipe

PFAS Standards	Volume (mL) to add in 100 mL FV							
	CS-1	CS-2	CS-3	CS-4	CS-5	CS-6	CS-7	CS-8
1633 IM/LCS (0.02 µg/mL)	0.125	0.25	1.25	5	12.5	25	50	250
1633 IDA Mix (0.025µg/mL)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
1633 IS Mix (0.1-0.4 µg/mL)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

7.6.1. Initial Calibration (ICAL) Levels (ng/mL)

Table 7.6.1
Initial Calibration Solution Concentrations (ng/mL)

Compound	CS-1	CS-2	CS-3	CS-4	CS-5	CS-6	CS-7	CS-8
PFBA	0.32	0.8	2	5	10	20	50	250
PFPeA	0.16	0.4	1	2.5	5	10	25	125
PFHxA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFHpA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFOA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFNA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFUdA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFDoA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFTrDA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFTeDA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
PFBS	0.07072	0.1768	0.442	1.105	2.21	4.42	11.05	55.25
PFPeS	0.07504	0.1876	0.469	1.1725	2.345	4.69	11.725	58.625
PFHxS*	0.0728	0.182	0.455	1.1375	2.275	4.55	11.375	56.875
PFHpS	0.07616	0.1904	0.476	1.19	2.38	4.76	11.9	59.5
PFOS*	0.07424	0.1856	0.464	1.16	2.32	4.64	11.6	58
PFNS	0.0768	0.192	0.48	1.2	2.4	4.8	12	60
PFDS	0.07712	0.1928	0.482	1.205	2.41	4.82	12.05	60.25
PFDoS	0.07744	0.1936	0.484	1.21	2.42	4.84	12.1	60.5
4:2 FTS	0.29888	0.7472	1.868	4.67	9.34	18.68	46.7	233.5
6:2 FTS	0.30336	0.7584	1.896	4.74	9.48	18.96	47.4	237
8:2 FTS	0.30656	0.7664	1.916	4.79	9.58	19.16	47.9	239.5
FOSA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
Me-FOSA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
Et-FOSA	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
MeFOSAA*	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
EtFOSAA*	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
Me-FOSE	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
Et-FOSE	0.08	0.2	0.5	1.25	2.5	5	12.5	62.5
HFPO-DA	0.32	0.8	2	5	10	20	50	250

Table 7.6.1
Initial Calibration Solution Concentrations (ng/mL)

Compound	CS-1	CS-2	CS-3	CS-4	CS-5	CS-6	CS-7	CS-8
DONA	0.30144	0.7536	1.884	4.71	9.42	18.84	47.1	235.5
PFMPA (PFECA F)	0.16	0.4	1	2.5	5	10	25	125
PFMBA (PFECA A)	0.16	0.4	1	2.5	5	10	25	125
NFDHA (PFECA B)	0.16	0.4	1	2.5	5	10	25	125
9Cl-PF3ONS	0.29824	0.7456	1.864	4.66	9.32	18.64	46.6	233
11Cl-PF3OUdS	0.30144	0.7536	1.884	4.71	9.42	18.84	47.1	235.5
PFEESA (PES)	0.1424	0.356	0.89	2.225	4.45	8.9	22.25	111.25
3:3 FTCA	0.399	0.9984	2.496	6.24	12.48	24.96	62.4	312
5:3 FTCA	1.9968	4.992	12.48	31.2	62.4	124.8	312	1560
7:3 FTCA	1.9968	4.992	12.48	31.2	62.4	124.8	312	1560
Labeled Isotope Dilution Analytes (IDA)								
13C4-PFBA	10	10	10	10	10	10	10	10
13C5-PFPeA	5	5	5	5	5	5	5	5
13C5-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C9-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C6-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C7-PFUdA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C3-PFBS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C3-PFHxS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C8-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C2-4:2 FTS	5	5	5	5	5	5	5	5
13C2-6:2FTS	5	5	5	5	5	5	5	5
13C2-8:2FTS	5	5	5	5	5	5	5	5
13C8-FOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d3-MeFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d5-EtFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d3-MeFOSAA	5	5	5	5	5	5	5	5
d5-EtFOSAA	5	5	5	5	5	5	5	5
d7-Me-FOSE	25	25	25	25	25	25	25	25
d9-Et-FOSE	25	25	25	25	25	25	25	25
13C3-HFPO-DA	10	10	10	10	10	10	10	10
Internal Standard (IS)								
13C3-PFBA	5	5	5	5	5	5	5	5
13C2-PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C4-PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
13C5-PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
13C2-PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
18O2-PFHxS	2.365	2.365	2.365	2.365	2.365	2.365	2.365	2.365
13C4-PFOS	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

** Both branched and linear isomers are used.*

***Note**: Sample extracts are in 80% MeOH/H_2O.*

***Note**: The above calibration limits are provided only as an example. The actual ICAL level used for each analytical batch will depend upon the LOQ requirements of the program. The MLVS only allows the use of a 500 mL aliquot for aqueous samples.*

7.6.2. A technical (qualitative) grade standard which contains both linear and branched isomers for PFOA, PFNA, FOSA, Me/Et-FOSE and Me/Et-FOSA is used as a retention time (RT) marker. This is used to integrate the total response for both linear and branched isomers of these analytes in environmental samples while relying on the initial calibration with the linear isomer quantitative standard. This technical (qualitative) grade standard is analyzed with every initial calibration and at the beginning of a daily sequence.

7.6.2.1. Additionally, standards of the bile acids (TDCA, {TUDCA and TCDA, only if eluent is not acetonitrile}) at 1.0 ug/mL are to be analyzed, after the qualitative standard for the initial calibration, on days when tissue samples are analyzed and any time when DoD samples are analyzed. Be certain to attach those three chromatograms to the document listed in Section 7.6.2.2.

7.6.2.1.1 The analysis of these standards are required daily for the MLVS.

7.6.2.2. Attach this document to the ICV from the associated ICAL by scanning the document and associating it to the file as a single document type of High Res MS Tune in TALS and to the CCVL on non-CAL days. Use the following naming convention: "_TSTD_Instrument_Date." Example: _TSTD_A10_15Mar2019.

7.6.2.3. The daily checks are attached to the initial CCV of the sequence.

7.7. Initial Calibration Verification Standard (ICV)

7.7.1. The ICV is prepared from commercially available mixed solutions (the PFC-MXB mixture from Wellington) augmented by individual stock solutions for those components not present in the commercial mixture. When available, individual stock solutions are purchased from a vendor other than Wellington laboratories. If not available, a second lot from Wellington is sourced, and if that is not available, a second laboratory chemist will prepare the intermediate mixed solution for the ICV. Currently, the commercially available mixture contains the following compounds at the listed

concentrations in methanol:

Table 7.7.1
PFC-MXB composition

Analyte	Stock Conc. (µg/mL)	Analyte	Stock Conc. (µg/mL)
PFHxA	2	PFBS	2
PFHpA	2	PFHxS	2
PFOA	2	PFOS	2
PFNA	2	EtFOSAA	2
PFDA	2	MeFOSAA	2
PFUdA	2	HFPO-DA	2
PFDoA	2	9Cl-PF3ONS	2
PFTrDA	2	11Cl-PF3OUdS	2
PFTeDA	2	4,8-dioxa-3H- PFNA (DONA)	2

7.7.2. ICV-IM: 10 mL of a combined stock for the analytes listed below is created, using the recipe below, and methanol as the final solvent:

Table 7.7.2
ICV-IM Recipe

Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	ICV-IM Conc. (µg/mL)	Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	ICV-IM Conc. (µg/mL)
PFBA	50	0.1	0.5	FOSA	50	0.1	0.5
PFPeA	50	0.1	0.5	Et-FOSA	50	0.1	0.5
PFPeS	46.9	0.1	0.469	Me-FOSA	50	0.1	0.5
PFHpS	47.6	0.1	0.476	Et-FOSE	50	0.1	0.5
PFNS	48	0.1	0.480	Me-FOSE	50	0.1	0.5
PFDS	48.2	0.1	0.482	4:2 FTS	46.7	0.1	0.467
PFDoS	48.4	0.1	0.484	6:2 FTS	47.4	0.1	0.474
				8:2 FTS	47.9	0.1	0.479

7.7.3. ICV-IM2: 10 mL of a combined stock for the analytes listed below is created, using the recipe below, and methanol as the final solvent:

Table 7.7.3
ICV-IM2 Recipe

Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	ICV-IM Conc. (µg/mL)	Analyte	Stock Conc. (µg/mL)	Aliquot (mL)	ICV-IM Conc. (µg/mL)
3:3 FTCA	50	0.1	0.5	PFEESA (PES)	44.5	0.1	0.445

Table 7.7.3 ICV-IM2 Recipe							
Analyte	**Stock Conc. (µg/mL)**	**Aliquot (mL)**	**ICV-IM Conc. (µg/mL)**	**Analyte**	**Stock Conc. (µg/mL)**	**Aliquot (mL)**	**ICV-IM Conc. (µg/mL)**
5:3 FTCA	50	0.1	0.5	PFMPA (PFECA F)	50	0.1	0.5
7:3 FTCA	50	0.1	0.5	PFMBA (PFECA A)	50	0.1	0.5
				NFDHA (PFECA B)	50	0.1	0.5

7.7.4. Finally, the ICV solution is created, at a nominal concentration of 2.5 ng/mL for target analytes (sulfonic acids slightly less), and the same concentrations as the calibration solutions for IS and IDA, by filling a 100 mL flask with 20 mL of water, then adding methanol. After adding the solutions below, the contents are diluted to the mark with methanol:

Table 7.7.4 1633 ICV Recipe	
PFAS Standards	**Volume (mL) to add in 100 mL FV**
Commercial PFAS Mix	0.1
1633 ICV_IM	0.40
1633 ICV_IM2	1.0
1633 IDA Mix	2.5
1633 IS Mix	0.250

8. SAMPLE COLLECTION, PRESERVATION, AND STORAGE

Laboratory default requirements for sample containers, sample size, preservation and holding time are detailed in the table below.

Table 8 Sample Collection, Preservation, and Storage Requirements				
Matrix	**Sample Container**	**Minimum Sample Size**	**Preservation**	**Holding Time[1]**
Water	500 mL HDPE Bottle	500	0-6°C	28 days if 0-6°C or 90 days if stored at ≤ -20°C[2]
Soil/Sediment	4 oz. HDPE wide-mouth container	100 g	0-6°C	90 days
Tissue	4 oz. HDPE wide-mouth container	50 g	≤ -20 °C	90 days

[1] Extraction holding time is calculated from date of collection. Analytical holding time is determined from date of extraction.

[2] By default, aqueous samples for Draft Method 1633 are stored at 0-6 Centigrade and held for up to 28 days prior to extraction. During initial development of Draft Method 1633, potential issues were observed with NMeFOSE, NEtFOSE, NMeFOSAA, and NEtFOSAA, after 7 days of storage at 0-6 C. These issues are more likely to elevate the

observed concentrations of other PFAS compounds via the transformation of these precursors if they are present in the sample.

8.1. Extracts are stored at 0 - 6°C and must be analyzed within 28 days of extraction.

8.2. Unless otherwise specified by client or regulatory program, after analysis, samples and extracts are retained for a minimum of 30 days after provision of the project report and then disposed of in accordance with applicable regulations.

8.3. Biphasic samples

8.3.1. Samples denoted as aqueous (groundwaters, surface waters, and wastewaters) with less than 50 mg of solids content are prepared and handled as a liquid sample (Section 11.2). Compare the sample to a reference container with 50 mg solid content. If the sample contains more than 50 mg solids, contact the client for authorization to extract the sample at a smaller aliquot or as a solid. Detailed descriptions of any deviations from the procedure must be documented in the LIMS NCM program.

8.3.1.1. Use a pre-weighed filter (ProWeigh filter).

8.3.1.2. Label each dish with a sample identifier

8.3.1.3. Scan each dish into the “Dish Value” field of the TALS batch.

8.3.1.4. Copy the documented weight into the TALS batch as the tare weight.

8.3.1.5. Assemble the needed filtering apparatus.

8.3.1.6. Insert the reweighed filter into the apparatus.

8.3.1.7. Condition the filter with 10 mL of reagent water.

8.3.1.8. Filter 10.0 ± 0.02 mL of well mixed sample through the filter.

8.3.1.9. Dry the filter for ~10 seconds by drawing vacuum through that single port.

8.3.1.10. Use tweezers to carefully transfer the filter from the filtering apparatus to its reweighed dish.

8.3.1.11. Dry the filter for a minimum of 12 hours at 110 ± 5°C.

8.3.1.12. Transfer the filter to a desiccator for 1 hour or until cool.

8.3.1.13. Weigh the filter and residue using the analytical balance in Gen. Chem.

8.3.1.14. Enter this value into the TALS batch as the “WT1” value.

8.3.1.15. Make sure the following values are entered correctly into the TALS batch.

- Initial Amount = 10 mL
- Final Amount = 10 mL
- Nominal Amount Used = 10 mL (on batch information page)

8.3.1.16. TALS will calculate the percent solids as follows:

Equation 1

$$\%\ Solids = \frac{Weight\ after\ drying\ (WT1)(g) - Tare\ Weight\ (g)}{10\ g} \times 100\%$$

8.3.1.17. If the percent solids >0.01% (50 mg/500 mL or 1 mg/10 mL), the extract the sample at a reduced volume.

8.3.2. Samples considered solids (biosolids, sediments, and soils) are prepared and handled as solid samples following appropriate homogenization as per Section 11.6. Correction for moisture content is provided through the LIMS when required by the client.

8.3.3. In the event that results are required individually for the solid and aqueous phases of a sample, the phases are separated via centrifugation, and extracted separately using the appropriate preparation (Section 11.2 for the aqueous phase and Section 11.6 for the solid phase). The extracts are analyzed, and results reported for each phase separately.

9. QUALITY CONTROL

9.1. Initial Demonstration of Capability (IDOC)

The initial demonstration and method detection limit (MDL) studies described in Section 13 must be acceptable before analysis of samples may begin.

9.2. Batches are defined at the sample preparation step. Batches should be kept together through the whole analytical process as far as possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence. Refer to the QC program document (WS-PQA-003) for further details of the batch definition.

9.2.1. The quality control batch is a set of up to 20 samples of the same matrix processed using the same procedure and reagents within the same time period. The quality control batch must contain a low level laboratory control sample (LLCS), a laboratory control sample (LCS) and a method blank. Laboratory generated QC samples (Blank, LLCS, LCS,) do not count toward the maximum 20 samples in a batch. Field QC samples are included in the batch count. In some cases, at client request, a matrix spike/matrix spike duplicate (MS/MSD) may be included in the batch. In the event that multiple MS/MSDs are run with a batch due to client requirements, the

additional MS/MSDs do not count toward the maximum 20 samples in a batch.

9.3. One method blank (MB, laboratory reagent blank) must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. For aqueous samples, the method blank is an aliquot of laboratory reagent water. For solid samples, the method blank is an aliquot of Ottawa sand wetted with reagent water. For tissue samples the method blank is an aliquot of stored purchased chicken breast or tilapia. The method blank is processed in the same manner and at the same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, and then implemented when target analytes are detected in the method blank above the reporting limit or when IDA recoveries are outside of the control limits. Re-extraction of the blank, other batch QC and the affected samples are required when the method blank is deemed unacceptable. See policy WS-PQA-003 for specific acceptance criteria.

9.3.1. If the MB produces a peak within the retention time window of any of the analytes, determine the source of the contamination and eliminate the interference before processing samples.

9.3.2. The method blank must not contain any analyte at or above the reporting limit, greater than 1/3 the regulatory compliance limit or at or above 10% of the measured concentration of that analyte in the associated samples, whichever is higher.

9.3.2.1. DoD/DOE QSM: in addition to the above criteria, the method blank must not contain any analyte at or above ½ the reporting limit. The MLVS uses the same acceptance criteria as DoD.

9.3.3. If there is no target analyte greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with qualifiers. Such action should be taken in consultation with the client.

9.3.4. Re-extraction and reanalysis of samples associated with an unacceptable method blank is required when reportable concentrations are determined in the samples.

9.3.5. Refer to WS-PQA-003 for further details of the corrective actions.

9.3.6. The position of the method blank in the SPE manifold during SPE extraction is rotated across batches.

9.4. A laboratory control sample (LCS), defined as OPR (on-going precision and recovery) in Method 1633, must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. The LCS is an aliquot of laboratory matrix (e.g. water for aqueous samples and Ottawa sand for solids) spiked with analytes of known identity

and concentration. The LCS must be processed in the same manner and at the same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, then implemented when recoveries of any spiked analyte is outside of the control limits. Re-extraction of the blank, other batch QC, and all associated samples are required if the LCS is deemed unacceptable. See WS-PQA-0003 for specific acceptance criteria.

9.4.1. The control limits for the LCS are stored in TALS. Once sufficient data has been gathered, limits based on historical recoveries are generated and implemented.

9.4.2. For DoD/DOE QSM, the lower recovery limits based on historical values must be greater than or equal to 40%. The MLVS uses the same acceptance criteria as DoD.

9.5. Low level LCS (LLCS), defined as LLOPR (low-level on-going precision and recovery) in Method 1633, must be extracted with every process batch of similar matrix, not to exceed twenty (20) samples. The LLCS is an aliquot of laboratory matrix (e.g. water for aqueous samples and Ottawa sand for solids) spiked with analytes of known identity and at a concentration of twice the RL. The LLCS must be processed in the same manner and at the same time as the associated samples. Corrective actions must be documented on a Non-Conformance memo, then implemented when recoveries of any spiked analyte is outside of the control limits. Re-extraction of the blank, other batch QC, and all associated samples are required if the LLCS is deemed unacceptable. See WS-PQA-0003 for specific acceptance criteria.

9.5.1. The control limits for the LLCS are stored in TALS. Once sufficient data has been gathered, limits based on historical recoveries are generated and implemented.

9.5.2. For DoD/DOE QSM, the lower recovery limits based on historical values must be greater than or equal to 40%. The MLVS uses the same acceptance criteria as DoD.

9.6. Matrix spikes are not required for this method because any deleterious effect of the matrix is evident in the recoveries of the IDA. A matrix spike/matrix spike duplicate (MS/MSD or MS/SD) can be processed per client request. An MS/MSD pair is aliquots of a selected field sample spiked with analytes of known identity and concentration. The MS/MSD pair must be processed in the same manner and at the same time as the associated samples. Spiked analytes with recoveries or precision outside of the control limits must be within the control limits in the LCS. Corrective actions must be documented on a nonconformance memo, and then implemented when recoveries of any spiked analyte are outside of the control limits provided by TALS or by the client. Recovery limits for MS/MSD are the same as those used for the LCS.

9.6.1. For DoD/DOE QSM, the RPD limit for the MS/MSD pair is less than or equal to 30%. No MS/MSD samples are to be prepared for the MLVS.

9.7. Instrument blanks (RB or CCB) are required at the beginning of an analytical sequence, after high level samples (>UCL) and every CCV. The blank should contain IDA and IS to quantitate results. The blank should not contain any analyte > RL. See WS-PQA-003 for specific acceptance criteria.

9.8. Initial calibration verification (ICV) –A second source standard is analyzed with the initial calibration curve. The concentration should be at the mid-range of the curve.

Corrective actions for the ICV include:

- Rerun the ICV.
- Remake or acquire a new ICV.
- Evaluate the instrument conditions.
- Evaluate the initial calibration standards.
- Rerun the initial calibration.

9.9. Isotope Dilution Analytes

9.9.1. The IDA solution is added to each field and QC sample at the time of extraction, as described in Section 11. As described in Section 7, this solution consists of isotopically labeled analogs of the analytes of interest.

9.9.2. IDA recoveries are flagged if they are outside of the acceptance limits stored in TALS. If IDA recoveries are outside of these limits, additional clean-up is needed. If the recoveries cannot be met after clean up then re-extract a smaller aliquot.

9.9.2.1. If the IDA recovery is just outside of the control limits, re-analyze the extract at 1X prior to re-extraction. If in control, report the data.

9.9.3. Once sufficient data has been gathered, limits based on historical recoveries may be generated and implemented.

9.9.4. For DoD/DOE QSM, limits based on historical recoveries are required. The lower recovery limit must be greater than or equal to 20%. The MLVS uses the same acceptance criteria as DoD.

9.10. Ion Ratio

9.10.1. Compare the quantifier/qualifier SRM transition ratio in the sample to the SRM transition ratio in the standard.

Equation 2

$$Ion\ Ratio = \frac{Area\ Quantitation\ Ion\ (1° Transition)}{Area\ Qualitative\ Ion\ (2° Transition)}$$

9.10.2. The quantifier/qualifier SRM ion ratio should be within ±50% of the quantifier/qualifier SRM ion ratios calculated from the mid-level ICAL point.

9.10.2.1. If data is reported to the MDL the ratio should also be within ±50% of the quantifier/qualifier SRM ion ratios calculated from the initial daily CCV.

9.10.3. If the ion ratio does not meet criteria after corrective actions, (extract clean-up, sample dilution, etc.), then data should be qualified "I" if the ratio is not met.

9.10.3.1. Ion ratios must be in control in calibration solutions. If they are outside of limits, stop the analysis and correct the issues.

9.11. Internal Standards

Internal standards (IS) are spiked into every field sample, QC sample, standard, and instrument blank. They are used for quantitation of the IDA.

9.11.1. The area of the IS in field and QC samples should be within 50-200% of the average area of the calibration standards.

9.11.2. For DoD/DOE QSM, the following instances are required to be greater than the 30% of the average area of the calibration standards: The MLVS uses the same acceptance criteria as DoD.

- the internal standard areas in undiluted extracts
- the internal standard areas in sample extracts where additional IS was added post-dilution.
- the internal standard areas in diluted extracts, once corrected for the dilution factor, when additional IS was not added post-dilution.

10. CALIBRATION

10.1. For details of the calculations used to generate the regression equations, and how to use the factors generated by these equations, refer to SOP CA-Q-P-003 "Calibration Curves and Selection of Calibration Points".

10.2. Routine instrument operating conditions are listed in the table in Section 11.12.

10.3. Instrument Tuning & Mass Calibration

10.3.1. Mass Calibration is performed by instrument manufacturer service representatives in accordance with the manufacturer's procedures during installation, and annually thereafter.

10.3.2. Instrument tuning is done initially when the method is first developed and

thereafter as needed during troubleshooting. Tuning is done by infusing each individual compound (native and/or IDA) into the mobile phase using a tee fitting at a point just before the entrance to the electrospray probe. The responses for the parent and daughter ions for each compound are observed and optimized for sensitivity and resolution. Mass assignments are reviewed and updated as needed. The mass assignments must be within ± 0.5 amu of the values shown in the table in Section 11.12.

10.3.3. Once the optimal mass assignments (within ±0.5 amu of true) are made immediately following the initial tune, the lowest level standard from the initial calibration curve is assessed to ensure that a signal to noise ratio greater than 10 to 1 (S/N > 10:1) is achieved for each PFAS analyte. The first level standard from the initial calibration curve is used to evaluate the tune stability on an ongoing basis. The instrument mass windows are set initially at ± 0.5 amu of the true value; therefore, continued detection of the analyte transition with S/N > 10:1 serves as verification that the assigned mass remains within ± 0.5 amu of the true value, which meets the tune criterion.

10.3.3.1. The instrument must have a valid mass calibration prior to sample analysis. This is verified through the acquisition of a full scan continuum mass spectrum of a PFAS stock standard. All masses must be verified to be within ± 0.5 amu of true value.

10.4. A new calibration curve must be generated after major changes to the system or when the continuing calibration criteria cannot be met. Major changes include, but are not limited to, new columns or pump seals. A new calibration is not required after minor maintenance.

10.5. With the exception of the circumstances delineated in policy CA-Q-P-003, it is not acceptable to remove points from a calibration curve. In any event, at least five points must be included in the calibration curve. Average Response Factor and linear fit calibrations require five points, whereas Quadratic (second order) calibrations require six points.

10.6. A fixed injection volume is used for quantitation purposes and is to be the same for both the sample and standards.

10.7. All units used in the calculations must be consistently uniform, such as concentration in ng/mL.

10.8. Initial Calibration

Refer to Section 12.4.3 for details relating to setting retention times and evaluating retention times.

10.8.1. A number of analytical standards of different analyte concentrations are used to generate the curve. Each standard is injected once to obtain the peak response for each analyte at each concentration. These standards define the working range of the analysis.

10.8.1.1. A minimum of six analytical standards is used when using average response factor and/or linear calibration fits, five of which must be ≥ RL.

10.8.1.2. A minimum of seven analytical standards is used when a quadratic fit is used to generate the curve, six of which must be ≥ RL.

10.8.2. Calibration is by average response factor, linear fit, or by quadratic fit. Quadratic fit is used for the analyte if the response is non-linear.

10.8.2.1. For average response factor (RFa), the relative standard deviation (RSD) for all compounds must be ≤ 20% for the curve to be valid.

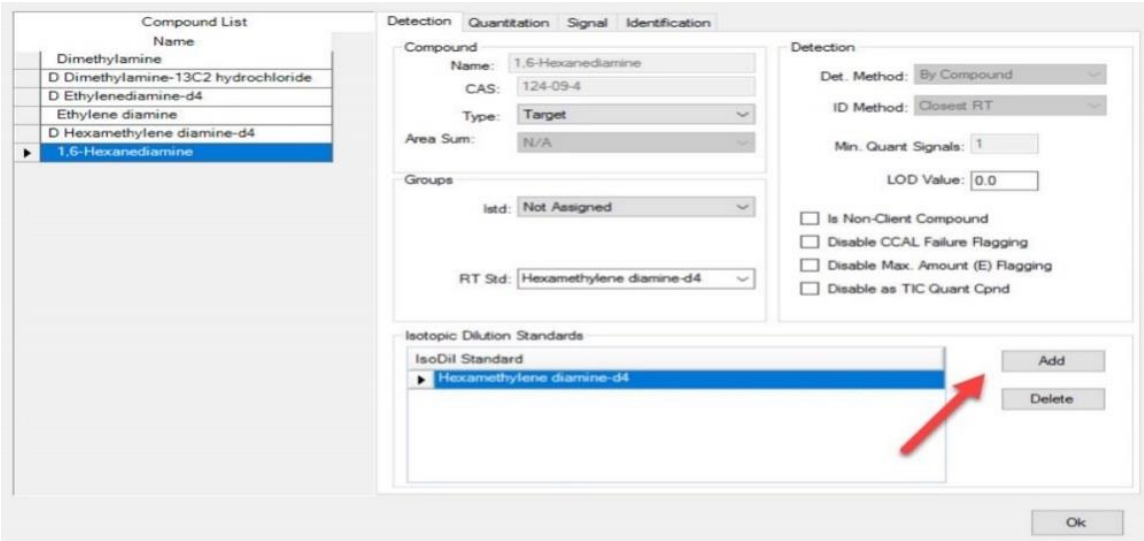
10.8.2.2. Alternatively, for average response factor (RFa), the relative standard error (RSE) for all compounds must be ≤ 20% for the curve to be valid.

10.8.2.3. For linear fits, the intercept of the line must be less than ½ the reporting limit, and the relative standard error (RSE) must be ≤ 20%.

10.8.2.4. For quadratic fits, the intercept of the line must be less than ½ the reporting limit, and the relative standard error (RSE) must be ≤ 20%.

10.8.2.5. Please note for this method PFTrDA is quantitated against the average areas of the IDA 13C2-PFTeDA and 13C2-PFDoA. In order to set this quantitation up correctly in Chrom be certain to update the analyte PFTrDA per the example below (Figure 10.8.2.5).

Figure 10.8.2.5



10.9. Calibration Curve Fits

10.9.1. Linear regression or quadratic curves may be used to fit the data to a calibration function. Detailed descriptions and formulas for each fitting type can be found in SOP CA-Q-P-003, "Calibration Curves and Selection of Calibration Points".

10.9.2. The Chrom data system is programmed to complement the calibration evaluation guidelines in policy CA-Q-P-003 by evaluating calibration curve fits in the order listed below. An optimal fit is recommended to the analyst, who may override based on evaluation of the residuals for each calibration level, as per policy CA-Q-P-003.

- Average Response Factor
- Linear, 1/concentration^2 weighting
- Linear, 1/concentration weighting, forced through zero
- Quadratic, 1/concentration^2 weighting

10.9.3. The linear curve uses the following function:

Equation 3

$$y = bx + c$$

Where:

y = $\frac{Area\ (Analyte)}{Area\ (IDA)} \times Concentration(IDA)$

x = concentration

b = slope

c = intercept

10.9.4. The quadratic curve uses the following function:

Equation 4

$$y = ax^2 + bx + c$$

Where y, x, b, and c are the same as above, and a = curvature.

10.9.5. Evaluation of Calibration Curves

The following requirements must be met for any calibration to be used:

- The signal to noise ratio for each component must be greater than or equal to 3:1 in the lowest calibration standard for that component.
- Response must increase with increasing concentration.
- The absolute value of the intercept of a regression line (linear or non-linear) at zero response must be less than the reporting limit.
- There should be no carryover at or above 1/2 MRL after a high CAL standard.

If these criteria are not met, instrument conditions and standards will be checked, and the ICAL successfully repeated before continuing.

10.9.6. Weighting of Calibration Points

In linear and quadratic calibration fits, the points at the lower end of the calibration curve have less absolute variance than points at the high concentration end of the curve. This can cause severe errors in quantitation at the low end of the calibration. Because accuracy at the low end of the curve is very important for this analysis, it is preferable to increase the weighting of the lower concentration points. 1/concentration or 1/x weighting is encouraged. Visual inspection of the line fitted to the data is important in selecting the best fit.

10.9.7. Bile Salts Interference Check

The laboratory must analyze a bile salts standard (TDCA, {TCDA and TUDCA only if the eluent is not acetonitrile}) after the initial calibration, prior to the analysis of tissue samples, to check for interferences caused by bile salts. If an interference is present, the chromatographic conditions must be modified to eliminate the interference of TDCA (e.g. changing the retention time of TDCA such that it falls outside the retention time window for PFOS by more than 15 seconds with baseline resolution), and the initial calibration is repeated. If tissue samples are not being analyzed this check can be skipped.

10.9.7.1. The check is required daily for all matrices when analyzing DoD/DOE QSM and MLVS samples.

10.10. Initial Calibration Blank (ICB)

10.10.1. Immediately following the ICAL, a calibration blank is analyzed that consists of an injection of final extract solvent containing both IDA and IS.

10.10.2. The result for the calibration blank must be less than the reporting limit.

10.10.3. If the ICB is greater than the reporting limit then the source of contamination must be identified and any necessary cleaning completed, and then the instrument should be recalibrated.

10.11. Initial Calibration Verification (ICV)

10.11.1. Following the ICAL and the ICB, an ICV standard obtained from a different source or vendor than the ICAL standards is analyzed. This ICV standard is a mid-range standard.

10.11.2. The recovery for the ICV must be equal to or within 70-130% for all natives and IDA.

10.11.3. See Section 9.8 for corrective actions in the event that the ICV does not meet the criteria above.

10.12. Continuing Calibration Verification (CCV)

Analyze a CCV at the beginning of a run, the end of a run, and after every 10 samples to determine if the calibration is still valid. The exception is after an acceptable curve and ICV are run 10 samples can be analyzed before a CCV is required. The CCVs are at the mid-level range of the curve. The curve and ICV do not need to be run every day. To start an analytical sequence on days when an ICAL is not performed, a CCVL (low standard at the RL) is analyzed and if it meet acceptance criteria a run can be started.

10.12.1. The recovery for the CCV standards must be equal to or within 70-130% for all natives and IDA.

10.12.2. If this is not achieved, the instrument has drifted outside the calibration limits. The instrument must be recalibrated.

11. PROCEDURE

11.1. One-time procedural variations are allowed only if deemed necessary in the professional judgment of a supervisor to accommodate variation in sample matrix, chemistry, sample size, or other parameters. Any variation in procedure shall be completely documented using a non-conformance memo (NCM). The NCM process is described in more detail in SOP WS-QA-0023. The NCM shall be filed in the project file and addressed in the case narrative.

Any deviations from this procedure identified after the work has been completed must be documented in an NCM, with a cause and corrective action described.

Differences for samples run in accordance with the DoD/DOE QSM version 5.4 or higher and MLVS are called out as needed in the procedures below, in particular the choice of SPE column and the use of loose Envi-carb.

11.2. Water Sample Preparation

11.2.1. Visually inspect samples for the presence of settled and/or suspended sediment/particulates. Samples >50 mg solids should be processed as a solid sample. See Section 8.3.1.1 for TSS procedure. Compare sample to comparison/reference bottle. If the sample should be processed as a solid or biphasic or reduced volume contact the client for guidance prior to such action. Invert samples to homogenize prior to adding any spiking solutions.

Warning: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

11.2.2. Unknown samples may be screened prior to extraction using the following:

11.2.2.1. Weigh out 10 (+ 0.10) g of sample into a 50 mL centrifuge tube.

11.2.2.2. Add 0.625 mL of IDA and 62.5 uL of IS. Vortex.

11.2.2.3. Transfer 1 mL of sample into an injection vial.

11.2.2.4. Submit for analysis.

11.2.2.5. The screening analysis is to follow the same analytical specifications as the definitive analysis, i.e. ICAL, CCV and all analytes.

11.2.2.6. Evaluate the screening results to determine an appropriate volume to extract:

- If < 0.625 ng/mL (on-column) = 1X (500 mL)
- If > 0.625 ng/mL but < 6.25 ng/mL = 10 X (50 mL)
- If > 6.25 ng/mL but <62.5 ng/mL = 100X (5 mL)
- If > 62.5 ng/mL but < 625 ng/mL = 1000X (0.5 mL)
- If > 625 ng/mL but < 6250 ng/mL = 10,000X (0.05 mL)

11.2.3. Weigh the sample container prior to extraction and then weigh the sample container after extraction to determine the initial volume. Unless otherwise directed by client, use the entire sample volume, and spike directly into the sample container.

11.2.3.1. If the sample is identified as a leachate please prep at 100 mL. The sample should be collected in an appropriately sized container, i.e. 100-125 mL. If not, please document such and that a 100 mL aliquot was used for the analysis.

11.2.4. Prepare additional aliquots of a field sample for the MS/MSD, if requested.

11.2.5. Prepare three 500 mL aliquots of HPLC-grade water for the method blank, LLCS and LCS, dependent upon container type submitted by the client.

11.2.6. Vortex the LCS/Matrix PFC Spike and IDA PFC solutions prior to use.

11.2.7. Add 0.625 mL of the IDA PFC solution (Section 7.4) into each sample and QC sample, for a fixed concentration of 1.25-25 ng/mL in the final sample vial.

11.2.8. Spike the LCS and MS/MSD (if requested) with 1.0 mL of the LCS/Matrix PFC Spike solution (Section 7.3), for a fixed concentration of 3.2 - 80 ng/mL in the final sample vial.

11.2.9. Spike the LLCS with the 100 uL of the LCS/Matrix PFS Spike solution (Section 7.3), for a fixed concentration of 0.32-80 ng/mL in the final sample vial.

11.2.10. Swirl or vortex all samples after adding spike solutions.

11.2.11. Check that the pH is 6.5 ± 0.5 using narrow range pH paper (Section 6.13). If necessary, adjust pH with 50% formic acid and 3% ammonium hydroxide.

11.3. Solid Phase Extraction (SPE) of Aqueous Samples

The automated Zymark Auto-Trace Workstation can be used as long as the program follows these conditions and passes the background check.

11.3.1. Pack clean silanized glass wool to half the height of the WAX SPE cartridge barrel.

11.3.2. Condition the SPE cartridges (Section 6.8.2, Phenomenex Strata PFAS WAX/GCB, 500mg/50mg/6cc or equivalent) by passing the following without drying the column.

11.3.2.1. For DOD/DOE and MLVS samples, use the Oasis Wax Cartridges (Section 6.8.1).

Note: *The cartridges should not be allowed to go dry until the final elution step with methanol. At all of the other transition steps, the solvent/sample level should be stopped at the top of the column before the next liquid is added.*

WARNING: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

11.3.3. Wash with 15.0 mL of 1.0% NH_4OH/methanol.

11.3.4. Wash with 5.0 mL of 0.3M formic acid. Close valve when ~ 200 uL remains on top to keep column wet. After this step, the columns cannot go dry until the completion of loading and rinsing samples.

11.3.5. Appropriately label the columns and add the reservoir to the column. Be certain to rotate method blank samples through each sample port on the SPE manifold, such that each new batch uses a different port for the MB.

11.3.6. Pour the samples into the reservoirs attached to the SPE columns and with vacuum, pull the entire sample volume (500 mL) through the cartridge at a rate of approximately 2 to 5 drops per second.

11.3.6.1. If the SPE column should plug (flow rate <1 drop per minute) prior to the entire content of the sample container passing through the column do the following:

1. Stop adding sample to the reservoir.
2. Return any remaining sample volume back to the original container.
3. Weigh the original container and record this weight into the worksheet notes field within the TALS extraction batch.
4. Determine the full volume of sample fortified by using the "Gross Weight" – (remaining sample volume – default tare weight of a sample container (26.1 g)).
5. Enter this value into the "Initial Amount" field in the TALS extraction batch.
6. Proceed to Section 11.4, noting that additional vacuum or pressure might be needed to elute the SPE column.

11.3.6.2. Section 11.3.6.1 is not allowed for the MLVS. Should the SPE column plug then use a second pre-conditioned SPE column and continue loading the sample. Elute both columns individually per Section 11.4.1. Then proceed to Sections 11.5.1-11.5.6, being certain to filter both columns into the same centrifuge tube. Transfer 350 uL of extract into a microvial and mark the level. Add another 350 uL aliquot to the microvial and reduce the volume to 350 uL using a stream of nitrogen (water bath at 40^{o}C). Submit for analysis. Should this occur be certain to document this via the NCM program.

11.3.7. After the entire sample has been loaded onto the column, rinse the sample bottle with two 5 mL aliquots of reagent water and pour into the column reservoir.

11.3.8. After the final loading of the sample but before completely passed through the column, rinse the SPE column with 5 mL of 1:1 0.1 M formic acid/MeOH.

11.3.9. After the sample and water rinse have completely passed through the cartridge, allow the column to dry with vacuum for 15 seconds.

11.3.10. Discard the rinses.

11.4. SPE Elution of Aqueous Samples – using 15 mL polypropylene test tubes as receiving tubes in the SPE manifold.

11.4.1. Add the collection tubes to the manifold. Rinse sample bottles with 5 mL of 1.0% NH_4OH/methanol and transfer to the column reservoir onto the cartridge. Elute the analytes from the cartridge by pulling the 1% NH_4OH/methanol through using low vacuum such that the solvent exits the cartridge in a dropwise fashion.

11.4.2. Air dry and weigh the bottles (record as the tare weight in TALS) to get the sample volume extracted.

11.4.3. Proceed to Section 11.5 for final volume. For DOD/DOE/MLVS samples proceed to Section 11.11.1

11.5. Final volume for Aqueous Sample extracts

11.5.1. Add 25 uL of concentrated acetic acid to each sample. Cap, vortex, and set the samples aside.

11.5.2. Vortex the IS solution prior to use.

11.5.3. Add 62.5 uL of IS (Section 7.5) at 100-400 ng/mL concentration, into a new centrifuge tube.

11.5.4. Place a syringe filter (25 mm filter, 0.2 um nylon membrane) on a polypropylene syringe.

11.5.5. Decant the sample extract from section 11.5.1 into the polypropylene syringe fitted with a syringe filter.

11.5.6. Filter into the centrifuge tube that contains IS from section 11.5.3.

WARNING: Ongoing, regular use of a filtering syringe with the SPE cartridge presents an extreme risk of ergonomic injury due to the force needed to push the

sample through the cartridge, Use step boxes to position yourself above the syringe and manifold so that your body weight can be carefully applied to pushing the syringe plunger down. Ensure that this task is rotated amongst staff members. Ensure that routine breaks are taken, and that muscles involved with this task are routinely stretched to offset this hazard.

11.5.7. Adjust the volume to 5 mL. Cap and vortex.

11.5.8. Transfer a portion of the extract to a 1 mL polypropylene micro vial. Archive the rest of the extract in a refrigerator for re-injection and dilution.

11.5.9. Seal the vial with a polypropylene snap top cap. Note: Teflon lined caps cannot be used due to detection of low level concentration of PFAS.

11.6. Solid and Biosolids Sample Preparation and Extraction

11.6.1. Visually inspect soil samples. Homogenize the entire sample in accordance with SOP WS-QA-0018. If the sample cannot be mixed in the container, pour into a larger QC'd PFAS-free container and mix thoroughly. Transfer the sample label to the new container.

11.6.2. All solid and biosolids samples must have their default mass increased by the percent moisture content prior to extraction.

11.6.2.1. Review TALS for the percent moisture results. Use the following equation to determine what adjustment is needed to the default masses listed in Section 11.7.3.

11.6.2.1.1. Dry wt. adjusted mass = default mass X (1+ percent moisture as a decimal)

11.6.2.1.2. Do not add more that 2X the default mass, regardlesss of percent moisture value.

11.6.3. Weigh a representative dry weight adjusted 5 g aliquot of sample (0.5g for biosolids) into a 50 mL centrifuge tube. Weigh additional sample amounts for the matrix spike and matrix spike duplicate analyses if they are requested.

11.6.3.1. Do not batch solid sample and biosolids samples together due to the different masses.

11.6.4. For the method blank, LLCS and LCS matrix, use 5 g each of Ottawa sand wetted with 2.5g of DI water or 0.5 g of Ottawa sand wetted with 0.25g of DI water for biosolids.

11.6.5. Vortex the LCS/Matrix Spike and 1633 IDA solutions prior to use.

11.6.6. Add 0.625 mL of the 1633 IDA solution (Section 7.4) into each sample and QC sample, for a fixed concentration of 1.25-25 ng/mL in the final sample vial.

11.6.7. Spike the LCS and MS/MSD (if requested) with 1.0 mL of the LCS/Matrix Spike solution (Section 7.3), for a fixed concentration of 3.2 - 80 ng/mL in the final sample vial.

11.6.8. Spike the LLCS with 100 uL of the LCS/Matrix Spike solution (Section 7.3), for a fixed concentration of 0.32-8 ng/mL in the final sample vial.

11.6.9. Cap the tubes, vortex samples and allow the spike to settle into the sample matrix for at least 30 minutes.

11.6.10. Add 10 mL of 0.3% NH_4OH/methanol to each sample. Cap and vortex.

11.6.11. Shake each sample on an orbital shaker at room temperature for 30 minutes.

11.6.12. Centrifuge each sample at 2800 rpm for 10 minutes.

11.6.13. Collect and decant the solvent into a new container.

11.6.14. Add 15 mL of 0.3% NH_4OH/methanol solution to the residue and vortex.

11.6.15. Shake each sample again on an orbital shaker at room temperature for 30 minutes.

11.6.16. Centrifuge each sample at 2800 rpm for 10 minutes.

11.6.17. Collect/decant the solvent into the new centrifuge tube from Section 11.6.13.

11.6.18. Add 5 mL of 0.3% NH_4OH/methanol solution to the residue and vortex.

11.6.19. Centrifuge each sample at 2800 rpm for 10 minutes.

11.6.20. Collect/decant the solvent into the new centrifuge tube from Section 11.6.13. *Note All DOD/DOE/MLVS samples proceed to Section 11.11, prior to Section 11.6.21*.

11.6.21. Bring the volume up to 250 mL with reagent water for each sample. Check that the pH is 6.5 ± 0.5 using narrow range pH paper (Section 6.13). If necessary, adjust pH with 50% formic acid and 3% ammonium hydroxide.

11.6.22. Proceed to Section 11.7.

11.7. Solid Phase Extraction (SPE) of Solid, Biosolids and Tissue Samples

The automated Zymark Auto-Trace Workstation can be used as long as the program follows these conditions and passes the background check.

11.7.1. Pack clean silanized glass wool to half the height of the WAX SPE cartridge barrel.

11.7.2. Condition the SPE cartridges (Section 6.8.2, Phenomenex Strata PFAS WAX/GCB, 200mg/50mg/6mL or equivalent) by passing the following without drying the column.

11.7.2.1. For DOD/DOE/MLVS samples, use the Oasis Wax Cartridges (Section 6.8.1)

Note: *The cartridges should not be allowed to go dry until the final elution step with methanol. At all of the other transition steps, the solvent/sample level should be stopped at the top of the column before the next liquid is added.*

WARNING: The use of a vacuum system creates the risk of glassware implosion. Inspect all glassware prior to use. Glassware with chips, scratches, rub marks or cracks must not be used.

11.7.3. Wash with 15.0 mL of 1% NH_4OH/methanol.

11.7.4. Wash with 5.0 mL of 0.3M formic acid. Close valve when ~ 200 uL remains on top to keep column wet. After this step, the columns cannot go dry until the completion of loading and rinsing samples.

11.7.5. Appropriately label the columns and add the reservoir to the column. Be certain to rotate method blank samples through each sample port on the SPE manifold, such that each new batch uses a different port for the MB.

11.7.6. Add samples to the columns and with vacuum, pull the entire 50 mL aliquot of the sample through the cartridge at a rate of approximately 2 to 5 drops per second.

11.7.7. After the entire sample has been loaded onto the column, rinse the centrifuge tube with two 5 mL aliquots of reagent water and pour into the column reservoir.

11.7.8. After the final loading of the sample but before completely passed through the column, rinse the SPE column with 5 mL of 1:1 0.1M formic acid/methanol.

11.7.9. After the sample and water rinse have completely passed through the cartridge, allow the column to dry with vacuum for 15 seconds. Discard the rinses.

11.8. SPE Elution of Solid, Biosolids and Tissue Samples – using 15 mL polypropylene test tubes as receiving tubes in the SPE manifold.

11.8.1. Vortex the 1633 IS solution prior to use.

11.8.2. Add 62.5 uL of 1633 IS (Section 7.5) at 100-400 ng/mL concentration into a new centrifuge tube.

11.8.3. Place the centrifuge tubes containing the IS in the manifold.

11.8.4. Rinse centrifuge tubes with 5 mL of 1% NH_4OH/methanol and transfer to the column reservoir onto the cartridge. Elute the analytes from the cartridge by pulling the 1% NH_4OH/methanol through using low vacuum such that the solvent exits the cartridge in a dropwise fashion.

11.8.5. Proceed to Section 11.9 for final volume.

11.9. Final volume for Solid, Biosolids and Tissue Sample extracts

11.9.1. Add 25 uL of concentrated acetic acid to each sample. Cap, vortex, and set the samples aside.

11.9.2. Adjust final volume to 5 mL.

11.9.3. Place a syringe filter (25 mm filter, 0.2 um nylon membrane) on a polypropylene syringe.

11.9.4. Decant the sample extract into the polypropylene syringe fitted with a syringe filter.

11.9.5. Filter the eluted sample.

WARNING: Ongoing, regular use of a filtering syringe with the SPE cartridge presents an extreme risk of ergonomic injury due to the force needed to push the sample through the cartridge, Use step boxes to position yourself above the syringe and manifold so that your body weight can be carefully applied to pushing the syringe plunger down. Ensure that this task is rotated amongst staff members. Ensure that routine breaks are taken, and that muscles involved with this task are routinely stretched to offset this hazard.

11.9.6. Transfer a portion of the extract to a 1 mL polypropylene microvial. Archive the rest of the extracts for re-injection and dilution.

11.9.7. Seal the vial with a polypropylene snap top cap. Note: Teflon lined caps cannot be used due to detection of low level concentration of PFAS.

11.10. Tissue Sample Preparation and Extraction

Prior to subsampling tissue matrices, ensure that they have been appropriately homogenized in accordance with SOP WS-WI-0018, Tissue Handling and Extraction.

11.10.1. Weigh a representative 2 g aliquot of sample into a 50 mL centrifuge tube. Weigh additional sample amounts for the matrix spike and matrix spike duplicate analyses if they are requested.

11.10.2. For the method blank, LLCS and LCS matrix, use 2 g each of tissue reference material (chicken breast or fish).

11.10.3. Vortex the LCS/Matrix Spike and 1633 IDA solutions prior to use.

11.10.4. Add 0.625 mL of the 1633 IDA solution (Section 7.4) into each sample and QC sample, for a fixed concentration of 1.25-25 ng/mL in the final sample vial.

11.10.5. Spike the LCS and MS/MSD (if requested) with 1.0 mL of the LCS/Matrix Spike solution (Section 7.3), for a fixed concentration of 3.2 - 80 ng/mL in the final sample vial.

11.10.6. Spike the LLCS with 100 uL of the LCS/Matrix Spike solution (Section 7.3) for a fixed concentration of 0.32- 8 ng/mL in the final sample vial.

11.10.7. Cap the tubes, vortex samples and allow the spike to settle into the sample matrix for at least 30 minutes.

11.10.8. Add 10 mL of 0.05M KOH/methanol to each sample. Cap and vortex.

11.10.9. Shake each sample on an orbital shaker at room temperature for at least 16 hours.

11.10.10. Centrifuge each sample at 2800 rpm for 10 minutes.

11.10.11. Collect and decant the solvent into a new container.

11.10.12. Add 10 mL of acetonitrile (ACN) to the residue. Cap and vortex.

11.10.13. Sonicate each sample for 30 minutes.

11.10.14. Centrifuge each sample at 2800 rpm for 10 minutes.

11.10.15. Collect/decant the solvent into the new centrifuge tube from Section 11.10.11.

11.10.16. Add 5 mL of 0.05M KOH/methanol to the residue. Cap and vortex.

11.10.17. Centrifuge each sample at 2800 rpm for 10 minutes.

11.10.18. Collect/decant the solvent into the new centrifuge tube from Section 11.10.11. *Note: All DOD/DOE/MLVS samples proceed to Section 11.11, prior to Section 11.10.19.*

11.10.19. [redacted]

11.10.20. Proceed to Section 11.7 SPE for Solid, Biosolids, and Tissue Samples, followed by Section 11.8 SPE Elution of Solid, Biosolids, and Tissue Samples, and Section 11.9 Final volume for Solid, Biosolids, and Tissue Samples

11.11. Use of Loose Graphitized Carbon (Envi-Carb)

Analyses performed in accordance with the DOD/DOE QSM Table B-24 and MLVS require the use of loose graphitized carbon in place of pre-packed cartridges for cleanups. Instructions for performing this cleanup are provided below:

11.11.1. **Water** Samples: Immediately following Section 11.4 (SPE elution) add 25 uL of acetic acid to each sample eluted in the collection tubes and vortex to mix. Add 10 mg of carbon to each sample and batch QC extract. Proceed to 11.11.4.

11.11.2. **Solid/Biosolids** Samples: Immediately following Section 11.6.20 add 10 mg of carbon to each sample and batch QC extract. Proceed to 11.11.4.

11.11.3. **Tissue** Samples: Immediately following Section 11.10.18 add 10 mg of carbon to each sample and batch QC extract. Proceed to 11.11.4.

11.11.4. Hand-shake occasionally for no more than 5 minutes. It is important to minimize the time the sample extract is in contact with the carbon.

11.11.5. Immediately vortex for 30 seconds and centrifuge at 2800 rpm for 10 minutes.

11.11.6. **Water** Samples: Proceed to Section 11.5.2.

11.11.7. **Solid/Biosolid** Samples: Immediately decant into a new centrifuge tube. Proceed to Section 11.6.21

11.11.8. **Tissue** Samples: Immediately decant into a new centrifuge tube. Proceed to Section 11.10.19.

11.12. Instrument Analysis

Suggested operating conditions are listed in Tables 11.12-1 through 11.12--4 for the SCIEX LCMS systems:

Table 11.12 - 1
Recommended Instrument Operating Conditions

HPLC Conditions (Shimadzu HPLC)				
Column (Column temp = 45°C)	Phenomenex Gemini 3 µm C18 110Å, 50 X 2 mm			
Mobile Phase Composition	A = 20 mM Ammonium Acetate in Water		B = Methanol	
Gradient Program	**Time**	**%A**	**%B**	**Flow Rate - mL/min**

Table 11.12 - 1 Recommended Instrument Operating Conditions				
HPLC Conditions (Shimadzu HPLC)				
	0	90	10	0.60
	0.1	45	55	0.60
	4.5	1	99	0.60
	5.9	1	99	0.60
	5.95	90	10	0.60
	Maximum pressure limit = 5,000 psi			
Injection Size	20 µL (fixed amount throughout the sequence).			
Run Time	~6.6 minutes			
Mass Spectrometer Interface Settings (SCIEX 5500)				
MS Interface Mode	ESI Negative Ion. Minimum of 10 scans/peak.			
Ion Spray Voltage (kV)	4.5			
Entrance Potential (V)	5			
Declustering Potential (V)	25			
Desolvation Temp	600ºC			
Curtain Gas	35 psi			
Collision Gas	8 psi			

Table 11.12 - 2 Masses/Transitions Utilized				
ID	**Comments**	**Q1**	**Q3**	**RT**
11Cl-PF3OUdS	Native Analyte	630.9	450.9	8.31
11Cl-PF3OUdS_2	Native Analyte	632.9	452.9	8.31
13C2_PFDA	Internal Standard	515.1	470.1	6.95
13C2_PFDoA	Isotope Dilution Analyte	615.1	570	7.86
13C2_PFHxA	Internal Standard	315.1	270	4.5
13C2_PFHXA_2	Internal Standard	315.1	119.4	4.5
13C2_PFTeDA	Isotope Dilution Analyte	715.2	670	8.68
13C3_HFPO-DA	Isotope Dilution Analyte	286.9	168.9	4.78
13C3_HFPO-DA_2	Isotope Dilution Analyte	286.9	184.9	4.78
13C3_PFBA	Internal Standard	216	172	1.87
13C3_PFBS	Isotope Dilution Analyte	302.1	79.9	4.36
13C3_PFBS_2	Isotope Dilution Analyte	302.1	98.9	4.36
13C3_PFHxS	Isotope Dilution Analyte	402.1	79.9	5.96
13C3_PFHxS_2	Isotope Dilution Analyte	402.1	98.8	5.96
13C4_PFBA	Isotope Dilution Analyte	216.8	171.9	1.87
13C4_PFHpA	Isotope Dilution Analyte	367.1	322	5.25

Table 11.12 - 2
Masses/Transitions Utilized

ID	Comments	Q1	Q3	RT
13C4_PFOA	Internal Standard	417.1	172	5.89
13C4_PFOS	Internal Standard	502.8	79.9	7.06
13C4_PFOS_2	Internal Standard	502.8	98.9	7.06
13C5_PFHxA	Isotope Dilution Analyte	318	273	4.5
13C5_PFHxA_2	Isotope Dilution Analyte	318	120.3	4.5
13C5_PFNA	Internal Standard	468	423	6.44
13C5_PFPeA	Isotope Dilution Analyte	268.3	223	3.51
13C6_PFDA	Isotope Dilution Analyte	519.1	474.1	6.95
13C7_PFUdA	Isotope Dilution Analyte	570	525.1	7.41
13C8_PFOA	Isotope Dilution Analyte	421.1	376	5.89
13C8_PFOS	Isotope Dilution Analyte	507.1	79.9	7.06
13C8_PFOS_2	Isotope Dilution Analyte	507.1	98.9	7.06
13C8_PFOSA	Isotope Dilution Analyte	506.1	77.8	7.91
13C9_PFNA	Isotope Dilution Analyte	472.1	427	6.44
18O2_PFHxS	Internal Standard	403	83.9	5.96
3:3 FTCA	Native Analyte	241	177	2.96
3:3 FTCA_2	Native Analyte	241	117	2.96
4.2FTS_2	Native Analyte	327.1	80.9	4.22
4:2 FTS	Native Analyte	327.1	307	4.22
5:3 FTCA	Native Analyte	341	237.1	4.85
5:3 FTCA_2	Native Analyte	341	217	4.85
6:2 FTS	Native Analyte	427.1	407	5.67
6:2 FTS_2	Native Analyte	427.1	80.9	5.67
7:3 FTCA	Native Analyte	441	316.9	6.14
7:3 FTCA_2	Native Analyte	441	336.9	6.14
8:2 FTS	Native Analyte	527.1	507	6.74
8:2 FTS_2	Native Analyte	527.1	80.8	6.74
9CI-PF3ONS	Native Analyte	530.8	351	7.4
9CI-PF3ONS_2	Native Analyte	532.8	353	7.4
d3MeFOSA	Isotope Dilution Analyte	515	219	9.45
d3-MeFOSAA	Isotope Dilution Analyte	573.2	419	6.98
d5EtFOSA	Isotope Dilution Analyte	531.1	219	9.77
d5-EtFOSAA	Isotope Dilution Analyte	589.2	419	7.17
d7N-MeFOSE	Isotope Dilution Analyte	623.2	58.9	9.32
d9N-EtFOSE	Isotope Dilution Analyte	639.2	58.9	9.64
DONA	Native Analyte	376.9	250.9	5.5
DONA_2	Native Analyte	376.9	84.8	5.5
EtFOSA	Native Analyte	526	219	9.79

Table 11.12 - 2
Masses/Transitions Utilized

ID	Comments	Q1	Q3	RT
EtFOSA_2	Native Analyte	526	169	9.79
HFPO-DA	Native Analyte	284.9	168.9	4.78
HFPO-DA_2	Native Analyte	284.9	184.9	4.78
M2-4:2FTS	Isotope Dilution Analyte	329.1	80.9	4.22
M2-4:2FTS_2	Isotope Dilution Analyte	329.1	309	4.22
M2-6:2FTS	Isotope Dilution Analyte	429.1	80.9	5.67
M2-6:2FTS_2	Isotope Dilution Analyte	429.1	409	5.67
M2-8:2FTS	Isotope Dilution Analyte	529.1	80.9	6.74
M2-8:2FTS_2	Isotope Dilution Analyte	529.1	509	6.74
MeFOSA	Native Analyte	511.9	219	9.45
MeFOSA_2	Native Analyte	511.9	169	9.45
N-EtFOSAA	Native Analyte	584.2	419.1	7.17
N-EtFOSAA_2	Native Analyte	584.2	526	7.17
N-EtFOSE	Native Analyte	630	58.9	9.66
NFDHA (PFECA B)	Native Analyte	295	201	4.36
NFDHA_2 (PFECA B_2)	Native Analyte	295	84.9	4.36
N-MeFOSAA	Native Analyte	570.1	419	6.98
N-MeFOSAA_2	Native Analyte	570.1	483	6.98
N-MeFOSE	Native Analyte	616.1	58.9	9.32
PFBA	Native Analyte	212.8	168.9	1.87
PFBS	Native Analyte	298.7	79.9	4.36
PFBS_2	Native Analyte	298.7	98.8	4.36
PFDA	Native Analyte	512.9	469	6.95
PFDA_2	Native Analyte	512.9	219	6.95
PFDoA	Native Analyte	613.1	569	7.86
PFDoA_2	Native Analyte	613.1	319	7.86
PFDoS	Native Analyte	699.1	79.9	8.83
PFDoS_2	Native Analyte	699.1	98.8	8.83
PFDS	Native Analyte	599	79.9	8
PFDS_2	Native Analyte	599	98.8	8
PFEESA (PES)	Native Analyte	314.8	134.9	4.8
PFEESA_2 (PES_2)	Native Analyte	314.8	82.9	4.8
PFHpA	Native Analyte	363.1	319	5.25
PFHpA_2	Native Analyte	363.1	169	5.25
PFHpS	Native Analyte	449	79.9	6.54
PFHpS_2	Native Analyte	449	98.8	6.54
PFHxA	Native Analyte	313	269	4.5
PFHxA_2	Native Analyte	313	118.9	4.5

Table 11.12 - 2
Masses/Transitions Utilized

ID	Comments	Q1	Q3	RT
PFHxS	Native Analyte	398.7	79.9	5.96
PFHxS_2	Native Analyte	398.7	98.9	5.96
PFMBA (PFECA A)	Native Analyte	279	85.1	3.85
PFMPA (PFECA F)	Native Analyte	229	84.9	2.65
PFNA	Native Analyte	463	419	6.44
PFNA_2	Native Analyte	463	219	6.44
PFNS	Native Analyte	548.8	79.9	7.55
PFNS_2	Native Analyte	548.8	98.8	7.55
PFOA	Native Analyte	413	369	5.89
PFOA_2	Native Analyte	413	169	5.89
PFOS	Native Analyte	498.9	79.9	7.06
PFOS_2	Native Analyte	498.9	98.8	7.06
PFOSA	Native Analyte	498.1	77.9	7.93
PFOSA_2	Native Analyte	498.1	478	7.93
PFPeA	Native Analyte	263	219	3.51
PFPeA_2	Native Analyte	263	68.9	3.51
PFPeS	Native Analyte	349.1	79.9	5.27
PFPeS_2	Native Analyte	349.1	98.9	5.27
PFTeDA	Native Analyte	713.1	669	8.68
PFTeDA_2	Native Analyte	713.1	168.9	8.68
PFTrDA	Native Analyte	663	619	8.29
PFTrDA_2	Native Analyte	663	168.9	8.29
PFUdA	Native Analyte	563.1	519	7.41
PFUdA_2	Native Analyte	563.1	269.1	7.41
TCDA_1	Native Analyte	498.29	106.98	0
TCDA_2	Native Analyte	498.29	123.9	0
TCDA_3	Native Analyte	499.29	106.98	0
TCDA_4	Native Analyte	499.29	123.9	0
TCDCA	Native Analyte	464.21	126	0
TUDCA	Native Analyte	464.2	126	0

Table 11.12 – 3
Recommended Instrument Operating Conditions

Mass Spectrometer Scan Settings (SCIEX 5500)

RT	ID	MRM (win)	Dwell Weight	DP (volts)	EP (volts)	CE (volts)	CXP (volts)
0	TCDA_1	70	1	-65	-5	-58	-12

Table 11.12 – 3
Recommended Instrument Operating Conditions

Mass Spectrometer Scan Settings (SCIEX 5500)

RT	ID	MRM (win)	Dwell Weight	DP (volts)	EP (volts)	CE (volts)	CXP (volts)
0	TCDA_2	70	1	-65	-5	-58	-12
0	TCDA_3	90	1	-65	-5	-58	-12
0	TCDA_4	90	1	-65	-5	-58	-12
0	TCDCA	120	1	-65	-5	-58	-12
0	TUDCA	120	1	-65	-5	-58	-12
1.87	13C3_PFBA	90	1	-25	-5	-12	-31
1.87	13C4_PFBA	90	1	-25	-5	-12	-31
1.87	PFBA	90	1	-25	-5	-12	-31
2.65	PFMPA (PFECA F)	70	1	-23	-10	-10	-16
2.96	3:3 FTCA	70	1	-46	-10	-11	-13
2.96	3:3 FTCA_2	70	1	-33	-10	-44	-15
3.51	13C5_PFPeA	80	1	-55	-7	-12	-13
3.51	PFPeA	80	1	-55	-7	-12	-13
3.51	PFPeA_2	80	1	-55	-7	-62	-15
3.85	PFMBA (PFECA A)	70	1	-5	-10	-16	-9
4.22	4.2FTS_2	70	1	-60	-10	-50	-12
4.22	4:2 FTS	70	1	-50	-7	-32	-10
4.22	M2-4:2FTS	70	1	-50	-7	-80	-10
4.22	M2-4:2FTS_2	70	1	-50	-7	-32	-10
4.36	13C3_PFBS	70	1	-55	-6	-58	-37
4.36	13C3_PFBS_2	70	1	-55	-6	-58	-37
4.36	NFDHA (PFECA B)	70	1	-35	-10	-14	-17
4.36	NFDHA_2 (PFECA B_2)	70	1	-35	-10	-34	-5
4.36	PFBS	70	1	-55	-6	-58	-37
4.36	PFBS_2	70	1	-55	-5	-40	-12
4.5	13C2_PFHxA	50	1	-55	-5	-14	-13
4.5	13C2_PFHXA_2	50	1	-55	-5	-26	-7
4.5	13C5_PFHxA	50	1	-60	-5	-12	-15
4.5	13C5_PFHxA_2	50	1	-60	-5	-30	-9
4.5	PFHxA	50	1	-55	-5	-14	-13
4.5	PFHxA_2	50	1	-55	-5	-26	-7
4.78	13C3_HFPO-DA	70	1	-15	-10	-5	-17
4.78	13C3_HFPO-DA_2	70	1	-75	-10	-18	-15
4.78	HFPO-DA	70	1	-15	-10	-5	-17
4.78	HFPO-DA_2	70	1	-75	-10	-18	-15
4.8	PFEESA (PES)	70	1	-98	-12	-28	-12
4.8	PFEESA_2 (PES_2)	70	1	-98	-12	-28	-12

Table 11.12 – 3 Recommended Instrument Operating Conditions							
Mass Spectrometer Scan Settings (SCIEX 5500)							
RT	ID	MRM (win)	Dwell Weight	DP (volts)	EP (volts)	CE (volts)	CXP (volts)
4.85	5:3 FTCA	70	1	-10	-10	-18	-13
4.85	5:3 FTCA_2	70	1	-10	-10	-38	-11
5.25	13C4_PFHpA	70	1	-25	-6	-12	-41
5.25	PFHpA	70	1	-25	-6	-12	-41
5.25	PFHpA_2	70	1	-25	-6	-20	-10
5.27	PFPeS	70	1	-57	-9	-66	-40
5.27	PFPeS_2	70	1	-57	-9	-45	-12
5.5	DONA	70	1	-55	-10	-16	-17
5.5	DONA_2	70	1	-55	-10	-35	-17
5.67	6:2 FTS	70	1	-50	-7	-32	-10
5.67	6:2 FTS_2	70	1	-80	-10	-72	-12
5.67	M2-6:2FTS	70	1	-50	-7	-90	-10
5.67	M2-6:2FTS_2	70	1	-50	-7	-32	-10
5.89	13C4_PFOA	70	1	-110	-6	-24	-20
5.89	13C8_PFOA	70	1	-110	-6	-18	-20
5.89	PFOA	70	1	-110	-6	-18	-20
5.89	PFOA_2	70	1	-110	-6	-24	-20
5.96	13C3_PFHxS	65	1	-145	-12	-88	-11
5.96	13C3_PFHxS_2	65	1	-145	-12	-80	-13
5.96	18O2_PFHxS	65	1	-145	-12	-88	-11
5.96	PFHxS	65	1	-145	-12	-88	-11
5.96	PFHxS_2	65	1	-145	-12	-80	-13
6.14	7:3 FTCA	70	1	-27	-12	-18	-10
6.14	7:3 FTCA_2	70	1	-22	-12	-31	-35
6.44	13C5_PFNA	70	1	-25	-6	-14	-48
6.44	13C9_PFNA	70	1	-25	-6	-14	-48
6.44	PFNA	70	1	-25	-6	-14	-47
6.44	PFNA_2	70	1	-25	-6	-24	-47
6.54	PFHpS	70	1	-65	-11	-88	-46
6.54	PFHpS_2	70	1	-65	-11	-50	-12
6.74	8:2 FTS	70	1	-50	-7	-40	-15
6.74	8:2 FTS_2	70	1	-60	-10	-82	-9
6.74	M2-8:2FTS	70	1	-50	-7	-90	-15
6.74	M2-8:2FTS_2	70	1	-50	-7	-40	-15
6.95	13C2_PFDA	70	1	-25	-6	-16	-51
6.95	13C6_PFDA	70	1	-25	-6	-16	-51
6.95	PFDA	70	1	-25	-6	-16	-51

Table 11.12 – 3 Recommended Instrument Operating Conditions							
Mass Spectrometer Scan Settings (SCIEX 5500)							
RT	**ID**	**MRM (win)**	**Dwell Weight**	**DP (volts)**	**EP (volts)**	**CE (volts)**	**CXP (volts)**
6.95	PFDA_2	70	1	-25	-6	-26	-12
6.98	d3-MeFOSAA	90	1	-40	-7	-36	-15
6.98	N-MeFOSAA	90	1	-40	-7	-36	-15
6.98	N-MeFOSAA_2	90	1	-75	-10	-22	-12
7.06	13C4_PFOS	90	1	-140	-9	-130	-13
7.06	13C4_PFOS_2	90	1	-140	-9	-98	-5
7.06	13C8_PFOS	90	1	-205	-9	-112	-11
7.06	13C8_PFOS_2	90	1	-205	-9	-112	-11
7.06	PFOS	90	1	-140	-9	-130	-13
7.06	PFOS_2	90	1	-140	-9	-98	-5
7.17	d5-EtFOSAA	90	1	-50	-7	-36	-15
7.17	N-EtFOSAA	90	1	-50	-7	-36	-15
7.17	N-EtFOSAA_2	90	1	-90	-10	-28	-12
7.4	9Cl-PF3ONS	70	1	-120	-10	-30	-17
7.4	9Cl-PF3ONS_2	70	1	-120	-10	-30	-15
7.41	13C7_PFUdA	70	1	-25	-7	-18	-54
7.41	PFUdA	70	1	-25	-7	-18	-54
7.41	PFUdA_2	70	1	-25	-7	-28	-12
7.55	PFNS	70	1	-75	-10	-113	-52
7.55	PFNS_2	70	1	-75	-8	-71	-12
7.86	13C2_PFDoA	70	1	-25	-5	-18	-54
7.86	PFDoA	70	1	-25	-5	-18	-54
7.86	PFDoA_2	70	1	-25	-5	-30	-12
7.91	13C8_PFOSA	75	1	-90	-8	-92	-11
7.93	PFOSA	75	1	-90	-8	-92	-11
7.93	PFOSA_2	75	1	-60	-10	-40	-8
8	PFDS	70	1	-30	-11	-130	-11
8	PFDS_2	70	1	-30	-11	-110	-17
8.29	PFTrDA	90	1	-25	-7	-20	-54
8.29	PFTrDA_2	90	1	-25	-7	-36	-12
8.31	11Cl-PF3OUdS	70	1	-160	-10	-40	-17
8.31	11Cl-PF3OUdS_2	70	1	-160	-10	-40	-15
8.68	13C2_PFTeDA	120	1	-25	-7	-22	-54
8.68	PFTeDA	120	1	-25	-7	-22	-10
8.68	PFTeDA_2	120	1	-25	-7	-36	-30
8.83	PFDoS	90	1	-10	-11	-76	-11
8.83	PFDoS_2	90	1	-10	-11	-130	-5
9.32	d7N-MeFOSE	70	1	-20	-5	-70	-10

Table 11.12 – 3
Recommended Instrument Operating Conditions

Mass Spectrometer Scan Settings (SCIEX 5500)

RT	ID	MRM (win)	Dwell Weight	DP (volts)	EP (volts)	CE (volts)	CXP (volts)
9.32	N-MeFOSE	70	1	-20	-5	-70	-10
9.45	d3MeFOSA	70	1	-75	-7	-37	-15
9.45	MeFOSA	70	1	-75	-7	-37	-15
9.45	MeFOSA_2	70	1	-50	-2	-40	-6
9.64	d9N-EtFOSE	70	1	-20	-5	-70	-10
9.66	N-EtFOSE	70	1	-20	-5	-70	-10
9.77	d5EtFOSA	70	1	-75	-7	-37	-15
9.79	EtFOSA	70	1	-75	-7	-37	-15
9.79	EtFOSA_2	70	1	-50	-8	-40	-6

Table 11.12 – 4
Retention Times & Quantitation

Native Compounds	Typical Native RT (minutes)	IDA analog	Typical IDA RT (minutes)	Quantitation Method
PFBA	2.54	13C4_PFBA	2.54	Isotope Dilution
3:3 FTCA	2.9	13C5_PFPeA	2.98	Isotope Dilution
PFPeA	2.97	13C5_PFPeA	2.97	Isotope Dilution
PFBS	2.98	13C3-PFBS	2.98	Isotope Dilution
PFECA A (PFMBA)	3	13C5_PFPeA	2.97	Isotope Dilution
PES (PFEESA)	3.09	13C5_PFHxA	2.98	Isotope Dilution
PFECA B (NFDHA)	3.21	13C5_PFHxA	3.35	Isotope Dilution
4:2 FTS	3.28	13C2-4:2FTS	3.28	Isotope Dilution
PFHxA	3.35	13C5_PFHxA	3.35	Isotope Dilution
PFPeS	3.45	13C3_PFHxS	2.98	Isotope Dilution
HFPO-DA	3.46	13C3_HFPO-DA	3.46	Isotope Dilution
5:3 FTCA	3.7	13C5_PFHxA	3.77	Isotope Dilution
PFECA_F (PFMPA)	3.08	13C5_PFPeA	3.77	Isotope Dilution
PFHpA	3.74	13C4_PFHpA	3.74	Isotope Dilution
PFHxS	3.74	13C3_PFHxS	3.74	Isotope Dilution
DONA	3.79	13C3_HFPO-DA	4.5	Isotope Dilution
6:2 FTS	4.12	13C2-6:2FTS	4.12	Isotope Dilution
PFOA	4.14	13C8_PFOA	4.14	Isotope Dilution
PFHpS	4.14	13C8_PFOS	4.5	Isotope Dilution
7:3 FTCA	4.5	13C5_PFHxA	4.55	Isotope Dilution
PFOS	4.5	13C8_PFOS	4.5	Isotope Dilution
PFNA	4.52	13C9_PFNA	4.52	Isotope Dilution
9Cl-PF3ONS	4.69	13C3_HFPO-DA	4.5	Isotope Dilution

Table 11.12 – 4
Retention Times & Quantitation

Native Compounds	Typical Native RT (minutes)	IDA analog	Typical IDA RT (minutes)	Quantitation Method
PFOSA	4.82	13C8_PFOSA	4.82	Isotope Dilution
PFNS	4.83	13C8_PFOS	4.5	Isotope Dilution
PFDA	4.86	13C6_PFDA	4.86	Isotope Dilution
8:2 FTS	4.86	13C2-8:2FTS	4.86	Isotope Dilution
N-MeFOSAA	5.03	d3-MeFOSAA	5.03	Isotope Dilution
PFDS	5.16	13C8_PFOS	4.5	Isotope Dilution
PFUdA (PFUnA)	5.19	13C7_PFUdA	5.19	Isotope Dilution
N-EtFOSAA	5.19	d5-EtFOSAA	5.19	Isotope Dilution
N-MeFOSE	5.25	d7N-MeFOSE	5.25	Isotope Dilution
MeFOSA	5.26	d3MeFOSA	5.26	Isotope Dilution
11Cl-PF3OUdS	5.31	13C3_HFPO-DA	4.5	Isotope Dilution
N-EtFOSE	5.4	d9N-EtFOSE	5.4	Isotope Dilution
EtFOSA	5.44	d5EtFOSA	5.44	Isotope Dilution
PFDoA	5.47	13C2_PFDoA	5.47	Isotope Dilution
PFDoS	5.72	13C8_PFOS	4.5	Isotope Dilution
PFTrDA	5.75	13C2_PFDoA	5.47	Isotope Dilution
PFTeDA	5.99	13C2_PFTeDA	5.99	Isotope Dilution

Table 11.12 – 5
Retention Times & Quantitation

IDA	Typical IDA RT (minutes)	IS analog	Typical RT (minutes)	Quantitation Method
13C4_PFBA	2.08	13C3_PFBA	2.09	Internal Standard
13C5_PFPeA	3.71	13C2_PFHxA	4.62	Internal Standard
13C5_PFHxA	4.62	13C2_PFHxA	4.62	Internal Standard
13C4_PFHpA	5.34	13C2_PFHxA	4.62	Internal Standard
13C8_PFOA	5.94	13C4_PFOA	5.94	Internal Standard
13C9_PFNA	6.43	13C5_PFNA	4.52	Internal Standard
13C6_PFDA	6.88	13C2_PFDA	4.86	Internal Standard
13C7_PFUnA	7.32	13C2_PFDA	6.88	Internal Standard
13C2_PFDoA	7.72	13C2_PFDA	6.88	Internal Standard
13C2_PFTeDA	8.42	13C2_PFDA	6.88	Internal Standard
13C3-PFBS	4.50	18O2_PFHxS	6.00	Internal Standard
13C3_PFHxS	6.00	18O2_PFHxS	6.00	Internal Standard
13C8_PFOS	6.98	13C4_PFOS	6.98	Internal Standard
13C2_4:2FTS	4.41	18O2_PFHxS	6.00	Internal Standard
13C2_6:2FTS	5.75	18O2_PFHxS	6.00	Internal Standard
13C2_8:2FTS	6.72	18O2_PFHxS	6.00	Internal Standard
13C8_PFOSA	8.01	13C4_PFOS	6.98	Internal Standard
d3MeFOSA	9.49	13C4_PFOS	6.98	Internal Standard
d5EtFOSA	9.81	13C4_PFOS	6.98	Internal Standard
d3-MeFOSAA	6.93	13C4_PFOS	6.98	Internal Standard
d5-EtFOSAA	7.10	13C4_PFOS	6.98	Internal Standard
d7N-MeFOSE	9.37	13C4_PFOS	6.98	Internal Standard
d9N-EtFOSE	9.68	13C4_PFOS	6.98	Internal Standard
13C3_HFPO-DA	4.90	13C2-PFHxA	4.62	Internal Standard

11.12.1. Tune and calibrate the instrument as described in Section 10.

11.12.2. A typical run sequence is as follows:

- Rinse Blank (RB, not linked to anything)
- CCVL (referred to as an ISC in Method 1633)
- Qualitative verification standard
- Rinse Blank (RB, not linked to anything)
- Method blank
- LLCS
- LCS
- Bile salt interference check (TDCA, when analyzing tissues, DOD or MLVS samples)

- 10 samples: link to midpoint of ICAL
- CCV: link to midpoint of ICAL
- CCB
- 10 more samples: link to midpoint of ICAL
- CCV: link to midpoint of ICAL
- CCB
- Etc.

11.13. Vortex all sample aliquots and standards prior to placing on the autosampler.

11.14. Samples analyzed subsequent to any sample with results at or above the upper calibration limit must be evaluated for potential carryover, and corrective actions taken, as detailed below.

11.14.1. If carryover is suspected, those samples are to be re-analyzed from a fresh extract aliquot (i.e. go the archive of the extract).

11.14.2. Should there be instrument contamination, as evident by sample carryover, any sample >5X the UCL or instrument blanks with detections > RL:

- Analyze 20 blanks alternating between 1% formic acid/methanol and 1% formic acid/water.
- Then analyze 3 methanol only blanks.
- If the system is clean resume analyses. Proceed to 11.14.4. If not clean, proceed as directed below.

11.14.3. If the system is still contaminated the following items might need to be cleaned or replaced:

- Reverse flush the analytical column
- Reverse flush the isolation column
- Replace the column (isolation, analytical or both)
- Clean the cones/entry port
- Replace the PEEK tubing in the sample pathway
- Then, repeat 11.14.2.

11.14.4. Should a high level sample be analyzed that triggers these steps then detections for those analytes over the next 2-3 days require additional evaluation (are all instrument blanks from the sequence < ½ RL) and possible re-analysis. If sample results replicate and the associated instrument blanks from the sequences are <1/2 RL then one can assume the system is under control and confirmation of positive detections can stop.

12. CALCULATIONS / DATA REDUCTION

12.1. If the concentration of the analyte ions exceeds the working range as defined by the calibration standards, then the sample might require to be diluted and reanalyzed, based upon client need. It may be necessary to dilute samples due to matrix.

12.2. Extracts can be diluted up to no more than 10X without diluting out the IDA, in most cases, and thus preserving quantitation via isotope dilution. IDA recovery must be >5% in the dilution. Use the IDA recoveries in the undiluted analysis to select the dilution factor, with the objective of keeping the IDA recoveries in the dilution above the 5% lower limit.

12.2.1. For example, if the IDA recovery for the affected analyte in the undiluted analysis is 50%, then the extract cannot be diluted more than 10X. If the IDA recovery of the affected analyte in the undiluted analysis is 30%, then the extract cannot be diluted more than 6X.

12.2.2. If the IDA response in the dilution is < 10:1 signal to noise or RT is off then the sample is to be re-extracted at a smaller aliquot.

12.2.3. If a dilution greater than 10X is needed, then the sample should be re-extracted at a smaller aliquot.

12.2.4. If a dilution is required, report the 1X data, including IDA, as primary data, and analyte of interest and associated IDA only from the dilution as secondary data.

12.3. Results less than the reporting limit are flagged in the client report as estimated. Generally, the "J" flag is used to denote ≥ MDL and ≤ RL, but the specific flag may change based on client requirements.

12.4. Qualitative Identification

12.4.1. The retention times of PFAS with labeled standards should be the same as that of the labeled IDA's to within 0.1 min. For PFAS with no labeled standards, the RT must be within ± 0.4 minutes of the ICAL or the most recent CCV standard.

Note: The IDA RT and native RT may be offset by 0.02 to 0.04 minutes.

12.4.2. PFBS, PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions specified in the method due to the linear and branch isomers of these compounds. Most PFAS compounds are produced by one of two processes. One gives rise to linear PFAS only while the other process produces both linear and branched isomers. Both branched and linear PFAS compounds can potentially be

found in the environment. For the aforementioned compounds that give rise to more than one peak, all chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in the sample must be integrated in the same way as the calibration standard and concentrations reported as a total for each of these analytes.

12.4.3. The expected retention times (RT) are established in the Chrom data processing module during the processing of the ICAL by selecting Edit>Method>Update RT. Once the retention times are established Chrom will look for a peak within ± 0.25 minutes of the RT. The analyst confirms that the branched isomers present in the quantitative calibration standards for PFOS, PFHxS, NEtFOSAA and NMeFOSAA are within the ± 0.25 minute window. If they are not, an adjustment to the RT window is made. The analyst confirms the presence of the branched isomers in the technical (qualitative) standard as well, and adjusts the RT window for an analyte if it is not present within the ± 0.25 minute window.

12.4.3.1. If a peak is detected within this window of ±0.25 minutes, Chrom will assign the absolute retention time at the apex of the peak. Chrom assigns the RT to the most predominant peak within this window. As the linear peak is the predominant peak in calibration solutions for those PFAS that are calibrated with the combination of both branched and linear isomers, those PFAS require additional evaluation in the event that the branched isomer is the predominant peak in a field sample and Chrom has not positively identified the peak due to the RT shift, as the apex may now be the branched isomer.

12.4.3.2. Additional evaluation is required if the field samples contain branched isomers not present in the quantitative or qualitative standards. The analyst confirms that only the peaks present in the calibration standards are included in the peak integration, or adjusts the peak integration to assure that only the peaks present in the standards are identified and quantitated.

12.4.3.3. RT are updated as needed based upon evaluation of the daily CCV.

12.4.4. The signal to noise ratio for both quantitative and qualitative ions/transitions must be ≥ 3:1 for a baseline deflection to be considered a peak. If this criterion is not met, the analyte is not considered and reported as “non-detect”.

12.5. The ICAL established in Section 10 is used to calculate concentrations for the extracts.

12.6. Extract concentrations are calculated as below. The first equation applies Average Response Factor model, the second to a linear fit, and the third to the quadratic line fit.

Equation 5 $$Concentration\ (ng/mL) = \frac{y}{RRF}$$

Equation 6 $$Concentration\ (ng/mL) = \frac{y-c}{b}$$

Equation 7 $$Concentration\ (ng/mL) = \frac{-b \pm \sqrt{b^2-4ac-y}}{2a}$$

Where:

y = $\frac{Area_{Target}}{Area_{IDA}} \times Concentration(IDA)$

RRF = Relative Response Factor

x = concentration

a = curvature

b = slope

c = intercept

12.7. Water Sample Result Calculation:

Equation 8 $$Concentration\ (ng/L) = \frac{C_{ex}V_t}{V_0}$$

Where:

C_{ex} = Concentration measured in sample extract (ng/mL)

V_t = Volume of total extract (mL)

V_o = Volume of water extracted (L), i.e. total volume fortified with IDA

12.8. Soil Sample Result Calculation:

Equation 9 $$Concentration\ (ng/g) = \frac{C_{ex}V_t}{W_sD}$$

Where ng/g = µg/kg and:

C_{ex} = Concentration measured in sample extract (ng/mL)

V_t = Volume of total extract (mL)

W_s = Weight of sample extracted (g)

D = Fraction of dry solids, which is calculated as follows:

$\frac{100-\%\ moisture\ in\ sample}{100}$ (for dry weight result)

12.9. IDA Recovery Calculation:

Equation 10 $$\%\ Recovery = \frac{A_{IDA}Q_{IS}}{A_{IS}Q_{IDA}RRF_{IDA}} \times 100$$

Where:

RRF_{IDA}	=	Response Factor for IDA compound
A_{IDA}	=	Area response for IDA compound
A_{IS}	=	Area Response for IS compound
Q_{IS}	=	Amount of IS added
Q_{IDA}	=	Amount of IDA added

12.10. Raw data, calibration summaries, QC data, and sample results are reviewed by the analyst. These must also be reviewed thoroughly by a second qualified person. See the Data Review Policy (WS-PQA-0012). These reviews are documented in TALS.

13. METHOD PERFORMANCE

13.1. The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required expertise.

13.2. Method Detection Limit

The laboratory must generate a valid method detection limit for each analyte of interest. The MDL must be below the reporting limit for each analyte. The procedure for determination of the method detection limit is given in 40 CFR Part 136, Appendix B, and further defined in SOP WS-QA-0006 and policy WS-PQA-003. MDLs are available in the Quality Assurance Department.

13.3. Initial Demonstration of Capability (IDOC)

13.3.1. The method initial demonstration of capability is performed by processing 4 LCS samples and a method blank. Compare the average recovery and RSD to the IPR limits in Table 5 of the reference method.

13.3.2. Each analyst performing this procedure must successfully analyze four LCS QC samples using current laboratory LCS control limits in the LIMS. IDOCs are approved by the Quality Assurance Manager and the Technical Director. IDOC records are maintained by the QA staff in the central training files.

14. POLLUTION PREVENTION

14.1. All waste will be disposed of in accordance with Federal, State and Local regulations.

14.2. Solid phase extraction used for water samples greatly reduces the amount of solvent used compared to liquid-liquid extraction.

14.3. Standards and reagents are purchased and prepared in volumes consistent with laboratory use to minimize the volume of expired standards and reagents requiring disposal.

14.4. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in Section 13 of the NDSC Safety Manual for "Waste Management and Pollution Prevention."

14.5. Do not allow waste solvent to vent into the hoods. All solvent waste is stored in capped containers unless waste is being transferred.

14.6. Transfer waste solvent from collection cups (tri-pour and similar containers) to jugs and/or carboys as quickly as possible to minimize evaporation.

15. WASTE MANAGEMENT

The following waste streams are produced when this method is carried out:

15.1. Assorted test tubes, autovials, syringes, filter discs and cartridges. Dump the dry solid waste into a yellow contaminated lab trash bucket. When the bucket is full or after no more than one year, tie the plastic bag liner shut and put the lab trash into the hazardous waste – landfill steel collection drum in the H3 closet. When the drum is full or after no more than 75 days, move it to the waste collection area for shipment.

15.2. Extracted soil samples, used sodium sulfate, paper funnel filters, glass wool, thimbles, and extracted solids saturated with solvents. Dump these materials into an orange contaminated lab trash bucket. When the bucket is full or after no more than one year, tie the plastic bag liner shut and put the lab trash into the incineration steel collection drum in the H3 closet. When the drum is full or after no more than 75 days, move it to the waste collection area for shipment.

15.3. Waste Methanol. Collect the waste solvents in tripours during use. Empty the tripours into a 1-liter to 4-liter carboy at the fume hood. When the carboy is full, or at the end of your shift, whichever comes first, empty the carboy into the steel flammable solvent drum in the H3 closet. When the drum is full to between four and six inches of the top, or after no more than 75 days, move the steel flammable solvent drum to the waste collection area for shipment.

15.4. Mixed water/methanol waste from soil extraction. Collect the waste in the HPLC waste carboy. When full, or after no more than one year, dump into the blue plastic HPLC collection drum in the H3 closet. When the drum is full to between four and six inches of the top or after no more than 75 days, move it to the waste collection area for shipment.

15.5. Aqueous acidic waste from the LCMS instrument contaminated with methanol. This is collected in a 1-gallon carboy at the instrument. When the carboy is full, or after no more than one year, it is emptied into the blue plastic HPLC collection drum in the H3 closet. When the drum is full to between four and six inches of the top or after no more than 75 days, move it to the waste collection area for shipment.

15.6. Autovials contaminated with methanol. As the autovials are removed from the instrument after analysis, they are collected in open containers at the instrument. After all autovials are removed, the open container must be dumped into a closed satellite collection container in a fume hood, as the punctured septa in the autovial can allow methanol and other contaminants to evaporate into the atmosphere. The satellite collection containers are transferred to the waste disposal area when full or after no more than one year, where they are disposed through the vial eater or by consolidation into 55-gallon open top plastic drum, which is shipped after no more than 90 days.

16. REFERENCES

16.1. Draft Method 1633 – Analysis of Per- and Polyfluroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids and Tissue Samples by LC-MS/MS, August 2021.

16.2. 2nd Draft Method 1633 – Analysis of Per- and Polyfluroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids and Tissue Samples by LC-MS/MS, June 2022.

17. METHOD MODIFICATIONS

17.1. Modifications from Method 1633 are detailed below: Note that only items 17.1.3 and 17.1.5 are applicable to the MLVS. All other items can not be used in the MLVS.

17.1.1. Percent solids in aqueous samples is determined by visual comparison to a reference sample that contains 50 mg of solid material (carbon). If samples are more turbid the extracted volume is reduced or the sample is processed as a solid based upon consultation with the client.

17.1.2. An SPE cartridge with 500 mg of WAX and 50 mg of carbon is used for water extraction and solid matrices clean up. As a result solvents and elution procedures are different.

17.1.3. The TDCA separation window is changed from 60 seconds to less than 15 seconds and baseline resolution.

17.1.4. The CCVL (ISC) will be used to start the analytical sequence on non-ICAL days and is to meet both S/N (3:1) and CCV acceptance criteria.

17.1.5. The corrective action to be taken in the event of clogging occurring in the SPE columns that is described in Section 11.3.6.1 is in lieu of using a second SPE cartridge as described in the reference method.

17.1.6. Immediately following the loading of aqueous samples onto the SPE columns, sample bottles are rinsed with reagent water, and the reagent water added to the column reservoir. This step is addition to the basic methanol rinse as part of the SPE elution step.

18. ATTACHMENTS

18.1. Appendix 1 – Cartridge Description

19. REVISION HISTORY

19.1. WS-LC-0039, Revision 1.3, Effective 10/12/2022

19.1.1. Section 8.3.1 rewritten to clarify process for determining solids.

19.1.2. Section 8.3.2, removed, “including aqueous samples with more than 50 mg solids”

19.1.3. Section 11.2.2.3, changed to read, “Transfer 1mL of sample into an injection vial.”

19.1.4. Section 11.2.2.6, changed all values to be multiples of 0.625 rather than 0.25, added 10,000X dilution bullet.

19.1.5. Inserted Table 11.12-5.

19.1.6. Editorial changes.

19.2. WS-LC-0039, Revision 1.2, Effective 09/27/2022

19.2.1. Section 11.5.7 revised to, “Adjust the volume to 5 mL. Cap and vortex.”

19.2.2. Section 11.9.2 revised to, “Adjust final volume to 5 mL.”

19.2.3. Editorial changes.

19.3. WS-LC-0039, Revision 1.1, Effective 08/19/22

19.3.1. Section 5.1.2 inserted, filtering warnings added throughout.

19.3.2. Sections 7.6.2.1 and 10.9.7 had “only if eluent is not acetonitrile” added.

19.3.3. Section 8.3.1.1 was added.

19.3.4. Section 9.11.1 was added.

19.3.5. Section 11.2.2.1 was added.

19.3.6. Section 11.2.3.1 was added.

19.3.7. Section 12.2 was completely revised.

19.3.8. Section 17.1.1 was added.

19.3.9. Table 11.12-2, 13C8_PFOS, changed Q3 to 79.9, 13C8_PFOC_2, changed

Q3 to 98.9.

19.3.10. Section 11.2.10, added, “using narrow range pH paper (Section 6.13).”

19.3.11. Section 11.6.21, added, “Check that the pH is 6.5 ± 0.5 using narrow range pH paper (Section 6.13). If necessary, adjust pH with 50% formic acid and 3% ammonium hydroxide.”

19.3.12. [redacted]

19.3.13. Section 16, added reference to 2nd Draft Method 1633, June 2022.

19.3.14. Removed references to 250 mL sample volume for aqueous samples throughout the document.

19.3.15. Editorial Revisions.

19.4. WS-LC-0039, Revision 1.0, Effective 04/08/22.

19.4.1. MLVS and its definition was added to Section 3.

19.4.2. MLVS requirements were delineated where needed: Sections 6.3, 6.8.1, 6.9, 7.6.2.1, 9.3.2.1, 9.4.2, 9.5.2, 9.6.1, 9.9.4, 9.11.1, 10.9.7.1, 11.1, 11.3.2.1, 11.4.3, 11.7.21, 11.6.20.2, 11.10.18.2 and 17.

19.4.3. Added Sections 6.3.1, 11.2.4.1, 11.3.6.2, 11.6.20.1 and 11.10.18.1.

19.4.4. Deleted Sections 11.6.21 through 11.6.24.

19.4.5. Deleted Sections 11.10.21 through 11.10.23.

19.4.6. Section 11.12.2 revised run sequence order.

19.4.7. Editorial changes.

19.5. WS-LC-0039, Revision 0, Effective 03/08/2022

19.5.1. This is the initial version of this SOP.

APPENDIX 1

1. The SPE used for DOD/DOE/MLVS samples is the standard 150 mg OASIS WAX SPE without carbon and manually packed with rinsed glass wool. All other SPE parameters: solvents, elution procedures, etc. are identical to those outlined in Section 11.

Attachment B. Example Field Forms

HALEY ALDRICH

TEST PIT LOG

Test Pit No.

Page 1 of

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP**	
CONTRACTOR		**DATE**	
EQUIPMENT		**WEATHER**	

Ground El. ft.		**Location**	**Groundwater depths/entry rates (in./min.):**
El. Datum		**PID Make/Model**	

Depth (ft.)	Sample ID	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand			% Fines	Field Test			
					% Coarse	% Fine	% Coarse	% Medium	% Fine		Dilatancy	Toughness	Plasticity	Strength
0														

Obstructions:

Remarks:

Field Tests

Dilatancy:	R - Rapid S - Slow N- None
Toughness:	L - Low M - Medium H - High
Plasticity:	N - Nonplastic L - Low M - Medium H - High
Dry Strength:	N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit:

at depth ft.

measured after hrs. elapsed

Boulders:

Diameter (in.)	Number		Approx. vol. (cu. ft.)
12 to 24		=	
over 24		=	

Test Pit Dimensions (ft.):

Pit Depth

Pit Length X Width

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

Form 2006

ENVIRONMENTAL TEST PIT LOG

HALEY ALDRICH

Test Pit No.

Page 1 of

PROJECT		H&A FILE NO.	
LOCATION		PROJECT MGR.	
CLIENT		FIELD REP	
CONTRACTOR		DATE	
EQUIPMENT		WEATHER	

Ground El. _____ ft.
El. Datum _____

Location _____
PID Make / Model _____

Groundwater depths/entry rates (in./min.):

Depth (ft.)	Sample ID	PID Reading (ppm.)	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand			% Fines	Field Test			
						% Coarse	% Fine	% Coarse	% Medium	% Fine		Dilatancy	Toughness	Plasticity	Strength
0															

Obstructions:

Remarks:

Bucket Decontamination Meth

Field Tests

Dilatancy:	R - Rapid S - Slow N- None
Toughness:	L - Low M - Medium H - High
Plasticity:	N - Nonplastic L - Low M - Medium H - High
Dry Strength:	N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit:

at depth _____ ft.
measured after _____ hrs. elapsed

Boulders:

Diameter (in.)	Number		Approx. vol. (cu. ft.)
12 to 24		=	
over 24		=	

Test Pit Dimensions (ft.):

Pit Depth _____
Pit Length X Width _____

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

J:\forms\final\Frm_3709.xls

Form 2006 USCS Env.

HALEY ALDRICH

Haley & Aldrich, Inc.
465 Medford St.,
Suite 2200,
Boston, MA 02129-1402

CHAIN OF CUSTODY RECORD

Phone (617) 886-7400
Fax (617) 886-7600

Page of

H&A FILE NO.		**LABORATORY**		**DELIVERY DATE**	
PROJECT NAME		**ADDRESS**		**TURNAROUND TIME**	
H&A CONTACT		**CONTACT**		**PROJECT MANAGER**	

Sample No.	Date	Time	Depth	Type	Analysis Requested: VOA	ABNs PAH only	MCP Metals	Pesticides PCBs	VPH Full Suite C-ranges only	EPH Full Suite C-ranges only	TPH (specify)	TCLP (specify)	Reactivity Ignitability Corrosivity				Number of Containers	Comments (special instructions, precautions, additional method numbers, etc.)
																		Laboratory to use applicable DEP CAM methods, unless otherwise directed.

Sampled and Relinquished by	**Received by**
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time

Relinquished by	**Received by**
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time

Relinquished by	**Received by**
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time

LIQUID	
	VOA Vial
	Amber Glass
	Plastic Bottle
	Preservative
	Volume

SOLID	
	VOA Vial
	Amber Glass
	Clear Glass
	Preservative
	Volume

PRESERVATION KEY

A	Sample chilled	**C**	NaOH	**E**	H_2SO_4	**G**	Methanol
B	Sample filtered	**D**	HNO_3	**F**	HCL	**H**	Water/NaHSO4 (circle)

Sampling Comments

Evidence samples were tampered with? YES NO

If YES, please explain in section below.

Presumptive Certainty Data Package (Laboratory to use applicable DEP CAM methods)

If Presumptive Certainty Data Package is needed, initial all sections:

_____ The required minimum field QC samples, as designated in BWSC CAM-VII have been or will be collected, as appropriate, to meet the requirements of Presumptive Certainty.

_____ Matrix Spike (MS) samples for MCP Metals and/or Cyanide are included and identified herein.

_____ This Chain of Custody Record (specify) _____includes _____does not include samples defined as Drinking Water Samples.

_____ If this Chain of Custody Record identifies samples defined as Drinking Water Samples, Trip Blanks and Field Duplicates are included and identified and analysis of TICs are required, as appropriate. Laboratory should (specify if applicable)_____analyze

Required Reporting Limits and Data Quality Objectives

☐ RC-S1 ☐ S1 ☐ GW1
☐ RC-S2 ☐ S2 ☐ GW2
☐ RC-GW1 ☐ S3 ☐ GW3
☐ RC-GW2

WHITE - Laboratory **CANARY** - Project Manager **PINK** - Haley & Aldrich Laboratory

FEBRUARY 2016

Form 3003

WATER AND WASTEWATER METHODS			Solid	Liquid	
Analysis Description	**Method No.**	**Preservative**	**Sample Volume/Container**		**Holding Time**
Alkalinity	310	Cool 4° C	N/A	250 mL HDPE	14 days
Amenable Cyanide	Std. Mth. 412 F.	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
Ammonia	350	pH<2 H2SO4, Cool 4° C	N/A	1 L HDPE	28 days
Base/Neutral & Acid Extractables	625	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Biochemical Oxygen Demand (BOD)	405.1	Cool 4° C	N/A	2 L HDPE	48 hours
Chemical Oxygen Demand (COD)	410	pH<2 H2SO4, Cool 4° C	N/A	125 mL HDPE	28 days
Chloride	300.0, 325	None Required	N/A	125 mL HDPE	28 days
Chromium, Hexavalent	3500D, 218.4/5	None Required	N/A	1 L HDPE	24 hours
Fluoride	300.0, 340	None Required	N/A	500 mL HDPE	28 days
Hardness, Total (as CaCO3)	130	pH<2 H2SO4, Cool 4° C	N/A	250 mL HDPE	6 Months
Nitrate	300.0, 352.1	Cool 4° C	N/A	250 mL HDPE	48 Hours
Nitrite	300.0, 354.1	Cool 4° C	N/A	125 mL HDPE	48 Hours
Orthophosphate	300.0, 365	Filter, Cool 4° C	N/A	125 mL HDPE	48 Hours
PCBs	608	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Pesticides	608	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Physiologically Available Cyanide	MADEP draft	pH>12 NaOH, 4° C	N/A	1 L HDPE	14 days
Priority Pollutant Metals (13 Metals)	200.7/AA, 200 Series	pH<2 HNO3, 4° C	N/A	1 L HDPE	28 days (Hg), 6 mos. (others)
Purgeable Halocarbons & Aromatics	8021	pH 2 HCI, Cool 4° C	N/A	40 mL Glass Vial	14 days
RCRA Metals (8 Metals)	200.7/AA, 200 Series	pH<2 HNO3, 4° C	N/A	1 L HDPE	28 days (Hg), 6 mos. (others)
Sulfate	300.0, 375	Cool 4° C	N/A	250 mL HDPE	28 days
Sulfide	376	pH>9 NaOH, Zn Acetate, Cool 4° C	N/A	1 L HDPE	7 days
Sulfite	377.1	None Required	N/A	125 mL HDPE	Analyze Immediately
Total Cyanide	335	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
Total Dissolved Solids (TDS)	209	Cool 4° C	N/A	250 mL HDPE	7 days
Total Organic Carbon (TOC)	415	pH<2 HCI or H2SO4, Cool 4° C, Dark	N/A	40 mL Amber	28 days
Total Organic Halogen (TOX)	506	pH<2 HNO3, 4° C	N/A	1 L Amber	check with lab
Total Phenolics	420.1	pH<2 H2SO4, Cool 4° C	N/A	1 L Amber	28 days
Total Phosphorus	365	pH<2 H2SO4, Cool 4° C	N/A	125 mL HDPE	28 days
Total Solids (TS)	160.3	Cool 4° C	N/A	250 mL HDPE	7 days
Total Suspended Solids (TSS)	160.2	Cool 4° C	N/A	250 mL HDPE	7 days
Volatile Organics	624	pH 2 HCI, Cool 4° C	N/A	40 mL Glass Vial	14 days
Weak and Dissociable Cyanide	Std. Mth. 412 H.	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
DRINKING WATER ANALYSIS					
Volatile Organics	502.2 or 524.2	pH 2 HCI, Cool 4° C	N/A	40 mL Glass Vial	14 days
MICROBIOLOGY					
Fecal Coliform	STDMTH	Cool 4° C	N/A	sterile, 125 mL	6 hours
Standard Plate Count	STDMTH	Cool 4° C	N/A	sterile, 125 mL	6 hours
Total Coliform	STDMTH	Cool 4° C	N/A	sterile, 125 mL	6 hours

SOIL/SEDIMENTS/WATER		Solids (S) / Liquids (L)	Solid	Liquid	
Analysis Description	**Method No.**	**Preservative**	**Sample Volume/Container**		**Holding Time**
Acid Extractables/Base/Neutral Extractables	8270	S/L: Cool 4° C	8 oz. CWM	1 L Amber	S:14 days Ext / L:7 days Ext
Amenable Cyanide	-	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Chromium, Hexavalent - Soil	3060A/7196	Cool 4° C	8 oz. CWM	-	S:30 days Ext / L:7 days Ext
Chromium, Hexavalent - Liquid	7196	Cool 4° C	-	1 L HDPE	24 hours
Herbicides	8150	S/L: Cool 4° C	8 oz. CWM	1 L Amber	S:14 days Ext / L:7 days Ext
MCP Metals	6010, 7470, 7471	S/L: Cool 4° C	8 oz. CWM	1 L HDPE	28 days (Hg), 6 mos. (others)
PAH (low level)	8310 or GC/MS SIM	S/L: Cool 4° C	8 oz. AWM	1 L Amber	S:14 days Ext / L:7 days Ext
Paint Filter Liquids Test	9095	S: Cool 4° C	8 oz. CWM	1 L Amber	Analyze ASAP
PCBs	8082	S/L: Cool 4° C	8 oz. CWM	1 L Amber	S:14 days Ext / L:7 days Ext
Pesticides	8081	S/L: Cool 4° C	8 oz. CWM	1 L Amber	S:14 days Ext / L:7 days Ext
Physiologically Available Cyanide	MADEP	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Priority Pollutant Metals(13 Metals)	6010&7000	S: 4° C / L: pH<2 HNO3, 4° C	8 oz. CWM	1 L HDPE	28 days (Hg), 6 mos. (others)
RCRA Metals (8 Metals)	6010&7000	S: 4° C / L: pH<2 HNO3, 4° C	8 oz. CWM	1 L HDPE	28 days (Hg), 6 mos. (others)
Total Cyanide	9014	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Volatile Organics	8260B, 8021	S: methanol/$NaHSO_4$, 4° C / L: pH<2 HCI, 4° C	4 oz. CWM	40 mL Glass Vial	14 days
RCRA HAZARDOUS WASTE CHARACTERIZATION					
Corrosivity (pH only)	SW846-7.2	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
Ignitability/Flashpoint	SW846-7.1	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
Reactivity (CN-/S2-)	SW846-7.3	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
TCLP (RCRA 8) Metals	1311	S: Cool 4° C	16 oz. CWM	check with lab	6 mos. Ext/6 mos. Analyze
TCLP Pesticides/Herbicides	1311	S: Cool 4° C	16 oz. CWM	check with lab	14 days Ext/40 days Analyze
TCLP Semivolatiles	1311	S: Cool 4° C	16 oz. CWM	check with lab	14 days Ext/40 days Analyze
TCLP Volatiles	1311	S: Cool 4° C	8 oz. CWM	check with lab	14 days Ext/14 days Analyze
HYDROCARBON OIL & GREASE ANALYSIS					
MADEP EPH Method	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
MADEP EPH Method (C-Ranges only)	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
MADEP VPH Method	MADEP REV. 0	S: methanol, 4° C / L: pH<2 HCI, 4° C	40 mL+2 oz. CWM.	40 mL Glass Vial	S: 28 days / L: 14 days
MADEP VPH Method (C-Ranges only)	MADEP REV. 0	S: methanol, 4° C / L: pH<2 HCI, 4° C	40 mL+2 oz. CWM.	40 mL Glass Vial	S: 28 days / L: 14 days
MADEP EPH Method - with selected PAHs (including acenaphthene, naphthalene, 2-methylnaphthalene, and phenanthrene)	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
Petroleum Identification	ASTM D3328				
Quantitative (include Chromatograms)		S: Cool 4° C / L: pH<2 H_2SO_4, 4° C	4 oz. CWM	1 L Amber	S: 7 days / L: 28 days
Total Petroleum Hydrocarbons (Infrared)	418.1	S: Cool 4° C / L: pH<2 H_2SO_4, 4° C	4 oz. CWM	1 L Amber	S: 7 days / L: 28 days

MCP METALS						
Antimony (Sb)	Barium (Ba)	Cadmium (Cd)	Lead (Pb)	Nickel (Ni)	Silver (Ag)	Vanadium (V)
Arsenic (As)	Beryllium (Be)	Chromium (Cr)	Mercury (Hg)	Selenium (Se)	Thallium (Tl)	Zinc (Zn)

This table is offered for informational purposes only and is intended to be followed and used by persons having related technical skills and at their own discretion and risk. Since conditions and the manner of use are outside of Haley & Aldrich's control,

Haley & Aldrich, Inc.
465 Medford St., Suite 2200
Boston, MA 02129
Tel: 617-886-7400

Sample ID:	File Number:
Depth:	Project:
Date:	Analysis:
Time:	Preservative:
Collected By:	Laboratory:
Comments:	

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Collected By:	Laboratory:
Comments:	

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Comments:	

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Date:	Analysis:
Time:	Preservative:
Collected By:	Laboratory:
Comments:	

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Sample ID:	File Number:
Depth:	Project:
Date:	Analysis:
Time:	Preservative:
Collected By:	Laboratory:
Comments:	

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LOW-FLOW GROUNDWATER SAMPLING RECORD

Page of

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP**	
CONTRACTOR		**DATE**	

GROUNDWATER SAMPLING INFORMATION

Well ID													
Depth Of Well (ft.) per Log													
Reference Mark													
Depth to Water from Reference Mark (ft.)													
Time													
Depth to Product (ft.)													
Field Measured Depth Of Well (ft.)													
Inside Diameter (in.)													
Standing Water Depth (ft.)													
Volume Of Water In Well (gallons/liters)													
Purging Device													
Volume of Bailer/Pump Capacity													
Cleaning Procedure													
Bails Removed/ Volume Removed													
Time Purging Started													
Time Purging Stopped													
Instrument Used to Monitor Field Parameters													
Sampling Device													
Cleaning Procedure													
Color													
Odor													
TIME SAMPLES TAKEN	VOA												
	ABN												
	Metals												
PARAMETERS	Time												
	Temp, C (+/-3%)												
	Conductivity, us/cm (+/- 3%)												
	Dissolved Oxygen, mg/L (+/- 10%)												
	pH (+/-0.1)												
	ORP/eH, mv (+/-10mv)												
	Turbidity, NTU (<5 NTU)												
	Volume purged, gallons												
	Drawdown, ft												

Remarks: (ie: field filtrations, persons communicated with at site, etc.)

Instrument Calibration Log

Project _____ **File No.** _____
Location _____ **Date** _____
Contractor _____ **Field Rep.** _____
Weather _____ **Outdoor Temp** _____

Equipment ID _____

Time Calibration Started: _____ **Time Calibration Completed:** _____

Dissolved Oxygen (100%)

Reading Before Calibration: _____
Barometric Pressure: _____
Temperature (C°) _____
Reading after calibration: _____
Probe Type (Check One)
Membrane ☐ Optical ☐

pH 7

Reading Before Calibration: _____
Calibration Value: _____
Temperature (C°) _____
Lot/Expiration: _____
Reading After Calibration: _____

pH 10

Reading Before Calibration: _____
Calibration Value: _____
Temperature (C°) _____
Lot/Expiration: _____
Reading After Calibration: _____

pH 4

Reading Before Calibration: _____
Calibration Value: _____
Temperature (C°) _____
Lot/Expiration: _____
Reading After Calibration: _____

Specific Conductance/ Conductivity

Reading Before Calibration: _____
Calibration Value: _____
Temperature (C°) _____
Lot/Expiration: _____
Reading After Calibration: _____

ORP **Standard** **(mv) at 25°C** _____

Reading Before Calibration: _____
Calibration Value: _____
Temperature (C°) _____
Lot/Expiration: _____
Reading After Calibration: _____

Dissolved Oxygen (0 mg/L)

Reading _____
Temperature (C°) _____
Lot/Expiration: _____
Reading less than 0.20 mg/L? _____

PM Calibration Check

Time Start: Time End: Temp:

DO 100 % _____
pH 7 _____
Specific Conductivity _____
ORP (mv) _____

Notes:

HALEY ALDRICH

DAILY FIELD REPORT

Page of

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**REPORT NO.**	
CONTRACTOR		**DATE**	
WEATHER		**TEMPERATURE**	

Field Representative(s)	**Time on site**	**Report/Travel/Other**	**Total hours**

Distribution:

Haley & Aldrich, Inc.

10. HASP ACKNOWLEDGEMENT FORM

All Haley & Aldrich employees onsite must sign this form prior to entering the site.

I hereby acknowledge receipt of, and briefing on, this HASP prior to the start of on-site work. I declare that I understand and agree to follow the provisions, processes, and procedures set forth herein at all times while working on this site.

Printed Name	Signature	Date

Attachment C. Glossaries, Acronyms, and Abbreviations

Attachment C. Glossaries, Acronyms, and Abbreviations

Glossary of General Terms

Ambient: Background or away from point sources of contamination. Surrounding environmental condition.

Anthropogenic: Human-caused.

Conductivity: A measure of water's ability to conduct an electrical current. Conductivity is related to the concentration and charge of dissolved ions in water.

Dissolved oxygen (DO): A measure of the amount of oxygen dissolved in water.

pH: A measure of the acidity or alkalinity of water. A low pH value (0 to 7) indicates that an acidic condition is present, while a high pH (7 to 14) indicates a basic or alkaline condition. A pH of 7 is considered to be neutral. Since the pH scale is logarithmic, a water sample with a pH of 8 is 10 times more basic than one with a pH of 7.

Point source: Source of pollution that discharges at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites where more than 5 acres of land have been cleared.

Pollution: Contamination or other alteration of the physical, chemical, or biological properties of any waters of the state. This includes change in temperature, taste, color, turbidity, or odor of the waters. It also includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state. This definition assumes that these changes will, or are likely to create a nuisance or render such waters harmful, detrimental, or injurious to: (1) public health, safety, or welfare; or (2) domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or (3) livestock, wild animals, birds, fish, or other aquatic life.

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Synoptic survey: Data collected simultaneously or over a short period of time.

Acronyms and Abbreviations

AFFF	aqueous film-forming foam
BOD	biological oxygen demand
CAS	Chemical Abstract Service
CLARC	Cleanup Levels and Risk Calculations
DO	dissolved oxygen
DOD	United States Department of Defense
DQO	data quality objective
e.g.	for example
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management (database)
EIS	extracted internal standards
EPA	U.S. Environmental Protection Agency
ETFE	ethylene-tetrafluoroethylene
FAA	Federal Aviation Administration
FEP	fluorinated ethylene propylene
ft bgs	feet below ground surface
GSI Environmental	GSI Environmental Inc.
HDPE	high-density polyethylene
HFPO-DA, or GenX	hexafluoropropylene dimer acid
i.e.	in other words
IPI	Initial PFAS Investigation
Isotech	Isotech Laboratories Inc.
LCS	laboratory control sample
LDPE	low-density polyethylene
MDL	method detection limit
MQO	measurement quality objective
ND	non-detect
ng/L	nanograms per liter
NIS	non-extracted internal standards
OP	operating procedure

ORP	oxidation reduction potential
PCTFE	polychlorotrifluoroethylene
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutane sulfonate
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PPE	personal protective equipment
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RL	reporting limit
RPD	relative percent difference
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
SC	specific conductance
SIA	Spokane International Airport (Site)
SM	Standard Method
SOP	standard operating procedure
SPE	solid phase extraction
TOC	total organic carbon
VSMOW	Vienna Standard Mean Ocean Water
WAC	Washington Administrative Code

Units of Measurement

°C	degrees centigrade
°F	degrees Fahrenheit
µm	micrometer
g	gram, a unit of mass
mg/L	milligrams per liter (parts per million)
mL	milliliter
ng/L	nanograms per liter (parts per trillion)
ppt	parts per trillion also ng/L

Quality Assurance Glossary

Accreditation: A certification process for laboratories, designed to evaluate and document a lab's ability to perform analytical methods and produce acceptable data (Kammin, 2010). For Ecology, it is defined according to WAC 173-50-040: "Formal recognition by [Ecology] that an environmental laboratory is capable of producing accurate and defensible analytical data."

Accuracy: The degree to which a measured value agrees with the true value of the measured property. EPA recommends that this term not be used, and that the terms *precision* and *bias* be used to convey the information associated with the term *accuracy* (EPA, 2014).

Analyte: An element, ion, compound, or chemical moiety (pH, alkalinity) which is to be determined. The definition can be expanded to include organisms, e.g., fecal coliform, Klebsiella (Kammin, 2010).

Bias: Discrepancy between the expected value of an estimator and the population parameter being estimated (Gilbert, 1987; EPA, 2014).

Blank: A synthetic sample, free of the analyte(s) of interest. For example, in water analysis, pure water is used for the blank. In chemical analysis, a blank is used to estimate the analytical response to all factors other than the analyte in the sample. In general, blanks are used to assess possible contamination or inadvertent introduction of analyte during various stages of the sampling and analytical process (U.S. Geological Survey [USGS], 1998).

Calibration: The process of establishing the relationship between the response of a measurement system and the concentration of the parameter being measured (Ecology, 2004).

Check standard: A substance or reference material obtained from a source independent from the source of the calibration standard; used to assess bias for an analytical method. This is an obsolete term, and its use is highly discouraged. See Calibration Verification Standards, Laboratory Control Samples (LCS), Certified Reference Materials (CRM), and/or spiked blanks. These are all check standards but should be referred to by their actual designator, e.g., CRM, LCS (Kammin, 2010; Ecology, 2004).

Comparability: The degree to which different methods, data sets and/or decisions agree or can be represented as similar; a data quality indicator (EPA, 2014 and 2020).

Completeness: The amount of valid data obtained from a project compared to the planned amount. Usually expressed as a percentage. A data quality indicator (EPA, 2014 and 2020).

Continuing Calibration Verification Standard (CCV): A QC sample analyzed with samples to check for acceptable bias in the measurement system. The CCV is usually a mid-point calibration standard that is re-run at an established frequency during the course of an analytical run (Kammin, 2010).

Control limits: Statistical warning and action limits calculated based on control charts. Warning limits are generally set at +/- 2 standard deviations from the mean, action limits at +/- 3 standard deviations from the mean (Kammin, 2010).

Data integrity: A qualitative data quality indicator that evaluates the extent to which a data set contains data that is misrepresented, falsified, or deliberately misleading (Kammin, 2010).

Data quality indicators (DQI): Commonly used measures of acceptability for environmental data. The principal DQIs are precision, bias, representativeness, comparability, completeness, sensitivity, and integrity (EPA, 2006).

Data quality objectives (DQO): Qualitative and quantitative statements derived from systematic planning processes that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions (EPA, 2006).

Data set: A grouping of samples organized by date, time, analyte, etc. (Kammin, 2010).

Data validation: The process of determining that the data satisfy the requirements as defined by the data user (EPA, 2020). There are various levels of data validation (EPA, 2009).

Data verification: Examination of a data set for errors or omissions, and assessment of the DQIs related to that data set for compliance with acceptance criteria (MQOs). Verification is a detailed quality review of a data set (Ecology, 2004).

Detection limit (limit of detection)**:** The concentration or amount of an analyte which can be determined to a specified level of certainty to be greater than zero (Ecology, 2004).

Duplicate samples: Two samples taken from and representative of the same population, and carried through and steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variability of all method activities including sampling and analysis (EPA, 2014).

Field blank: A blank used to obtain information on contamination introduced during sample collection, storage, and transport (Ecology, 2004).

Initial Calibration Verification Standard (ICV): A QC sample prepared independently of calibration standards and analyzed along with the samples to check for acceptable bias in the measurement system. The ICV is analyzed prior to the analysis of any samples (Kammin, 2010).

Laboratory Control Sample (LCS)/LCS duplicate: A sample of known composition prepared using contaminant-free water or an inert solid that is spiked with analytes of interest at the midpoint of the calibration curve or at the level of concern. It is prepared and analyzed in the same batch of regular samples using the same sample preparation method, reagents, and analytical methods employed for regular samples. Monitors a lab's performance for bias and precision (EPA, 2014).

Matrix spike/Matrix spike duplicate: A QC sample prepared by adding a known amount of the target analyte(s) to an aliquot of a sample to check for bias and precision errors due to interference or matrix effects (Ecology, 2004).

Measurement Quality Objectives (MQOs)**:** Performance or acceptance criteria for individual data quality indicators, usually including precision, bias, sensitivity, completeness, comparability, and representativeness (EPA, 2006).

Measurement result: A value obtained by performing the procedure described in a method (Ecology, 2004).

Method: A formalized group of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, data analysis), systematically presented in the order in which they are to be executed (EPA, 2001).

Method blank: A blank prepared to represent the sample matrix, prepared and analyzed with a batch of samples. A method blank will contain all reagents used in the preparation of a sample, and the same preparation process is used for the method blank and samples (Ecology, 2004; Kammin, 2010).

Method Detection Limit (MDL): The minimum measured concentration of a substance that can be reported with 99 percent confidence that the measured concentration is distinguishable from method blank results (EPA, 2016). MDL is a measure of the capability of an analytical method of distinguished samples that do not contain a specific analyte from a sample that contains a low concentration of the analyte (EPA, 2020).

Minimum level: Either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the MDL, whichever is higher. For the purposes of National Pollutant Discharge Elimination System compliance monitoring, EPA considers the following terms to be synonymous: "quantitation limit," "reporting limit," and "minimum level" (40 CFR 136).

Parameter: A specified characteristic of a population or sample. Also, an analyte or grouping of analytes. Benzene and nitrate + nitrite are all parameters (Kammin, 2010; Ecology, 2004).

Precision: The extent of random variability among replicate measurements of the same property; a data quality indicator (USGS, 1998).

Quality assurance (QA): A set of activities designed to establish and document the reliability and usability of measurement data (Kammin, 2010).

Quality Assurance Project Plan (QAPP): A document that describes the objectives of a project, and the processes and activities necessary to develop data that will support those objectives (Kammin, 2010; Ecology, 2004).

Quality control (QC): The routine application of measurement and statistical procedures to assess the accuracy of measurement data (Ecology, 2004).

Relative Percent Difference (RPD): RPD is commonly used to evaluate precision. The following formula is used:

$$RPD = [Abs(a-b)/((a + b)/2)] * 100\%$$

where "Abs()" is absolute value and *a* and *b* are results for the two replicate samples. RPD can be used only with two values. Percent Relative Standard Deviation is (%RSD) is used if there are results for more than two replicate samples (Ecology, 2004).

Relative Standard Deviation (RSD): A statistic used to evaluate precision in environmental analysis. It is determined in the following manner:

$$RSD = (100\% * s)/x$$

where *s* is the sample standard deviation and *x* is the mean of results from more than two replicate samples (Kammin, 2010).

Replicate samples: Two or more samples taken from the environment at the same time and place, using the same protocols. Replicates are used to estimate the random variability of the material sampled (USGS, 1998).

Reporting level: Unless specified otherwise by a regulatory authority or in a discharge permit, results for analytes that meet the identification criteria (i.e., rules for determining qualitative presence/absence of an analyte) are reported down to the concentration of the minimum level established by the laboratory through calibration of the instrument. EPA considers the terms "reporting limit," "quantitation limit," and "minimum level" to be synonymous (40 CFR 136).

Representativeness: The degree to which a sample reflects the population from which it is taken; a data quality indicator (USGS, 1998).

Sample (field): A portion of a population (environmental entity) that is measured and assumed to represent the entire population (USGS, 1998).

Sample (statistical): A finite part or subset of a statistical population (EPA, 1992).

Sensitivity: In general, denotes the rate at which the analytical response (e.g., absorbance, volume, meter reading) varies with the concentration of the parameter being determined. In a specialized sense, it has the same meaning as the detection limit (Ecology, 2004).

Spiked blank: A specified amount of reagent blank fortified with a known mass of the target analyte(s); usually used to assess the recovery efficiency of the method (EPA, 2014).

Spiked sample: A sample prepared by adding a known mass of target analyte(s) to a specified amount of matrix sample for which an independent estimate of target analyte(s) concentration is available. Spiked samples can be used to determine the effect of the matrix on a method's recovery efficiency (EPA, 2014).

Split sample: A discrete sample subdivided into portions, usually duplicates (Kammin, 2010).

Standard Operating Procedure (SOP): A document which describes in detail a reproducible and repeatable organized activity (Kammin, 2010).

Surrogate: For environmental chemistry, a surrogate is a substance with properties similar to those of the target analyte(s). Surrogates are unlikely to be native to environmental samples. They are added to environmental samples for quality control purposes, to track extraction efficiency and/or measure analyte recovery. Deuterated organic compounds are examples of surrogates commonly used in organic compound analysis (Kammin, 2010).

Systematic planning: A step-wise process which develops a clear description of the goals and objectives of a project, and produces decisions on the type, quantity, and quality of data that will be needed to meet those goals and objectives. The DQO process is a specialized type of systematic planning (EPA, 2006).

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GSI Job No.: 6892
Issued: 13 December 2024

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX C

Appendix C. Health and Safety Plan

HALEY & ALDRICH, INC.
SITE-SPECIFIC SAFETY PLAN

FOR

Spokane International Airport PFAS Support

9000 W Airport Dr, Spokane, WA 99224

Project/File No. 0209800-000

Gensuite EZ Scan®

MAN - General

Prepared By: Chad Moniz	**Date: 12/13/2024**
Approvals: The following signatures constitute approval of this Health & Safety Plan.	
Field Safety Manager: Andrew Foerster	**Date: 12/13/2024**
Project Manager: Breeyn Greer	**Date: 12/13/2024**
HASP Valid Through: 12/31/2025	

Table of Contents

Attachments

STOP WORK AUTHORITY

In accordance with Haley & Aldrich (Haley & Aldrich) Stop Work Authority Operating Procedure (OP1035), any individual has the right to refuse to perform work that he or she believes to be unsafe without fear of retaliation. He or she also has the authority, obligation, and responsibility to stop others from working in an unsafe manner.

STOP Work Authority is the stop work policy for all personnel and subcontractors on the Site. When work has been stopped due to an unsafe condition, Haley & Aldrich site management (e.g., Project Manager [PM], Site Health & Safety Officer [SHSO], etc.) and the Haley & Aldrich Senior Project Manager (SPM) will be notified immediately.

Reasons for issuing a stop work order include, but are not limited to:

- The belief/perception that injury to personnel or accident causing significant damage to property or equipment is imminent.
- A Haley & Aldrich subcontractor is in breach of site safety requirements and/or their own site HASP.
- Identifying a substandard condition (e.g., severe weather) or activity that creates an unacceptable safety risk as determined by a qualified person.

Work will not resume until the unsafe act has been stopped OR sufficient safety precautions have been taken to remove or mitigate the risk to an acceptable degree. Stop work orders will be documented as part of an on-site stop work log, on daily field reports to include the activity/activities stopped, the duration, person stopping work, person in-charge of stopped activity/activities, and the corrective action agreed to and/or taken. Once work has been stopped, only the Haley & Aldrich SPM or SHSO can give the order to resume work. Haley & Aldrich senior management is committed to support anyone who exercises his or her “Stop Work” authority.

ISSUANCE AND COMPLIANCE

This HASP has been prepared in accordance with Occupational Safety and Health Administration (OSHA) regulations (CFR 29, Parts 1904, 1910, and 1926) if such are applicable.

The specific requirements of this HASP include precautions for hazards that exist during this project and may be revised as new information is received or as site conditions change.

- This HASP must be signed by all Haley & Aldrich personnel involved in implementation of the SOW (Section 2 of this HASP).
- This HASP, or a current signed copy, must be retained at all times when Haley & Aldrich staff are present.
- Revisions to this HASP must be outlined within the contents of the HASP. If immediate or minor changes are necessary, the Field Safety Manager (FSM), Haley & Aldrich, SSO and/or Project Manager (PM) may use Attachment A (HASP Amendment Form), presented at the end of this HASP. Any revision to the HASP requires employees and subcontractors to be informed of the changes so that they understand the requirements of the change.
- Deviations from this HASP are permitted with approval from the Haley & Aldrich FSM, PM, or Senior Health & Safety Manager (SHSM). Unauthorized deviations may constitute a violation of Haley & Aldrich company procedures/policies and may result in disciplinary action.
- This HASP will be relied upon by Haley & Aldrich's subcontractors and visitors to the site. Haley & Aldrich's subcontractors must have their own HASP which will address hazards specific to their trade that is not included in this HASP. This HASP will be made available for review to Haley & Aldrich's subcontractors and other interested parties (e.g. Facility personnel and regulatory agencies) to ensure that Haley & Aldrich has properly informed our subcontractors and others of the potential hazards associated with the implementation of the SOW to the extent that Haley &Aldrich is aware.

This site-specific HASP provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this HASP (e.g., injury reporting, medical surveillance, personal protective equipment (PPE) selection, etc.) are described in detail in the Haley &Aldrich Corporate Health and Safety Program Manual and within Haley & Aldrich's Standard Operating Procedures. Both the manual and SOPs can be located on the Haley & Aldrich's Company Intranet. When appropriate, users of this HASP should always refer to these resources and incorporate to the extent possible. The manual and SOPs are available to clients and regulators upon request.

EMERGENCY EVENT PROCEDURES

1 - ASSESS THE SCENE

- **STOP WORK**
- Review the situation and ascertain if it's safe to enter the area.
- Evacuate the site if the conditions are unsafe.

2 - EVALUATE THE EMERGENCY

- **Call 911, or designated emergency number, if required.**
- **Provide first aid for the victim if qualified and safe to do so.**
  - First aid will be addressed using the onsite first aid kit. *
    - If providing first aid, remember to use proper first aid universal precautions if blood or bodily fluids are present.
- **For all injuries or illnesses (including exposure to ticks) not requiring 911 or similar emergency response, staff shall contact the WorkCare Injury Illness Hotline (1-888-449-7787) to initiate a health assessment and receive guidance.**
- **If exposure to hazardous substance is suspected, immediately vacate the contaminated area.**
  - Remove any contaminated clothing and/or equipment.
  - Wash any affected dermal/ocular area(s) with water for at least 15 minutes.
  - Seek immediate medical assistance if any exposure symptoms are present.

** Note: Haley & Aldrich employees are not required or expected to administer first aid / CPR to any Haley & Aldrich staff member, Contractor, or Civilian personnel at any time; it is Haley & Aldrich´s position that those who do are doing so on their own behalf and not as a function of their job.*

3 - SECURE THE AREA

- **Cordon off the incident area, if possible.**
  - Notify any security personnel, if required.
  - Escort all non-essential personnel out of the area, if able.

4 - REPORT ON-SITE ACCIDENTS / INCIDENTS TO PM / SSO

- **Notify the PM and SSO as soon as it is safe to do so.**
  - Assist PM and SSO in completing any additional tasks, as required.

5 - INVESTIGATE / REPORT THE INCIDENT

- **Record details of the incident for input to the Gensuite.**
  - Complete any additional forms as requested by the PM and SSO.

6 - TAKE CORRECTIVE ACTION

- **Implement corrective actions per the PM following root cause analysis.**
  - Complete Lessons Learned form.

PROJECT INFORMATION AND CONTACTS	
Project Name: Spokane International Airport PFAS Support	**Haley & Aldrich File No.:** 0209800-000
Location: 9000 W Airport Dr, Spokane, WA 99224	
Client/Site Contact: Phone Number:	Lisa Corcoran 509-808-6577
Haley & Aldrich Field Representative: Phone Number: Emergency Phone Number:	Zack Castillo da Silva 509-828-3404 509-907-6198
Haley & Aldrich Project Manager: Phone Number: Emergency Phone Number:	**Breeyn Greer** 206-972-6521 206-972-6521
Field Safety Manager: Phone Number: Emergency Phone Number:	Andrew Foerster 216-706-1318 440-227-8765
Subcontractor Site Representative: Phone Number:	Aaron Adams; Yellowjacket Drilling Services District Manager 602-350-2563
Nearest Hospital: Address: (see map on next page) Phone Number:	MultiCare Deaconess Hospital 800 W 5th Ave, Spokane, WA 99204 509-303-5800
Nearest Occ. Health Clinic:	Contact WorkCare for location of nearest Occupational Health Clinic
Liberty Mutual Claim Policy	**WC6Z11254100034**
WorkCare Injury Hotline	**888-449-7787**
Emergency Response Number:	**911**
Other Local Emergency Response Number:	Police Emergencies and Dispatch can also be reached at 509-455-6429. Airfield Operations can be reached at 509-455-6421.
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	

DIRECTIONS TO THE NEAREST HOSPITAL

Spokane International Airport
9000 W Airport Dr, Spokane, WA 99224

Take W Airport Dr and I-90 E/US-2 E to W 5th Ave

9 min (6.3 mi)

1. Head southwest on W Airport Dr toward Flint Rd

56 ft

2. Turn left at the 1st cross street onto Flint Rd

0.2 mi

3. Turn left onto W Airport Dr

2.2 mi

4. Merge onto US-2 E

0.6 mi

5. Keep left at the fork, follow signs for I-90 E/Spokane/US-2 and merge onto I-90 E/US-2 E

2.5 mi

6. Use the right lane to take exit 280 toward Lincoln St

0.2 mi

7. Continue onto W 5th Ave

364 ft

8. Continue straight onto W 4th Ave

0.4 mi

9. Turn right onto S Monroe St

384 ft

Continue on W 5th Ave to your destination

2 min (0.2 mi)

10. Turn left at the 1st cross street onto W 5th Ave

0.2 mi

11. Turn left
Destination will be on the right

213 ft

MultiCare Deaconess Hospital
800 W 5th Ave, Spokane, WA 99204

1. WORK SCOPE

This Site-Specific Health and Safety Plan addresses the health and safety practices and procedures that will be exercised by all Haley & Aldrich employees participating in all work on the Project Site. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich and Haley & Aldrich's experience with other similar project sites. The scope of work includes the following:

- **Verify and document the current condition of monitoring wells and well monuments**
- **Measure depth to water (DTW) in each monitoring well**
- **Purge groundwater using a peristaltic pump and low-flow methodology**
- **Sample groundwater for per- and polyfluoroalkyl substances (PFAS), cations, anions, alkalinity, stable isotopes, and biological oxygen demand**
- **Sonic drilling of soil cores for geologic documentation and soil sampling**
- **Sample soil for PFAS**
- **Monitoring well installation**

Project Task Breakdown

Task No.	Task Description	Employee(s) Assigned	Work Date(s) or Duration
1	Water Sampling – includes taking DTW measurements, purging wells, sampling groundwater, and deploying transducers	Zack Castillo da Silva, Luke Peden	3/4/24 – TBD
2	Drilling and well installation – Includes drilling oversight on a drilling rig using one or more drilling methods.	Zack Castillo da Silva, Luke Peden	11/25/24 - TBD
3	Soil sampling – Includes soil sample collection from drilled soil cores	Zack Castillo da Silva, Luke Peden	11/25/24 - TBD

Subcontractor(s) Tasks

Firm Name	Work Activity	Work Date(s) or Duration
Yellow Jacket Drilling Services	Sonic Drilling	TBD

Projected Start Date: 11/25/2024

Projected Completion Date: TBD

2. SITE OVERVIEW / DESCRIPTION

Site Classification

Industrial

Site Description

The Spokane International Airport (GEG) is a 6,000-acre commercial airport served by six airlines and three air cargo carriers. GEG is located in Spokane, Washington, approximately 7 miles west-southwest of downtown Spokane.

Background and Historic Site Usage

The Department of Defense purchased the airport from Spokane County and renamed to Geiger Field in 1941. During the World War II, the airport served as a major aircraft training base for United States Air Force and United States Army Air Forces, as well as an aircraft maintenance and supply depot. Following World War II, the City of Spokane acquired ownership of GEG in 1946 and renamed to Spokane International Airport in 1960.

Groundwater samples were collected and analyzed for PFAS in the years 2017, 2018, and 2019, but the analysis was limited to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). PFOA concentrations in groundwater ranged between 1.4-5000 nanograms per liter (ng/L) and PFOS concentrations ranged between 9.5-1100 ng/L.

Site Status

Indicate current activity status and describe operations at the site:

Active

Operations are typical of a commercial airport, which includes passenger enplanement and cargo shipment.

Site Plan

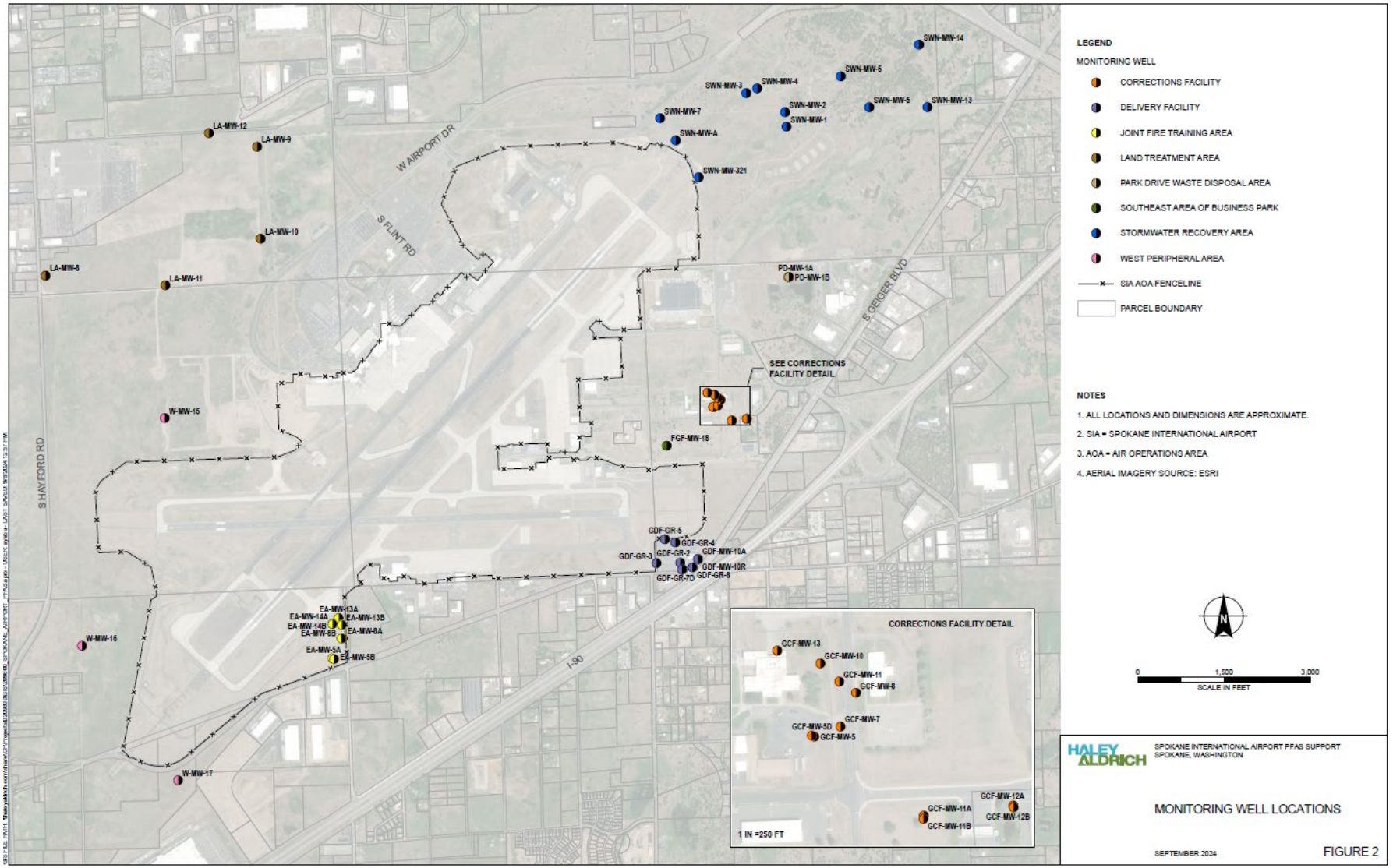
Is a site plan or sketch available? Yes

Work Areas

List and identify each specific work areas(s) on the job site and indicate its location(s) on the site plan:

Enter work area description

Site Plan



3. HAZARD ASSESSMENT

Indicate all hazards that may be present at the site and for each task. If any of these potential hazards are checked, it is the Project Manager's responsibility to determine how to eliminate / minimize the hazard to protect onsite personnel.

Site Chemical Hazards

Is this Site impacted with chemical contamination? Yes

Source of information about contaminants: Owner Knowledge

Contaminant of Concern	Location/Media	Concentration	Units
PFAS	**Groundwater**	**5**	**ug/L**

Per- and polyfluoroalkyl substances (PFAS) are a class of anthropogenic compounds that are persistent in nature due to unique properties such as thermal and chemical resistance, hydrophobicity, and oleophilicity. Due to these properties, PFAS are extensively used in commercial and industrial applications including as a surfactant for firefighting activities. Exposure to certain levels of PFAS may lead to negative reproductive and developmental defects, increased risk of some cancers, and reduced ability to fight infections.

Site Hazards Checklist

Weather

Cold Temperatures	High Winds	Hot Temperatures	Select Hazard

Cold Temperatures

Cold stress may occur at any time work is being performed at low ambient temperatures and high velocity winds. Because cold stress is common and has potentially serious illnesses associated with outdoor work during cold seasons, regular monitoring and other preventative measures are vital.

Refer to OP1003-Cold Stress for additional information and mitigation controls.

High Winds

While high winds are commonly associated with severe thunderstorms and hurricanes they may also occur as a result of differences in air pressures, such as when a cold front passes across the area. They can cause downed trees and power lines, and flying debris (such as dust or larger debris), which adds additional risks and could lead to power outages, transportation disruptions, damage to buildings and vehicles, and serious injury.

Wind Advisory are issued for sustained winds 25 to 39 mph and/or gusts to 57 mph. High Wind warnings are issued by the National Weather Service when high wind speeds may pose a hazard or is life threatening. The criteria for this warning will varies by state. The Beaufort Wind Scale is a helpful tool to when dealing with high winds.

Hot Temperatures

Heat stress may occur at any time work is being performed at elevated ambient temperatures. Because heat stress is one of the most common and potentially serious illnesses associated with outdoor work during hot seasons, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management.

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working when there are hot temperatures or a high heat index. Refer OP1015-Heat Stress for a discussion on hot weather hazards.

Biological			
Small Mammals	Stinging Insects	Wildlife Droppings	Choose an item.

Small Mammals

Rodents are the most abundant order of mammals. There are hundreds of species of rats; the most common are the black and brown rat. Other rodents you may encounter are mice, beavers, squirrels, guinea pigs, capybaras and coypu.

The Brown Rat has small ears, blunt nose, and short hair. It is approximately 14-18” long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, and supermarkets. They also frequent any space with an easy meal and potential nesting sites. The Black Rat is identified by its tail, that is always longer than the length from the head to the body. It is also slimmer and more agile than the Brown rat. Its size varies according to its environment and food supply.

The House Mouse has the amazing ability to adapt and can frequently be found in human dwellings. In buildings, mice will live anywhere and difficult to keep out. Mice are omnivorous, they will eat anything. Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

Some major problems caused by rats and mice are contaminating the food they eat with urine and

excrement. Gnawing into materials such as paper, wood, or upholstery, to use as nest material. Also gnawing plastic, cement, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard. Occasionally biting people and may kill small animals. They, or the parasites they carry, like fleas, mites and worms, spread many diseases such as salmonella, trichinosis, rat bite fever, hantavirus, Weil's disease, and bubonic plague. They damage ornamental plants by burrowing among the roots or feeding on new growth. They also eat garden vegetables, such as corn and squash. These rodents have been a problem for centuries, because of their incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

Avoid contact with rodents, if possible. Avoid contact with rodent excrement. Do not eat food or water that may have encountered rodent excrement. If exposed, wash hands and avoid touching your face with your hands.

Stinging Insects

Stinging Insects fall into two major groups: Apidae (honeybees and bumblebees) and vespids (wasps, yellow jackets, and hornets). Apidae are docile and usually do not sting unless provoked. The stinger of the honeybee has multiple barbs, which usually detach after a sting. Vespids have few barbs and can inflict multiple stings.

There are several kinds of stinging insects that might be encountered on the project site. Most stings will only result in a temporary injury. However, sometimes the effects can be more severe, even life-threatening depending on where you are stung and what allergies you have. Being stung in the throat area of the neck may cause edema (swelling caused by fluid build-up in the tissues) around the throat and may make breathing difficult.

In rare cases, a severe allergic reaction can occur. This can cause "anaphylaxis" or anaphylactic shock with symptoms appearing immediately or up to 30 minutes later. Symptoms include hives, itching and swelling in areas other than the sting site, swollen eyes/eyelids, wheezing, chest tightness, difficulty breathing, hoarse voice, swelling of the tongue, dizziness or sharp drop in blood pressure, shock, unconsciousness or cardiac arrest. Reactions can occur the first time you are stung or with subsequent stings. If you see any signs of reaction, or are unsure, call or have a co-worker call emergency medical services (e.g., 911) right away. Get medical help for stings near the eyes, nose or throat. Stay with the person who has been stung to monitor their reaction.

Staff who are allergic to bee stings are encouraged to inform their staff/project manager. If staff member carries an Epi-pen (i.e., epinephrine autoinjector) they are encouraged to inform their colleagues in case they are stung and are incapable of administering the injection. Examine site for any signs of activity or a hive/nest. If you see several insects flying around, see if they are entering/exiting from the same place. Most will not sting unless startled or attacked. Do not swat, let insects fly away on their own. If you must, walk away slowly or gently "blow" them away. If a nest is disturbed and you hear "wild" buzzing, protect your face with your hands and run from the area immediately. Wear long sleeves, long pants, and closed-toed boots. Wear light-colored clothes such as khakis. Avoid brightly colored, patterned, or black clothing. Tie back long hair to avoid bees or wasps from entanglement. Do

not wear perfumes, colognes or scented soaps as they contain fragrances that are attractive. If bee or wasp is found in your car, stop and leave windows open.

Wildlife Droppings

Project sites involving abandoned buildings may bring staff into contact with animal droppings. There are many diseases that one can be exposed to from a variety of animals.

Mice and Rats
Hantavirus is transmitted to humans from dried droppings, urine, or saliva of mice and rats. The disease begins as a flu-like illness with fever, chills, and muscle aches, but can rapidly progress to a life-threatening condition marked by respiratory failure as fluids fill the lungs. Persons working in infested buildings are at increased risk to this disease, particularly during dusty clean-up activities.

Birds and Bats
Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the nutrient-rich accumulations of bird droppings, feathers and debris under a roost, particularly if roosts have been active for years.

Histoplasmosis and Cryptococcosis are the most common fungal diseases associated with bird and bat dropping. Infection occurs when spores, carried by the air, are inhaled, especially after a roost has been disturbed. The active and inactive roosts of blackbirds, starlings and cowbirds have also been found to be heavily contaminated with fungus spores. Most infections are mild and produce either no symptoms or a minor influenza-like illness. Occasionally the disease can cause high fever, blood abnormalities, pneumonia and even death.

Do not touch droppings with unprotected hands. Avoid disturbing the droppings and generating dust. Employee work practices and dust control measures that eliminate or reduce dust generation during removal of manure from a building will also reduce risks of infection and development of disease. Use an industrial vacuum cleaner with a high-efficiency (HEPA) filter to bag contaminated material.

Location/Terrain			
Public Rd/Right of Way	SIMOPS	Slip/Trip/Falls	AOA

Public Right of Way

H&A staff and their subcontractors conducting work on public roads and/or right of ways can be exposed to vehicular traffic and expose the public to the hazards of the job site. Where a hazard exists to site workers because of traffic or haulage conditions at work sites that encroach public streets or highways, a system of traffic controls in conformance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), or state program, is required. A Temporary Traffic Control

Plan (TCP) describes traffic controls to be used for facilitating vehicle and pedestrian traffic through a temporary traffic control zone TCPs are required to provide for worker protection and safe passage of traffic through and around job sites with as little inconvenience and delay as possible.

The plan may range in scope from being very detailed, to merely referencing typical drawings contained in the MUTCD. The degree of detail in the TCP depends entirely on the complexity of the situation, and TCPs should be prepared by persons knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

H&A Project Managers or their subcontractors need to establish appropriate control measures and obtain any permits when project work is on or encroaches public roadways. You may need flaggers or police details. Cease work and notify the field supervisor immediately if any conditions are such that safety is jeopardized. Utilize protective vehicles whenever appropriate or position equipment so in between the work and oncoming traffic.

SIMOPS

SIMOPS are described as the potential class of activities which could bring about an undesired event or set of circumstances, e.g., safety, environment, damage to assets, schedule, commercial, financial, etc. SIMOPS are defined as performing two or more operations concurrently.

SIMOPS should be identified at an early stage before operations commence to understand issues such as schedule and physical clashes, maintenance activities, failure impacts, interferences between vessels, contracts and third part interfaces and environmental impacts.

Coordinate project with site activities. Identify and understand the hazards associated with the host and client's activities. Integrate site emergency response protocols where appropriate and communicate to all project staff. Integrate site communication protocols and communicate to all project staff.

Slips, Trips & Falls

Slip and trip injuries are the most frequent injuries to workers. Statistics show most falls happen on the same level resulting from slips and trips. Both slips and trips result from unintended or unexpected change in the contact between the feet and the ground or walking surface. Good housekeeping, quality of walking surfaces (flooring), awareness of surroundings, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents.

Site workers will be walking on a variety of irregular surfaces that may affect their balance. Extra care must be taken to walk cautiously near rivers because the bottom of the riverbed maybe slick and may not be visible. Rocks, gradient changes, sandy bottoms, and debris may be present but not observable.

Take your time and pay attention to where you are going. Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing. Check the work area to identify hazards - beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain. Establish and utilize a pathway free of slip and trip hazards. Choose a safer walking route. Carry loads you can see over. Keep work areas clean and free of clutter. Communicate hazards to on-site personnel and remove hazards as appropriate.

Some components of Site work are to occur within the Air Operations Area (AOA). The AOA is the portion of the airport where aircraft takeoff, land, and taxi. Working in the AOA has hazards associated with moving aircraft. Site workers are required to be badged by the airport to work in these areas and will take extra care when driving to give all aircraft the right of way. Airport Operations will be notified in advance of Sote workers entering and exiting the AOA.

Miscellaneous			
Extended Shift	Choose an item.	Choose an item.	Choose an item.

Extended Shift

An extended shift can include extending a workday beyond eight hours. Extended or unusual work shifts may be more stressful physically, mentally, and emotionally. Non-traditional shifts and extended work hours may disrupt the body's regular schedule, leading to increased fatigue, stress, and lack of concentration. This leads to an increased risk of operator error, injuries and/or accidents. The degree to which an individual is exposed to fatigue risk factors depends upon the work schedule. As both the duration of the workday and the number of days worked increase so does the fatigue risk factors. Staff Managers need to be aware of the fatigue risk factors and ensure projects are structured to mitigate these factors. Staff Members also have a responsibility to manage the personal fatigue risk factors that they can control outside of work (e.g, duration and quality of sleep, diet, drugs, and alcohol)

Fatigue is a message to the body to rest and can be eliminated with proper rest. However, if rest is not possible, fatigue can increase and becomes distressing and eventually debilitating. Fatigue symptoms, both mental and physical, vary and depend on the person and degree of overexertion. Examples include weariness, sleepiness, irritability, reduced alertness, lack of memory, concentration and motivation, increased susceptibility to illness, depression, headache, loss of appetite, and digestive problems.

When possible, managers should limit use of extended shifts and increase the number of days worked. Working shifts longer than 8 hours generally result in reduced productivity and alertness. Additional breaks and meals should be provided when working extended shift periods. Tasks requiring heavy physical labor or intense concentration should be performed at the beginning of the shift if possible. This is an important consideration for pre-emergency planning.

Make efforts, when feasible, to ensure that unavoidable extended work shifts and shift changes allow affected employees time for adequate rest and recovery. Project Managers need to plan to have an adequate number of personnel available to enable workers to take breaks, eat meals, relax, and sleep.

Plan for regular and frequent breaks throughout the work shift. If at remote sites, ensure, if possible, that there is a quiet, secluded area designated for rest and recuperation. In addition to formal breaks such as lunch or dinner, encourage use of micro breaks to change positions, move about, and shift concentration. Personnel should look to obtain an adequate quantity and quality of sleep.

Task Hazard Summary

Task 1 – Water Sampling

Environmental water sampling could include activities such as groundwater sampling from permanent or temporary wells, or surface water sampling from streams, rivers, lakes, ponds, lagoons, and surface impoundments.

Sampling tasks could involve uncapping, purging (pumping water out of the well), and sampling, and/or monitoring, new or existing monitoring wells. A mechanical pump may be used to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the collection methods and procedures used.

When sampling bodies of water containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge, where ground failure or slips, trips or falls may cause him/her to lose his/her balance. The person performing the sampling should have fall restraint or protection for the task. When conducting sampling from a boat in an impoundment or flowing waters, appropriate vessel safety procedures should be followed. Avoid lifting heavy coolers with back muscles; instead, use ergonomic lifting techniques, team lift or mechanical lifts. Wear proper gloves, such as when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

Inhalation and absorption of COCs are the primary routes of entry associated with water sampling, due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different groundwater sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains or sprains from hand bailing, and potential eye hazards. Exposure to water containing COCs is also possible. All tools and equipment that will be used at the site must be intrinsically safe (electronics and electrical equipment) and non-sparking or explosion-proof (hand tools).

Task 2 – Drilling

Drilling is conducted for a range of services that can include but are not limited to: soil characterization, environmental investigation, well installation, and ore exploration. Familiarity with basic drilling safety is an essential component of all drilling projects. Potential hazards related to drilling operations include, but are not limited to encountering underground or overhead utilities, traffic and heavy equipment,

hoisting heavy tools, steel impacts, open rotation entanglement, and the planned or unexpected encountering of toxic or hazardous substances. While staff members do not operate drilling equipment, they may work in close proximity to operating drilling equipment and may be exposed to many of the same hazards as the drilling subcontractor. It is imperative that staff are aware of emergency stops and establish communication protocols with the drillers prior to the start of work.

See OP 1002 Drilling Safety for more information.

Task 3 – Soil Sampling

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activities such as building construction, earthwork and soil management related activities. These activities can include, but are not limited to: drill spoil characterization and management during building foundation element installation, characterization of excavated soils for management/disposal/reuse during earthwork activities, and as part of environmental remedial activities such as delineation and confirmation sampling. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites. Potential hazards related to soil sampling at construction sites include, but are not limited to: encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used. At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task Physical Hazards Checklist				
Potential Task Hazards	**Task 1** **Water Sampling**	**Task 2** **Drilling**	**Task 3** **Soil Sampling**	**Task 4** Task Name
Congested Area	☒	☒	☒	☐
Heavy Equipment	☒	☒	☒	☐
Ergonomics	☒	☒	☒	☐
Generated Wastes	☒	☒	☒	☐
Ground Disturbance	☐	☒	☐	☐
Hand/Power Tools	☒	☒	☒	☐
Line of Fire	☒	☒	☒	☐
Manual Lifting	☒	☒	☒	☐
Noise	☒	☒	☒	☐
Overhead Utilities	☐	☒	☒	☐
Rotating Equipment	☐	☒	☒	☐
Slippery Surfaces	☐	☒	☒	☐
Sharp Objects	☒	☒	☒	☐
Traffic	☐	☒	☒	☐
Underground Utilities	☐	☒	☒	☐
Other: rotating equipment	☐	☒	☒	☒
Other: Wildfire Smoke	☒	☒	☒	☐

Summary of Physical Hazards & Controls

Congested Areas

Working in congested areas can expose both workers and the public to a wide range of hazards depending upon the specific activities taking place. Staff Members need to understand the work scope, work areas, equipment on-site, and internal traffic patterns to minimize or eliminate exposure potential.

Controls

- Provide barricades, fencing, warning signs/signals and adequate lighting to protect people while working in or around congested areas.
- Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas.
- Lay out traffic control patterns to eliminate excessive congestion.
- Workers in congested areas should always wear high visibility clothing.
- Be aware of Line of Fire hazards when performing work activities in congested areas.
- Hazards associated with SIMOPs should be discussed daily at Tailgate Safety Meetings.

Heavy Equipment

Staff must be careful and alert when working around heavy equipment, failure or breakage and limited visibility can lead to accidents and worker injury. Heavy equipment such as cranes, drills, haul trucks, or other can fail during operation increasing chances of worker injury. Equipment of this nature shall be visually inspected and checked for proper working order prior to commencement of field work. Those operating heavy equipment must meet all requirements to operate the equipment. Haley & Aldrich, Inc. staff that supervise projects or are associated with high-risk projects that involve digging or drilling should use due diligence when working with a construction firm.

See OP1052 Heavy Equipment for additional information.

Controls

- Only approach equipment once you have confirmed contact with the operator (e.g., operator places the bucket on the ground).
- Always maintain visual contact with operators and keep out of the strike zone whenever possible.
- Always be alert to the position of the equipment around you.
- Always approach heavy equipment with an awareness of the swing radius and traffic routes of all equipment and never go beneath a hoisted load.
- Avoid fumes created by heavy equipment exhaust.

Ergonomics

Most Work-related Musculoskeletal Disorders (WMSDs) are caused by Ergonomic Stressors. Ergonomic Stressors are caused by poor workplace practices and/or insufficient design, which may present ergonomic risk factors. These stressors include, but not limited to, repetition, force, extreme postures, static postures, quick motions, contact pressure, vibration, and cold temperatures.

WMSDs are injuries to the musculoskeletal system, which involves bones, muscles, tendons, ligaments, and other tissues in the system. Symptoms may include numbness, tightness, tingling, swelling, pain, stiffness, fatigue, and/or redness. WMSD are usually caused by one or more Ergonomic Stressors. There may be individual differences in susceptibility and symptoms among employees performing similar tasks. Any symptoms are to be taken seriously and reported immediately.

See OP1053 Ergonomics for more information.

Controls

- Ensure workstations are ergonomically correct so bad posture is not required to complete tasks.
- Take periodic breaks over the course of the day.
- Stretch during break times.
- Break up tasks that require repetitive motion.
- Contact Corporate H&S with any ergonomic concerns

Generated Waste

Activities on environmental sites may generate waste that requires regulated handling and disposal. Excess sample solids, decontamination materials, poly sheeting, used PPE, etc. that are determined to be free of contamination through field or laboratory screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off-site disposal.

Controls

- Manage waste properly through good work practices.
- Collect, store, containerize waste, and dispose of it properly.
- All wastes generated shall be containerized in an appropriate container (i.e. open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM.
- Containers should be inspected for damages or defects
- Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary.
- Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

Ground Disturbance

Ground disturbance is defined as any activity disturbing the ground. Ground disturbance activities include, but are not limited to, excavating, trenching, drilling (either mechanically or by hand), digging, plowing, grading, tunneling and pounding posts or stakes.

Because of the potential hazards associated with striking an underground utility or structure, the operating procedure for underground utility clearance shall be followed prior to performing any ground disturbance activities.

See OP1020 Working Near Utilities

Controls

Prior to performing ground disturbance activities, the following requirements should be applied:

- Confirm all approvals and agreements (as applicable) either verbal or written have been obtained.

- Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable.
    - Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit.
- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone.
- Notifications to landowners and/or tenant, where deemed reasonable and practicable.
- Proximity and Common Right of Way Agreements shall be checked if the line locator information is inconclusive.

Hand and Power Tools

Hand and power tools can expose staff to a wide range of hazards depending upon the tool used. Hazards can include but are not limited to: falling, flying, abrasive, and splashing objects, or harmful dusts, fumes, mists, vapors, or gases.

Serious accidents often occur before steps are taken to evaluate and avoid or eliminate tool-related hazards. Staff must recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent those hazards.

See OP 1026 Hand and Power Tools for more information.

Controls

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job. Do not use a tool for a task which it was not designed for.
- Examine each tool for damage before use and do not use damaged tools.
- For tools that are damaged or defective, red tag the tool and take out of service.
- Operate tools per the manufacturers' instructions.
- Use the appropriate personal protective equipment.
- All electrically powered tools will be connected through a ground fault circuit interrupter (GFCI).
- All personnel must be trained on the use of the tool they are utilizing.

Line of Fire

Line of fire refers to the path an object will travel. Examples of line of fire situations typically observed on project sites include lifting/hoisting, lines under tension, objects that can fall or roll, pressurized objects or lines, springs or stored energy, work overhead, vehicles and heavy equipment.

Controls

- Never walk under a suspended load.
- Be aware and stay clear of tensioned lines such as cable, chain and rope.
- Be cautious of torque stresses that drilling equipment and truck augers can generate. Equipment can rotate unexpectedly long after applied torque force has been stopped.

- Springs and other items can release tremendous energy if compressed and suddenly released
- Items under tension and pressure can release tremendous energy if it is suddenly released.
- Not all objects may be overhead; be especially mindful of top-heavy items and items being transported by forklift or flatbed.
- Secure objects that can roll such as tools, cylinders, and pipes.
- Stay clear of soil cuttings or soil stockpiles generated during drilling operations and excavations, be aware that chunks of soil, rocks, and debris can fall or roll.

Manual Lifting/Moving

Most materials associated with investigation, remedial, or construction-related activities are moved by hand. The human body is subject to damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process.

Controls

- Under no circumstances should any one person lift more than 49 pounds unassisted.
- Always push, not pull, the object when possible.
- Size up the load before lifting. If it is heavy or clumsy, get a mechanical aid or help from a worker.
- Bend the knees; it is the single most important aspect of lifting.
- When performing the lift:
    - Place your feet close to the object and center yourself over the load.
    - Get a good handhold.
    - Lift straight up, smoothly and let your legs do the work, not your back!
    - Avoid overreaching or stretching to pick up or set down a load.
    - Do not twist or turn your body once you have made the lift.
    - Make sure beforehand that you have a clear path to carry the load.
    - Set the load down properly.

Noise

Working around heavy equipment (drill rigs, excavators, etc.) often creates excessive noise. The effects of noise include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities. Noise monitoring data that indicates that working within 25 feet of operating heavy equipment result in exposure to hazardous levels of noise (levels greater than 85 dBA).

See OP 1031 Hearing Conservation for additional information.

Controls

- Personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of heavy equipment.
- Limit the amount of time spent at a noise source.
- Move to a quiet area to gain relief from hazardous noise sources.
- Increase the distance from the noise source to reduce exposure.

Overhead Utilities

When work is undertaken near overhead electrical lines, the distance maintained from those lines shall also meet the minimum distances for electrical hazards as defined in Table 1 below. Note: utilities other than overhead electrical utilities need to be considered when performing work.

Table 1 Minimal Radial Clearance Distances *

Normal System Voltage Kilovolts (kV)	Required Minimal Radial Clearance Distance (feet/meters)
0 – 50	10/3.05
51 – 100	12/3.66
101 – 200	15/4.57
201 – 300	10/6.1
301 – 500	25/7.62
501 – 750	35/10.67
750 - 1000	45/13.72

* For those locations where the utility has specified more stringent safe distances, those distances shall be observed.

Controls

- To prevent damage, guy wires shall be visibly marked, and work barriers or spotters provided in those areas where work is being conducted.
    - When working around guy wires, the minimum radial clearance distances for electrical power shall be observed.
- The PM shall research and determine if the local, responsible utility or client has more restrictive requirements than those stated in Table 1.
- If equipment cannot be positioned in accordance with the requirements established in Table 1 the lines need to be de-energized.

Rotating Equipment

Exposure to rotating parts can occur when working near a drilling rig, or other similar equipment. All rotating parts should be covered with guards to prevent access by workers. When performing maintenance activities that require the rotating parts to be exposed, workers should not allow loose clothing, hands, or tools to approach the rotating parts. Energy isolation procedures must be followed, and guards must be replaced as soon as possible after completing the maintenance task.

Operation of drilling equipment also creates hazards associated with pinch points and rotating equipment. These are hazards where the body and extremities, especially the hands, can be caught in moving equipment and crushed.

Controls

- Evaluate work procedures to avoid placing the body and extremities in the path of rotating equipment and tools to avoid being struck by moving equipment, tools and machinery.
- Evaluate equipment and tool use to identify pinch points and develop procedures to avoid placing body parts in a position where they can be caught in moving equipment, tools and machinery.
- Follow energy isolation procedures if required
- Do not work near rotating equipment with long loose hair, loose clothing or jewelry.

Slippery Surfaces

Both slips and trips result from unintended or unexpected change in the contact between the feet and ground or walking surface. Good housekeeping, quality of walking surfaces, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents. Slips happen where there is too little friction or traction between the footwear and walking surface.

Common causes of slips are wet or oily surfaces, spills, weather hazards, loose unanchored rugs or mats and flooring or other walking surfaces that do not have same degree of traction in all areas.

Weather-related slips and falls become a serious hazard as winter conditions often make for wet or icy surfaces outdoors. Even wet organic material or mud can create hazardous walking conditions. Spills and leaks can also lead to slips and falls.

Controls

- Evaluate the work area to identify any conditions that may pose a slip hazard.
- Address any spills, drips or leaks immediately.
- Mark areas where slippery conditions exist.
- Select proper footwear or enhance traction with additional PPE.
- Where conditions are uncertain or environmental conditions result in slippery surfaces walk slowly, take small steps, and slide feet on wet or slippery surfaces.

Sharp Objects

Workers who handle sharp edged objects like sheets of steel or glass are at risk of cuts. Workers who handle sharp edged objects are also at risk of cuts. Injuries may occur to hands, fingers, or legs when they are in the way of the blade, when the blade slips, or if an open blade is handled unexpectedly. Other hazards at job sites include stepping on sharp objects (e.g. wooden boards with protruding nails, sharp work-tools, chisels, etc.) and colliding with sharp and/or protruding objects.

Controls

Always be alert when handling sharps. Never look away or become distracted while handling sharp objects. Use caution when working with tools; use right tool for the job. Keep tools sharp, dull blades are a safety hazard, requiring more force to make cuts which can lead to tool slippage. Wear appropriate PPE and do not handle sharp objects (i.e., broken glass) with bare hands. Use mechanical devices, when possible. Stay away from building debris; avoid handling site debris or placing your hand where you cannot see. Watch out for barbed wire and electrical fences; cover with a car mat or equivalent to cross or walk around; use the buddy system to avoid entanglement; wear gloves. Do not leave unprotected

sharps unattended. Use protective shields, cases, styrofoam blocks, etc. Pass a sharp by handing it over carefully by the handle with the blade down or retracted. Fixed open blades are prohibited. Always cut away from the body, making several passes when cutting thicker materials. Make sure blades are fitted properly into the knife. Never cut items with a blade or other sharp object on your lap. Never try to catch a blade or cutting tool that is falling.

Traffic

To ensure worker protection and the safe passage of traffic through and around job sites, Site Traffic Control procedures may need to be implemented on project sites. Job zone control and traffic management are necessary when Simultaneous Operations (SIMOPS) or third parties could be at risk of injury by entering the work zone, or when the work crew is at risk of injury by other operations.

Traffic patterns shall be evaluated. Conditions such as high pedestrian traffic, peak periods, daily deliveries or SIMOPS known, Heavy equipment traffic volume and light duty traffic volume shall be evaluated.

Early identification and planning for site operations that require job zone control and traffic management, including SIMOPS, is the responsibility of the Project Manager and primary contractor manager. Traffic control plans shall be consistent with the Manual on Uniform Traffic Control Devices.

See OP1025 Signs, Signals, and Barricades and/or OP1043 Site Traffic Control for more information.

Controls

- Alternate walkways where possible.
- Use of the local police to direct traffic.
- Use of an air horn to alert drivers or other workers.
- Maintain good housekeeping and clean the area as work is completed.
- Use the ‘buddy’ or ‘watchperson’ system while performing work.
- Use a spotter for backing, tight maneuvers, and bin/tank/equipment drop-offs.
- Use traffic control devices, field vehicles and barricades and avoid the use of caution tape.
- Park all vehicles (with wheels in a safe direction away from work) to block traffic with a flashing yellow light. Park so that access to the vehicle is away from oncoming traffic while working.
- When parking a vehicle and equipment, utilize a ‘first move forward’ driving practice.
- Work in an upright position, face traffic and make eye contact with drivers when possible.
- Minimize work time in traffic.
- Establish a ‘Stop Work’ hand signal.
- Personnel shall always wear high visibility vest.

If public sites, such as public roads, bicycle paths or footpaths, are closed or rerouted, local and regulatory requirements shall be followed, and traffic control permits shall be put in place. Proper traffic guiding equipment includes stop/slow paddle signs, flaggers, flashing lights and directional signs.

All personnel on-site should be aware of the plan of the day and the Traffic Control Plan should be communicated with all parties involved during the pre-shift meeting.

Underground Utilities

Various forms of underground/overhead utility lines or conveyance pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SHSO, Project Manager, and Regional H&S Manager shall be notified immediately. Work will be suspended until the client and applicable utility agency is contacted and the appropriate actions for the situation can be addressed.

See OP1020 Work Near Utilities for complete information.

Controls

- Obtain as-built drawings for the areas being investigated from the property owner;
- Visually review each proposed soil boring locations with the property owner or knowledgeable site representative;
- Perform a geophysical survey to locate utilities;
- Hire a private line locating firm to determine location of utility lines that are present at the property;
- Identifying a no-drill or dig zone;
- Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

Wildfire Smoke

Working in and around areas where wildfires are present is always a concern. Primarily the resulting poor air quality poses the greatest risk to staff required to work outdoors. The following groups of people are at greatest risk of the effects of poor air quality:

- Asthma and other lung conditions;
- Chronic Obstructive Pulmonary Disorder (COPD);
- Heart Disease;
- Pregnant People;
- Children and Teenagers;
- Responders and outdoor workers.

Extend exposure to poor air quality could lead to many negative health impacts. Both acute, and chronic health impacts are listed below:

<u>Acute:</u>

- Coughing
- Chest Pain
- Headache
- Scratchy Throat
- Tiredness
- Trouble Breathing

- Asthma Attack

Chronic:

- Increased risk of mortality
- Development of multiple health conditions
- Respiratory Illness
- Cancers

See OP1080 Wildfire Smoke Air Quality for more information.

Controls:
H&A has a robust wildfire smoke & air quality plan that adheres to the most stringent of the state requirements. When air quality is a concern staff member are encouraged to spend as much time as possible in a filtered air location without sacrificing the quality of their work. Staff sensitive to poor air quality are encouraged to have their work reassigned until air quality conditions improve.

H&A Air Quality Requirements

- Only Staff who have completed Wildfire Smoke & Air Quality training are allowed to work outdoors when AQI exceeds 51.
- NIOSH Approved N95 Respirators are made available in all offices for staff to use voluntarily when AQI exceeds 101.
- Staff are required to take breaks in filtered air locations (car, building with air circulation) when AQI exceeds 201.
- Outdoor Project work is stopped when AQI exceeds 251.

4. PROTECTIVE MEASURES

The personal protective equipment and safety equipment (if listed) is specific to the associated task. The required PPE and equipment listed must be onsite during the task being performed. Work shall not commence unless the required PPE or Safety Equipment is present.

Required Safety & Personal Protective Equipment

Required Personal Protective Equipment (PPE)	**Task 1**	**Task 2**	**Task 3**	**Task 4**
	Water Sampling	Drilling	Soil Sampling	Enter task description.
Hard hat	☒	☒	☒	☐
Safety Glasses	☒	☒	☒	☐
Safety Toed Shoes	☒	☒	☒	☐
Nitrile Gloves	☒	☒	☒	☐
Cut Resistant Gloves (A2)	☒	☒	☒	☐
Level of protection required	D	D	D	Select
Required Safety Equipment				
Fire Extinguisher	☒	☒	☒	☐
First Aid Kit	☒	☒	☒	☐
Safety Cones	☒	☒	☒	☐

5. TRAINING REQUIREMENTS

The table below lists the training requirements staff must have respective to their assigned tasks and that are required to access the Site.

Site Specific Training Requirements
HAZWOPER - 40 Hour (Initial)
First Aid/CPR
Site Specific Orientation – Airport Badging
Site Specific Orientation – PFAS Sampling

Task Specific Training Requirements				
Required Training Type	**Task 1**	**Task 2**	**Task 3**	**Task 4**
	Groundwater Sampling	Drilling	Soil Sampling	Enter task description.
SIA Airport Badging	☒	☒	☒	☐
PFAS Sampling	☒	☐☒	☐☒	☐

6. AIR MONITORING PLAN AND EQUIPMENT

Exposures to airborne substances shall be fully characterized throughout project operations to ensure that exposure controls are effectively selected and modified as needed.

Is air/exposure monitoring required at this work site for personal protection? No

Is perimeter monitoring required for community protection? No

Air monitoring plan not applicable Yes

7. DECONTAMINATION & DISPOSAL METHODS

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials.)

Personal Hygiene Safeguards

The following minimum personal hygiene safeguards shall be adhered to:

1. No smoking or tobacco products in any project work areas.
2. No eating or drinking in the exclusion zone.
3. It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.

It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Decontamination Supplies

All decontamination should be conducted at the project site in designated zones or as dictated by Client requirements. Decontamination should not be performed on Haley & Aldrich owned or leased premises.

☐ Acetone	☒ Distilled Water	☐ Polyethylene Sheeting
☒ Alconox Soap	☒ Drums	☐ Pressure/Steam Cleaner
☒ Brushes	☐ Hexane	☐ Tap Water
☐ Disposal Bags	☐ Methanol	☐ Wash tubs
☒ 5 Gallon Buckets	☒ Paper Towels	☐ Other: PFAS-Free Decon Water

Location of Decontamination Station

Decontamination station will be with the work truck.

Standard Personal Decontamination Procedures

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site contact the Project Manager and Field Safety Manager to discuss proper decontamination procedures.

The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots (if applicable)
6. Remove outer gloves (if applicable)
7. Remove Tyvek coverall (if applicable)
8. Remove respirator, wipe clean and store (if applicable)
9. Remove inner gloves (if outer gloves were used)

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles.

Small Equipment Decontamination

Pretreatment of heavily contaminated equipment may be conducted as necessary:

1. Remove gross contamination using a brush or wiping with a paper towel
2. Soak in a solution of Alconox and water (if possible)
3. Wipe off excess contamination with a paper towel

Standard decontamination procedure:

1. Wash using a solution of Alconox and water
2. Rinse with potable water
3. Rinse with distilled/deionized water

Inspect the equipment for any remaining contamination and repeat as necessary.

Disposal Methods

Procedures for disposal of contaminated materials, decontamination waste, and single use personal protective equipment shall meet applicable client, locate, State, and Federal requirements.

Disposal of Single Use Personal Protective Equipment

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles. PPE that is grossly contaminated must be bagged (sealed and field personnel should communicate with the Project Manager to determine proper disposal.

Standard Disposal Methods for Contaminated Materials

- Excess sample solids, decontamination materials, rags, brushes, poly-sheeting, etc. that are determined to be free of contamination through field screening can usually be disposed into client-approved, on-site trash receptacles.
- Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur.
- Contaminated materials must be segregated into liquids or solids and containerized separately for offsite disposal.

Any additional requirements that are designated by the workplan or by client specifications should be entered here.

8. SITE CONTROL

The overall purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. The degree of site control necessary depends on site characteristics, site size, and the surrounding community. The following information identifies the elements used to control the activities and movements of people and equipment at the project site.

Communication

Internal
Haley & Aldrich site personnel will communicate with other Haley & Aldrich staff member and/or subcontractors or contractors with:

Cellular Phones

External
H&S site personnel will use the following means to communicate with off-site personnel or emergency services.

Cellular Phones

Visitors

Project Site
Will visitors be required to check-in prior to accessing the project site?

Yes, visitors will be required to check-in.

Visitor Access
Authorized visitors that require access to the project site need to be provided with known information with respect to the site operations and hazards as applicable to the purpose of their site visit. Authorized visitors must have the required PPE and appropriate training to access the project site.

Project Safety Manager is responsible for facilitating authorized visitor access.

Zoning

Work Zone
The work zone will be clearly delineated to ensure that the general public or unauthorized worker access is prevented. The following will be used:

Cones

9. SITE SPECIFIC EMERGENCY RESPONSE PLAN

The Emergency Response Plan addresses potential emergencies at this site, procedures for responding to these emergencies, roles, responsibilities during emergency response, and training. This section also describes the provisions this project has made to coordinate its emergency response with other contractors onsite and with offsite emergency response organizations (as applicable).

During the development of this emergency response plan, local, state, and federal agency disaster, fire, and emergency response organizations were consulted (if required) to ensure that this plan is compatible and integrated with plans of those organizations. Documentation of the dates of these consultations are the names of individuals contacted is kept on file and available upon request.

The site has been evaluated for potential emergency occurrences, based on site hazards, and the major categories of emergencies that could occur during project work are:

- Fire(s)/Combustion
- Hazardous Material Event
- Medical Emergency
- Natural Disaster
- Airfield Specific Hazards; See Attachment E – SIA Operational Safety Specifications

A detailed list of emergency types and response actions are summarized in Table 9.2 below. The SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of these routes and assembly areas.

Pre-Emergency Planning

Before the start of field activities, the Project Manager will ensure preparation has been made in anticipation of emergencies. Preparatory actions include the following:

Meeting with the subcontractor/and or client concerning the emergency procedures in the event a person is injured. Appropriate actions for specific scenarios will be reviewed. These scenarios will be discussed, and responses determined before the sampling event commences. A form of emergency communication (i.e.; Cell phone, Air horn, etc.) between the Project Manager and subcontractor and/or client will be agreed on before the work commences.

A training session (i.e., “safety meeting”) given by the Project Manager or their designee informing all field personnel of emergency procedures, locations of emergency equipment and their use, and proper evacuation procedures.

Ensuring field personnel are aware of the existence of the emergency response HASP and ensuring a copy of the HASP accompanies the field team(s).

Onsite Emergency Response Equipment

Emergency procedures may require specialized equipment to facilitate work rescue, contamination control and reduction or post-emergency cleanup. Emergency response equipment stocked:

Table 9.1 Emergency Equipment and Emergency PPE			
Emergency Equipment	**Specific Type**	**Quantity Stocked**	**Location Stored**
First Aid Kit	ANSI Compliant	1	Truck
Fire Extinguisher	ABC Type	1	Drill Rig
Emergency Eyewash Bottle	Single Use	One 16 oz bottle, minimum	Truck
Emergency PPE	**Specific Type**	**Quantity Stocked**	**Location Stored**
N/A	N/A	N/A	N/A

EVACUATION ALARM
Verbal Communication (Site Personnel are adjacent in work zone)
EVACUATION ROUTES
Will be given a map after site specific training
EVACUATION MUSTER POINT(S)/ SHELTER AREA(S)
If Site Personnel are within the AOA, they are to exit via the nearest gate. Otherwise, Site Personnel are to listen to the direction of SIA Personnel as the evacuation may be dependent on the nature and location of the emergency.
EVACUTION RESPONSE DRILLS
The Site relies on outside emergency responders and a drill is not required.

Table 9-2 – Emergency Planning

Emergency Type	Notification	Response Action	Evacuation Plan/Route
Chemical Exposure	Report event to SSO immediately	Refer to Safety Data Sheet for required actions	Remove personnel from work zone
Fire - Small	Notify SSO and contact 911	Use fire extinguisher if safe and qualified to do so	Mobilize to *Muster Point*
Fire – Large/Explosion	Notify SSO and contact 911	Evacuate immediately	Mobilize to *Muster Point*
Vehicle or Aircraft Accident	Notify SSO and contact 911; If life threatening or transport is required call 911, immediately	Evacuate immediately; if medical treatment is needed wait at site for ambulance Mobilize to *Muster Point*	
Hazardous Material – Spill/Release	Notify SSO; SSO will contact PM to determine if additional agency notification is	If practicable don PPE and use spill kit and applicable procedures to contain the release	See Evacuation Map for route, move at least 100 ft upwind of spill location
Medical – Bloodborne Pathogen	Notify SSO	If qualified dispose in container or call client or city to notify for further instruction.	None Anticipated
Medical – First Aid	Notify SSO	If qualified perform first aid duties	None Anticipated
Medical – Trauma	If life threatening or transport is required call 911, immediately	Wait at site entrance for ambulance	Noe Anticipated
Security Threat	Notify SSO who will call 911 as warranted	Keep all valuables out of site and work zones delineated.	None Anticipated
Weather – Earthquake/Tsunami's	STOP WORK and evacuate Site upon any earthquake	Turn off equipment and evacuate as soon as is safe to do so	Mobilize to *Shelter Location*
Weather – Lightning Storm	STOP WORK	Work may resume 30 minutes after the last observed lightning.	None Anticipated
Weather – Tornadoes/Hurricanes	Monitor weather conditions STOP WORK and evacuate the site	Evacuate to shelter location or shelter in place immediately	Mobilize to *Shelter Location*

MUSTER POINT	*SHELTER LOCATION*
South Spotted Road, South of W Airport Drive; NE side of site	Truck
In case of site emergencies, site personnel shall be evacuated per this table and will not participate in emergency response activities. Site emergencies shall be reported to local, state, and federal governmental agencies as required.	

10. HASP ACKNOWLEDGEMENT FORM

All Haley & Aldrich employees onsite must sign this form prior to entering the site.

I hereby acknowledge receipt of, and briefing on, this HASP prior to the start of on-site work. I declare that I understand and agree to follow the provisions, processes, and procedures set forth herein at all times while working on this site.

Printed Name	Signature	Date

ATTACHMENT A
HASP AMENDMENT FORM

HASP AMENDMENT FORM

This form is to be used whenever there is an immediate change in the project scope that will require an amendment to the HASP. For project scope changes associated with "add-on" tasks, the changes must be made in the body of the HASP. Before changes can be made, a review of the potential hazards must be initiated by the Haley & Aldrich Project Manager.

This original form must remain on site with the original HASP. If additional copies of this HASP have been distributed, it is the Project Manager's responsibility to forward a signed copy of this amendment to those who have copies.

Amendment No.	
Site Name	
Work Assignment No.	
Date	
Type of Amendment	
Reason for Amendment	
Alternate Safeguard Procedures	
Required Changes in PPE	

Project Manager Name (Print)	Project Manager Signature	Date

Health & Safety Approver Name (Print)	Health & Safety Approver Signature	Date

ATTACHMENT B
TRAINING REQUIREMENTS

TRAINING REQUIREMENTS

Health and Safety Training Requirements

Personnel will not be permitted to supervise or participate in field activities until they have been trained to a level required by their job function and responsibility. Haley & Aldrich staff members, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

The Haley & Aldrich Project Manager/FSM will be responsible for maintaining and providing to the client/site manager documentation of Haley & Aldrich staff members' compliance with required training as requested. Records shall be maintained per OSHA requirements.

40-Hour Health and Safety Training

The 40-Hour Health and Safety Training course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, and supervisors, who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120.

8-hour Annual Refresher Training

Personnel who complete the 40-hour health and safety training are subsequently required to attend an annual 8-hour refresher course to remain current in their training. When required, site personnel must be able to show proof of completion (i.e., certification) at an 8-hour refresher training course within the past 12 months.

8-Hour Supervisor Training

On-site managers and supervisors directly responsible for, or who supervise staff members engaged in hazardous waste operations, should have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. Supervisor Training includes, but is not limited to, accident reporting/investigation, regulatory compliance, work practice observations, auditing, and emergency response procedures.

Additional Training for Specific Projects

Haley & Aldrich personnel will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities including:

- Client specific training or orientation
- Competent person excavations
- Confined space entry (entrant, supervisor, and attendant)
- Heavy equipment including aerial lifts and forklifts
- First aid/ CPR
- Use of fall protection
- Use of nuclear density gauges
- Asbestos awareness

ATTACHMENT C
ROLES AND RESPONSIBILITIES

SITE ROLES AND RESPONSIBILITIES

Haley & Aldrich Personnel

Field Safety Manager (FSM)

The Haley & Aldrich FSM is a full-time Haley & Aldrich staff member, trained as a safety and health professional, who is responsible for the interpretation and approval of this Safety Plan. Modifications to this Safety Plan cannot be undertaken by the PM or the SSO without the approval of the FSM.

Specific duties of the FSM include:

- Approving and amending the Safety Plan for this project
- Advising the PM and SHSOs on matter relating to health and safety
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation
- Maintaining regular contact with the PM and SSO to evaluate the conditions at the property and new information which might require modifications to the HASP and
- Reviewing and approving JSAs developed for the site-specific hazards.

Project Manager (PM)

The Haley & Aldrich PM is responsible for ensuring that the requirements of this HASP are implemented at that project location. Some of the PM´s specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the FSM with updated information regarding environmental conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SHSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SHSO;
- Maintaining regular communications with the SHSO and, if necessary, the FSM;
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project;
- Providing project scheduling and planning activities; and
- Providing guidance to field personnel in the development of appropriate Job Safety Analysis (JSA) relative to the site conditions and hazard assessment.

Site Health & Safety Officer (SHSO)

The SHSO is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SHSO functions may include some or all of the following:

- Act as Haley & Aldrich´s liaison for health and safety issues with client, staff, subcontractors, and agencies.
- Verify that utility clearance has been performed by Haley & Aldrich subcontractors.
- Oversee day-to-day implementation of the Safety Plan by Haley & Aldrich personnel on site.

- Interact with subcontractor project personnel on health and safety matters.
- Verify use of required PPE as outlined in the safety plan.
- Inspect and maintain Haley & Aldrich safety equipment, including calibration of air monitoring instrumentation used by Haley & Aldrich.
- Perform changes to HASP and document in Appendix A of the HASP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents and incidents involving Haley & Aldrich and its subcontractors.
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers).
- Report accidents, injuries, and near misses to the Haley & Aldrich PM and FSM as needed.

The SHSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with Haley & Aldrich employees and Haley & Aldrich subcontractors at regular intervals and in accordance with Haley & Aldrich policy and contractual obligations. The SHSO will track the attendance of site personnel at Haley & Aldrich orientations, toolbox talks, and safety meetings.

Field Personnel

Haley & Aldrich personnel are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed Safety Plan Acceptance Form and documentation of medical surveillance and training to the SHSO prior to the start of work;
- Attending the pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the Safety Plan to the PM or the SHSO prior to the start of work;
- Stopping work when it is not believed it can be performed safely;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SHSO;
- Complying with the requirements of this safety plan and the requests of the SHSO; and
- Reviewing the established JSAs for the site-specific hazards on a daily basis and prior to each shift change, if applicable.

Visitors

Authorized visitors (e.g., Client Representatives, Regulators, Haley & Aldrich management staff, etc.) requiring entry to any work location on the site will be briefed by the Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer´s health and safety policies. In addition, this safety plan specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these

requirements at all times. Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

SUBCONTRACTOR PERSONNEL

Subcontractor Site Representative

Each contractor and subcontractor shall designate a Contractor Site Representative. The Contractor Site Representative will interface directly with Breeyn Greer, with regards to all areas that relate to this safety plan and safety performance of work conducted by the contractor and/or subcontractor workforce. Contractor Site Representatives for this site are listed in the Contact Summary Table at the beginning of the Safety Plan.

Subcontractor Site Safety Manager

Each contractor / subcontractor will provide a qualified representative who will act as their Site Safety Manager (Sub-SSM). This person will be responsible for the planning, coordination, and safe execution of subcontractor tasks, including preparation of job hazard analyses (JHA), performing daily safety planning, and coordinating directly with the Haley & Aldrich SHSO for other site safety activities. This person will play a lead role in safety planning for Subcontractor tasks, and in ensuring that all their employees and lower tier subcontractors are in adherence with applicable local, state, and/or federal regulations, and/or industry and project specific safety standards or best management practices.

General contractors / subcontractors are responsible for preparing a site-specific HASP and/or other task specific safety documents (e.g., JHAs), which are, at a minimum, in compliance with local, state, and/or federal other regulations, and/or industry and project specific safety standards or best management practices. The contractor(s)/subcontractor(s) safety documentation will be at least as stringent as the health and safety requirements of the Haley & Aldrich Project specific HASP.

Safety requirements include, but are not limited to: legal requirements, contractual obligations and industry best practices. Contractors/subcontractors will identify a site safety representative during times when contractor/subcontractor personnel are on the Site. All contractor/subcontractor personnel will undergo a field safety orientation conducted by the Haley & Aldrich SHSO and/or PM prior to commencing site work activities. All contractors / subcontractors will participate in Haley & Aldrich site safety meetings and their personnel will be subject to training and monitoring requirements identified in this Safety Plan. If the contractors / subcontractors means and methods deviate from the scope of work described in Section 1 of this Safety Plan, the alternate means and methods must be submitted, reviewed and approved by the Haley & Aldrich SHSO and/or PM prior to the commencement of the work task. Once approved by the Haley & Aldrich SHSO and/or PM, the alternate means and methods submittal will be attached to this Safety Plan as an Addendum.

ATTACHMENT D
JOB HAZARD ANALYSIS

JOB HAZARD ANALYSIS

1.0 GENERAL INFORMATION	
Project Name: Spokane International Airport (SIA) PFAS Support	Client: Spokane International Airport
Site Name & Location: Spokane International Airport, 9000 W Airport Dr, Spokane, WA 99224	Project #: 0209800-001
Field Work Start Date: 11/25/2024	Anticipated Field Work End Date: 12/31/2026
Reviewed by Project Manager: Breeyn Greer	Date: 11/8/2024
JHA/PPE Hazard Assessment Approved By: Andrew Foerster	Date: 9/11/2024

2.0 PROJECT TEAM		
	Office Phone #	**Cell Phone #**
SIA Site Contact: Lisa Corcoran	509-455-6406	509-808-6577
H&A Project Manager: Breeyn Greer	509-960-7426	612-232-7343
H&A Field Safety Manager: Andrew Foerster	216-706-1318	440-227-8765
H&A Site Safety Officer: Keylin Huddleston	253-370-1152	253-370-1152
H&A Field Team Members: Zack Castillo da Silva	509-907-6198	509-828-3404
Other: Luke Peden	509-703-6428	706-263-9809

3.0 EMERGENCY ACTION PLAN

Emergency Contact List

In the event of an emergency, contact 911 immediately. If it is not an emergency, contact WorkCare at 1-888-449-7787 for support.

Contact	Name	Location	Phone
Hospital	MultiCare Deaconess Hospital	800 W 5th Ave, Spokane, WA 99204	509-303-5800
Occupational Health Clinic	MultiCare Indigo Urgent Care	9746 W Sunset Hwy Suite D, Spokane, WA 99224	509-598-7940
Police	Airport Police	International Airport, Spokane, WA 99224	509-455-6429
Fire	Spokane International Airport Fire Department	International Airport, Spokane, WA 99224	509-455-6455

National Spill Response Center	Click here to enter text.	N/A	800-424-8802
Poison Control	Click here to enter text.	N/A	800-222-1222
Airport Operations	Enter client specific information.	International Airport, Spokane, WA 99224	509-455-6421
Liberty Mutual Claim Policy – WC6-Z11-254100-034			

4.0 PERSONAL PROTECTIVE EQUIPMENT HAZARD ASSESSMENT

Use this table to identify appropriate PPE for each task listed. For each JHA you add to this file, add the title to the "Tasks" column and appropriate PPE, if any.

Standard PPE	**Tasks**	**Additional PPE**							
									
☒		☐	☐	☒	☒	☐	☐	☐	☐
• Hard Hat • Safety Vest • Cut Resistant Gloves • Safety Glasses • Ear Plugs • Steel-Toed Boots		Eye/Face Protection	Safety Shoes	Protective Gloves	Hearing Protection	Protective Clothing	Respiratory Protection	PFD	Fall Protection
	Water Sampling	Choose item or enter text.	Choose item or enter text.	Nitrile - chemical	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.
	Drilling Oversight	Choose item or enter text.	Choose item or enter text.	Nitrile - chemical	Ear plugs - >/= 85 dBA	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.
	Click here to enter task.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.
	Click here to enter task.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.	Choose item or enter text.

5.0 SIMULTANEOUS OPERATIONS AND SITE HAZARDS

Use this table to identify general, repetitive hazards in our work, the hazards related to work performed around us and mitigations to put in place.

Hazard/Energy Source	**Mitigations**
Cold Stress	Dress appropriately for the weather and use hand warmers when needed. Field staff should also take breaks in a warm area (e.g. field truck with the heat on) if necessary.
Driving	Do not exceed the observed speed limit. Be aware of the surroundings and any other moving vehicles or equipment. The airport has non-moving and moving areas. We are strictly only allowed access in the non-moving areas. Do not cross any solid lines indicating a moving area.

Slips, Trips, Falls	Be aware of any objects or uneven ground that could cause a trip. Be aware that the ground may be wet due to weather or water spillage.
Chemical Exposure	Dress appropriately and wear nitrile gloves to cover the skin to prevent sample bottle preservatives or decontamination chemicals from making direct contact. Use caution when sampling and decontaminating to avoid splashing or spraying. Wash hands before eating, using restrooms, taking medication, etc.

6.0 SPECIFIC & HIGH-RISK TASKS

Task	Hazard/Energy Source	Mitigations
Decontamination - Rinse Equipment and Clean with Alconox or other Cleaner	Slips, Trips, Falls	• Be aware that plastic sheeting under decontamination area is slippery when wet and use caution when walking in the area.
	Chemical Exposure	• PFAS and other chemicals are all possibly present during the decontamination process. • Safety glasses with side shields, long sleeved shirts and nitrile gloves shall be always worn during decontamination activities. • Face shield will be worn if splash hazards are likely. • Ensure employees wash hands before eating, smoking, taking medication, chewing gum/tobacco, using restrooms, or applying cosmetics and before leaving the work area for the day.
Sampling Collection Placing Project Waste in Containers Drum Handling	Chemical Exposure	• Avoid contact of preservation solution with skin, eyes and clothes. • Safety glasses with side shields, and nitrile gloves shall be worn during preservation activities. • Maintain the portable emergency eyewash station within reach of sample preservation activities if employees' eyes encounter sample preservation solution. • If preservation solution is splashed onto skin or in eyes, immediately flush the area with water and consult SDS for additional measures. • Nitrile gloves shall be worn while handling acid preserved bottles. • Avoid contact with skin and clothes. • Change gloves before collecting next sample.
	Hazardous Inhalation	• Follow Air Monitoring Plan if applicable.
Calibrate Measurement Equipment Take Samples and Measurements Decontaminate Self and Equipment	Chemical Exposure	• Some glassware used for groundwater collection contains acids/bases necessary for later analysis in a lab. Spilling this chemical poses threats to human well-being.

		• Interaction with the groundwater sample could expose the field staff to potentially dangerous chemicals in the sample. • Certain sites such as landfills sometimes release chemicals in from the ground in a gaseous form. • Proper detection equipment and adequate PPE are necessary
Unload Equipment/Mobilize Site	Biological	• When conducting groundwater sampling in woody areas or with tall grass, ticks, and other insects present a serious threat. • Proper PPE including long sleeves, pants, and insect repellent must be considered. • Long grasses also present the threat of contact with poisonous plants. • Visually inspecting the collection site before entry will help minimize the risk of encountering poisonous plants (poison ivy/oak/sumac). • Collecting samples in sites prevent the danger of interactions with wild animals which could be dangerous. Be prepared to avoid the potential dangers posed by wild animals when working in remote locations.
Drilling Oversight and Sampling	Noise	• Drill rigs can be extremely noisy while in operation. • Ensure a distance of at least 25 feet from the drilling procedure when possible. • Wear proper PPE, which could include multiple, or more sophisticated forms of ear protection. • Utilize the NIOSH noise measurement app to ensure noise exposure is limited.
	Chemical Exposure	• Wear proper PPE (Nitrile gloves) when handling unknown environmental samples as the sample could contain dangerous chemicals. • Keep eyewash near-by in the event of exposure. • Examine site or nearby site history for information on potential contamination before beginning work.
	Underground Utilities	• Double check site plans, confirm Dig safe, question private unmarked utilities. • Look for trenches, manholes, overhead lines, Follow Dig in Policy for Utility Clearance.

		• Visually check area to validate overhead clearance and utility mark out soft dig where possible if a known electrical hazard is in the work area.
Verify locations have been marked and clear of utilities	Underground and Overhead Utilities	• **Verify One-Call ticket number(s) are valid prior to any ground disturbance and utility/site owners have marked utilities before the start of any ground disturbance task.** • Follow OP 1020 for Utility Clearance. • Visually check area to validate overhead clearance and utility mark outs. • Maintain a minimum of 2-foot clearance from outer edge of utility when using mechanical digging equipment. Hand dig around utility when 2-foot clearance can't be maintained. • Pre-clear the borehole (hand auger, air knife, etc.) prior to advancing drill tooling when possible. • Maintain a minimum of 10 feet of clearance between overhead utilities and drill rig tower. • Tower down drill rig prior to relocation for each boring. NEVER move drill rig with tower up.
Work in public right of way	Vehicle strikes, pedestrian interference	• Implement traffic control in accordance with the approved traffic control plan. • Place appropriate signage and delineate work zone with barricades/delineators and caution tape. • Provide access path around work zone for pedestrian walkway on roadway shoulder. • Have appropriate emergency signaling device (e.g., air horn) to signal an emergency or work stoppage condition.
Inspect drill rig	Heavy Equipment	• Drillers to inspect drill rig prior to mobilization to ensure proper functioning. • Maintenance records for drill rig within the last year need to be available on drill rig for review. • Test all kill switches prior to drill rig operation. If malfunctioning, replace or repair prior to initiating drilling activities. • Drillers to have spill kit on hand in case of fuel or hydraulic line leaks.
Drilling	Excessive Noise	• Monitor noise with a decibel meter. Wear hearing protection if noise exceeds 85 decibels.

		• If no decibel meter available, personnel will wear ear plugs or muffs within 25 feet of any operating equipment and implement a system of hand signals understood by all. • Increase distance from noise source if not needed for work task.
Active Airfield Work	Vehicle or Aircraft Accident	• Use caution when operating a vehicle onsite. • Reduce time spent in the air operations area (AOA) to the extent practical • Maximize distance between field work vehicle and all other vehicles and aircraft
	Explosives	• Reduce time spent in the AOA to the extent practical • Report any suspicious parcels to airport security
	National Security Threat (e.g., illicit substances, human trafficking)	• Reduce time spent in the AOA to the extent practical • Report any suspicious parcels or human activity to airport security

Staff Member Name	Staff Member Signature	Date
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ATTACHMENT E
SIA OPERATIONAL SAFETY SPECIFICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. The Spokane Airport is a complex operating facility which is governed by a very strict set of operating rules to insure the safety of the traveling public, the operators of the various airlines and those individuals who function as support personnel to the facility. It is recognized and understood that the Contractor is required to comply with the most current edition requirements contained in FAA Advisory Circulars and Spokane Airport Rules and Regulations as they pertain to this project. It is understood and accepted by Spokane Airport that the Contractor has familiarized itself with general Airport operations and has taken these into consideration in arriving at its bid prices and in scheduling its various activities.

B. Following are the general safety operations and objectives that must be achieved to maximize safety and to minimize time and economic loss to the aviation community, construction contractors and others directly or indirectly affected by the project. The Contractor shall keep these objectives in mind when formulating schedules and operational activities. The Contractor shall be responsible for controlling their operations and the operations of subcontractors (at all levels) and suppliers so as to comply with the requirements of this Section.

1. Keep the airport operational for all users
2. Minimize delays to aircraft operations
3. Maintain safety of aircraft movement and airport operations as a whole
4. Minimize delays to construction operations
5. Minimize airport operation and construction activity conflicts
6. Maintain safety of personnel using the airport at all times

C. Section includes:

ARTICLE	TITLE
1.02	Definitions

ARTICLE	TITLE
1.03	References
1.04	Related Sections
1.05	Requirements and Regulations Relating to Operation of Motor Vehicles
1.06	Requirements and Regulations Relating to Operators of Motor Vehicles
1.07	Requirements for Orientation of Contractor Personnel and Project Meetings
1.08	Security Requirements
1.09	Safety Requirements
1.10	Interruptions and Stoppages of the Work Due to Aircraft Operations and Hazardous Conditions
1.11	Requirements and Regulations Affecting the Conduct of the Work
1.12	Obstructions to Navigation
1.13	Daily Inspections
1.14	Emergency Procedures
1.15	Administrative Requirements

1.02 DEFINITIONS

A. Air Operations Area (AOA): That area within the airfield perimeter security fence.

B. Air or Aircraft Movement Area (AMA): The movement area consists of runways, taxiways and other areas of the airport that are used for taxiing or hover taxiing, air taxiing, takeoff and landing of aircraft, exclusive of loading aprons and aircraft parking areas.

C. Non-Movement Area: That area of the Airport Operations Area not defined as a movement area and including the exterior of buildings on or adjacent to the non-movement area. Aircraft in motion on these surfaces are not under control of the air traffic control tower.

D. Apron: That non-movement area prepared for the positioning or parking of aircraft during ground operations not involving landing and takeoff of airplanes. The areas are usually

designed according to use, such as terminal, cargo, parking, service hangar, or holding apron. Such terms as “ramp,” “hardstand,” “turnaround,” etc., are synonymous with apron. Other sub-area designations are:

1. Aircraft Parking Positions - used for parking aircraft to enplane and deplane passengers, load or unload cargo.
2. Aircraft Service Area - on or adjacent to an aircraft parking position. They are used by airline personnel and equipment for servicing aircraft and staging of baggage, freight, and mail for loading and unloading of aircraft.
3. Service/Fire Lanes - identified rights-of-way on apron designated for aircraft ground service vehicles and fire equipment.
4. Taxi lanes - reserved to provide taxing aircraft with access to and from parking positions.

E. Runway: A clearly defined area on the airport that has been prepared and is suitable for landing and takeoff of airplanes. The principal runway elements include the structural pavement, shoulders, blast pads, runway safety area, extended runway safety area, and airport imaginary surfaces. The runway drainage system, lighting, marking and areas required for landing aids are also integral design parts of the runway.

F. Taxiway: A defined path over which airplanes can taxi from one part of an airport to another. It includes the structural pavement, shoulder, taxiway safety area, and obstacle-free area.

G. Vehicle Drive Lanes: Identified rights-of-way in the non-movement area designated for vehicular movement on the AOA. Drive lanes are delineated by white lines or traffic markings painted on the pavement.

H. Terminal Buildings and Support Facilities: Interior of terminal and concourses, and support facilities such as cargo buildings (including exterior of buildings and roofs), which are inside the AOA.

I. Street-Side of Buildings: Exterior of building and roof on street side, outside of the AOA streets, multilanes, drives, parking garage, and remote parking lots. This area is also referred to as the landside of the airport.

J. Foreign Object Debris (FOD): Any object capable of being ingested into aircraft engines or penetrating aircraft tires. Examples are knives, forks, spoons, hand tools, bolts, nails, nuts, cable, polyurethane, vehicle parts, sand, gravel, paper, rocks, dirt, cans, glass, wood, et al.

K. Director, Airport Operations: That individual who directs all airfield operations and activities with respect to safety, security, airport rules and regulations, and emergency situations.

L. Manager-Airfield Security/Airport Security Coordinator: That individual who directs all activities with respect to security.

M. Unsuitable Weather: Atmospheric or environmental conditions which restrict construction activities and effect operation of aircraft while approaching a runway to land; during landing; taxiing between runways, ramps, aprons, hangars, or loading zones; standing by to takeoff; or during takeoff as determined by the General Manager, or his authorized representative. In addition, that atmospheric or environmental condition which may, in the opinion of the Engineer, affect the final outcome, position, or condition of construction work, maintenance work, or improvement of any sort or nature.

N. Jet Blast: Jet blast is the force of jet exhaust produced by the aircraft engines. The high velocities produced by aircraft engines are capable of causing bodily injury and damage to equipment. The drag and uplift forces produced by jet engines are capable of moving large boulders. A jet engine operating at maximum thrust is capable of lifting a 2-foot boulder 35 feet behind the airplane completely off the ground.

As an example, a DC10 at takeoff thrust can produce a velocity of 750 mph 10 feet behind the aircraft; a velocity of 260 mph 100 feet behind the aircraft; a velocity of 55 mph 1,000 feet behind the aircraft; 10 mph 4,400 feet behind the aircraft. At maximum values, these velocities may extend 30 feet out beyond the wingtips of the aircraft and to a height of 60 feet above ground level. (This information is taken from FAA Advisory Circular 150/5300-13 Figure 8-4.)

O. Low Visibility Operations: Low Visibility Operations means movement of aircraft for takeoff landing or taxi when the visibility is reported to be less than 1,200 feet runway visual range (RVR).

1.03 REFERENCES

The rules, requirements and regulations specified in this section have been compiled from the following sources:

A. Federal Aviation Administration Advisory Circular 150/5370-2E, 150/5210-5B Appendix 1, and 70/7460-1K (Current Edition).

B. Federal Aviation Regulations (FAR) Part 77.

C. FAA order NM 5200.3.

1.04 REQUIREMENTS AND REGULATIONS RELATING TO THE OPERATION OF MOTOR VEHICLES

A. General:

1. During the term of this Contract, the Contractor shall recognize and abide by the following rules and controls as they may be modified by federal regulations.

2. In addition to these regulations, the Engineer is empowered to issue such other instructions as may be deemed necessary for the safety and well being of Airport users or otherwise in the best interests of Spokane Airport.

B. Operation of Motor Vehicles:

1. General:

a. Motor vehicle operations within and on the Airport premises shall be governed generally by the provisions of the Washington State Motor Vehicle Codes and Traffic Direction procedures and signals for turns, lights and safe-driving precaution shall be in conformity therewith. In addition, motor vehicles shall conform to all special regulations prescribed by the Commission or procedures imposed pursuant to Commission regulation by the Director.

b. Traffic on enplaning and deplaning drives, public thoroughfares and parking areas of the Airport is limited to those vehicles properly licensed to operate on public streets and highways.

c. All vehicular equipment in the AOA, cargo, access road, aircraft parking or storage areas shall at all times comply with any lawful signal or direction of Spokane Airport employees. All traffic signs, lights and signals shall be obeyed, unless otherwise directed by Spokane Airport employees.

d. Every person operating motorized equipment of any character on any area shall operate the same in a careful and prudent manner and at a rate of speed posted or fixed by this section and at no time greater than is reasonable and proper under the conditions existing at the point of operation, taking into account traffic and road conditions, view obstructions, and consistent with all conditions so as not to endanger the life, limb, or property or the rights of others entitled to the use thereof.

2. Operation of Vehicles Within AOA:

a. All motor vehicles that enter the AOA shall possess exhaust systems which are protected with screens, mufflers, or other devices adequate to prevent the escape of sparks or the propagation of flame.

b. Regardless of the time of day, all powered construction vehicles that are equipped with headlights shall operate with the headlights on when the vehicle is in motion on the AOA.

c. All Contractor vehicles shall be equipped with the following visibility/identification features: 1) Operable yellow flashing beacons, beacons must be lighted during all periods of vehicle operation; 2) 3-foot by 3-foot flags having a checkered pattern of international orange and white squares at least 1 foot on each side (For fabric color specifications see FAA Advisory Circular 150/5210-5C, Appendix A.). Attach flag on top of vehicle with rigid pole so that flag will be visible at all times. Vehicles without beacons/flags will not be permitted to enter the AOA.

d. No person shall operate any motor vehicle or motorized equipment in the AOA of the Airport unless such motor vehicle or motorized equipment is in a safe and mechanically reliable condition for such operation.

e. Any person operating equipment in the Air Operations Area shall, in addition to this section, abide by all existing Federal Aviation Administration and other governmental rules and regulations.

f. No person shall operate any motor vehicle or motorized equipment on the aircraft movement or non-movement areas of the Airport at a speed in excess of 20 miles per hour [32 km/h], or the posted speed limit, whichever is lower, less where conditions warrant. Designated motor vehicle drive lanes shall be utilized where provided unless specific authorization to the contrary is given by the Engineer.

g. No person operating a motor vehicle or motorized equipment in the AOA shall in any way hinder, stop, slow, or otherwise interfere with the operation of any aircraft on the Airport.

h. All aircraft and emergency vehicles have priority over Contractor vehicles. Contractor vehicles shall yield right of way to aircraft and emergency vehicles. Contractor shall ensure that under no circumstances will any contractor or subcontractor or other vehicle associated with the job pass beneath any part of an aircraft or loading bridge, or block the access to any parking gate, or delay any aircraft movement.

i. Vehicles shall remain within established drive lanes. The Vehicle Control Line separates the aircraft movement area (runways and taxiways) from the non-movement area (terminal and aircraft aprons and parking areas). It is prohibited to use runways or taxiways or adjacent field areas unless specifically indicated on the drawings. It is emphasized that the Contractor's authority to operate does not extend to active aircraft movement area. The Contractor shall operate along established haul routes with prior approval of the Director, Airport Operations, or the Director's designee, and the Engineer. No vehicle shall cross the Vehicle Control Line without approval of the Airport Traffic Control Tower and must be in radio contact with the Tower, under escort, or on an established haul route.

j. Contractor vehicles shall not deviate from approved haul routes specified on the drawings.

k. Escorts: At all times during work within 250 feet of the centerline of an operating runway or 160 feet of the centerline of an operating taxiway, or when entering or crossing an active movement area, vehicles shall be accompanied by an approved Spokane Airport Escort. All requests for escorts and operations involving an aircraft movement area, or any other activity that may tend to interfere with the general operation of the Airport, shall be approved by the Director, Airport Operations by way of the Engineer. A minimum of 24 hours' prior notice shall be given the Engineer in each case. See Section 01500 - Temporary Facilities and Controls, for submittal requirements.

C. Parking:

1. No parking is permitted on any Airport roadway as the primary purpose of the Airport roadways is for motor vehicle traffic.

2. No person shall park any motor vehicle, other equipment, or materials in the AOA of the Airport, except in a neat and orderly manner and at such points as prescribed by the contract documents.

3. No person shall park any motor vehicle or other equipment or materials in the AOA of the Airport within 15 feet of any fire hydrant or standpipe.

4. Parking of construction workers' private vehicles shall also be within the storage area construction fence located outside the AOA or in a public or private parking facility outside the AOA. Under no circumstances will vehicles or equipment be parked within 5 feet of the Airport Perimeter Security fence line.

5. Vehicles parked within the AOA shall be chocked or have the parking brake activated.

D. Impoundment of Motor Vehicles:

1. Any vehicle in violation of the provisions as referenced in Chapter 46.52 (Abandoned Vehicles) or Chapter 46.61 (Rules of the Road) of the Revised Code of Washington may be subject to impoundment pursuant to the provisions and procedures contained therein.

2. No vehicle shall be impounded except under the direction of an authorized police officer.

E. Vehicle Identification:

1. All vehicular equipment operating within the AOA must display signs of commercial design on both sides of the vehicle to identify the vehicle as belonging to the Contractor firm. The Contractor's name must appear in letters a minimum of 2 inches high. Magnetic signs are acceptable.

2. Vehicles that appear at access gates without signs on both sides of the vehicle will be denied access. Vehicles found to be missing signs within the Air Operations Area will be escorted off the job site and not be permitted to re-enter until signs have been installed.

F. Load Limits: Unless otherwise indicated, when using airport roadways, the Contractor shall restrict the gross combination weight to the legal limits allowed on public roads.

1.05 REQUIREMENTS AND REGULATIONS RELATING TO OPERATORS OF VEHICLES

A. All drivers operating vehicles on airport property must carry a valid United States driver's license on his/her person, appropriately endorsed for the type of equipment being operated.

B. All personnel (including drivers) working within the AOA must have a valid Spokane Airport Identification/Access badge. See Section 01567 - Airport Personnel Identification/Access Control for Procedures required for badge issuance.

C. All personnel working within the AOA shall receive special drivers training and be approved by Spokane Airport before being allowed to operate within the AOA or be escorted by Spokane Airport approved escort. Personnel operating outside the AOA may operate vehicles without attending the special drivers training course.

D. Contractors, Subcontractors, Suppliers, and Contractor occasional deliveries requiring access to the AOA in support of the contract work that do not have valid Spokane Airport identification shall be escorted by authorized Contractor personnel. Spokane Airport will not provide escorts for the Contractor's work.

1.06 REQUIREMENTS FOR ORIENTATION OF CONTRACTOR PERSONNEL AND PROJECT MEETINGS

A. Air Operations Orientation:

1. After Award of the contract has been issued, but prior to the start of the construction, arrange with the Engineer to have all supervisory and job office personnel assigned to this project attend an "Air Operations Orientation." This orientation will be conducted by Spokane Airport for discussion of the rules and regulations pertinent to this Contract. The orientation will be repeated at reasonable intervals during the construction period. Spokane Airport attendees will include the Engineer and the Director, Airport Operations, or the Director's authorized representative.

2. The Air Operations Orientation may be conducted as part of the preconstruction meeting and shall not be considered an educational course in Air Operations Safety, but a discussion of existing rules or regulations related to airport activities. The Contractor shall be totally responsible and liable for the actions of his employees, agents, or representatives.

B. Safety and Security Meetings: An airport safety and security meeting will be conducted after the award of the contract and prior to commencing construction. Additional construction safety meetings will be scheduled throughout the life of the contract.

1.07 SECURITY REQUIREMENTS

A. General Intent: It is intended that the Contractor shall comply with all requirements of the Airport Security Plan (ASP) and with the security requirements specified herein.

B. Security Identification Display Area (SIDA) Training: Comply with the requirements of Section 01567 - Airport Personnel Identification/Access Control.

C. Identification/Access Badging: All Contractor personnel shall have Spokane Airport issued identification/access badges. See Section 01567 - Airport Personnel Identification/Access Control for procedures required for issuance of Identification/Access badges.

D. Perimeter Fence Security:

1. Do not open gates or remove fencing without approval of the Engineer. Adequate precautions shall be taken to prevent entrance of unauthorized persons to Airport-restricted areas or inadvertent entry of dogs or large animals into the AOA.

2. Prior to securing work each evening, ensure that all access gates which have been opened are closed and locked and that perimeter fencing is restored to a condition that will maintain present security standards.

3. Five Foot Rule: No Contractor will be permitted to store materials, park equipment or erect permanent or semi-permanent structures within 5 feet of either side of the AOA perimeter security fence.

4. Use of Gates: Access to work within the AOA shall be limited to only the gates shown on the drawings. Use of the gates shown for continuous access (in excess of twice per work shift) will require the gate be manned by Airport Operations or Security personnel, provided by the Spokane Airport. Gates for Contractor access during hours of darkness shall be supplied with a light plant and generator whenever the gate is in use. Furnishing, fueling, and maintaining the light plants shall be the responsibility of the Contractor. The Contractor shall schedule with the Engineer a minimum of 48 hours prior to requiring continuous access through a gate.

5. Prior to removing or making holes in the Airport perimeter fencing, the Contractor shall obtain permission and written approval from the Engineer, and take adequate precautions to prevent entry of unauthorized personnel or animals.

1.08 SAFETY REQUIREMENTS

A. In addition to the requirements specified in other sections, the following Safety Requirements shall also apply to the Contractor's activities:

1. Traffic Control: The Contractor shall furnish all required traffic control to protect the public outside the AOA. The actions, equipment, and position of flagmen, when required, shall be the sole responsibility of the Contractor. The Contractor shall provide flagmen and construction traffic control on public facilities in accordance local jurisdiction requirements and the current edition of the Manual of Uniform Traffic Control Devices (MUTCD). See Section 01570 - Traffic Control.

2. In the event an employee of the Contractor violates a safety provision, they shall be prohibited from returning to work on the AOA without first attending another Airport Safety Orientation class and approval of the Director, Airport Operations. Subsequent violations will be deemed as just and sufficient cause to demand the employee be permanently removed from the job site. The Contractor shall be responsible for all costs and delays caused by safety violation.

3. Contractor's Designated Representative: The Contractor shall inform its supervisors and workmen of the airport activity and operations that are inherent to this airport, as well as the safety requirements and security regulations of the airport. The Contractor shall conduct its construction activities to conform to both routine and emergency requirements. During the course of construction, the Contractor shall designate a responsible representative who will be personally available on a 24-hour basis. The Contractor shall advise the Engineer of the representative's name and telephone number (the telephone shall not be connected to an answering machine). The Contractor shall comply with all current safety laws, ordinances, and regulations as they may apply to this contract.

1.09 INTERRUPTIONS AND STOPPAGES OF THE WORK DUE TO AIRCRAFT OPERATIONS AND HAZARDOUS CONDITIONS

A. Work Stoppages:

1. Construction may be stopped by the Director, Airport Operations, or the Director's designee, through the Engineer, any time the former considers that the intent of the regulations regarding safety or Security Requirements are being violated or that a hazardous condition exists. This decision to suspend the operation will be final

and will only be rescinded when satisfied that the Contractor has taken action to correct the condition and prevent recurrence.

2. Frequent inspections will be made by the Director, Airport Operations, or the Director's authorized representative during the critical phases of the work to ensure that the Contractor is following the recommended safety procedures. The Inspector shall report any violations or potential safety hazards to the Engineer who will in turn advise the Contractor of the concern for immediate correction by the Contractor.

3. Construction may also be stopped or suspended by Airport Operations through the Engineer during periods of extremely inclement weather, such as low visibility, snow, or ice accumulation, or when it is necessary to provide an extra margin of safety to aircraft operations due to other unsuitable conditions, or reduce other activities in favor of conducting snow removal operations required to keep the airport operational.

B. Intermittent Construction Operations:

1. Portions of the work in this contract will occur in the AOA. Heavy construction may require closing of certain areas by the Airport. However, some work may be done on an intermittent basis. The Contractor shall maintain constant communication with the Engineer when working on an AOA location, and immediately obey all instructions from the Engineer. Failure to obey instructions or maintain proper communication will be cause to suspend the Contractor's operations in such areas until satisfactory conditions are assured.

2. When directed to cease construction and move from the area, the Contractor shall immediately respond and move all material, equipment and personnel outside areas. Operations shall not be resumed until directed from the Director, Airport Operations through the Engineer. Every reasonable effort will be made to cause minimum disturbance to the Contractor's operations; however, no guarantee can be made as to the extent to which disturbance can be avoided.

3. Limitation of Operations: The Contractor shall be responsible for controlling its operations and those of its subcontractors so as to provide for the free movement of aircraft in the apron areas of the AOA.

1.10 REQUIREMENTS AND REGULATIONS AFFECTING THE CONDUCT OF THE WORK

A. General:

1. Requirements to Begin Work: Before starting work, the Contractor shall provide and have available all flags, signs, barricades, lights, and electrical generators as may be required for the protection of air traffic, vehicular traffic, and the construction work. All personnel shall have the proper identification badges and have received the required training and instruction.

2. No hazardous materials will be stored within the terminal complex.

3. No burning is permitted on Airport property.

4. Smoking by personnel is prohibited on the AOA and inside the terminal.

5. Construction Activity and Aircraft Movements:

   a. Prior to the start of the construction activities in the AOA affecting aircraft movement areas, the safety requirements relating thereto will be coordinated by Spokane Airport between the Director, Airport Operations, air carriers, fixed base operators, other users and appropriate representatives of the FAA. This coordination will be based on the Contractors approved construction schedule with the primary purpose of compliance with the contract document requirements.

   b. Construction activity and storage of equipment, relating to off-AOA projects are not exempt from all the regulations that govern the AOA. Materials can not be stored in violation of Spokane Airport security fence set back clearances (5-foot rule). Activity and storage of equipment may also have an impact on the FAR Part 77 surfaces that are prescribed to protect the airspace associated with the airport.

c. Construction work will not be allowed within the safety area of an open runway or within the object free area of an open taxiway (160 feet from centerline) without prior permission of the Director, Airport Operations or authorized designee. (Refer to paragraph 1.12 Obstructions to Navigation.)

6. Limitation of Construction Activities:

a. During construction, there shall not be lips greater than 1 inch for pavement traveled by aircraft and 3 inches for edges between old and new surfaces at edges and ends not traveled by aircraft.

b. Open-flame welding or torch-cutting operations are prohibited unless adequate fire and safety precautions are provided and have been approved by the Fire Department through the Engineer.

c. Open trenches, excavations, and stockpiled material at the construction site shall be prominently marked with barricades and lights as detailed on the drawings.

d. Stockpiled material shall be limited in height and constrained in a manner to prevent movement resulting from aircraft blast or wind conditions.

e. The Contractor will ensure that all lighting fixtures are shielded against interference with the vision of pilots and air traffic controllers.

f. During non-working hours, all trenches and excavations outside of the barricaded work areas shall be backfilled or covered unless otherwise indicated in the contract documents.

g. Non-working hours shall be defined as when construction is not taking place within a work area.

B. Construction Adjacent to Runways:

1. All equipment and material above the runway centerline grade and within a distance of 250 feet from the runway centerline must be removed when the runway is being used by aircraft unless specifically allowed by the phasing drawings.

2. Within 250 feet of the runway centerline, all open trenches, lips greater than 1 inch, and drop-offs greater than 3 inches must be filled, covered, or sloped when the runway is open.

3. Notification to the Director, Airport Operations or his representative, by way of the Engineer, is required prior to beginning any construction within the aircraft movement area. Notification of the proposed construction should be made a minimum of fourteen (14) days prior to beginning work.

C. Construction Adjacent to Taxiways:

1. No equipment or material within 160 feet of a taxiway centerline shall be above the taxiway centerline grade while the taxiway is being used by aircraft unless specifically allowed in the phasing drawings.

2. Open trenches or abrupt drop-offs may be made adjacent to taxiway pavement edges only as shown on drawings.

3. Marking and lighting of work areas adjacent to taxiways shall be required and approved by the Engineer.

D. Barricades and Marking of Barricades:

1. Barricades shall be Multi-Barrier AR-10 X 96 HDPE or approved equal with 6-inch by 72-inch orange and white reflective striping on both sides and two integral solar powered flashing red lights.

2. Barricades shall be installed as shown on the drawings or relocated by the Contractor at the direction of the Engineer whenever the need arises throughout the duration of the Contract. Barricades shall be placed indicated on the drawings to separate active areas from areas under construction. Placement of the barricades shall be in accordance with the drawings and shall be approved by the Engineer.

3. Barricade lights shall be operative at all times. It shall be the Contractor's responsibility to immediately repair or replace any light or flasher that is not operating.

4. Barricades shall be in place prior to commencing construction operations, and shall be maintained in good appearance for the life of the contract.

5. Barricades shall be relocated as directed by the Engineer.

6. Barricades shall be water filled where shown on the drawings or as directed by the Engineer.

E. Reflector Markers:

1. Reflector markers shall be of an impact-resistance color impregnated special polymer extrusion that has been UV-stabilized with both ground and pavement mounts. Height shall be 18 inches; color shall be solid red or orange; or as specified in the specifications for color. Reflectors shall meet FAA AC 5345-39C.

2. Install reflector markers as shown on the drawings.

F. Closures: No ramp, apron, taxiway, or runway area shall be closed to aircraft without approval of the Director, Airport Operations through the Engineer. This will enable Notices to Airmen (NOTAMS), or other advisory communications to be issued. A minimum of 72 hours notice of requested closing shall be directed to the Engineer. The Engineer will arrange inspections prior to opening any area to air traffic. Any waste material and/or debris must be removed from aprons promptly to avoid possible damage to aircraft.

G. Debris

1. Debris Control: When Airport roadways and public highways are used in connection with construction under this contract, the Contractor shall remove all debris cluttering the surfaces of such roadways. Trucks and equipment shall have all accumulated dirt, mud, rocks, and debris removed before accessing the AOA and when leaving the work area. Loads shall be struck flush and secured to prohibit loss of material. If spillage occurs, such roadways shall be swept clean immediately after such spillage to allow for safe operation of vehicles as determined by the Engineer. If the Contractor is negligent in cleanup and Spokane Airport forces are required to perform the work, the expense of said cleanup shall be paid by the Contractor.

2. No loose material or waste [Foreign Object Debris (FOD)], capable of causing damage to aircraft or capable of being ingested into jet engines may be left in the working area on or next to runways, taxiways, ramps, or aprons. The Contractor shall direct special attention to all areas that are operational to aircraft during construction. These shall be kept clean and clear of all materials or debris at all times.

3. Food waste on a work site is a safety concern in that it attracts animals and birds that may impact the safe movement and operation of aircraft on the airfield. Food waste shall be promptly removed from construction sites.

H. Existing Airport Pavements and Facilities: The Contractor shall preserve and/or protect existing and new pavements and other facilities from damage due to construction operations. Existing pavements, facilities, utilities, or that are damaged shall be replaced or reconstructed to original strength and appearance at the Contractor's expense. The Contractor shall take immediate action to replace any damaged facilities and equipment and reconstruct any damaged area that is to remain in service.

I. Storage Areas:

1. The storage area(s) depicted on the plans shall be used to store all idle equipment, supplies, and construction materials (other than bulk materials such as aggregate, sand, and soil). Storage shall not interfere with operational areas.

2. All material and equipment shall be stored at storage sites indicated on the contract drawings.

3. Do not store materials or equipment in areas in which the equipment or materials will affect the operation of FAA electronic apparatus.

4. All equipment storage and movement shall have prior approval of the Director, Airport Operations, or the Director's authorized designee and the Engineer.

5. The perimeter of any storage area that abuts an AOA pavement shall be protected by barricades no more than 10 feet apart marked with red flashing lights. Upon completion of all work, remove all and barricades and lights from the project site.

6. Contractor's vehicles, equipment, and materials shall be stored in areas designated on the drawings. Upon completion of the work, the storage area shall be cleaned up and returned to its original condition to the satisfaction of the Engineer.

7. Equipment not in use during construction and during all non-construction hours shall be parked in the Contractor's storage area. All exceptions shall be approved in advance by the Director, Airport Operations by way of the Engineer. Parking of construction workers' private vehicles shall not be allowed within storage areas located on the AOA.

8. Stockpile areas shall be used to store all bulk materials needed for the project and may or may not be fenced at the Contractor's option. However, barricades, as specified herein, shall be installed where potential conflicts with aircraft or ground vehicular traffic exists. Stockpiles shall not penetrate the FAR Part 77 imaginary surfaces or present FOD problems.

9. Equipment and materials shall not be stored between runways. An exception to this is for tracked construction vehicles/devices, and certain materials that are specified in contract drawings. The height of the equipment and the location where it will be stored must be specified in the drawings.

1.11 OBSTRUCTIONS TO NAVIGATION

A. The Contractor shall limit the height of vehicles, equipment, stockpiled materials excavated earth, to the limits as specified on the drawings.

1.12 DAILY INSPECTIONS

A. The Director, Airport Operations or the Director's representative will conduct a daily inspection of each construction site before workers leave for the day to ensure that areas surrounding the sites are safe for aircraft operations. Inspector(s) will be watchful for FOD that can be ingested into aircraft engines, loose polyethylene and other light materials capable of being blown onto aircraft movement areas by wind, unlighted construction and obstruction lights, vehicles and equipment left outside construction areas, construction areas left unlocked, access gates left open, weak partitions or fences, etc. All discrepancies shall be corrected before workers depart from the work site.

B. Inspectors will review potentially hazardous conditions, which may occur during airport construction, and maintenance including, but not limited to the following:

1. Trenches, holes, or excavation on or adjacent to any open runway or related safety area.

2. Unmarked/unlighted holes or excavations in any apron, open taxiway, open taxi lane, or related safety area.

3. Mounds or piles of earth, construction materials, temporary structures, or other objects on or in the vicinity of any open runway, taxiway, taxi lane or in a related safety, approach or departure area.

4. Pavement drop-offs or pavement turf lips (either permanent or temporary) which would cause, if crossed at normal operating speeds, damage to aircraft that normally use the airport.

5. Vehicles or equipment (whether operating or idle) on any open runway, taxiway, taxi lane, or in any related safety, approach or departure area.

6. Vehicles, equipment, excavations, stockpiles, or other materials which could impinge upon NAVAID critical areas and degrade or otherwise interfere with electronic signals from radios or electronic NAVAIDs or interfere with visual NAVAID facilities.

7. Unmarked utility, NAVAID, weather service, runway lighting, or other power or signal cables that could be damaged during construction.

8. Objects (whether marked/flagged or not) or activities anywhere on or in the vicinity of airport which could be distracting, confusing, or alarming to pilots during aircraft operations.

9. Unflagged/unlighted low visibility items (such as tall cranes, drills, etc.) in the vicinity of an active runway, or in any approach or departure area.

10. Misleading or malfunctioning obstruction lights.

11. Unlighted/unmarked obstruction in an approach to any open runway.

12. Inadequate approach/departure surfaces (needed to assure adequate landing/takeoff clearance over obstructions or work or storage areas).

13. Inadequate, confusing, or misleading marking/lighting of runways (including displaced or relocated thresholds), taxiways, or taxi lanes.

14. Water, snow, dirt, debris, or other transient accumulation which temporarily obscures pavement marking, pavement edges, or derogates the visibility of runway/taxiway marking, lighting, or of construction and maintenance areas.

15. Inadequate or improper methods of marking, barricading, or lighting temporarily closed portions of airport operation areas.

16. Trash or other materials with foreign object damage (FOD) potential, whether on runways, taxiways, aprons, or related safety areas.

17. Inadequate fencing or other marking to separate construction or maintenance areas from open aircraft operating areas.

18. Inadequate control of vehicle and human access to and non-essential, non-aeronautical activities on, open aircraft operating areas.

19. Improper radio communication maintained between construction/ maintenance vehicles and air traffic control tower or other on-field communications facility [e.g., FAA Flight Service Station (FSS) or unicom radio].

20. Construction/maintenance activities or materials which could hamper Aircraft Rescue and Fire Fighting (ARFF) vehicle access from the ARFF stations to all parts of the runway/taxiway system, runway approach and departure areas, or aircraft parking locations.

21. Bird attractants such as edibles (food scraps, etc.) trees, brush, other trash, grass/crop seeding, or pond water on or near the airport.

22. Personnel at the construction site without proper identification.

23. No escorts for persons at the job site without proper identification.

24. Vehicles involved in the project do not meet the safety requirements of Spokane Airport Rules and Regulations.

25. Improperly marked, lighted and flagged vehicles involved in the project.

C. All work shifts, including the nightly work shifts are totally inclusive of the Contractor moving onto the site, performing work activities, performing all clean-up, having the work area and haul routes inspected and approved by the inspector(s) and moving off the site. The Contractor shall provide adequate lighting for the needs of the inspection personnel.

D. Any Aircraft Movement Surface or adjoining runway, taxiway or taxilane safety area that does not pass inspection must remain closed until such time cleanup is performed and approved. Damages will be assessed for any delays in the opening of the surface as defined in Document Number 00800 - Supplementary Conditions, paragraph SC-10.13.

1.13 EMERGENCY PROCEDURES

A. The Contractor shall familiarize itself with airport emergency procedures and shall conduct his operation so as not to conflict with such events. Clear routes for Airport Rescue and Fire Fighting (ARFF) equipment shall be maintained in operational condition at all times.

B. In case of an emergency caused by an accident, fire, or personal injury or illness, Police are to be immediately notified by calling 911. Police will coordinate with other emergency agencies as necessary.

1.14 ADMINISTRATIVE REQUIREMENTS

A. Applicability: The provisions of this section shall apply to the Prime Contractor, subcontractors at all tiers, suppliers, and all others which may have access to the Air Operations Area by way of the Contractor's activities.

B. Exclusion From Claims: Impacts caused by failure of the Prime Contractor, subcontractors at all tiers, and all others to comply, implement and maintain the provisions of this section shall not be cause for a claim of delay or increased cost to Spokane Airport.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items in the Lump Sum price bid for the Project.

End of Section

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX D

Appendix D. Inadvertent Discovery Plan

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Spokane International Airport (GEG) Location: 9000 W Airport Dr, Spokane, WA 99224

Project Lead/Organization: GSI Environmental, Inc. County: Spokane

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Kenia Whitehead PhD	Name:	Breeyn Greer PE
Organization:	GSI Environmental Inc.	Organization:	Haley & Aldrich Inc.
Phone:	564.999.5192	Phone:	612.232.7343
Email:	kwhitehead@gsi-net.com	Email:	bgreer@haleyaldrich.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Jeremy Schmidt	Name:	Jon Klem
Program:	Toxics Cleanup	Program:	Toxics Cleanup
Phone:	509.724.1164	Phone:	206-556-5584
Email:	jeremy.schmidt@ecy.wa.gov	Email:	jonk@ecy.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Spokane Tribe of Indians	Tribe:	Confederated Tribes of the Colville Reservation
Name:	Randy Abrahamson	Name:	Guy Moura
Title:	TPHO	Title:	TPHO
Phone:	509.258.4315	Phone:	509.634.2695
Email:	randya@spokanetribe.com	Email:	guy.moura@colvilletribes.com
Tribe:	Coeur d'Alene Tribe	Tribe:	Kalispel Tribe
Name:	Jill Maria Wagner PhD	Name:	Kevin lyons
Title:	TPHO	Title:	Cultural Resources Program Mgr.
Phone:	208-686-1572	Phone:	509-445-1147
Email:	jill.wagner@cdatribe-nsn.gov	Email:	kjlyons@kalispeltribe.com

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:		State Agency:	
Agency:		Agency:	
Name:		Name:	
Title:		Title:	
Phone:		Phone:	
Email:		Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: Spokane County Medical Examiner; 509.447.2296
   - Local Law Enforcement main name and phone: Spokane Police Department; 509.456.2233
   - Local Non-Emergency phone number (911 if without a non-emergency number): 509.242.8477
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

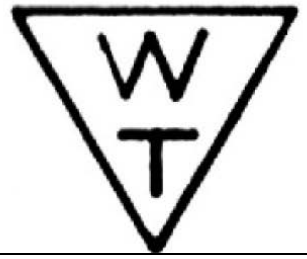
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

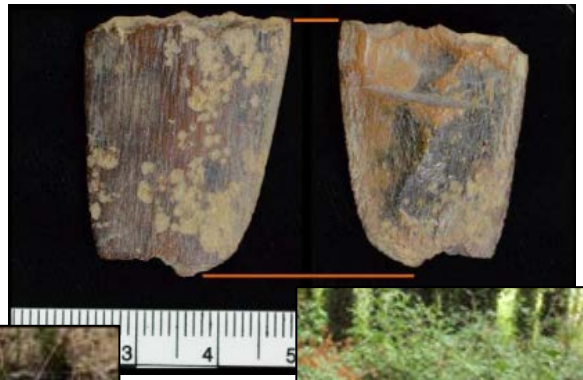
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*

GSI Job No.: 6892
Issued: 13 December 2024

INITIAL PFAS INVESTIGATION WORK PLAN
Spokane International Airport
Spokane, WA

APPENDIX E

Appendix E. Well Boring Logs

ECOVA Corporation

Well Installation Log

Well Number MW-5A

Date Drilled 4-30-90

Client Army Corps of Engineers

Drilling Company Fogle Pump & Supply

Coordinates 240023.4591 N

2452092.2401 E

Site Air Natl. Guard (Task 7)

Boring Method Air Rotary

Job Number 801126

Borehole Depth 96 Feet

Casing Elevation 2390.45

Field Geologist R.W. Goodfellow

Water Depth 36 Feet

Sheet 1 of 2

General: 50 feet of 6" steel casing, pressure grout.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5				2			SAND (SM) – Fine– to coarse–grained, brown, loose, basalt fragments.	
10							SAND (SM) – Fine– to coarse–grained, dark brown, loose, minor gravel, some wood fragments, damp	
15							WEATHERED BASALT – Gray to brown, dry, loose	
20								
25							SAND (SM) – Fine– to coarse–grained, brown, damp	
30							CLAY WITH SILTY AND SAND (CL) – Brown, semi–plastic, damp.	
35							▽ Static water level at 36 feet.	
40							WEATHERED BASALT – Black, mixed with brown clay, dry. Water yielding zone at 40 feet. WEATHERED BASALT – Black, water.	
45								
50				1				

801126-A-MW5A

* Background = 2 ppm

ECOVA Corporation

Well Installation Log

Client: Army Corps of Engineers
Site: Air Natl. Guard (Task 7)
Job Number: 801126
Field Geologist: R.W. Goodfellow

Drilling Company: Fogle Pump & Supply
Boring Method: Air Rotary
Borehole Depth: 96 Feet
Water Depth: 36 Feet

Well Number: MW-5A
Date Drilled: 4-30-90
Coordinates: 240023.4591 N
2452092.2401 E
Casing Elevation: 2390.45
Sheet 2 of 2

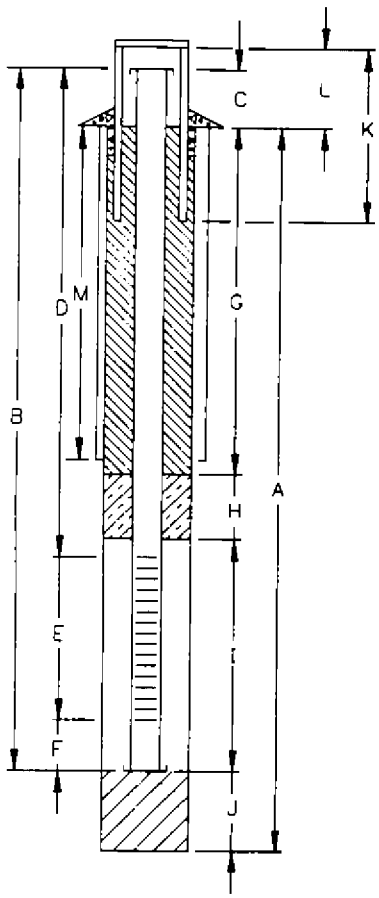
General: **50 feet** of 6" steel casing, pressure grout.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55							WEATHERED BASALT – Orange and black cuttings. water yielding zone at 57 feet.	
60								
65								
70								
75							WEATHERED BASALT	
80								
85							BASALT – Fresh, minor orange cuttings, ~ 30 gpm	
90								
95							Bottom of Hole – 96 Feet	
100								

801126-A-MW5A

* Background = 2 ppm

WELL COMPLETION MW-5A



TOP OF CASING ELEVATION 2390.45'

A BORING DEPTH 96 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 96 FT

C WELL STICKUP 0 FT.

D BLANK INTERVAL 64 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 81-91' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 3 FT.

G ANNULAR SEAL 69 FT.
MATERIAL: GROUT

H BENTONITE SEAL 5 FT.

I SANDPACK 19 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 2 FT.
MATERIAL: SAND

K WELL COVER 0 FT.

L STICKUP 0 FT.

M CONDUCTOR CASING 5' FT.

NOT TO SCALE

DRILLING TIMES:
START 0745 4/30/90 FINISH 1207 4/30/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT: DISPLACEMENT PUMPING

PUMP TIME 0830 TIME 1230 DATE 5/29/90

PUMPED 4 BARRELS IN 4 HOURS

TURBIDITY AFTER DEVELOPMENT:
X CLEAR ____ MOD TURBID
____ SL. TURBID ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:
____ GROUND SURFACE ____ STORAGE TANK
____ STORM SEWERS ____ TANK TRUCK
4 DRUMS

DEPTH OF WATER AFTER DEVELOPMENT: 30.5

MATERIALS USED

4 1/2 SACKS of 20/40 SAND
8 SACKS of PORTLAND CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION #6 BENTONITE
1 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
4 CENTRALIZERS at 18, 46, 74, AND 92 FEET BGS

WELL COVER USED:
____ Above Grade
X At Grade
____ Other
X Lockable

ECOVA Corporation

Well Installation Log

Well Number MW-5B
Date Drilled 5-2-90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 240023.3014 N
Site Air Natl Guard (Task 7)
Boring Method Air Rotary
2452104.0267 E
Job Number 801126
Borehole Depth 60 Feet
Casing Elevation 2390.48
Field Geologist R.W. Goodfellow
Water Depth 26 Feet
Sheet 1 of 2

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	General: Sample Description	Graphic Log
5							SAND (SM) – Fine– to coarse–grained, minor basalt pebbles, loose.	
10							SAND WITH GRAVEL (SM) – Fine– to coarse–grained, gravel is composed of basalt chips, brown, loose	
15								
20								
25							SILTY CLAY (CL) – Brown, semi–plastic, damp ▽ Static water level at 26 feet	
30								
35								
40							BASALT – Fresh, damp.	
45								
50							WEATHERED BASALT.	

801126-A-MW5B

* Background = 2 ppm

ECOVA Corporation

Well Installation Log

Client: Army Corps of Engineers
Site: Air Natl. Guard (Task 7)
Job Number: 801126
Field Geologist: R.W. Goodfellow

Drilling Company: Fogle Pump & Supply
Boring Method: Air Rotary
Borehole Depth: 60 Feet
Water Depth: 26 Feet

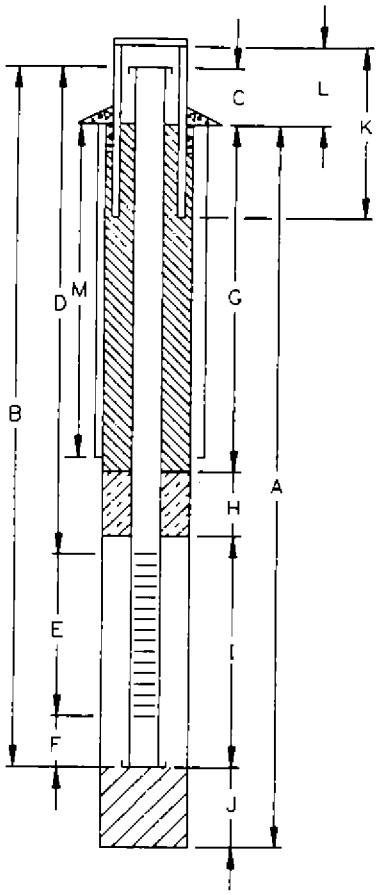
Well Number: MW-5B
Date Drilled: 5-2-90
Coordinates: 240023.3014 N
2452104.0267 E
Casing Elevation: 2390.48
Sheet 2 of 2

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	General: Sample Description	Graphic Log
55							WEATHERED BASALT – To bottom of hole.	
							Water yielding zone at ~30 gpm	
60							Bottom of Hole – 60 Feet	
65								
70								
75								
80								
85								
90								
95								
100								

801126-A-MW5B

* Background = 2 ppm

WELL COMPLETION MW-5B



TOP OF CASING ELEVATION 2390.48'

A BORING DEPTH 60 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 60 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 26 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 23-43' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 14 FT.

G ANNULAR SEAL 14 FT.
MATERIAL: GROUT

H. BENTONITE SEAL 3 FT.

I SANDPACK 40 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 3 FT.
MATERIAL: SAND

K WELL COVER 0 FT.

L STICKUP 0 FT.

M CONDUCTOR CASING ____ FT.

NOT TO SCALE

DRILLING TIMES:
START 1340 5/2/90 FINISH 5/2/90
STANDBY or DOWN TIME:

METHOD OF DECON PRIOR TO DRILLING.

DEVELOPMENT

METHOD OF DEVELOPMENT

PUMP TIME 0730 TO 1230 DATE 5/25/90

TURBIDITY AFTER DEVELOPMENT:
____ CLEAR ____ MOD TURBID
X SL. TURBID ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:
____ GROUND SURFACE ____ STORAGE TANK
____ STORM SEWERS ____ TANK TRUCK
4 DRUMS

DEPTH OF WATER AFTER DEVELOPMENT 29'

MATERIALS USED

4 1/2 SACKS of 20/40 SAND
6 SACKS of PORTLAND CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
GROUT COMPOSITION #6 BENTONITE
1 1/2 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
2 CENTRALIZERS at TOP AND BOTTOM SCREEN BGS

WELL COVER USED:
____ Above Grade
X At Grade
____ Other
X Lockable

801126-A-MW5BW

ECOVA Corporation

Well Installation Log

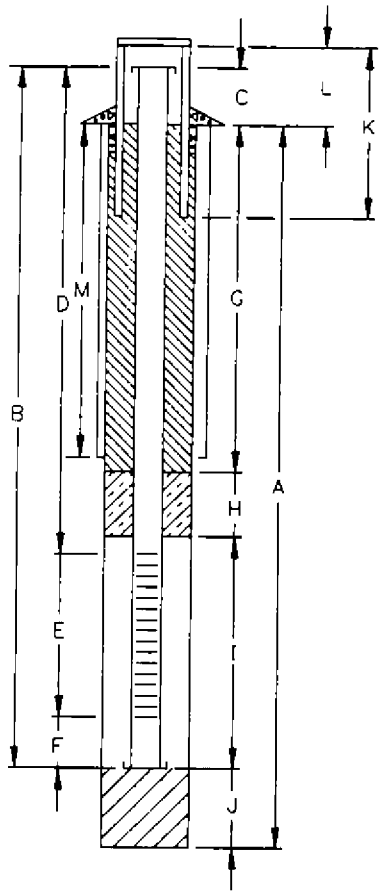
Well Number MW-5B
Date Drilled 4-19-90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 240669.5207 N
Site Air Natl. Guard (Task 7)
Boring Method Air Rotary
2451956.0038 E
Job Number 801126
Borehole Depth 40 Feet
Casing Elevation 2376.99
Field Geologist K. May
Water Depth 14 Feet
Sheet 1 of 1

Depth (Feet)	Blow Counts	Sample No	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
							General: 20 feet of 6" casing	
5							**SILTY GRAVEL (GM)** – Grayish brown, dry, **loose.**	
10				0.6			**SAND WITH GRAVEL (GM)** – Fine– to coarse–grained, **minor vesicular** basalt, loose, dry.	
							▽ **Static water** level at 14 feet	
15							**WEATHERED** BASALT – Moist, some clay **Water** yielding zone at 16.5 feet. **WEATHERED** BASALT – Wet, some clay.	
20								
25				0.6			**SILTY CLAY (CL)** – Light red to brown, **cohesive.** Highly weathered basalt?	
30							**SILTY CLAY (CL)** – Light yellow to brown, **loose clay,** well sorted. Highly weathered basalt?	
							SILTY CLAY WITH SAND (CL) – Dark red to brown, **moist.** Highly weathered basalt?	
35								
40							**BASALT (39.5')** – Brownish gray. Bottom of Hole – 40 Feet	
45								
50								

801126-A-MW5B

* Background = 0.6 ppm

WELL COMPLETION MW-6B



TOP OF CASING ELEVATION 2376.99'

A BORING DEPTH 40 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 40.5 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 14 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 10.5-30.5' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5 FT.

G ANNULAR SEAL 4 FT.
MATERIAL: GROUT

H BENTONITE SEAL 3 FT.

I SANDPACK 27'6" FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 4'6" FT.
MATERIAL: SAND

K WELL COVER FT.

L STICKUP 0 FT.

M CONDUCTOR CASING FT.

NOT TO SCALE

DRILLING TIMES.
START 0955 4/19/90 FINISH 1245 4/19/90
STANDBY or DOWN TIME:

METHOD OF DECON PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMP TIME 1045 TO 1500 DATE 5/25/90

TURBIDITY AFTER DEVELOPMENT: ___ CLEAR ___ MOD. TURBID ___ SL. TURBID [X] TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: ___ GROUND SURFACE ___ STORAGE TANK ___ STORM SEWERS ___ TANK TRUCK [3.5] DRUMS

DEPTH OF WATER AFTER DEVELOPMENT 15.1'

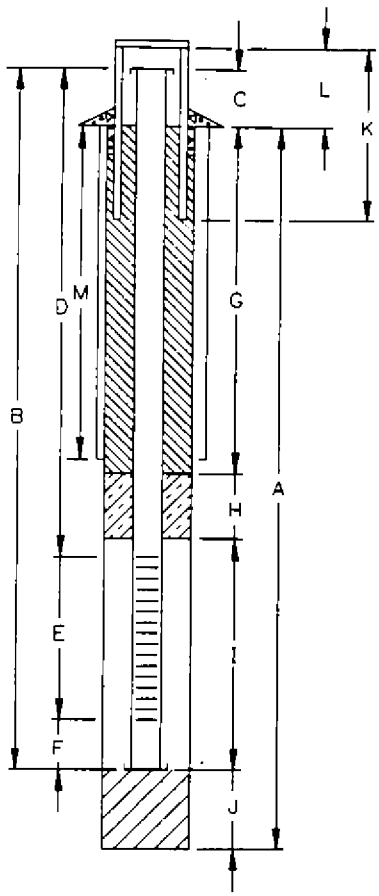
MATERIALS USED

6 1/2 SACKS of 20/40 SAND
___ SACKS of
___ SACKS of PREMIX CONCRETE
5 GALLONS of GROUT USED
GROUT COMPOSITION #6 BENTONITE
1 SACK of BENTONITE PELLETS
___ BUCKETS of BENTONITE PELLETS
___ YARDS CEMENT - SAND USED
2 CENTRALIZERS at TOP AND BOTTOM SCREEN BGS

WELL COVER USED:
___ Above Grade
[X] At Grade
___ Other
[X] Lockable

801126-A-MW3AW

WELL COMPLETION MW-7A



TOP OF CASING ELEVATION 2380.09'

A BORING DEPTH 75 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 73.2 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 58 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 10 FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5 FT.

G ANNULAR SEAL 44 FT.
MATERIAL: GROUT

H BENTONITE SEAL 5 FT.

I SANDPACK 20'8" FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 1'2" FT.
MATERIAL: SAND

K WELL COVER ____ FT.

L STICKUP 0 FT.

M CONDUCTOR CASING 31 FT.

NOT TO SCALE

DRILLING TIMES.
START 1045 4/23/90 FINISH 1251 4/23/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT

PUMP TIME 0800 TO 1200 DATE 5/23/90

TURBIDITY AFTER DEVELOPMENT:
____ CLEAR ____ MOD. TURBID
X SL. TURBID ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:
____ GROUND SURFACE ____ STORAGE TANK
____ STORM SEWERS ____ TANK TRUCK
X DRUMS

DEPTH OF WATER AFTER DEVELOPMENT: 20.5'

MATERIALS USED

3 SACKS of 20/40 SAND
5 SACKS of PORTLAND CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION #6 BENTONITE
1 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
____ CENTRALIZERS at 21, 50, 69 FEET BOS

WELL COVER USED:
____ Above Grade
X At Grade
____ Other
X Lockable

801126-A-MW7AW

ECOVA Corporation

Well Installation Log

Well Number MW-7A

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4-23-90

Site Air Natl. Guard (Task 7) | Boring Method Air Rotary | Coordinates 240754.9197 N

Job Number 801126 | Borehole Depth 75 Feet | 2452192.6017 E

Field Geologist K. May | Water Depth 20 Feet | Casing Elevation 2380.09

Sheet 2 of 2

General: 31' of 6" Casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55							WEATHERED BASALT – Orange mottled, water bearing, loose.	
60							@ 57 feet soft – water flow increased	
65							BASALT – Fresh, black.	
70								
75							WEATHERED BASALT – Brown, loose.*	
80							Bottom of Hole – 75 Feet	
85								
90								
95								
100								

801126-A-MW7A

* Background = ____ppm

ECOVA Corporation

Well Installation Log

Client: Army Corps of Engineers
Site: Air Natl. Guard (Task 7)
Job Number: 801126
Field Geologist: K. May

Drilling Company: Fogle Pump & Supply
Boring Method: Air Rotary
Borehole Depth: 75 Feet
Water Depth: 20 Feet

Well Number: MW-7A
Date Drilled: 4-23-90
Coordinates: 240754.9197 N, 2452192.6017 E
Casing Elevation: 2380.09
Sheet: 1 of 2

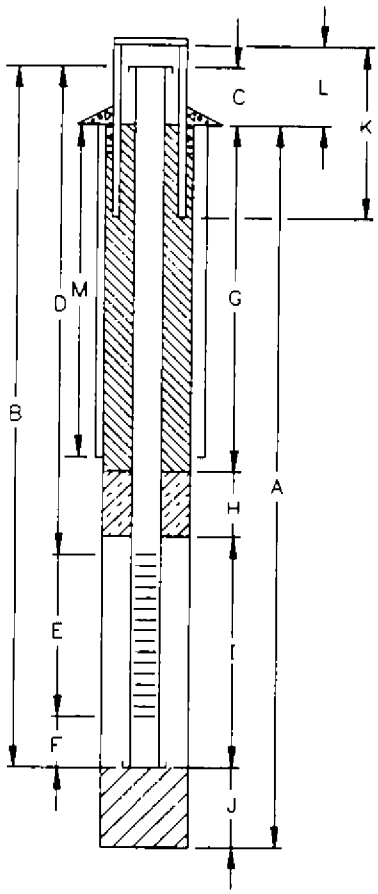
General: 31' of 6" Casing.

Depth (Feet)	Blow Counts	Sample No	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SAND (SM) – Fine– coarse–grained, subangular to subrounded, brown, dry, minor basalt cuttings.	
10							Color change to light gray.	
15							Same as above.	
20							▽ Static water level at 20 feet.	
25							SAND (SM) – Fine– to coarse–grained, brown, loose, possibly weathered basalt.	
30							CLAY WITH SAND AND SILT (CL) – Gray green, slightly damp, @ 27 feet sediments turn to brown silty clay with minor basalt fragments. Weathered basalt ?	
35							BASALT – At 30'.	
40							Gray–brown, basalt cuttings.	
45							BASALT – Water yielding zone at 45.5 feet.	
50								

801126-A-MW7A

* Background = ____ppm

WELL COMPLETION MW-7B



TOP OF CASING ELEVATION 2380.08'

A BORING DEPTH 43 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 35 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 14 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 7.5-27.5 FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 2 FT.

G ANNULAR SEAL 0 FT.
MATERIAL: ____

H BENTONITE SEAL 3 FT.

I SANDPACK 23'6" FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 1'6" FT.
MATERIAL: SAND

K WELL COVER 0 FT.

L STICKUP 0 FT.

M CONDUCTOR CASING ____ FT.

NOT TO SCALE

DRILLING TIMES:

START 1100 4/18/90 FINISH 1530 4/18/90

STANDBY or DOWN TIME:

DRILLING SLOW DUE TO CLAY ENCOUNTERED IN BORING.
CLAY PLUGGED UP DELIVERY PIPE TO CYCLONE.

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMP TIME 1100 TO 1500 DATE 5/23/90

TURBIDITY AFTER DEVELOPMENT:

____ CLEAR ____ MOD. TURBID
____ SL. TURBID __X__ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:

____ GROUND SURFACE ____ STORAGE TANK
____ STORM SEWERS ____ TANK TRUCK
__X__ DRUMS

DEPTH OF WATER AFTER DEVELOPMENT 18.0

MATERIALS USED

__7__ SACKS of 20/40 SAND
____ SACKS of ____
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION ____
__1__ SACK of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
__2__ CENTRALIZERS at TOP AND BOTTOM OF SCREEN BGS

WELL COVER USED:

____ Above Grade
__X__ At Grade
____ Other
__X__ Lockable

ECOVA Corporation

Well Installation Log

Well Number MW-7B

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4-18-90

Site Air Natl. Guard (Task 7) | Boring Method Air Rotary | Coordinates 240763.7185 N, 2452205.5566 E

Job Number 801126 | Borehole Depth 43 Feet | Casing Elevation 2380.08

Field Geologist K. May | Water Depth 18.0 Feet | Sheet 1 of 1

General: 24 feet of 6" steel casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5				1.0			SAND WITH GRAVEL (SM) – Medium– to coarse–grained, brown, minor black basalt chips, loose	
							At 6 feet encountered boulder, pulled 8 feet of casing and set 20 foot length.	
10								
15							SAND, SILT, AND GRAVEL (BASALT) – Loose, trace amount of gravel with granitic(?) composition	
							▽ Static water level at 18 feet.	
20				20			SAND (SM) – Coarse–grained, dark gray, loose, wet, petroleum odor.	
							WEATHERED BASALT(?) – Reddish brown, more water.	
25				15			Reddish brown, moist	
30							BASALT.	
35								
40								
							Bottom of Hole – 43 Feet	
45								
50								

801126-A-MW7B

* Background = 1.0 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-8A
Date Drilled 4/26/90 4/27/90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 240632.6323 N
Site Air Natl Guard (Task 7)
Boring Method Air Rotary
2452389.1722 E
Job Number 801126
Borehole Depth 86 Feet
Casing Elevation 2378.73
Field Geologist R.W. Goodfellow
Water Depth 19 Feet
Sheet 1 of 2

General: 48 feet of 6" casing

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SAND (SM) – Fine– to coarse–grained, brown, loose, minor basalt fragments, dry	
10								
15							SILTY CLAY (ML) – Brown, loose, with coarse basalt sand.	
20							▽ Static water level at 19 feet Same as above	
25							BASALT – Moderately fresh, dry.	
30								
35							Same as above, damp.	
40								
45							BASALT – Wet.	
50				0.0				

801126-A-MW8A

* Background = 5.0 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-8A

Date Drilled 4/26/90 4/27/90

Client Army Corps of Engineers

Drilling Company Fogle Pump & Supply

Coordinates 240632.6323 N 2452389.1722 E

Site Air Natl Guard (Task 7)

Boring Method Air Rotary

Job Number 801126

Borehole Depth 86 Feet

Casing Elevation 2378.73

Field Geologist R.W. Goodfellow

Water Depth 19 Feet

Sheet 2 of 2

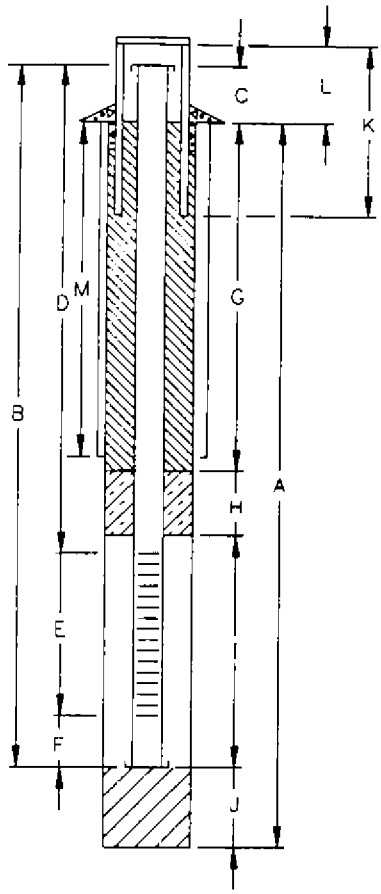
General: 48 feet of 6" casing

Depth (Feet)	Blow Counts	Sample No	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55							Water yielding zone at 57 feet.	
60								
65							BASALT – Fresh, water flow ~ 50 gpm	
70								
75							BASALT – Minor orange mottling, water flow ~50 gpm	
80							Same as above	
85							Bottom of Hole – 86 Feet	
90								
95								
100								

801126-A-MWBA

* Background = _____ppm

WELL COMPLETION MW-8A



TOP OF CASING ELEVATION 2378.73'

A	BORING DEPTH	86	FT.
	BORING DIAMETER	6	IN.
B	WELL DEPTH	85'6"	FT.
C	WELL STICKUP	0	FT.
D	BLANK INTERVAL	70	FT.
	BLANK DIAMETER	2	IN.
E	SCREEN INTERVAL	66.5-76.5	FT.
	SCREEN DIAMETER	2	IN.
	TYPE/SLOT SIZE	0.01	
F	SEDIMENT TRAP	5	FT.
G	ANNULAR SEAL	54	FT.
	MATERIAL:	GROUT	
H	BENTONITE SEAL	5'6"	FT.
I	SANDPACK	22'6"	FT.
	TYPE/SIZE:	20/40	
J	BOTOM SEAL/PACK	3'	FT.
	MATERIAL	SAND	
K	WELL COVER		FT
L	STICKUP	0	FT.
M	CONDUCTOR CASING	48	FT.

NOT TO SCALE

DRILLING TIMES:

START 1440 4/25/90 FINISH 1025 4/27/90

STANDBY or DOWN TIME:

METHOD OF DECON PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT

PUMP TIME 0800 TO 1200 DATE 5/24/90

PUMPED 6 BARRELS IN 4 HOURS.

TURBIDITY AFTER DEVELOPMENT:	X	CLEAR		MOD. TURBID
		SL. TURBID		TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:		GROUND SURFACE		STORAGE TANK
		STORM SEWERS		TANK TRUCK
	X	DRUMS		

DEPTH OF WATER AFTER DEVELOPMENT: 20.0'

MATERIALS USED

4	SACKS of 20/40	SAND
8	SACKS of PORTLAND CEMENT	
	SACKS of PREMIX CONCRETE	
	GALLONS of GROUT USED	
	GROUT COMPOSITION #6 BENTONITE	
1	SACKS of BENTONITE PELLETS	
	BUCKETS of BENTONITE PELLETS	
	YARDS CEMENT - SAND USED	
4	CENTRALIZERS EVERY 25'	BGS

WELL COVER USED:

	Above Grade
X	At Grade
	Other
X	Lockable

801126-A-MW3AW

ECOVA Corporation

Well Installation Log

Well Number MW-8B

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4-24-90 4-25-90

Site Air Natl. Guard (Task 7) | Boring Method Air Rotary | Coordinates 240631.2390 N 2452400.7590 E

Job Number 801126 | Borehole Depth 51 Feet | Casing Elevation 2378.08

Field Geologist R.W. Goodfellow | Water Depth 18 Feet | Sheet 1 of 2

General: 18 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SAND WITH GRAVEL (SM) – Fine– to coarse–grained sand, brown, minor gravel, dry.	
10							SAND WITH GRAVEL (SM) – Brown, loose, with basalt cuttings, dry.	
15							SILTY CLAY (ML) – Brown, semi–plastic, with basalt cuttings, damp.	
20							▽ Static water level at 18 feet.	
25							BASALT – Fresh, with minor amount of brown/gray sand, loose, dry.	
30								
35								
40							Water yielding zone at 40 feet. BASALT – Gray, fresh, wet	
45								
50							BASALT – Gray, fresh, wet.	

801126-A-MW8B

* Background = _____ppm

ECOVA Corporation

Well Installation Log

Well Number MW-8B

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4-24-90 4-25-90

Site Air Natl Guard (Task 7) | Boring Method Air Rotary | Coordinates 240631.2380 N 2452400.7590 E

Job Number 801126 | Borehole Depth 51 Feet | Casing Elevation 2378.08

Field Geologist R.W. Goodfellow | Water Depth 18 Feet | Sheet 2 of 2

General: 18 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
							BASALT – Fresh, gray, wet.	
							Bottom of Hole – 51 Feet	

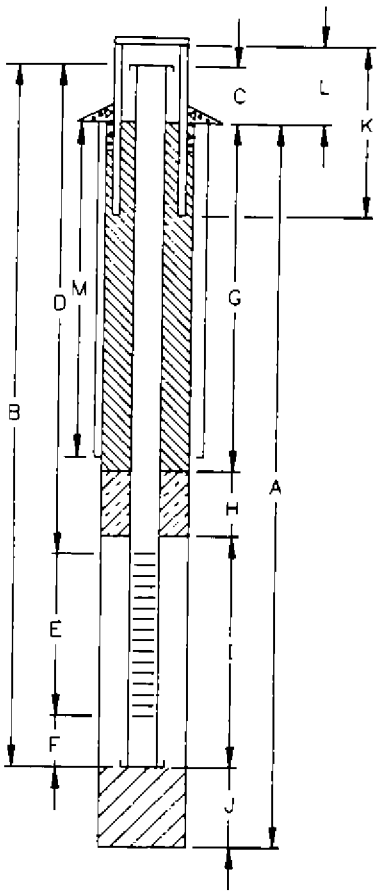
55 60 65 70 75 80 85 90 95 100

6'

801126-A-MW8B

* Background = _____ppm

WELL COMPLETION MW-8B



TOP OF CASING ELEVATION 2378.08'

A BORING DEPTH 51 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 51 FT

C WELL STICKUP 0 FT.

D BLANK INTERVAL 14 FT.
BLANK DIAMETER 2 IN

E SCREEN INTERVAL 13-33' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 14 FT.

G ANNULAR SEAL 2 FT.
MATERIAL: GROUT

H BENTONITE SEAL 2 1/2 FT.

I SANDPACK 41 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 4' FT.
MATERIAL: SAND

K WELL COVER FT

L STICKUP 0 FT

M CONDUCTOR CASING FT.

NOT TO SCALE

DRILLING TIMES:
START 1540 4/24/90 FINISH 1130 4/25/90
STANDBY or DOWN TIME

METHOD OF DECON. PRIOR TO DRILLING.

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMP TIME 1330 TO 1530 DATE 5/24/90

PUMPED 1 BARRELS IN 2 HOURS.

TURBIDITY AFTER DEVELOPMENT: X CLEAR ____ MOD TURBID ____ SL. TURBID ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: ____ GROUND SURFACE ____ STORAGE TANK ____ STORM SEWERS ____ TANK TRUCK 2 DRUMS

DEPTH OF WATER AFTER DEVELOPMENT 18.5'

MATERIALS USED

7 SACKS of 20/40 SAND
____ SACKS of ____
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION ____
2 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
2 CENTRALIZERS at TOP & BOTTOM SCREEN BOS

WELL COVER USED:
____ Above Grade
X At Grade
____ Other
X Lockable

801126-A-MW8BW

FEB 8 1991

RESOURCE PROTECTION WELL REPORT

START CARD NO. 57709

PROJECT NAME: SPOKANE AIRPORT BURN PIT
WELL INDENTIFICATION NO. MW13 A
DRILLING METHOD: 4¼" HOLLOW STEM AUGER & AIR ROTARY
DRILLER: WILL HAYES (2035)
FIRM: RUEN DRILLING, INC (RUEN CDI 1750)
SIGNATURE:
CONSULTING FIRM: LANDAU ASSOCIATES INC.
REPRESENTATIVE: DEB SUNNELL

County
LOCATION: T 24N, R 42E, SEC. 6 ¼ NE ¼ NE
DISTANCE: (W) 112 FT. FROM N/S SECTION LINE
(S) 450 FT. FROM E/W SECTION LINE
DATUM: USGS monument 250' SOUTH OF RUNWAY
WATER LEVEL ELEVATION: (23') 2,357.1'
INSTALLED: 12/18/92
DEVELOPED: 12/22/92

AS-BUILT	WELL DATA		FORMATION DESCRIPTION
see attached sheet		GM	Dark brown silty to sandy GRAVEL (med. dense, moist)
		SW	Dark brown gravelly medium to very coarse SAND (loose, moist)
		GM	Dark brown silty sandy GRAVEL (loose, moist)
		ML	Medium brown fine sandy SILT with trace charcoal and leaves (very stiff, damp)
		BASALT TO 42'	Weathered Basalt with small angular pebbles mixed with clay

5 10 15 20 25 30 35

End of HOLE 42'

RECEIVED
JAN 20 1993
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Will Ruen

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

SCALE: 1"= 5'

PAGE 1 OF 2

ECY 050-12

LANDAU ASSOCIATES, INC.
Edmonds, WA (206) 778-0907 FAX (206) 778-6409

As-built Well Completion Form

Project: SPOKANE AIRPORT BURNPIT
Project No.: 207001.33
Well(s) No.: MW 13 A
Drilling Co.: RUEN DRILLING IN
Installation Start Date: 12|18|92 Hour: 1000
Installation Finish Date: 12|22|92 Hour: 1000 monumental
Well Type: [X] Single [ ] Nested [ ] Clustered

WATER DISCHARGE MONITORING

Date: ____ Time: ____ PID(ppm) ____
Date: ____ Time: ____ PID(ppm) ____
Date: ____ Time: ____ PID(ppm) ____
Date: ____ Time: ____ PID(ppm) ____
Date: ____ Time: ____ PID(ppm) ____

EQUIPMENT USED

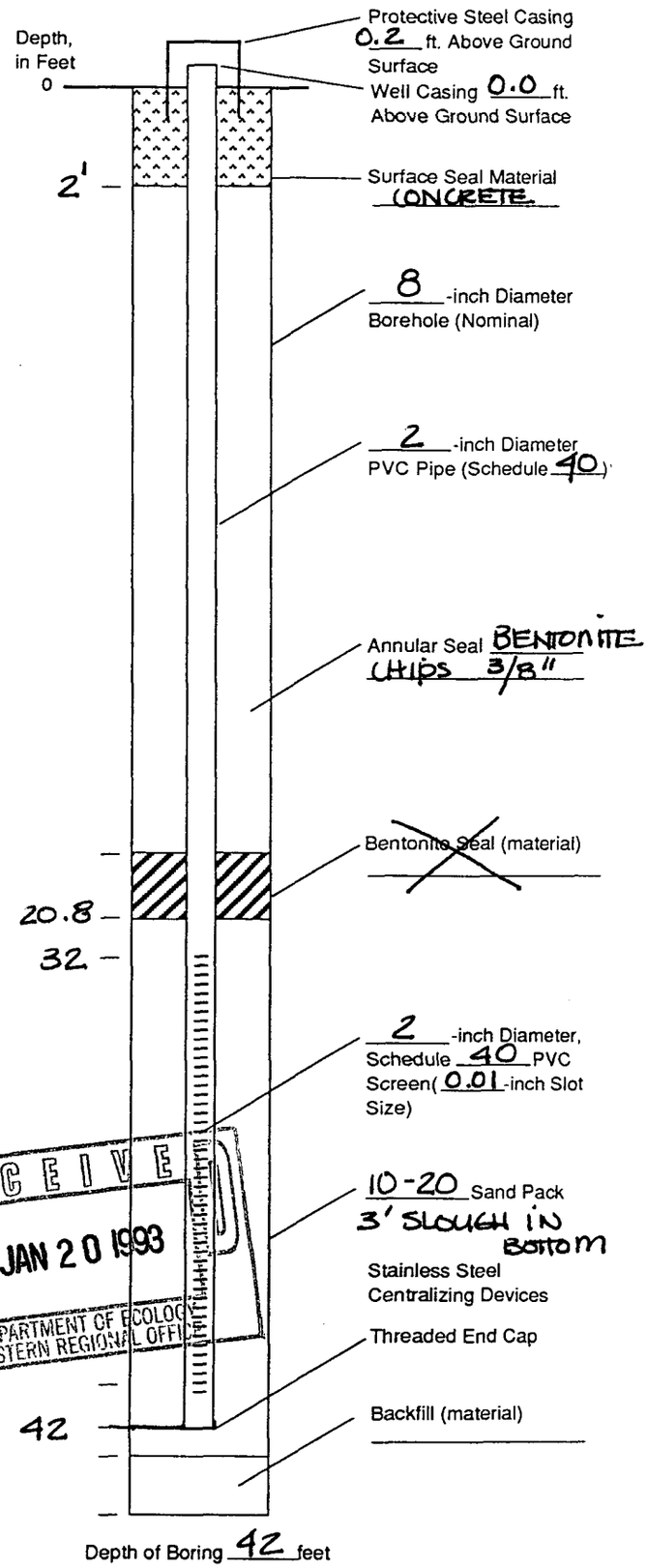
[X] Hollow Stem Auger 4 1/4"
[ ] Cable Tool
[ ] Air Rotary
[ ] Other ____

MATERIALS USED

2 Sacks of 10 - 20 Sand
____ Sacks of ____ Concrete/Cement
3 Sacks of ____ Grout Mix Used
15 Sacks of ~~Powdered~~ Bentonite CHIPS
____ Pounds of Bentonite Pellets/Chips
40 Feet of ____ Inch PVC Blank Casing
10 Feet of ____ Inch PVC Slotted Screen

DEVELOPMENT

Method of Development: BAILER 1 1/2" SS
Begin Date: 12|21|92 Time: 0800 BAIL 25 GALLONS
Finish Date: 12|22|92 Time: 1330 (≈ 10 GALLONS)
Yield: Time From: To: Date:
Estimate of Total Water Removed During Development: 35 (Gallons)
Description of Turbidity at End of Development: [ ] Clear [X] Slightly Cloudy [ ] Mod. Turbid [ ] Very Cloudy
Odor of Water: NONE
Water Discharged To: GROUND
Depth to Water After Development: 23.0 (Feet)



Depth of Boring 42 feet

3/91

RESOURCE PROTECTION WELL REPORT

START CARD NO. 57709

PROJECT NAME: SPOKANE AIRPORT BURNPIT
WELL INDENTIFICATION NO. MW13B
DRILLING METHOD: 4¼" HOLLOW STEM AUGER
DRILLER: WILL HAYES (2035)
FIRM: RUEN DRILLING (RUENCDI175QM)
SIGNATURE:
CONSULTING FIRM: LANDAU ASSOCIATES INC.
REPRESENTATIVE: DEB SUNNELL

County
LOCATION: T 24 N, R 42 E, SEC. 6 ¼ NE ¼ NE
DISTANCE: (W) 112 FT. FROM N/S SECTION LINE
(S) 450 FT. FROM E/W SECTION LINE
DATUM: USGS MONUMENT 250' SOUTH OF RUNWAY
WATER LEVEL ELEVATION: (14.7) 2,366.7'
INSTALLED: [illegible]92 12/17/92
DEVELOPED: 12/21/92

AS-BUILT	WELL DATA		FORMATION DESCRIPTION	
see attached sheet		GM	DARK brown silty to sandy GRAVEL (med. dense, moist)	5.0
		SW	Dark brown Gravelly medium to very coarse SAND (loose, moist)	10.0
		GM	Dark brown silty sandy GRAVEL (loose, moist)	15.0
		ML	Medium brown fine sandy SILT w/ trace charcoal and leaves (very stiff, damp)	20.0
			END OF HOLE 20 FT.	
				25.0
				30.0
				35.0

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RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

SCALE: 1"= 5'

PAGE 1 OF 2

ECY 050-12

LANDAU ASSOCIATES, INC.
Edmonds, WA (206) 778-0907 FAX (206) 778-6409

As-built Well Completion Form

Project: SPOKANE AIRPORT BURNPIT
Project No.: 207001.33
Well(s) No.: MW 13 B
Drilling Co.: RUEN DRILLING INC.
Installation Start Date: 12/17/92 Hour: _____
Installation Finish Date: 12/22/92 Hour: _____
Well Type: ☒ Single ☐ Nested ☐ Clustered

WATER DISCHARGE MONITORING

Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____

EQUIPMENT USED

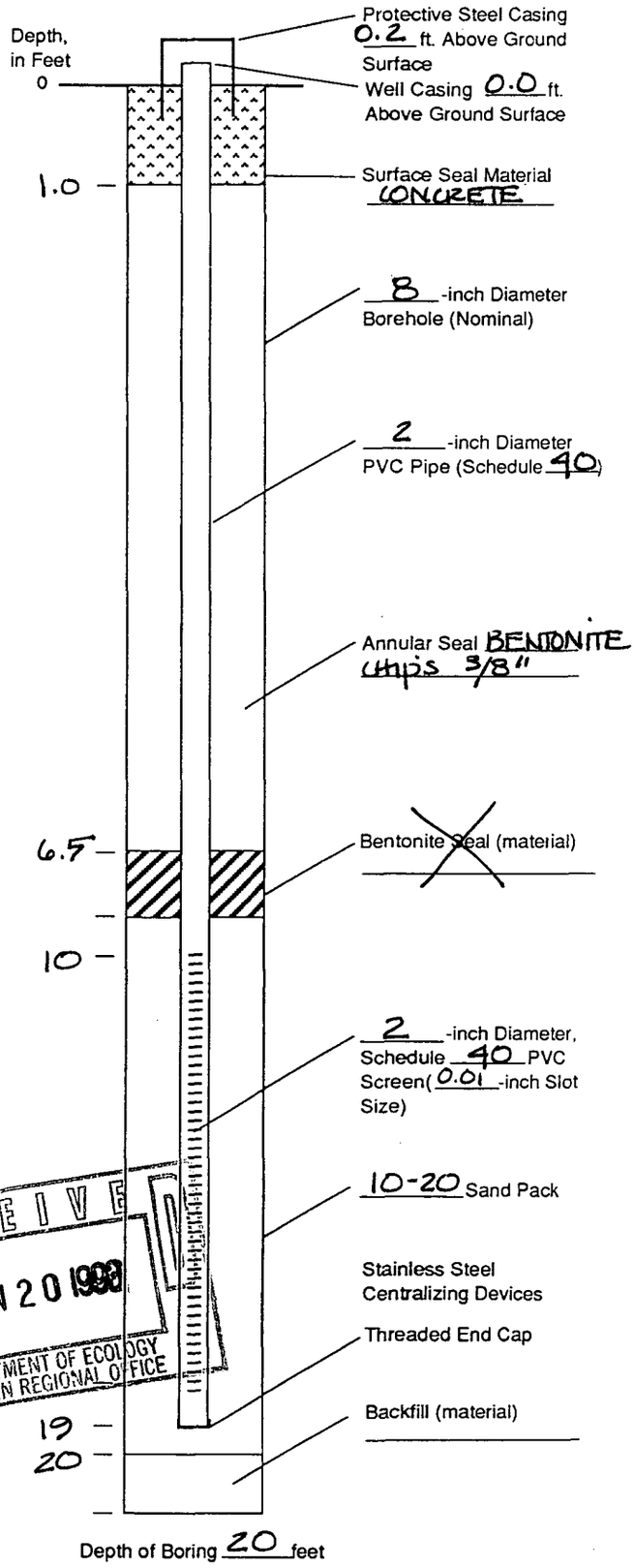
- ☐ Hollow Stem Auger
- ☐ Cable Tool
- ☐ Air Rotary
- ☐ Other _____

MATERIALS USED

4.5 Sacks of 10-20 Sand
2 Sacks of _____ Concrete/Cement
_____ Sacks of _____ Grout Mix Used
2 Sacks of ~~Powdered~~ Bentonite CHIPS
_____ Pounds of Bentonite Pellets/Chips
10 Feet of _____ Inch PVC Blank Casing
10 Feet of _____ Inch PVC Slotted Screen

DEVELOPMENT

Method of Development: HONDA PUMP
Begin Date: 12/18/92 Time: PURGE 25 GALL
Finish Date: 12/21/92 Time: PURGE 10 GAL.
Yield: Time From: To: Date:
Estimate of Total Water Removed During Development: 35 (Gallons)
Description of Turbidity at End of Development: ☐ Clear ☒ Slightly Cloudy ☐ Mod. Turbid ☐ Very Cloudy
Odor of Water: NONE
Water Discharged To: GROUND
Depth to Water After Development: 14.7 (Feet)



Depth of Boring 20 feet

3/91

RESOURCE PROTECTION WELL REPORT

START CARD NO. 57709

PROJECT NAME: SPOKANE AIRPORT BURNPIT
WELL INDENTIFICATION NO. MW14A
DRILLING METHOD: 4¼" HOLLOW STEM AUGER & AIR ROTARY
DRILLER: WILL HAYES (2035)
FIRM: RUEN DRILLING (RUENCDI175PM)
SIGNATURE:
CONSULTING FIRM: LANDAU ASSOCIATES INC.
REPRESENTATIVE: DEB SUNNELL

County
LOCATION: T 24 N, R 42E, SEC. 6 ¼ NE ¼ NE
DISTANCE: (W) 165 FT. FROM N/S SECTION LINE
(S) 555 FT. FROM E/W SECTION LINE
DATUM: USGS MONUMENT 250' SOUTH OF RUNWAY
WATER LEVEL ELEVATION: N/A
INSTALLED: 12/22/92
DEVELOPED: NOT YET

AS-BUILT	WELL DATA		FORMATION DESCRIPTION
See attached sheet		SW	Brown to Grey silty and fine to coarse SAND with trace Gravel (loose, moist)
		CL	Red-brown CLAY with trace Gravel (stiff, wet)
		SW	Dark Grey medium to coarse SAND with Gravel (medium dense, wet)
		CL	Brown CLAY with trace Gravels to brown sandy CLAY with silt and trace Organics (stiff, wet)
		CL/ML	Light brown sandy silty CLAY to clayey Sandy SILT (stiff, moist)
		BASALT	

5 10 15 20 25 30 35

END OF HOLE 35'

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

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EASTERN REGIONAL OFFICE

SCALE: 1"= 5'

PAGE 1 OF 2

ECY 050-12

LANDAU ASSOCIATES, INC.
Edmonds, WA (206) 778-0907 FAX (206) 778-6409

As-built Well Completion Form

Project: SAS - BURN PIT
Project No.: 207001.33
Well(s) No.: MW 14A
Drilling Co.: BUEN DRILLING INC.
Installation Start Date: 12/22/92 Hour: 1000
Installation Finish Date: 12/22/92 Hour: 1330
Well Type: ☒ Single ☐ Nested ☐ Clustered

WATER DISCHARGE MONITORING

Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____

EQUIPMENT USED

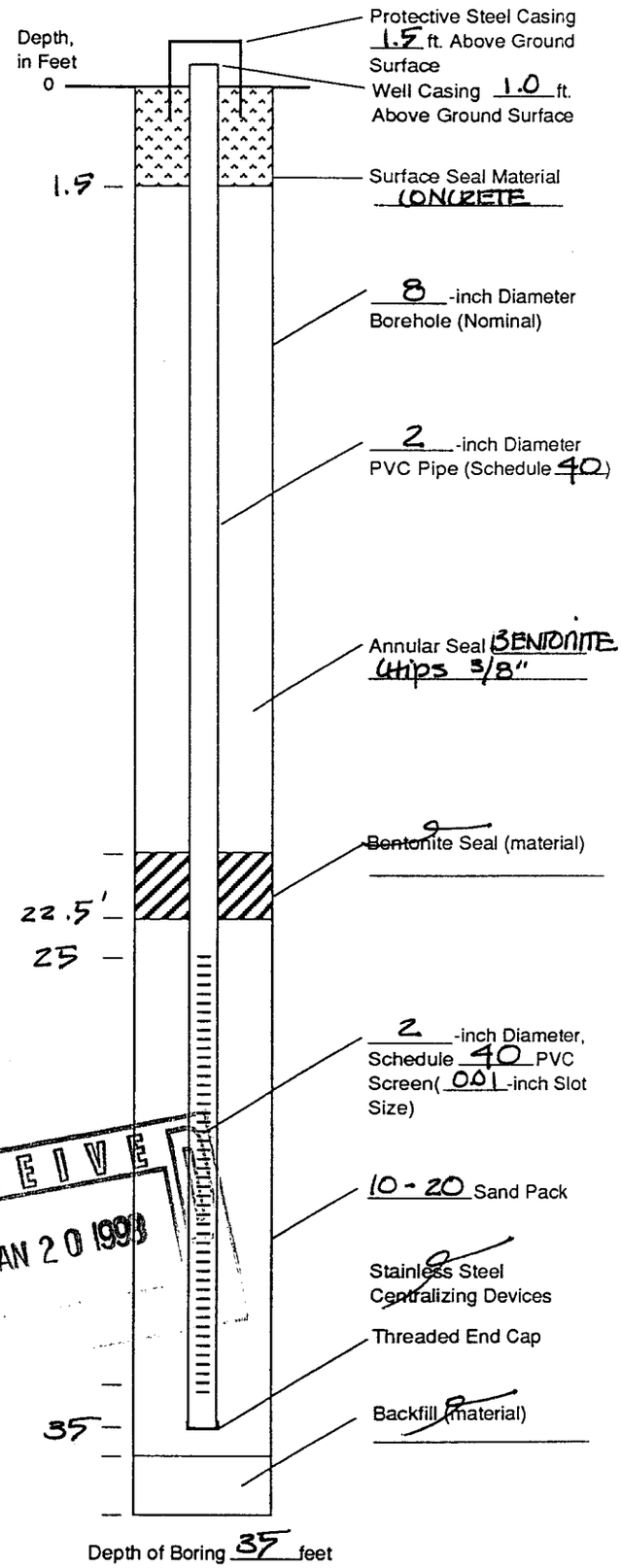
☒ Hollow Stem Auger 4¼"
☐ Cable Tool
☐ Air Rotary
☐ Other _____

MATERIALS USED

5 Sacks of 10 - 20 Sand
2 Sacks of _____ Concrete/Cement
_____ Sacks of _____ Grout Mix Used
9 Sacks of ~~Powdered~~ Bentonite CHIPS
_____ Pounds of Bentonite Pellets/Chips
25 Feet of 2" Inch PVC Blank Casing
10 Feet of 2" Inch PVC Slotted Screen

DEVELOPMENT

Method of Development:
Begin Date: Time:
Finish Date: Time:
Yield: Time From: To: Date:
Estimate of Total Water Removed During Development: Gallons
Description of Turbidity at End of Development: ☐ Clear ☐ Slightly Cloudy ☐ Mod. Turbid ☐ Very Cloudy
Odor of Water: NONE
Water Discharged To:
Depth to Water After Development: Feet



Depth of Boring 35 feet

3/91

RESOURCE PROTECTION WELL REPORT

START CARD NO. 57709

PROJECT NAME: SPOKANE AIRPORT BURNPIT
WELL INDENTIFICATION NO. MW 14B
DRILLING METHOD: 9¼" HOLLOW STEM AUGER
DRILLER: WILL HAYES (2035)
FIRM: RUEN DRILLING (RUENCDI 175QM)
SIGNATURE:
CONSULTING FIRM: LANDAU ASSOCIATES INC.
REPRESENTATIVE: DEB SCHNELL

County
LOCATION: T 24N, R 42E, SEC. 6 ¼ NE ¼ NE
DISTANCE: (W) 165 FT. FROM N/S SECTION LINE
(S) 555 FT. FROM E/W SECTION LINE
DATUM: USGS MONUMENT 250' SOUTH OF RUNWAY
WATER LEVEL ELEVATION: (18.5) 2,362.9
INSTALLED: 12|21|92
DEVELOPED: 12|22|92

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
see attached sheet	SW	Brown to grey silty and fine to coarse SAND with trace gravel (loose moist)
CL		Red-brown CLAY with trace Gravel (stiff, wet)
SW		Dark Grey medium to coarse SAND with Gravel (medium dense, wet)
CL		Brown CLAY with trace Gravels to brown sandy CLAY with silt and trace organics (stiff, wet)
		END OF HOLE 20.5'

5 10 15 20 25 30 35

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Will Ruen

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SCALE: 1"= 5'

PAGE 1 OF 2

ECY 050-12

LANDAU ASSOCIATES, INC.
Edmonds, WA (206) 778-0907 FAX (206) 778-6409

As-built Well Completion Form

Project: SAS - BURNPIT
Project No.: 207001.33
Well(s) No.: MW14B
Drilling Co.: RUEN DRILLING INC.
Installation Start Date: 12/21/92 Hour: 1515
Installation Finish Date: 12/21/92 Hour: 1015
Well Type: [X] Single [ ] Nested [ ] Clustered
120 monument

WATER DISCHARGE MONITORING

Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____
Date: _____ Time: _____ PID(ppm) _____

EQUIPMENT USED

- [ ] Hollow Stem Auger
- [ ] Cable Tool
- [ ] Air Rotary
- [ ] Other _____

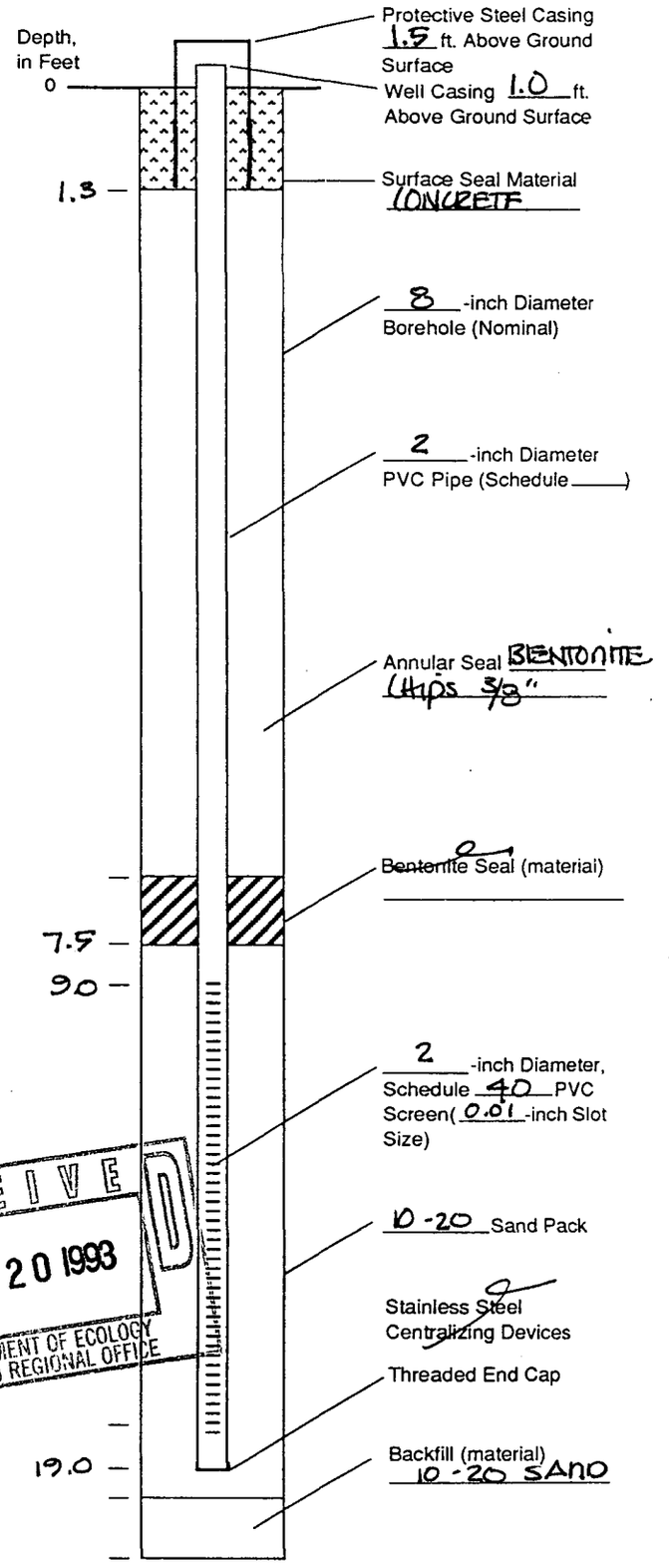
MATERIALS USED

15 Sacks of 10 - 20 Sand
2 Sacks of _____ Concrete/Cement
_____ Sacks of _____ Grout Mix Used
3 Sacks of ~~Powdered~~ Bentonite Chips
_____ Pounds of Bentonite Pellets/Chips
10 Feet of 2 Inch PVC Blank Casing
10 Feet of 2 Inch PVC Slotted Screen

DEVELOPMENT

Method of Development: BAILER 1½" SS
Begin Date: 12/22/92 Time: 20 GALS SLIGHT SLTY
Finish Date: Time:
Yield: Time From: To: Date:
Estimate of Total Water Removed During Development: 20 (Gallons)
Description of Turbidity at End of Development: [ ] Clear [X] Slightly Cloudy [ ] Mod. Turbid [ ] Very Cloudy
Odor of Water: NONE
Water Discharged To: GROUND
Depth to Water After Development: 18.49 TOP PVC (Feet)

3/91



Depth of Boring 20.5 feet

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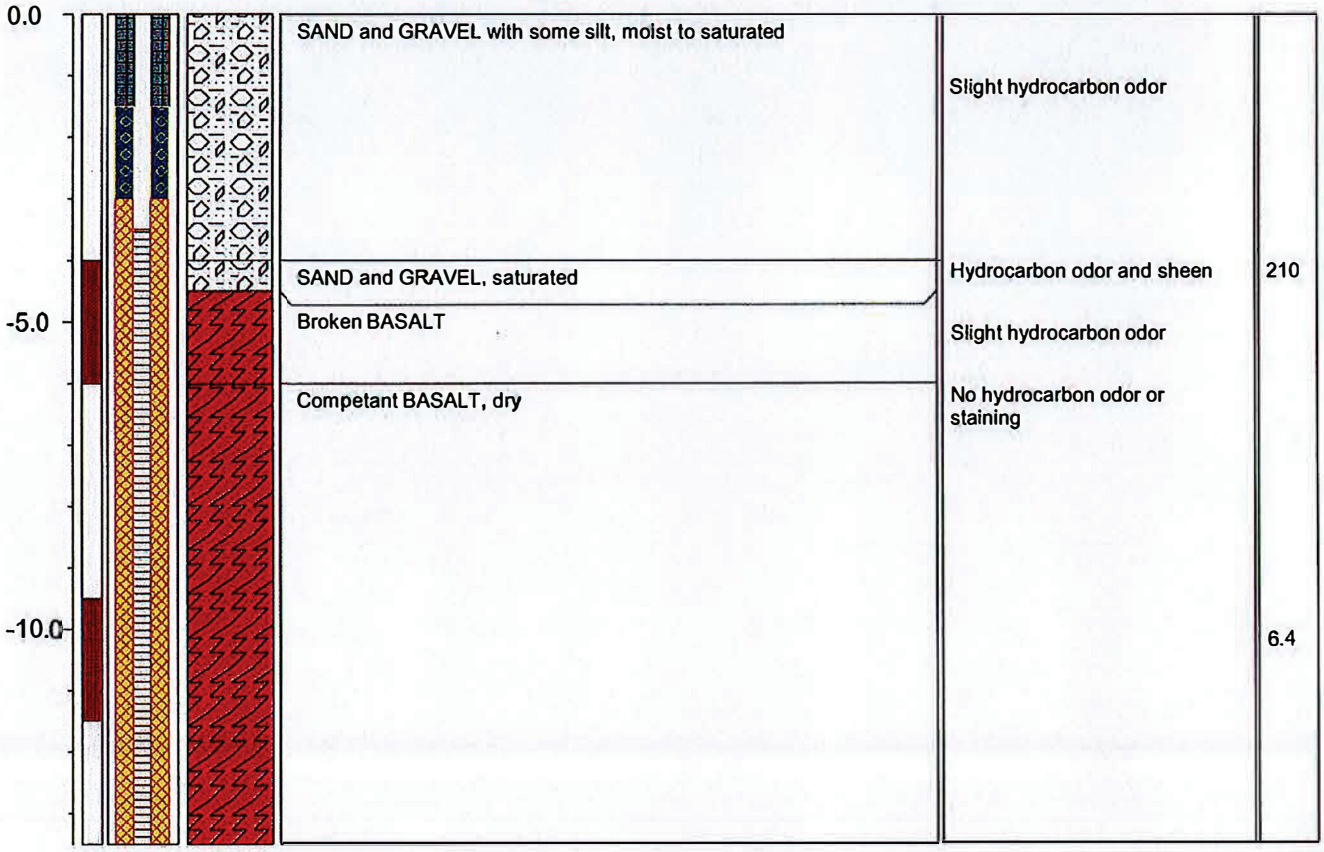
EASTERN REGIONAL OFFICE

					SES Project Number: 0270-001	Spokane International Airports, New Wells PFOA-PFOS Assessment	Boring Number: MW-18 Well Tag: BKP-261
					Equipment Type/ model #: Mobile G-2400		Location NAD 83 47.619878 N, -117.517124 W
					Auger type/diameter: 8-inch Hollow Stem		
					Contractor: Geologic Drill, LLC		
					Sampling method: 2-inch SPT		Sheet 1 of 1
					Hammer Weight: 140 Lbs		Above-Grade Monument
					Free Fall: 30"		
Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Location of Boring: South of W. Electric Avenue.		Time 1300
					Surface conditions/ Topsoil Depth: Grass-covered.		
							Date 7/30/18
					Material Description		
		0		GM	Brown silty Gravel with sand. Loose, Dry. With organics.		
		1					
		2					
		3					
		4					
3-7-9	60%	5		GM	Grey- brown silty GRAVEL with sand, Loose, Dry.		
		6					
		7					
		8					
		9					
10-12-15	70%	10		SP	Grey- brown SAND, Loose, Wet.	Becomes weathered Basalt	
		11		Rx	Weathered Basalt. Refusal at 13.0 feet bgs.		
		12					
		13					
		14					
		15					
		16					
		17					
		18					
		19			Completed well depth is 12.0- feet bgs.		
		20			Well constructed with 5-feet of 20-slot screen.		
		21			Boring Completed at 13.0-feet BGS. Groundwater encountered at 10.0 feet bgs.		

PROJECT NAME: Geiger Corrections Center
SITE LOCATION: Spokane, Washington
DRILL LOCATION: GCC MW-5
DRILL TYPE: Tubex
DRILLED BY: Environmental West, Inc.
LOGGED BY: William Craig
SCREENING METHOD: FID/VISUAL
DESCRIPTIVE LOCATION: Center of GCC eastern yard, south of driveway

MEASURING POINT ELEVATION (ft): 2354.81
STATIC WATER LEVEL (ft bgs): 4.2
SCREEN (_to_ ft;_SLOT): 3.5 to 13.5 ft; 20 slot
BOREHOLE DIA (in): 6
CASING DIA (in): 2.0
MONUMENT: Flush Mount
TOTAL DEPTH (ft bgs): 13.5
LAB ANALYSIS: 4'-6', 9.5'-11.5'
DATE COMPLETED: 3/19/02



PVC Casing | Screen | Concrete | Sand Pack | Bentonite Plug

2001730.810	MAXIM TECHNOLOGIES INC	WELL CONSTRUCTION SCHEMATIC	GCC MW-5

AECOM

Client: P-66
Project Number: 60285821
Site Location: Gerber Correctional
Coordinates: N/A Elevation: N/A
Drilling Method: Air Rotary
Sample Type(s): Split spoon Boring Diameter: 8"-AK

BORING ID: MW-5D
Sheet: 1 of 1
Monitoring Well Installed: Y
Screened Interval: 25-45
Depth of Boring: 45'
Water Level: ~5' and 38'

Weather: Cloudy
Logged By: FM MG Date/Time Started: 12/2/13 1130
Drilling Contractor: Environmental West
Ground Elevation: N/A Date/Time Finished:

Depth (ft)	Geologic sample ID	Sample Depth (ft)	Blows per 6"	Recovery (inches)	Headspace (ppm)	U.S.C.S	MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, consistancy, odor, and Geologic Unit (If Known)	Lab Sample ID	Lab Sample Depth (Ft.)
1			5/9/16"				~~Hollow~~ AIR KNIFE w/ POTABLE WATER TO 5'4".		
2		4.9	50/6"	12"/12"	42.9		A+nS' 4.9-5.2' ~~Gravel~~ -strong HC odor brown transition to gray. 25% gravel 1/4" SR-SA equant, flat. 75% M-C sand. Trace f sand.	MW-5D-4.9-5.9 (9458) 1013	4.9-5.9
3									
4							5.2-5.9 brown. 15% gravel SA equant, up to 1" long. ~~60~~ 75% f sand. 10% silt.		
5									
6		10	50/1"	1"/1"			~~10-11~~ 10-10.1' 40% gravel. 1/2" flat, equat, brown, ~~60~~ 55% f-c sand. 5% silt.		
7									
8									
9		15	70/1"	0"/1"	—		15' No recovery		
10		20	60/3"	3"/3"	0.2		20-20.25" A-SA gravel up to 1" long, brownish gray. ~60%, 50% f-c sand. 10% silt. dry.		
11									
12		25	65/3"	3"/3"	0.0		25-25.25" A-SA gravel up to 1", flat, equant. 60% Appears to be ~~60~~ pulverized gravel from f-c sand & gravel size. ~~30~~ 30% f-M sand. 10% c sand. Dry slight HC odor.		
13									
14		30	60/3"	0"/3"	—		30' No recovery.	MW-5D-35-35.2-1013 @ 1130	35.0-35.2'
15		35	50/2"	2"/2"	3.2		35-35.2" HC odor Appears to be pulverized gravel-drilling agree. 60% gravel SA-A up to 1", flat, elongated, 40% f-c sand. dk brown, dry.		
16									
17		40	50/3"	1"/3"	0.0	140	Wet-water @ ~38' feet bgs- dark brown- pulverized gravel - % is same as above. Iron Staining (moderately) throughout. Slight HC odor		
18									
19		45	11 27 50/1"	13"/13"			45-46.2' Yellow and dark brown w/ orange pockets (Fe) wet. Crumbly silt-like w/ gravel throughout. 20% gravel A-SA, flat,		
20									

NOTES:

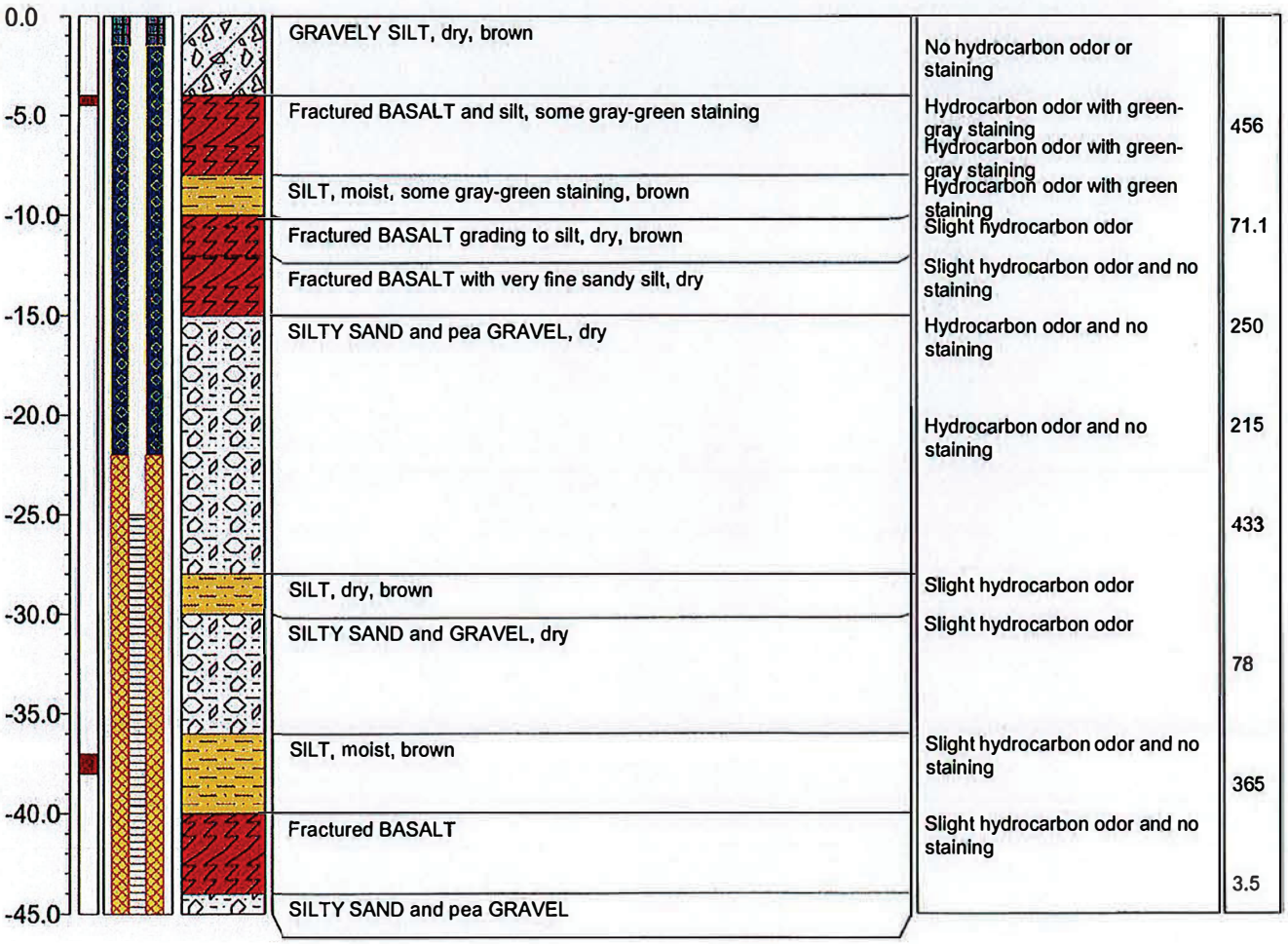
up to 1" long. 40% silt. 40% F-C sand sized ~~pebbles~~ Bottom 1" is gravel and F-C sand sized basalt. No odor.

Date	Time	Depth to groundwater while drilling

Checked by Date:

PROJECT NAME: Geiger Corrections Center
SITE LOCATION: Spokane, Washington
DRILL LOCATION: GCC MW-7
DRILL TYPE: Tubex
DRILLED BY: Environmental West, Inc.
LOGGED BY: William Craig
SCREENING METHOD: FID/VISUAL
DESCRIPTIVE LOCATION: Due south of firegate #3 driveway entrance, outside gate

MEASURING POINT ELEVATION (ft): 2356.25
STATIC WATER LEVEL (ft bgs): 37
SCREEN (_to_ ft;_SLOT): 25 to 45 ft; 20 slot
BOREHOLE DIA (in): 6
CASING DIA (in): 2.0
MONUMENT: Flush Mount
TOTAL DEPTH (ft bgs): 45
LAB ANALYSIS: 4'-4.5', 37'
DATE COMPLETED: 3/20/02

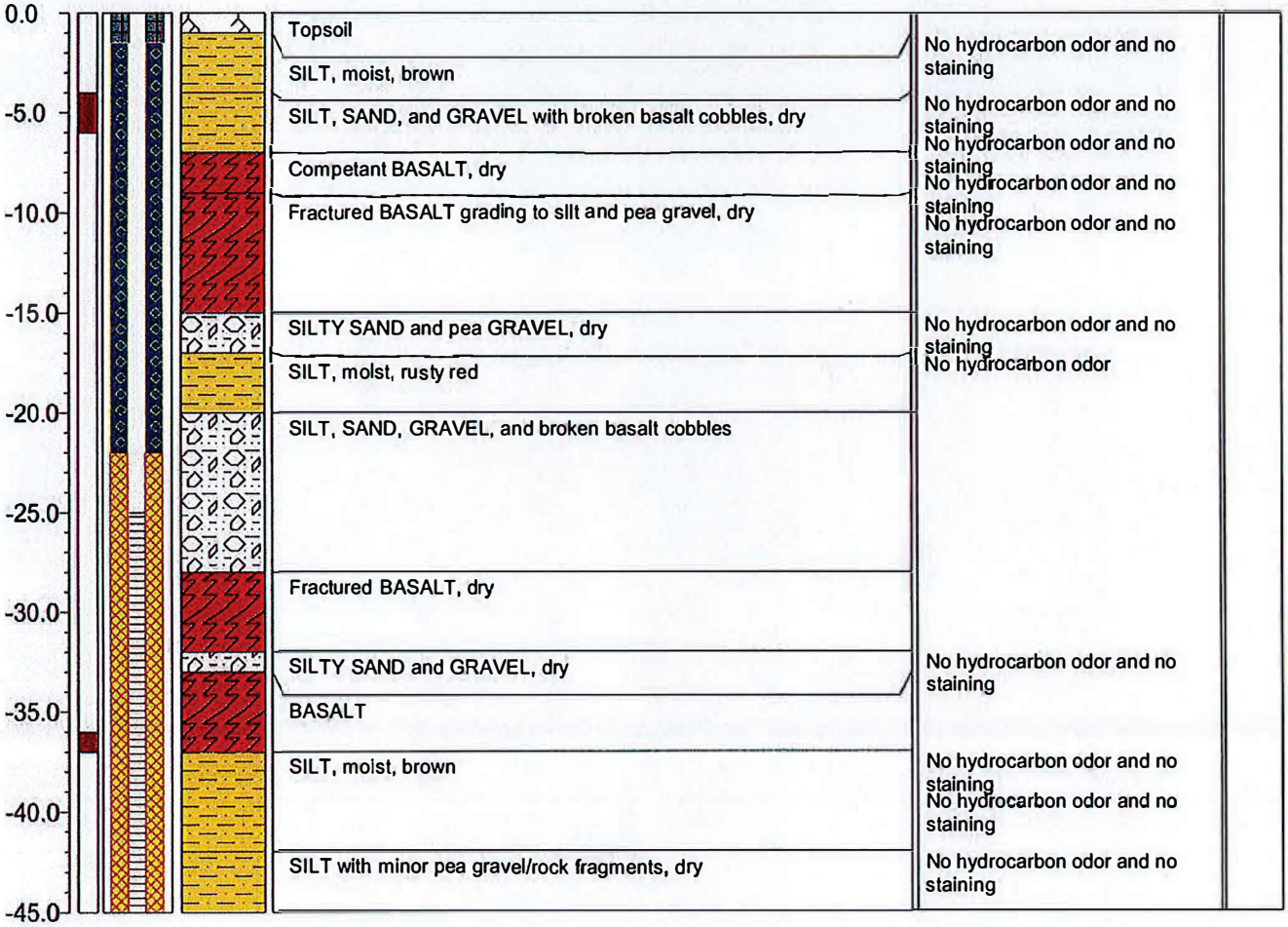


PVC Casing | Screen | Concrete | Sand Pack | Bentonite Plug

2001730.810	MAXIM TECHNOLOGIES INC	WELL CONSTRUCTION SCHEMATIC	GCC MW-7

PROJECT NAME: Geiger Corrections Center
SITE LOCATION: Spokane, Washington
DRILL LOCATION: GCC MW-8
DRILL TYPE: Tubex
DRILLED BY: Environmental West, Inc.
LOGGED BY: William Craig
SCREENING METHOD: FID/VISUAL
DESCRIPTIVE LOCATION: East side of spotted road, just off sidewalk embankment

MEASURING POINT ELEVATION (ft): 2356.57
STATIC WATER LEVEL (ft bgs): 35.12
SCREEN (_to_ ft; _SLOT): 25 to 45 ft; 20 slot
BOREHOLE DIA (in): 6
CASING DIA (in): 2.0
MONUMENT: Flush Mount
TOTAL DEPTH (ft bgs): 45
LAB ANALYSIS: 4'-6', 36'
DATE COMPLETED: 3/21/02



PVC Casing | Screen | Concrete | Sand Pack | Bentonite Plug

2001730.810	MAXIM TECHNOLOGIES INC	WELL CONSTRUCTION SCHEMATIC	GCC MW-8

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
- [x] Construction
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm GHD

Unique Ecology Well ID Tag No. BMG 162

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Aaron Bradley

Driller/Engineer /Trainee Signature Aaron Bradley

Driller or Trainee License No. 3181

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE 18257

Type of Well *(select one)*
- [x] Resource Protection
- [ ] Geotech Soil Boring

Property Owner Spokane Airport

Site Address S Spotted rd and Will D Alton Rd

City Spokane County Spokane

Location sw 1/4-1/4 nw 1/4 Sec 33 Twn 25n R 42e Select One [ ] BWM [ ] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

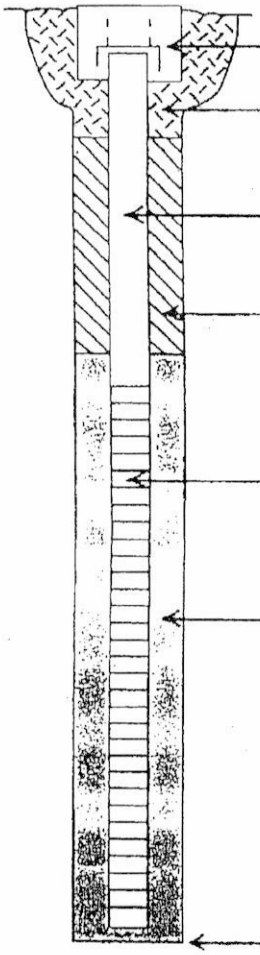
Tax Parcel No. _____

Cased or Uncased Diameter 6 Static Level _____

Work/Decommission Start Date Oct 11 2019

Work/Decommission Completed Date Oct 11 2019

Construction/Design



Well Data

MONUMENT TYPE: Flush

CONCRETE SURFACE SEAL 0-1 ft.

PVC BLANK 2 "x 0-3 '

BACKFILL 1-2 ft.

TYPE: Bentonite Chips

PVC SCREEN 2 "x 3-15 '

SLOT SIZE: .010

TYPE: PVC

GRAVEL PACK 2-15 ft.

MATERIAL: Sand 12x20

WELL DEPTH 15 ' "

Formation Description

0 - 15 ft. Rocky Sand
Weathered rock

_____ - _____ ft.

_____ - _____ ft.

_____ - _____ ft.

_____ - _____ ft.

REMARKS MW-10

110.19.1118

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Geiger Corrections Facility
PROJECT NUMBER: 11145847
CLIENT: Phillips 66 Company
LOCATION: S. Spotted Rd and W. Will D Alton Rd, Spkane, WA

HOLE DESIGNATION: MW-11
DATE COMPLETED: 11 October 2019
DRILLING METHOD: Vac/Sonic
FIELD PERSONNEL: D. Trudeau

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	Monitoring Well	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE	SAMPLE PID (ppm)
	TOPSOIL, grass/roots	0.30	CONCRETE					0
	ML-SILTS with basalt fragments, compact, brown, moist		BENTONITE					0
2								0.5
4	SP-SANDS with silt/basalt, compact, brown, moist	3.50						
	ML-SANDY SILT, trace gravel, fine grained, dense, brown-tan, moist	5.00		MW11-6.0				0.5
6								
								0.4
8			SAND					
10								0.1
	ML-CLAYEY SILT, few sands/gravel, soft, brown, moist	10.20						
	FRACTURED BASALT/BASALT BEDROCK, brown-grey, moist	11.50						0.0
12								
14								
	END OF BOREHOLE @ 15.00ft BGS	15.00		MW11-15.0				0.0
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

WELL DETAILS
Screened interval:
3.00 to 15.00ft BGS
Length: 12ft
Diameter: 2in
Slot Size: 10
Material: PVC
Seal:
1.00 to 2.00ft BGS
Material: BENTONITE
Sand Pack:
3.00 to 15.00ft BGS
Material: Sand 12/20

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (MW11-6.0, MW11-15.0)

OVERBURDEN LOG 11145847-SC.GPJ GHD_Corp 22/10/19

RESOURCE PROTECTION WELL REPORT

START CARD NO. 33164

PROJECT NAME: Army Corp of Engineers
WELL IDENTIFICATION NO. MW 11A & 11B, 12A & 12B
DRILLING METHOD: Air Rotary
DRILLER: Rod Fogle
FIRM: Fogle Pump & Supply
SIGNATURE: Rod Fogle
CONSULTING FIRM: Ecova Corp
REPRESENTATIVE: Karen May

COUNTY: Spokane
LOCATION: NE ¼ SW ¼ Sec 33 Twn 25 R 42
STREET ADDRESS OF WELL:
WATER LEVEL ELEVATION:
GROUND SURFACE ELEVATION:
INSTALLED:
DEVELOPED:

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	"SEE ATTACHED"	

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

ECOVA Corporation

Well Installation Log

Well Number MW-11A
Date Drilled 4/9/90 4/10/90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 244180.6684 N 2459142.5307 E
Site Pacific Pride (Task 10)
Boring Method Air Rotary
Job Number 801126
Borehole Depth 101.0 Feet
Casing Elevation 2353.43
Field Geologist K. May
Water Depth 38 feet.
Sheet 1 of 3

General: 20 feet 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SILTY SAND (SM) – Very fine-grained sand to fine-grained gravel (1/4" basalt), brown to reddish brown, loose, dry.	
10								
15							WEATHERED BASALT – Brown-reddish brown.	
20							Minor water inflow at 18 feet (perched). WEATHERED BASALT – Brown.	
25				2				
30								
35							▽ Static water level at 38 feet.	
40								
45							BASALT – Black. Harder drilling.	
50								

801126-A-MW11A

* Background = 2.5 ppm (4/10/90)

ECOVA Corporation

Well Installation Log

Well Number MW-11A
Date Drilled 4/9/90 4/10/90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 244180.6684 N
Site Pacific Pride (Task 10)
Boring Method Air Rotary
2459142.5307E
Job Number 801126
Borehole Depth 101.0 Feet
Casing Elevation 2353.43
Field Geologist K. May
Water Depth 38 feet.
Sheet 2 of 3

General: 20 feet 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55				2			BASALT – Light gray, dry.	
60								
65								
70							Color change to darker gray. Water yielding zone at 74 feet.	
75								
80								
85								
90							Water production at ~50 gpm.	
95							WEATHERED BASALT – Cuttings are soft, buff colored, vesicular.	
100								

801126-A-MW11A

* Background = 2 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-11A
Date Drilled 4/9/90 4/10/90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 244180.6684 N
Site Pacific Pride (Task 10)
Boring Method Air Rotary
2459142.5307 E
Job Number 801126
Borehole Depth 101.0 Feet
Casing Elevation 2353.43
Field Geologist K. May
Water Depth 18.0 and 74.0 Feet
Sheet 3 of 3

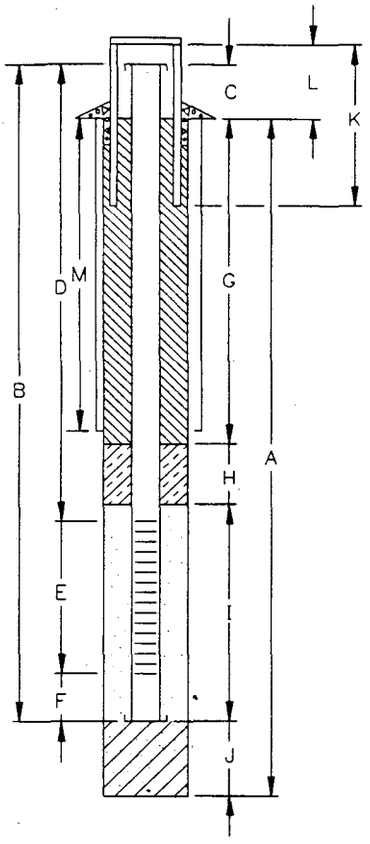
General: 20 feet 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
105							WEATHERED BASALT – Possible gravelly interbed.	
							Bottom of Hole – 101 Feet	

801126-A-MW11A

* Background = 2 ppm

WELL COMPLETION MW-11A



TOP OF CASING ELEVATION 2353.43'

A BORING DEPTH 101 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 99.5 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 87 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 10 FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5 FT.

G ANNULAR SEAL 64 1/2 FT.
MATERIAL: BENT/CEMENT

H. BENTONITE SEAL 3'4" FT.

I SANDPACK 27 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 2'4" FT.
MATERIAL: SAND 20/40

K WELL COVER 6" FT.

L STICKUP 0 FT.

M CONDUCTOR CASING 19 FT.

NOT TO SCALE

DRILLING TIMES:
START 1430 4/9/90 FINISH 1200 4/10/90
STANDBY or DOWN TIME:
SLOW DRILLING IN UPPER 20.0 FEET BECAUSE OF BOULDERS.

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMP TIME 1205 TO 1400 DATE 5/31/90

PUMPED 3 BARRELS IN 2 HOURS.

TURBIDITY AFTER DEVELOPMENT:
___ CLEAR ___ MOD. TURBID
X SL. TURBID ___ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO:
___ GROUND SURFACE ___ STORAGE TANK
___ STORM SEWERS ___ TANK TRUCK
3 DRUMS

DEPTH OF WATER AFTER DEVELOPMENT: 37.5'

MATERIALS USED

7 1/2 SACKS of 20/40 SAND
11 SACKS of PORTLAND CEMENT
4 SACKS of PREMIX CONCRETE
___ GALLONS of GROUT USED
___ GROUT COMPOSITION #6 BENTONITE
1/2 SACKS of BENTONITE PELLETS
___ BUCKETS of BENTONITE PELLETS
___ YARDS CEMENT - SAND USED
4 CENTRALIZERS at EVERY 25' BGS

WELL COVER USED:
___ Above Grade
X At Grade
___ Other
X Lockable

801126-A-MW11AW

RESOURCE PROTECTION WELL REPORT

START CARD NO. 33164

PROJECT NAME: Army Corp of Engineers
WELL IDENTIFICATION NO. MW 11A & 11B, 12A & 12B
DRILLING METHOD: Air Rotary
DRILLER: Rod Fogle
FIRM: Fogle Pump & Supply
SIGNATURE: Rod Fogle
CONSULTING FIRM: Ecova Corp
REPRESENTATIVE: Karen May

COUNTY: Spokane
LOCATION: NE ¼ SW ¼ Sec 33 Twn 25 R 42
STREET ADDRESS OF WELL:
WATER LEVEL ELEVATION:
GROUND SURFACE ELEVATION:
INSTALLED:
DEVELOPED:

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	"SEE ATTACHED"	

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

ECOVA Corporation

Well Installation Log

Well Number MW-11B

Date Drilled 4-10-90

Client Army Corps of Engineers

Drilling Company Fogle Pump & Supply

Coordinates 244171.4770 N

2459142.0172E

Site Pacific Pride (Task 10)

Boring Method Air Rotary

Job Number 801126

Borehole Depth 38.0 Feet

Casing Elevation 2353.94

Field Geologist K. May

Water Depth Not Encountered

Sheet 1 of 1

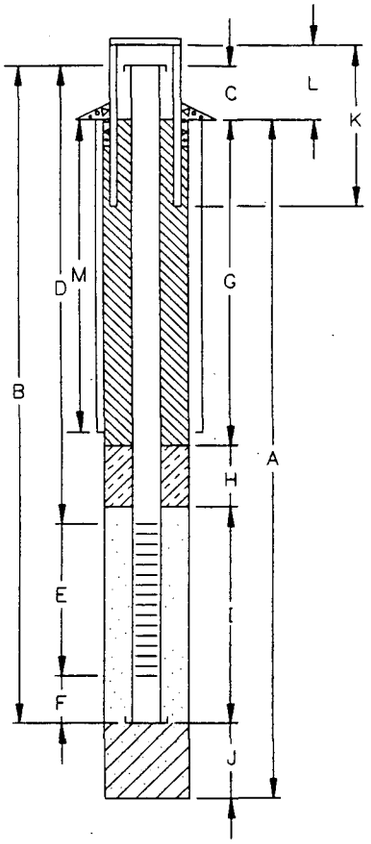
General: No water observed, but bottom 20' of drill steel was muddy.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SAND WITH GRAVEL (SM) – Brown to reddish brown, medium–grained sand to fine–grained gravel, loose, dry	
10							Bedrock at 11 feet. WEATHERED BASALT.	
15								
20								
25							WEATHERED BASALT – Brown.	
30								
35							▽ Static water level at 38 feet.	
40							BASALT – Gray, moist.	
45								
50							Bottom of Hole – 50 Feet	

8011B26-A-MW11B

* Background = ppm

WELL COMPLETION MW-11B



TOP OF CASING ELEVATION 2353.94'

A BORING DEPTH 50.7 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 50.7 FT.

C WELL STICKUP 1 FT.

D BLANK INTERVAL 29'1" FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 24.7-44.7' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5'3" FT.

G ANNULAR SEAL 14 FT.
MATERIAL: BENT/GROUT

H. BENTONITE SEAL 4'10" FT.

I SANDPACK 27'7" FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 1'8" FT.
MATERIAL: SAND 20/40

K WELL COVER ____ FT.

L STICKUP 1 FT.

M CONDUCTOR CASING ____ FT.

NOT TO SCALE

DRILLING TIMES:
START 1545 4/10/90 FINISH ____
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

YIELD 0715 TO 0900 DATE 6/1/90

PUMPED 1 BARREL IN 2 HOURS.

TURBIDITY AFTER DEVELOPMENT: X CLEAR; ____ MOD. TURBID; ____ SL. TURBID; ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: ____ GROUND SURFACE; ____ STORM SEWERS; 1 DRUMS; ____ STORAGE TANK; ____ TANK TRUCK

DEPTH OF WATER AFTER DEVELOPMENT: 37.5'

MATERIALS USED

5 SACKS of 20/40 SAND
2 SACKS of PORTLAND CEMENT CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION #6 BENTONITE
6 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
2 CENTRALIZERS at 25 AND 48 BGS

WELL COVER USED: ____ Above Grade; X At Grade; ____ Other; X Lockable

801126-A-MW11BW

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Geiger Corrections Facility
PROJECT NUMBER: 11145847
CLIENT: Phillips 66 Company
LOCATION: S. Spotted Rd and W. Will D Alton Rd, Spkane, WA

HOLE DESIGNATION: MW-12
DATE COMPLETED: 10 October 2019
DRILLING METHOD: Vac/Sonic
FIELD PERSONNEL: D. Trudeau

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	Monitoring Well	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE	SAMPLE PID (ppm)
0	GRAVEL/CRUSH ROCK, moist	0.30	CONCRETE					0
	ML-SILT with rocks, moist							
2								
	ML-SILTY INTERMITTENT BEDROCK, few sands/gravels, dense, brown-grey, moist	3.00						0
4	- black staining/heave odor at 4.00ft BGS							117
	- shallow groundwater at 5.00ft BGS		▽					360
6								
8	ML-SILT, with intermittent bedrock, few sands/gravels, compact, brown, moist	7.80						29.5
	BEDROCK/FRACTURED BEDROCK (BASALT)	9.60						14.3
10								
12			BENTONITE					
14								12.0
16								
18								
20								1.7
22								
24								0.8
26								
28								
30	ML-SILT/FRACTURED BEDROCK, compact, brown, moist	30.20						1.3 10.3
32	VESICULAR BASALT BEDROCK, grey with silt fractures	32.00						1.5
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Geiger Corrections Facility
PROJECT NUMBER: 11145847
CLIENT: Phillips 66 Company
LOCATION: S. Spotted Rd and W. Will D Alton Rd, Spkane, WA

HOLE DESIGNATION: MW-12
DATE COMPLETED: 10 October 2019
DRILLING METHOD: Vac/Sonic
FIELD PERSONNEL: D. Trudeau

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	Monitoring Well	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE	SAMPLE PID (ppm)
36			SAND					0.8
38	ML-CLAYEY SILT, soft, grey-brown, moist	38.10						4.1
40	FRACTURED/DECOMPOSED BASALT, moist	40.00						2.8
42								1.1
	BASALT, brown -grey, moist	42.80						
44								0.7
46								
48								
	END OF BOREHOLE @ 49.00ft BGS	49.00						0.4
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

WELL DETAILS
Screened interval:
24.00 to 49.00ft BGS
Length: 25ft
Diameter: 2in
Slot Size: 10
Material: PVC
Seal:
2.00 to 23.00ft BGS
Material: BENTONITE
Sand Pack:
23.00 to 49.00ft BGS
Material: Sand 12/20

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽

OVERBURDEN LOG 11145847-SC.GPJ GHD_Corp 22/10/19

RESOURCE PROTECTION WELL REPORT

START CARD NO. 33164

PROJECT NAME: Army Corp of Engineers
WELL IDENTIFICATION NO. MW 11A & 11B, 12A & 12B
DRILLING METHOD: Air Rotary
DRILLER: Rod Fogle
FIRM: Fogle Pump & Supply
SIGNATURE: Rod Fogle
CONSULTING FIRM: Ecova Corp
REPRESENTATIVE: Karen May

COUNTY: Spokane
LOCATION: NE ¼ SW ¼ Sec 33 Twn 25 R 42
STREET ADDRESS OF WELL:
WATER LEVEL ELEVATION:
GROUND SURFACE ELEVATION:
INSTALLED:
DEVELOPED:

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	"SEE ATTACHED"	

RECEIVED
FEB 6 1991

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

ECOVA Corporation

Well Installation Log

Well Number MW-12A

Date Drilled 4/11/90

Client · Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Coordinates 244203.3091 N

Site Pacific Pride (Task 10) | Boring Method Air Rotary | 2459408.1227 E

Job Number 801126 | Borehole Depth 97.0 Feet | Casing Elevation 2351.30

Field Geologist K. May | Water Depth 35.0 Feet | Sheet 1 of 2

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	General: / Sample Description	Graphic Log
5							SILTY SAND (SM) – Fine– to medium–grained sand, brown to reddish brown, cobbles and boulders encountered to 3.5', loose, dry.	
10							WEATHERED BASALT – Basalt cuttings with silty sand.	
15								
20				2			WEATHERED BASALT.	
25								
30								
35							▽ Static water level at 35 feet.	
40								
45							BASALT – Dark Brown. Harder drilling.	
50								

801126-A-MW12A

* Background = 2 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-12A

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4/11/90

Site Pacific Pride (Task 10) | Boring Method Air Rotary | Coordinates 244203.3091 N, 2459408.1227 E

Job Number 801126 | Borehole Depth 97.0 Feet | Casing Elevation 2351.30

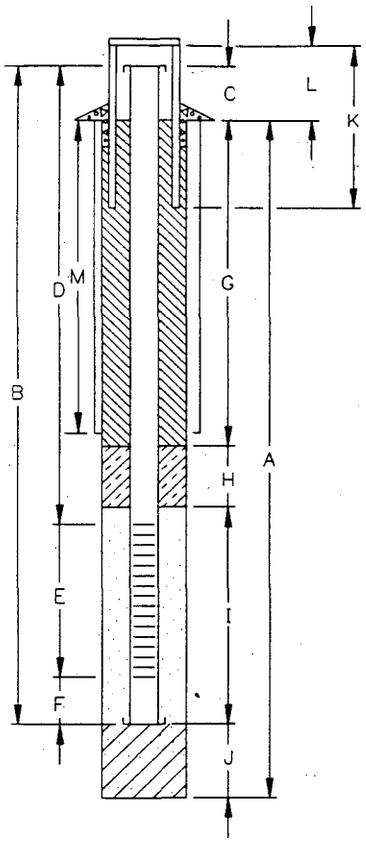
Field Geologist K. May | Water Depth 35.0 Feet | Sheet 2 of 2

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	General: / Sample Description	Graphic Log
55							BASALT – Gray, dry.	
60								
65								
70							WEATHERED BASALT – Strongly weathered vesicular basalt, with medium-grained sand and subrounded gravel (interbed?), orange to yellowish white. Water yielding zone at 71 feet.	
75								
80								
85							WEATHERED BASALT – Same as above, yellow-white, gray-rust, black, at 85 feet – 4 foot interval produced abundant water.	
90								
95								
100							Bottom of Hole – 97 FEET	

801126-A-MW12A

* Background = 2 ppm

WELL COMPLETION MW-12A



TOP OF CASING ELEVATION 2351.30'

A BORING DEPTH _____ FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 81 FT.

C WELL STICKUP 1 FT.

D BLANK INTERVAL 69' FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 68.1-78.1' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 2'3" FT.

G ANNULAR SEAL _____ FT.
MATERIAL: GROUT

H. BENTONITE SEAL 6 FT.

I SANDPACK 15 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 5" FT.
MATERIAL: _____

K WELL COVER _____ FT.

L STICKUP _____ FT.

M CONDUCTOR CASING _____ FT.

NOT TO SCALE

DRILLING TIMES:
START 1505 4/11/90 FINISH 1720 4/11/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMP TIME 1330 TO 1500 DATE

TURBIDITY AFTER DEVELOPMENT: _____ CLEAR _____ MOD. TURBID _____ SL. TURBID _____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: _____ GROUND SURFACE _____ STORM SEWERS _____ DRUMS _____ STORAGE TANK _____ TANK TRUCK

DEPTH OF WATER AFTER DEVELOPMENT:

MATERIALS USED

8 SACKS of 20/40 SAND
12 1/2 SACKS of PORTLAND CEMENT CEMENT
_____ SACKS of PREMIX CONCRETE
_____ GALLONS of GROUT USED
_____ GROUT COMPOSITION #6 BENTONITE
2 SACKS of BENTONITE PELLETS
_____ BUCKETS of BENTONITE PELLETS
_____ YARDS CEMENT - SAND USED
4 CENTRALIZERS at EVERY 25' BGS

WELL COVER USED:
_____ Above Grade
X At Grade
_____ Other
X Lockable

801126-A-MW12AW

RESOURCE PROTECTION WELL REPORT

START CARD NO. 33164

PROJECT NAME: Army Corp of Engineers
WELL IDENTIFICATION NO. MW 11A & 11B, 12A & 12B
DRILLING METHOD: Air Rotary
DRILLER: Rod Fogle
FIRM: Fogle Pump & Supply
SIGNATURE: Rod Fogle
CONSULTING FIRM: Ecova Corp
REPRESENTATIVE: Karen May

COUNTY: Spokane
LOCATION: NE ¼ SW ¼ Sec 33 Twn 25 R 42
STREET ADDRESS OF WELL:
WATER LEVEL ELEVATION:
GROUND SURFACE ELEVATION:
INSTALLED:
DEVELOPED:

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	"SEE ATTACHED"	

RECEIVED
FEB 6 1991

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

ECOVA Corporation

Well Installation Log

Well Number MW-12B

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 4-12-90

Site Pacific Pride (Task 10) | Boring Method Air Rotary | Coordinates 244197.6254 N, 2459408.9907 E

Job Number 801126 | Borehole Depth 51.0 Feet | Casing Elevation 2351.21

Field Geologist K. May | Water Depth 35 Feet | Sheet 1 of 2

General: 8 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SILTY SAND (SM) – Fine– to medium–grained, brown to reddish brown, loose, dry.	
10							WEATHERED BASALT – Reddish–brown.	
15								
20								
25								
30							WEATHERED BASALT – Gray–brown.	
35							Moist cuttings. ▽ Static water level at 35 feet.	
40							BASALT – Black, dry.	
45								
50								

801126-A-MW12B

* Background = _____ppm

ECOVA Corporation

Well Installation Log

Well Number MW-12B

Client: Army Corps of Engineers | Drilling Company: Fogle Pump & Supply | Date Drilled: 4-12-90

Site: Pacific Pride (Task 10) | Boring Method: Air Rotary | Coordinates: N ____ E ____

Job Number: 801126 | Borehole Depth: 51.0 Feet | Casing Elevation: 2351.21

Field Geologist: K. May | Water Depth: Not Encountered | Sheet 2 of 2

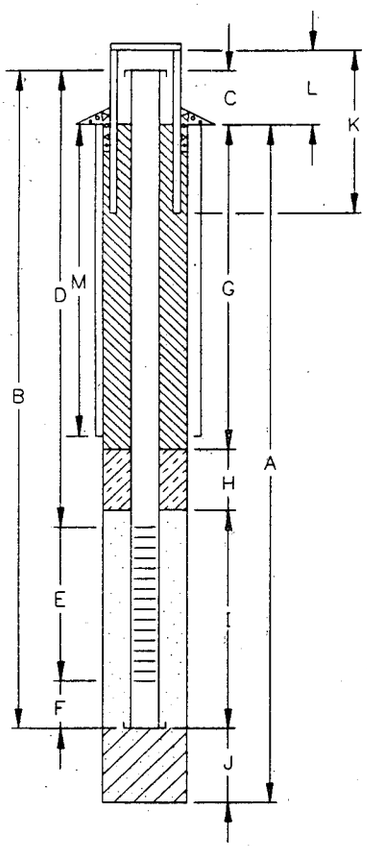
General: 8 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
							BASALT – Black.	
							Bottom of Hole – 51 Feet	
55								
60								
65								
70								
75								
80								
85								
90								
95								
100								

801126-A-MW12B

* Background = _____ppm

WELL COMPLETION MW-12B



TOP OF CASING ELEVATION 2351.21'

A BORING DEPTH 51' FT.
BORING DIAMETER 6 IN.
B WELL DEPTH 51 FT.
C WELL STICKUP 0 FT.
D BLANK INTERVAL _____ FT.
BLANK DIAMETER 2 IN.
E SCREEN INTERVAL 25-45' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE .01
F SEDIMENT TRAP 5'3" FT.
G ANNULAR SEAL 11' FT.
MATERIAL: GROUT
H. BENTONITE SEAL 5 FT.
I SANDPACK 27 FT.
TYPE/SIZE: 20/40
J BOTOM SEAL/PACK 1 FT.
MATERIAL: SAND
K WELL COVER _____
L STICKUP 0 FT.
M CONDUCTOR CASING _____ FT.

NOT TO SCALE

DRILLING TIMES:
START 1420 4/12/90 FINISH 1615 4/12/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

PUMPING TIMES 0930 TO 1200 DATE

TURBIDITY AFTER DEVELOPMENT: _____ CLEAR _____ MOD. TURBID _____ SL. TURBID _____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: _____ GROUND SURFACE _____ STORM SEWERS X DRUMS _____ STORAGE TANK _____ TANK TRUCK

DEPTH OF WATER AFTER DEVELOPMENT: 37'

MATERIALS USED

8 SACKS of 20/40 SAND
6 SACKS of PORTLAND CEMENT
_____ SACKS of PREMIX CONCRETE
_____ GALLONS of GROUT USED
_____ GROUT COMPOSITION
2 SACKS of BENTONITE PELLETS
_____ BUCKETS of BENTONITE PELLETS
_____ YARDS CEMENT - SAND USED
2 CENTRALIZERS at 25 AND 46 FEET BGS

WELL COVER USED:
_____ Above Grade
X At Grade
_____ Other
X Lockable

801126-A-MW12BW

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Geiger Corrections
PROJECT NUMBER: 12576484
CLIENT: Phillips 66
LOCATION: 3507 South Spotted Road, Spokane, WA

HOLE DESIGNATION: MW13
DATE COMPLETED: 14 March 2022
DRILLING METHOD: Vacuum/Sonic
FIELD PERSONNEL: N. Adamowski

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH BGS	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' Value	SAMPLE PID (ppm)
0	ASPHALT	0.50	Concrete					0.0
	GRAVEL, silty sand	0.80						0.0
2	ML-SANDY SILT, compact, brown-tan, moist, no odor, trace organics	1.20	Bentonite Chips					0.0
	ML-SANDY SILT, trace poorly sand, compact, tan-brown, moist, no odor	3.20						0.0
4	SM-SILTY SAND, poorly sorted, loose, brown-tan-grey, moist, no odor	4.50						0.0
6	SC-CLAYEY SAND, trace silt, compact, brown-tan-grey, moist, no odor, trace iron		▽	MW13				0.0
8								0.0
			Sand Pack					
10	CL-SANDY SILTY CLAY, very compact, red-orange-brown, moist, no odor	10.00	Well Screen					0.2
								0.2
12								0.0
14								0.0
	END OF BOREHOLE @ 15.00ft BGS	15.00						0.0
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

WELL DETAILS
Screened interval:
3.00 to 15.00ft BGS
Length: 12ft
Diameter: 2in
Slot Size: .010
Material: PVC
Sand Pack:
2.00 to 15.00ft BGS
Material: Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽
CHEMICAL ANALYSIS (MW13)

File: N:\US\LYNNWOOD\PROJECTS\561\12576484\TECH\12576484-FIELD\GINT\12576484.GPJ Library File: GHD_ENVIRO_V04.GLB Report: OVERBURDEN LOG Date: 14/4/22

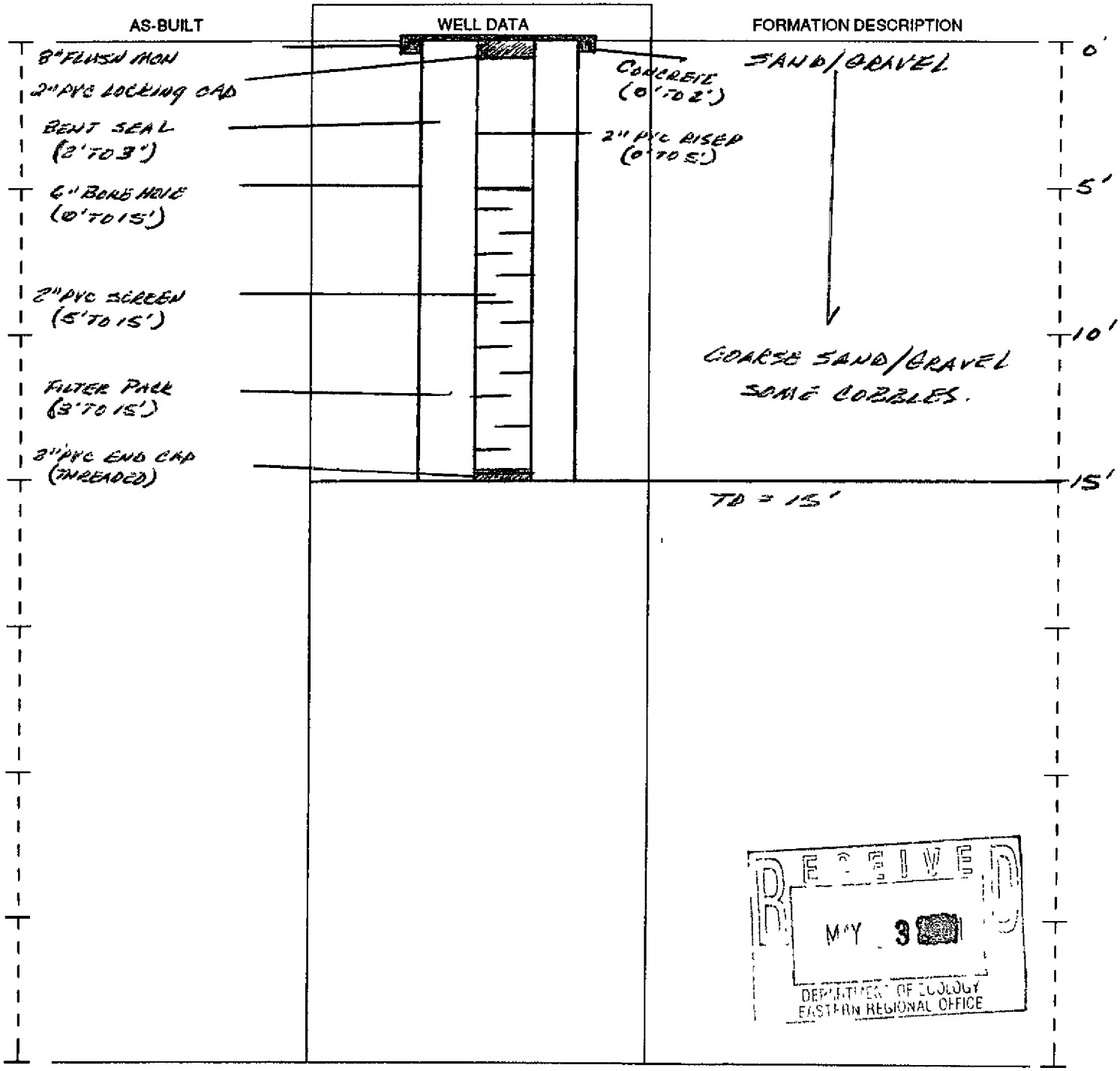
93943

RESOURCE PROTECTION WELL REPORT

START CARD NO R43239

PROJECT NAME YPL GEIGER FUEL FACILITY
WELL IDENTIFICATION NO GRFZ (AFS 803)
DRILLING METHOD AIR - ROTARY
DRILLER PAUL MIIIS.
FIRM ENV WEST EXPLORATION
SIGNATURE Paul S Mills
CONSULTING FIRM MAXIM
REPRESENTATIVE BILL CRAIG

COUNTY SPOKANE
LOCATION NW ¼ NW ¼ Sec 4 Twn 24N R 42
STREET ADDRESS OF WELL INTERSECTION AT GEIGER & ELECTRIC AVE.
WATER LEVEL ELEVATION
GROUND SURFACE ELEVATION
INSTALLED 4-16-01
DEVELOPED



SCALE 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev 11/89)

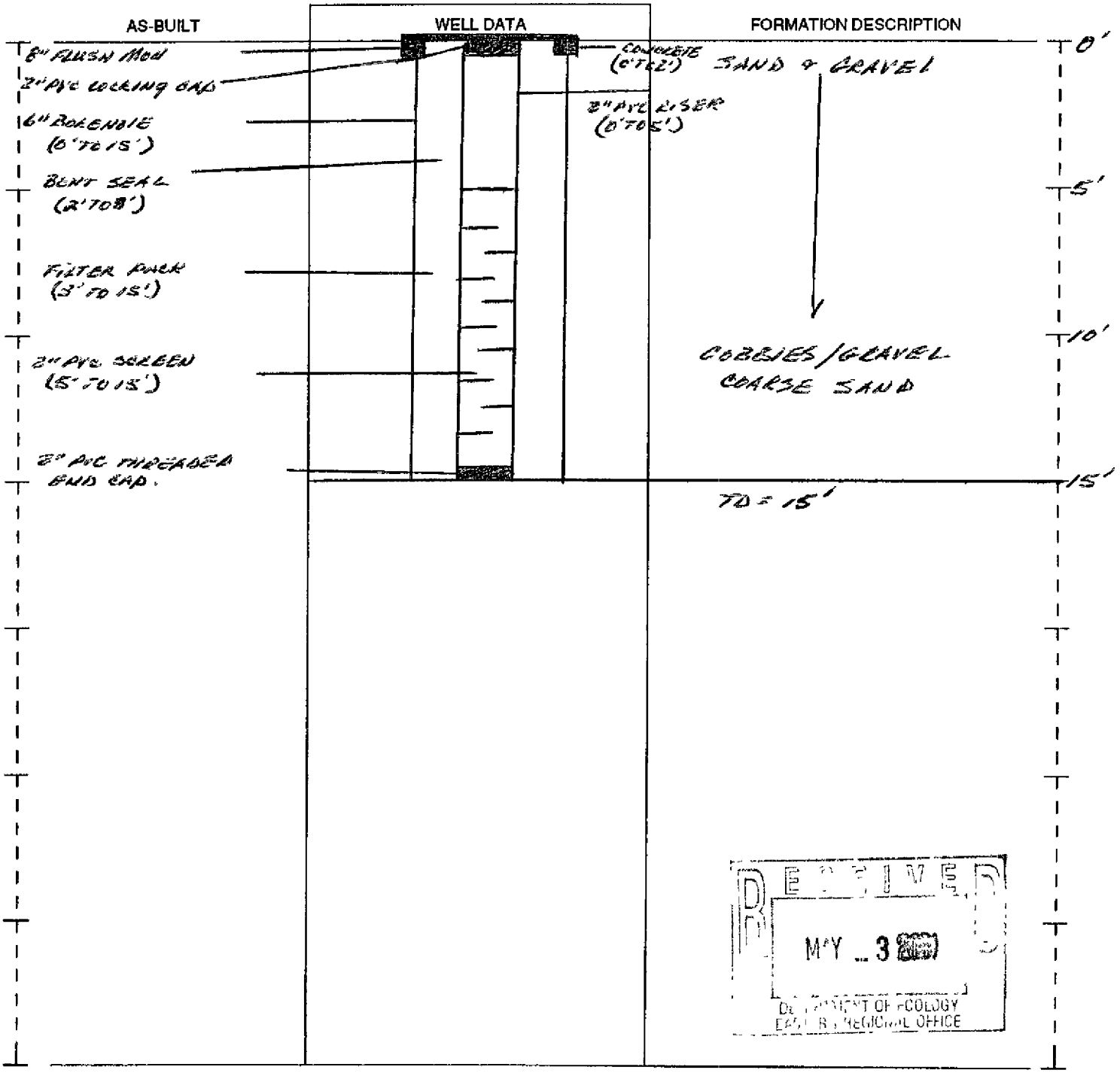
93944

RESOURCE PROTECTION WELL REPORT

START CARD NO R43239

PROJECT NAME VAL GEIGER FUEL FACILITY
WELL IDENTIFICATION NO GGM 3 (AFS 804)
DRILLING METHOD AIR-ROTARY
DRILLER PAUL MINS.
FIRM ENVIRONMENTAL EXPLORATION
SIGNATURE Paul Mins
CONSULTING FIRM MAXIM
REPRESENTATIVE BILL CRAIG

COUNTY SPOKANE
LOCATION NW 1/4 NW 1/4 Sec 4 Twn 24N R 42
STREET ADDRESS OF WELL INTERSECTION AT GEIGER & ELECTRIC AVE
WATER LEVEL ELEVATION
GROUND SURFACE ELEVATION
INSTALLED 4-17-01
DEVELOPED



SCALE 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev 11/89)

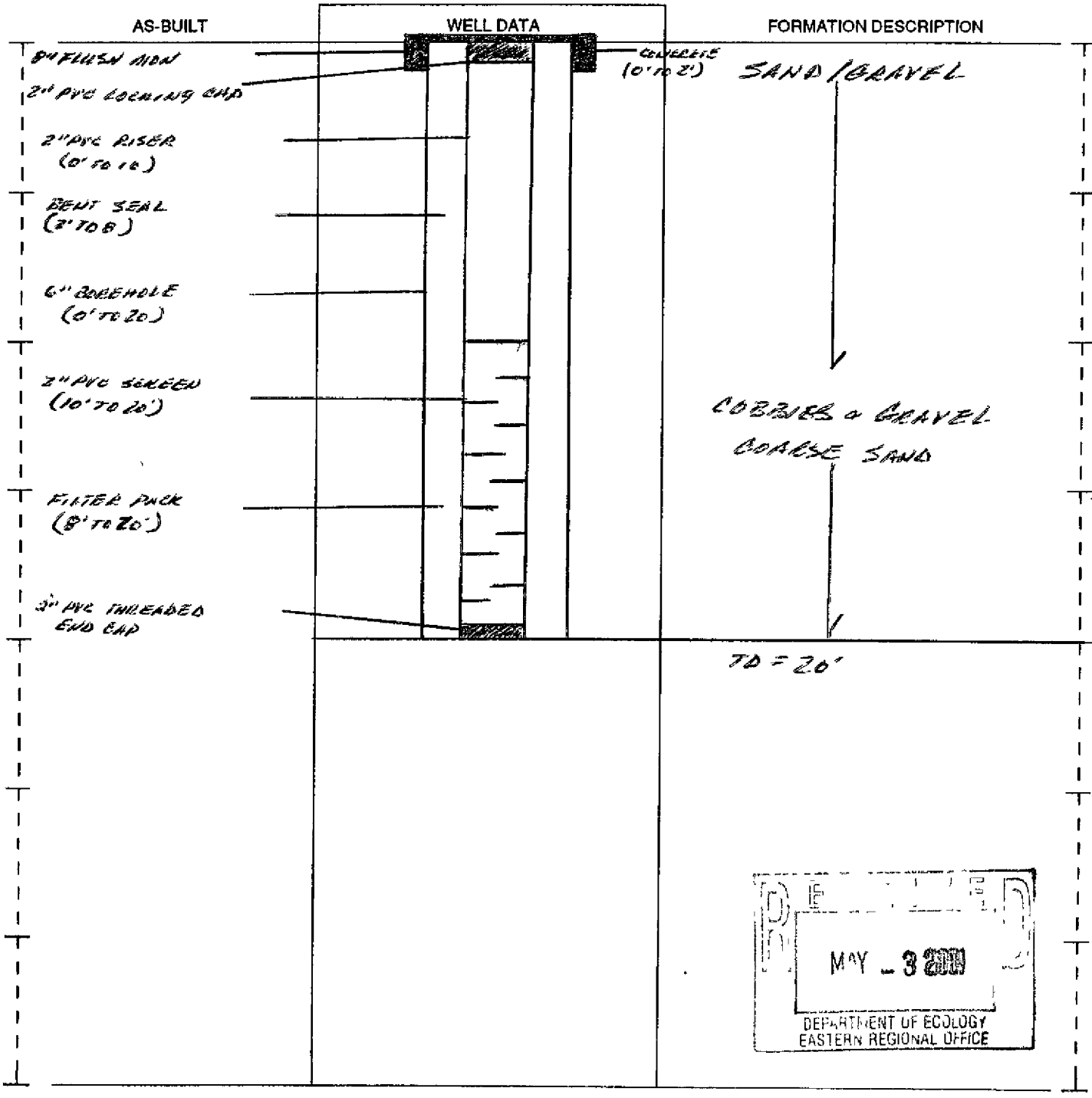
93945

RESOURCE PROTECTION WELL REPORT

START CARD NO R43239

PROJECT NAME VDL GEIGER FUEL FACILITY
WELL IDENTIFICATION NO GEF4 (AES 805)
DRILLING METHOD AIR-ROTARY
DRILLER PAUL MILLS
FIRM ENV WELL EXPLORATION
SIGNATURE Paul E Mills
CONSULTING FIRM MAXIM
REPRESENTATIVE BILL CRAIG

COUNTY SPOKANE
LOCATION NW 1/4 NW 1/4 Sec 4 Twn 24N R 42
STREET ADDRESS OF WELL INTERSECTION AT GEIGER & ELECTRIC AVE
WATER LEVEL ELEVATION
GROUND SURFACE ELEVATION
INSTALLED 4-17-01
DEVELOPED



SCALE 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev 11/89)

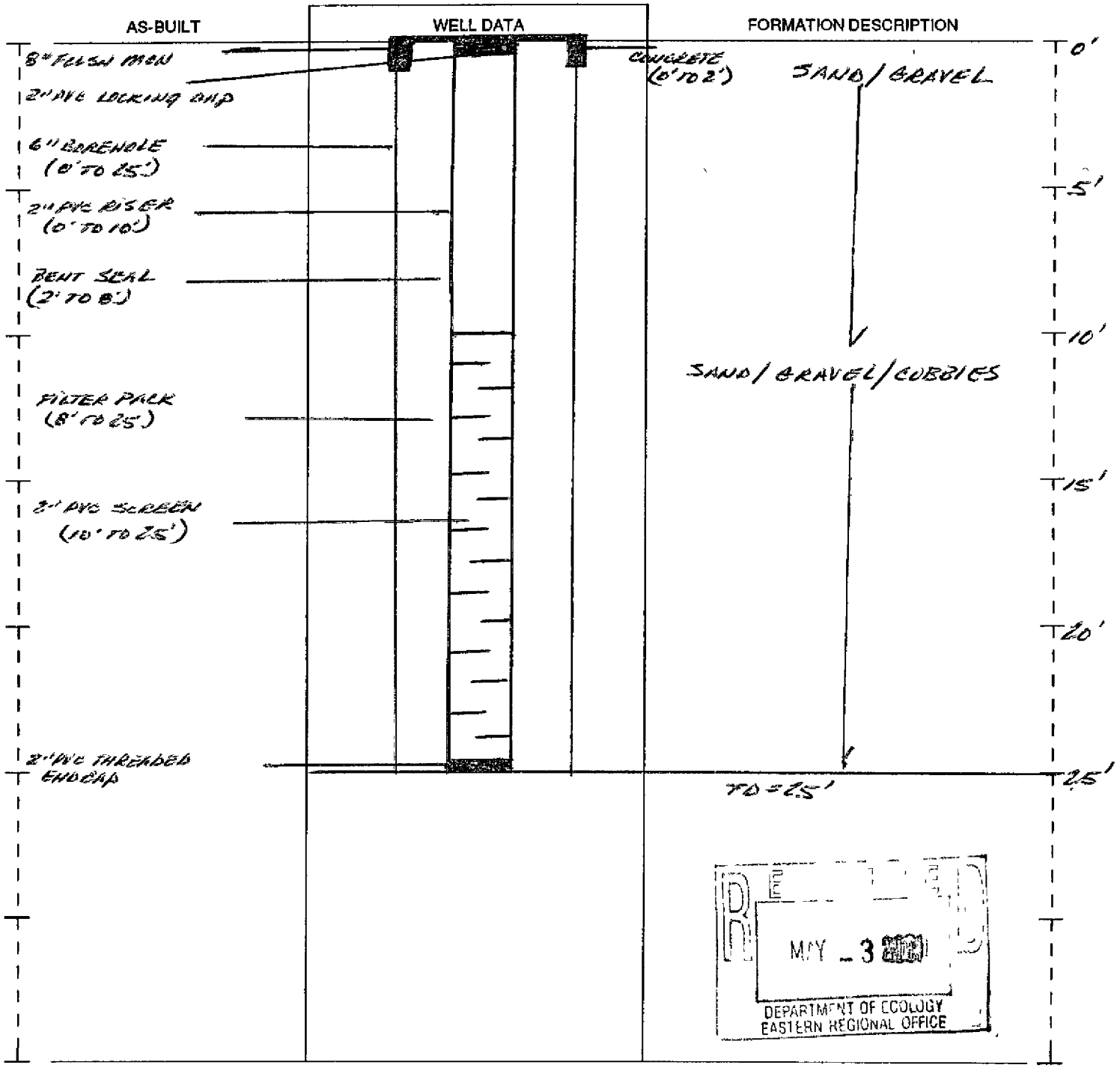
93946

RESOURCE PROTECTION WELL REPORT

START CARD NO. R43239

PROJECT NAME: YPL. GEIGER FUEL FACILITY
WELL IDENTIFICATION NO: GR#5 (AFS 806)
DRILLING METHOD: AIR-ROTARY
DRILLER: PAUL MILLS.
FIRM: ENV WEST EXPLORATION
SIGNATURE: PAUL E. MILLS
CONSULTING FIRM: MAXIM
REPRESENTATIVE: BILL CRAIG

COUNTY: SPOKANE
LOCATION: NW ¼ NW ¼ Sec 4 Twn 24N R 42
STREET ADDRESS OF WELL: INTERSECTION AT GEIGER & ELECTRIC AVE
WATER LEVEL ELEVATION:
GROUND SURFACE ELEVATION:
INSTALLED: 4-17-01
DEVELOPED:



SCALE 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev 11/89)

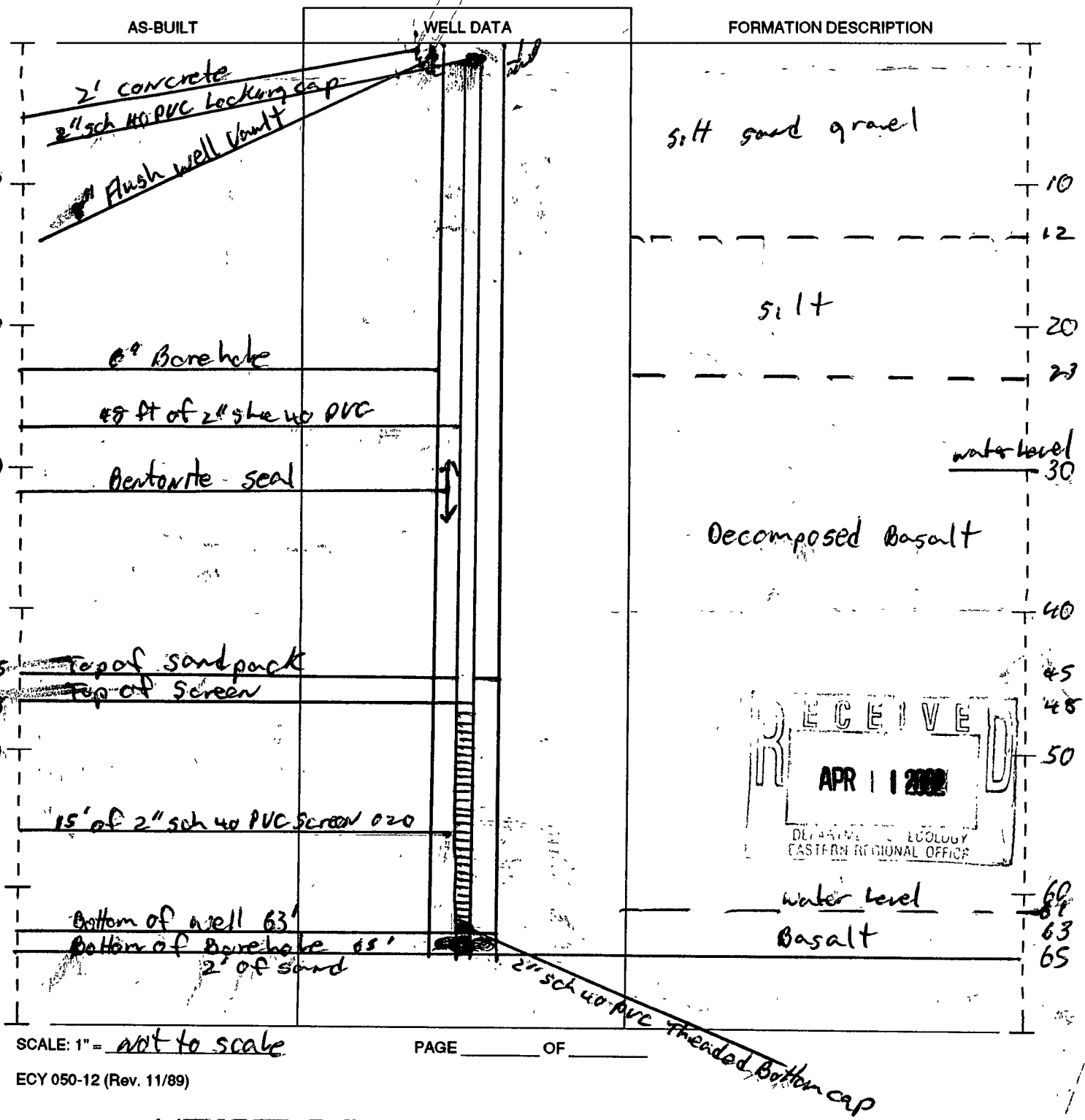
111232

RESOURCE PROTECTION WELL REPORT

START CARD NO. R 53930

PROJECT NAME: Geiger Delivery Facility
WELL IDENTIFICATION NO. AGS 165
DRILLING METHOD: Air Rotary
DRILLER: Randall E Wilder
FIRM: Environmental West Exploration
SIGNATURE: Randall E Wilder
CONSULTING FIRM: Maxim Technologies
REPRESENTATIVE: Mark Kemmer

COUNTY: Spokane
LOCATION: SW 1/4 SW 1/4 Sec 33 Twn 25N R 42 E
STREET ADDRESS OF WELL: unknown
WATER LEVEL ELEVATION: from surface 30'+ 61'
GROUND SURFACE ELEVATION: unknown
INSTALLED: 3-5-02
DEVELOPED: 3-7-02



SCALE: 1" = not to scale

PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

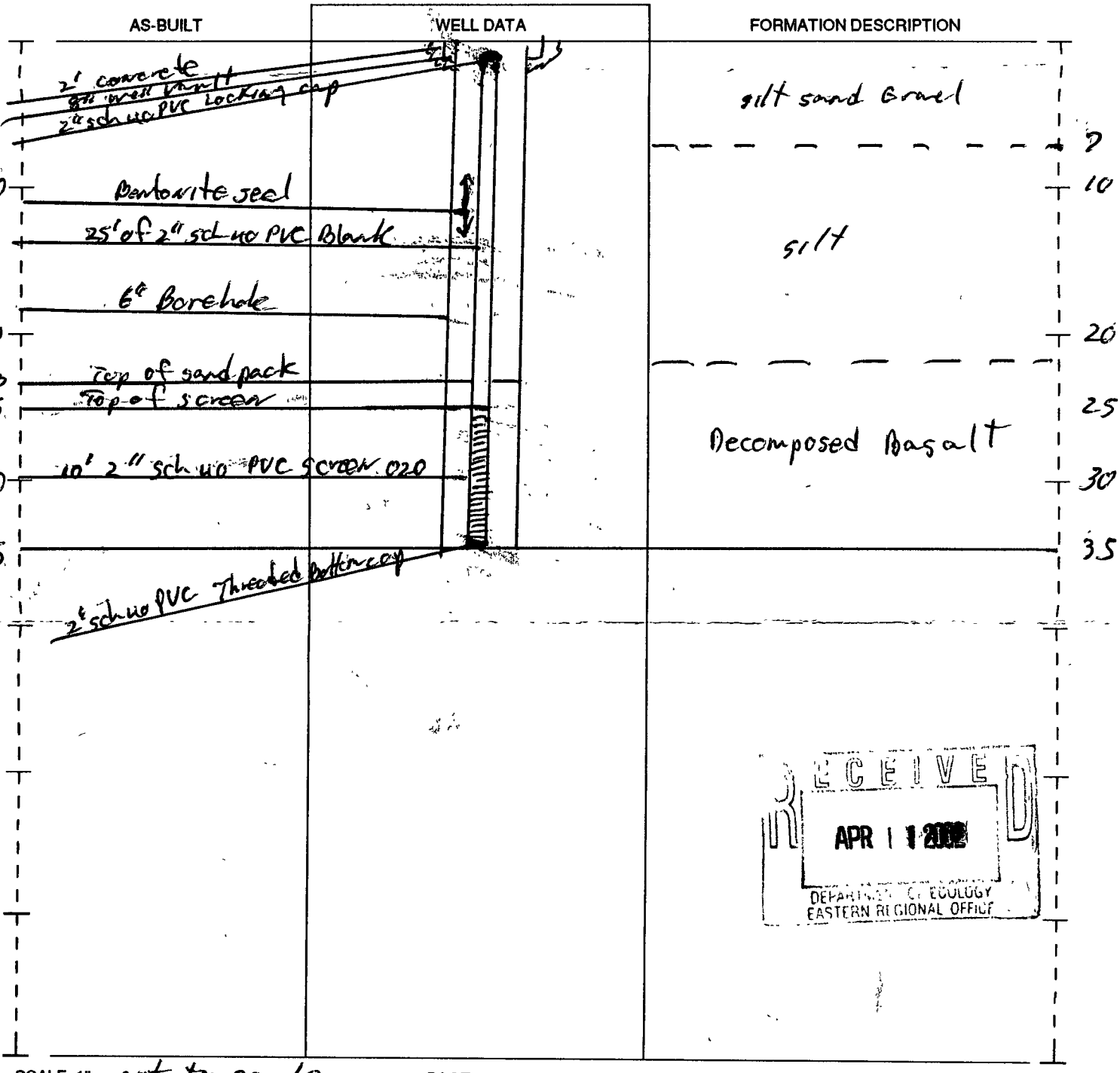
111229

RESOURCE PROTECTION WELL REPORT

START CARD NO. R 53930

PROJECT NAME: Geiger Delivery Facility
WELL IDENTIFICATION NO. AGS 156
DRILLING METHOD: Air Rotary
DRILLER: Randall E Wilder
FIRM: Environmental West Exploration
SIGNATURE: Randy Eco
CONSULTING FIRM: Maxium Technologies
REPRESENTATIVE: Mark Kemmer

COUNTY: Spokane
LOCATION: SW 1/4 SW 1/4 Sec 33 Twn 25N R 42E
STREET ADDRESS OF WELL: unknown
WATER LEVEL ELEVATION: from surface 30'
GROUND SURFACE ELEVATION: unknown
INSTALLED: 3-5-02
DEVELOPED: 3-7-02



SCALE: 1" = not to scale

PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

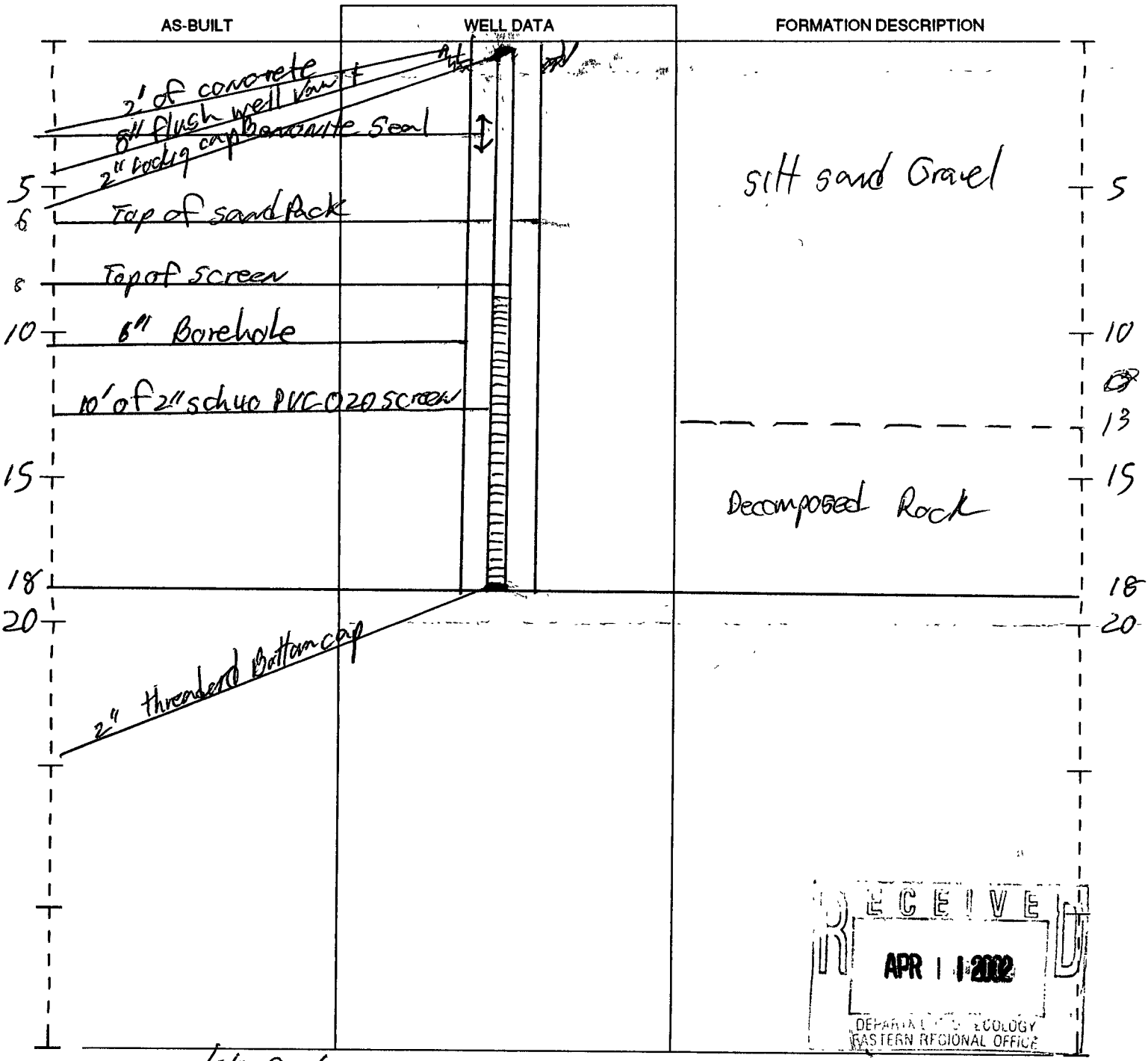
111230

RESOURCE PROTECTION WELL REPORT

START CARD NO. AS3930

PROJECT NAME: Geiger Delivery Facility
WELL IDENTIFICATION NO. AGS 157
DRILLING METHOD: Air Rotary
DRILLER: Randall E Wilder
FIRM: Environmental West Exploration
SIGNATURE: [signature]
CONSULTING FIRM: Maxum Technologies
REPRESENTATIVE: Mark Kemmer

COUNTY: Spokane
LOCATION: SW¼ SW¼ Sec 33 Twn 25N R 42E
STREET ADDRESS OF WELL: unknown
WATER LEVEL ELEVATION: from surface 13'
GROUND SURFACE ELEVATION: unknown
INSTALLED: 3-5-02
DEVELOPED: 3-7-02



SCALE: 1" = not to scale

PAGE _____ OF _____

ECY 050-12 (Rev. 11/89)

ECOVA Corporation

Well Installation Log

Well Number MW-10A

Date Drilled 4/13/90 4/16/90

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Coordinates 241755.8135 N

Site Conoco Fuel Area (Task 8) | Boring Method Air Rotary | 2458567.3530E

Job Number 801126 | Borehole Depth 88 Feet | Casing Elevation 2368.27

Field Geologist K May | Water Depth 21 Feet | Sheet 1 of 2

General: 38 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							GRAVEL WITH SILTY SAND (SM) – Brown, loose, dry, cobbles and possibly boulders encountered during drilling.	
10							WEATHERED BASALT – At 9 feet	
15				1			WEATHERED BASALT – Dark brown, trace orange color, moist.	
20				1			▽ Static water level at 21 feet.	
25								
30				250			Soft Basalt, petroleum odor, water yielding zone at 30 feet.	
35							Harder drilling, water stops.	
40							Abundant water, strong petroleum odor	
45								
50							Harder drilling – no water.	

801126-A-MW10A

* Background = 1.0 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-10A

Date Drilled 4/13/90 4/16/90

Client Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Coordinates 241755.81 35 N

Site Conoco Fuel Area (Task 8) | Boring Method Air Rotary | 2458567.3530 E

Job Number 801126 | Borehole Depth 88 Feet | Casing Elevation 2368.27

Field Geologist K. May | Water Depth 30 Feet | Sheet 2 of 2

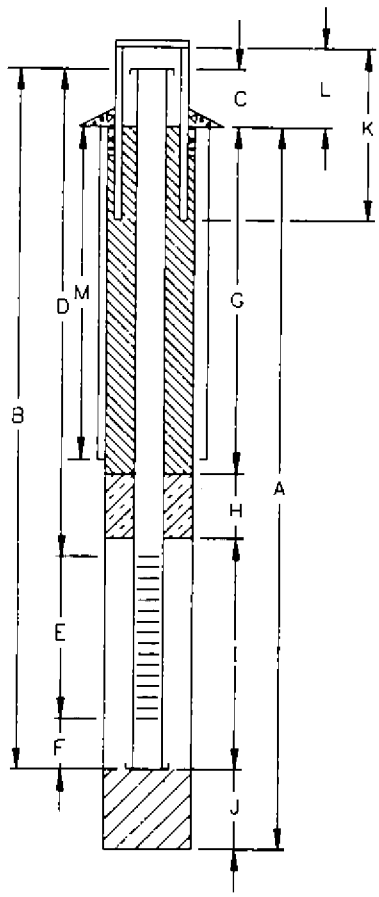
General: 36 feet of 6" casing.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55							WEATHERED BASALT – Reddish brown to yellowish white.	
60								
65								
70								
75								
80								
85							WEATHERED BASALT – Drill rods intermittently drop ~1 foot (fractured and/or vesicular basalt?) Abundant water.	
90							Bottom of Hole – 88 Feet	
95								
100								

801126-A-MW10A

* Background = ____ppm

WELL COMPLETION MW-10A



TOP OF CASING ELEVATION 2368.27

A BORING DEPTH 88 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 89 FT.

C WELL STICKUP 0 FT.

D BLANK INTERVAL 75 FT
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 73-83 FT
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5 FT.

G ANNULAR SEAL FT.
MATERIAL: GROUT

H BENTONITE SEAL 3'6" FT

I SANDPACK 21 FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 1 FT.
MATERIAL: SAND

K WELL COVER FT.

L STICKUP 0 FT.

M CONDUCTOR CASING 36 FT

NOT TO SCALE

DRILLING TIMES:
START 1115 4/13/90 FINISH 1540 4/16/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT:

YIELD 1535 TO 1730 DATE 6/6/90

TURBIDITY AFTER DEVELOPMENT: [X] CLEAR [ ] MOD. TURBID [ ] SL. TURBID [ ] TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: [ ] GROUND SURFACE [ ] STORM SEWERS [X] DRUMS [ ] STORAGE TANK [ ] TANK TRUCK

DEPTH OF WATER AFTER DEVELOPMENT 22.8'

MATERIALS USED

6 SACKS of 20/40 SAND
11 SACKS of PORTLAND CEMENT
SACKS of PREMIX CONCRETE
GALLONS of GROUT USED
GROUT COMPOSITION #6 BENTONITE
2 SACKS of BENTONITE PELLETS
BUCKETS of BENTONITE PELLETS
YARDS CEMENT - SAND USED
4 CENTRALIZERS at 10, 38, 66, AND 83 FEET BGS

WELL COVER USED: [ ] Above Grade [X] At Grade [ ] Other [X] Lockable

RESOURCE PROTECTION WELL REPORT

Notice of Intent No. RE 09019

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

AH94637

Construction/Decommission *("x" in circle)*

Ø Construction

O Decommission *Original Construction Notice of Intent Number* _____

Type of Well *("x" in circle)*

Ø Resource Protection

O Geotech Soil Boring

Property Owner city of spokane / Spokane County

Unique Ecology Well ID Tag No. BHW-854 MW10R

Consulting Firm AECOM Technical Services

Driller or Trainee Name Randall E Wilder

Driller or Trainee Signature [signature]

Driller or Trainee License No 2578

If trainee, licensed driller's Signature and License no. _____

Site Address W Electric At S Geiger

City Spokane County: Spokane

Location NW 1/4- 1/4 NW 1/4 Sec 4 Twn 24N R 42 (EWM) or WWM *circle one*

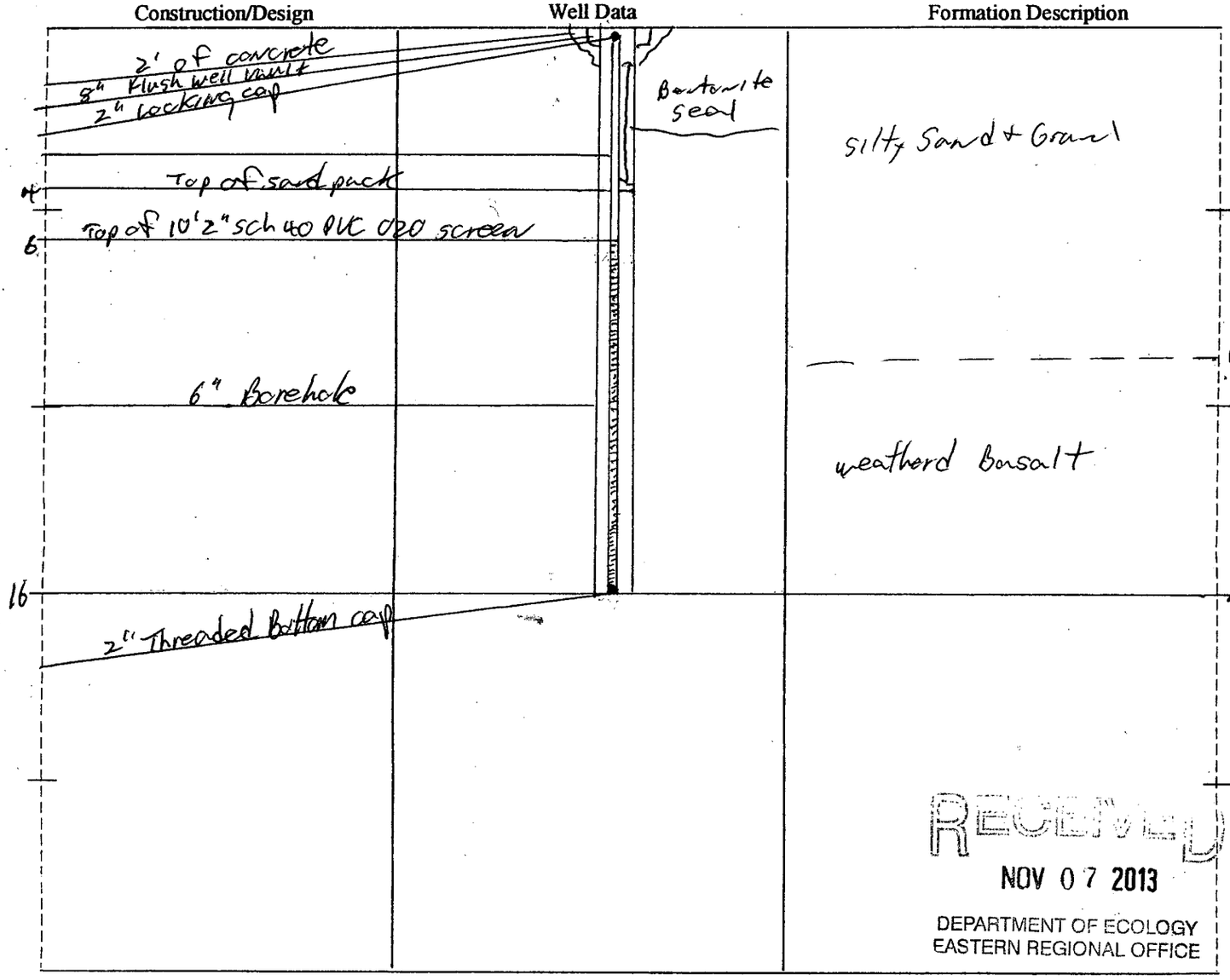
Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 25335.9056

Cased or Uncased Diameter _____ Static Level 11

Work/Decommission Start Date 10-10-13

Work/Decommission Completed Date 10-10-13



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NOV 07 2013
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Scale 1"=_____ Page_____of_____

ECY 050-12 (Rev 2/01)

Project: SIA Land Application Study Area **Project Location: Spokane International Airport** **Project Number: 36310160**	**Log of Boring MW-8** Sheet 1 of 1

Date(s) Drilled	11/29/12	Logged By	JEL	Checked By	GDP
Drilling Method	Air Rotary	Drilling Contractor	H2O Well Drilling	Total Depth of Borehole	25 feet bgs
Drill Rig Type	Star 30k-DH	Drill Bit Size/Type	6 in. Tubex	Ground Surface Elevation	2370.7 feet bgs
Groundwater Level	2360.75 feet	Sampling Method	Cuttings	Hammer Data	NA
Borehole Backfill	NA	Location	Northing 246693.59, Easting 2447195.34		

Elevation, feet	Downhole Depth, feet	SAMPLES Type	Number	Blows/ 6in.	Recovery (%)	PID/OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	REMARKS AND WELL DETAILS
2370	0							ML	Dark grayish brown (10 YR 4/2) SILT Grading more gravel (SM) with depth (moist)		
2365	5										
2360	10							SM/GM	Grayish brown (10 YR 5/2) silty/sandy GRAVEL, broken gravel, some cobbles (slightly moist)	13.0 ft ▼	
2355	15							CL	Yellowish brown (10 YR 5/4) CLAY with small basalt gravel (moist)		
2350	20								Gray (10 YR 5/1) BASALT, broken, oxidized, calcium carbonate seams, fractured and weathered, groundwater Grading more competent with depth, groundwater in drill cuttings, groundwater stabilized at 10.5 ft.		Groundwater below clay in fractured/weathered basalt
2345	25								Boring completed to 25' bgs.		
	30										

ENV2 WITH WELL T:\OVERDRIVE\36310160 SIA LAND APPLICATION STUDY AREA\363101601XLOGS.GPJ URSSEA3B.GLB URSSEA3.GDT 1/4/13

URS

484318

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE07819

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☒ Construction
☐ Decommission

ORIGINAL INSTALLATION Notice of Intent Number:

Type of Well *("x in box)*

☒ Resource Protection
☐ Geotech Soil Boring

Property Owner Spokane International Airport

Site Address Off Hayford & McFarlane

Consulting Firm URS Corporation

City Spokane County Spokane

Unique Ecology Well IDTag No. BBH-478 MW-9

Location NE1/4-1/4 NE1/4 Sec 30 Twn 25N R 42E

EWM ☒ or WWM ☐

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Min _____ Sec _____

Long Deg _____ Min _____ Sec _____

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) McLeslie, Jim

Driller/Engineer /Trainee Signature Jim McLeslie

Driller or Trainee License No. 2871

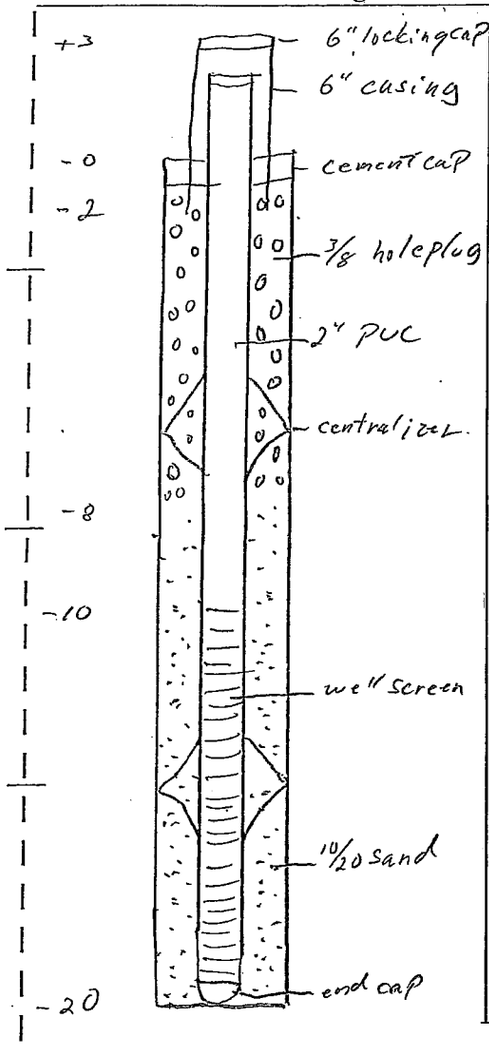
Tax Parcel No. 25305.9047

Cased or Uncased Diameter 6" Static Level 17'

Work/Decommission Start Date 11/28/12

Work/Decommission Completed Date 11/28/12

If trainee, licensed driller's Signature and License Number:

Construction/Design	Well Data	Formation Description
	6" Locking Well Cap +3 - 2' 6" Steel Casing Cement Cap 2" Locking Cap +3 - 20' 2" PVC Sch. 40 End Cap -10 - 20' 2" Pvc Screen .010 slot 2 Centralizers -0 - 8' 3/8 Holeplug -8 - 20' 10/20 Sand	0 - 3' Top Soil 3 - 18' Sand, Basalt Gravels 18 - 20' Basalt

SCALE: 1"= _____ PAGE _____ OF _____

Project: SIA Land Application Study Area
Project Location: Spokane International Airport
Project Number: 36310160

Log of Boring MW-10

Sheet 1 of 1

Date(s) Drilled	11/28/12	Logged By	JEL	Checked By	GDP
Drilling Method	Air Rotaty	Drilling Contractor	H2O Well Drilling	Total Depth of Borehole	25 feet bgs
Drill Rig Type	Star 30k-DH	Drill Bit Size/Type	6 in. Tubex	Ground Surface Elevation	2359.2 feet bgs
Groundwater Level	2351.13 feet	Sampling Method	Cuttings	Hammer Data	NA
Borehole Backfill	NA	Location	Northing 247338.63, Easting 2450941.31		

Elevation, feet	Downhole Depth, feet	SAMPLES Type Number	SAMPLES Blows/ 6in.	SAMPLES Recovery (%)	SAMPLES PID/OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	Well Completion Schematic	REMARKS AND WELL DETAILS
	0						ML	Brown (10 YR 5/3) SILT with few angular to subangular basalt gravel (dry to slightly moist)		
2355	5									
2350	10							10.5 ft ▼		
								Gray (10 YR 5/1) BASALT, fractured and weathered (moderately moist)		
2345	15									
								Grading (10 YR 6/1) to (10 YR 3/1) dependent on dry to wet with yellowish brown (10 YR 3/1) clay in fractures (wet)		
2340	20									
2335	25							Boring completed to 25' bgs.		
2330	30									

URS

ENV2 WITH WELL T:\ONEWORLD\36310160 SIA LAND APPLICATION STUDY AREA\36310160LOGS.GPJ URSSEA3B.GLB URSSEA3.GDT 1/4/13

PROJECT: SIA Land Application Site Monitoring Well Installation	CASCADE EARTH SCIENCES A Valmont Industries Company	PROJECT NUMBER: 2014230009	MONITORING WELL NUMBER: MW-11 PAGE: 1 OF 1	
BORING LOCATION: N246527.94 E2449283.08		LOGGED BY: BJK CHECKED BY: DRW	PERMIT NO. BIO-784	
DRILLED BY: Fogle Pump and Supply		START DATE: 8/21/2014	COMPLETION DATE: 8/23/2014	
DRILLING EQUIPMENT: Sandvik T25KW Air Roatary		SAMPLING EQUIPMENT: Cuttings		

WELL CONSTRUCTION DATA (MEASURED FROM TOP OF CASING)

TOTAL DEPTH: 19'	WELL DEPTH: 19'	BOREHOLE DIA.(IN): 6"	CASING MATERIAL AND DIA. (IN): 2" Schedule 40 PVC	CASING STICK-UP +/-: +2.79'

FILTER PACK INT. 7'-19'	SIZE: 10/20 CSSI	SURFACE SEAL INT: 0-3'	TYPE: Concrete
SANITARY SEAL INT. 3'-7'	TYPE: 3/8" Bentonite chips	WELL SCREEN INT: 9'-19'	SLOT SIZE (IN): 0.020
GROUT INT. None	TYPE: None	WATER LEVEL/DATE (MEASURED BELOW T.O.C.)	H2O @ 9.3' BGS - 8/21/14 @ 0830

GROUND SURFACE ELEV. (FT MSL): 2367.8	TOP OF CASING ELEV. (FT MSL): 2370.59	COMMENT:

GROUP SYMBOL	INTERVAL (FT. B.G.S.)	DESCRIPTION OF LITHOLOGY	DEPTH (FT. B.G.S.)	WELL GRAPHIC	SAMPLE BLOW COUNT	SAMPLE RECOVERY	SAMPLE TYPE	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
			0						Ground surface
ML	5'	**SANDY SILT:** Brown (2.5Y 3/3), dry, sand-silt mix, no gravels.	2	CEMENT					Start at 0740
			4						
			6	3/8" BENTONITE CHIPS					
			8						Final water level = 9.3' BGS.
	10'	**SAND AND GRAVEL:** Brown (2.5Y 4/2), damp, poorly graded sand with gravel.	10						
SP			12	10/20 CSSI SAND					Encountered water at 13' BGS.
			14						
SM	15'	**SILTY SAND:** Brown (10Y 2/2), with yellow pockets (10YR 8/8), damp/wet, silty sand with gravels.	16						Driller feel different layer at 15' BGS.
Basalt	17'-20'	**BASALT:** Brown, wet, fractured basalt.	18						Basalt at 17' BGS.
		Total Depth = 20'	20						Terminate drilling at 20' End at 0746
			22						When 6" casing was removed borehole collapsed a little. 2" schedule 40 pvc casing set to depth of 19' BGS.
			24						
			26						
			28						

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE INFORMATION PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

Surveyed data, except for T.O.C. and ground surface elevation, is accurate to +/- 0.5 feet.

S:\[Working Drafting]\2014230009 Spokane Airport\DWGs\2014230009 MW-11 LOG.dwg 11/6/2014 RKB

CASCADE EARTH SCIENCES
A Valmont Industries Company

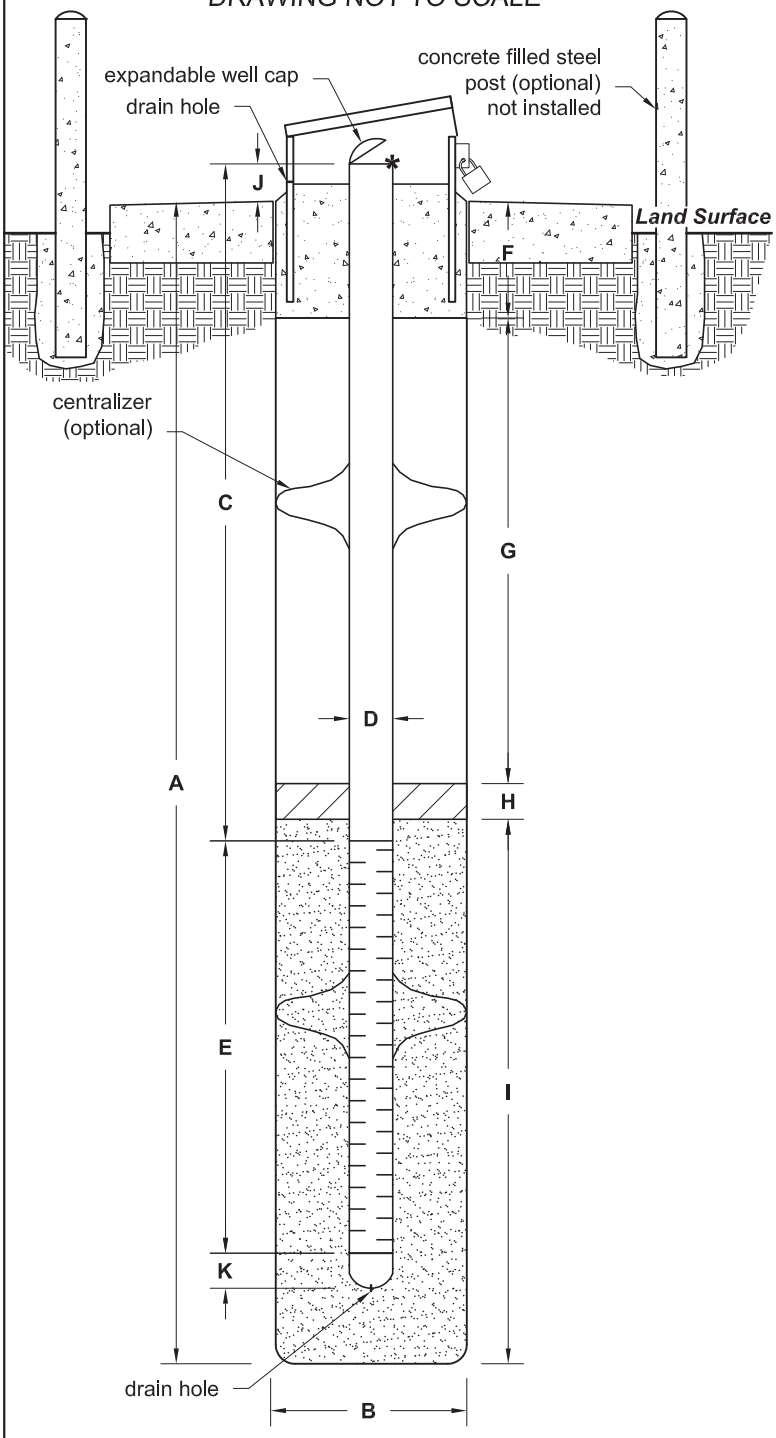
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NAME: SIA Land Application Site Monitoring Well Installation
PROJECT NUMBER: 2014230009
DATE INSTALLED: 8/21/2014
WELL PERMIT NO.: BIO-784
LOCATION: N246527.94, E2449283.08 (Washington State Plane North)
NOTES:

BORING/WELL NO.: MW-11
TOP OF CASING ELEV. AT MARK: 2370.59
GROUND SURFACE ELEV.: 2367.8
DATUM: NAVD88

WELL SCHEMATIC

DRAWING NOT TO SCALE



NOTE: Depths and intervals are measured from ground surface.

BORING INFORMATION

A. Total Depth: 19 ft.
B. Borehole Diameter: 6 in.
Drilling method: Sandvik T25KW Air Rotary

WELL CONSTRUCTION

C. Total Casing length: 21.79 ft.
Material: Schedule 40 PVC
D. Well Casing Diameter (I.D.): 2 in.
E. Well Screen
Screen length: 10 ft.
Screen interval from: 9 ft. to 19 ft.
Slot size: 0.020 in.
F. Surface Seal from: 0 ft. to 3 ft.
Seal materials: Concrete
G. Grout from: - ft. to - ft.
Grout material: -
H. Bentonite Sanitary Seal from: 3 ft. to 9 ft.
Seal materials: 3/8" Bentonite Chips
I. Filter Pack from: 7 ft. to 19 ft.
Pack material: 10/20 CSSI sand
J. Well Casing height (above grade): 2.79 ft.
K. Well Sump length: 0 ft.
Well tail piece length: 3 in.
Centralizers located at: 9 ft.

NOTES: -

S:\[Working Drafting]\2014230009 Spokane Airport\DWGs\2014230009 MW-11 LOG.dwg 11/6/2014 RKB

PROJECT: SIA Land Application Site Monitoring Well Installation	CASCADE EARTH SCIENCES A Valmont Industries Company	PROJECT NUMBER: 2014230009	MONITORING WELL NUMBER: MW-12 PAGE: 1 OF 1
BORING LOCATION: N249177.19 E2450041.46		LOGGED BY: BJK CHECKED BY: DRW	PERMIT NO. BIO-785
DRILLED BY: Fogle Pump and Supply		START DATE: 8/21/2014	COMPLETION DATE: 8/23/2014
DRILLING EQUIPMENT: Sandvik T25KW Air Roatary		SAMPLING EQUIPMENT: Cuttings	

WELL CONSTRUCTION DATA (MEASURED FROM TOP OF CASING)

TOTAL DEPTH: 26'	WELL DEPTH: 26'	BOREHOLE DIA.(IN): 6"	CASING MATERIAL AND DIA. (IN): 2" Schedule 40 PVC	CASING STICK-UP +/-: +2.65'

FILTER PACK INT. 5'-26' SIZE: 10/20 CSSI
SANITARY SEAL INT. 3'-5' TYPE: 3/8" Bentonite chips
GROUT INT. None TYPE: None

SURFACE SEAL INT: 0-3' TYPE: Concrete
WELL SCREEN INT: 6'-26' SLOT SIZE (IN): 0.020
WATER LEVEL/DATE (MEASURED BELOW T.O.C.) h2o @ 11.15' BGS - 8/21/14 @ 1120; h2o @ 10.7' BGS - 8/21/14 @ 1200

GROUND SURFACE ELEV. (FT MSL): 2349.8
TOP OF CASING ELEV. (FT MSL): 2352.45
COMMENT:

GROUP SYMBOL	INTERVAL (FT. B.G.S.)	DESCRIPTION OF LITHOLOGY	DEPTH (FT. B.G.S.)	WELL GRAPHIC	SAMPLE BLOW COUNT	SAMPLE RECOVERY	SAMPLE TYPE	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
			0						Ground surface
GW	5'	**SANDY GRAVEL:** Brown, dry, well graded sands and gravels with fine silt.	2	4" CEMENT; 3/8" BENTONITE CHIPS					Start at 0740
	10'	**SANDY GRAVEL:** Brown, dry, well graded sands and gravels with fine silt.	10	10/20 CSSI SAND					Final water level = 10.7' BGS
	13'-17'	**BOULDER**	12						Basalt at 13' BGS. Pause drilling at 0917 to cut 6" casing so driller can advance head. Drilling resumed at 0933.
ML	17'	**SANDY SILT:** Brown (2.5Y 3/3), with orange (10YR 5/8), and gray (Gley1 4/10GY) lenses and gravels, damp, sandy silt.	16						
	20'	**SANDY SILT:** Brown, wet, sandy silt with gravels.	20						Encountered water at 20' BGS.
Basalt	23'	**BASALT:** wet, fractured basalt.	22						Basalt at 23' BGS.
		Total Depth = 26'	26						Terminate drilling at 26' End at 0945
			28						

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE INFORMATION PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

Surveyed data, except for T.O.C. and ground surface elevation, is accurate to +/- 0.5 feet.

S:\[Working Drafting]\2014230009 Spokane Airport\DWGs\2014230009 MW-12 LOG.dwg 11/6/2014 RKB

CASCADE EARTH SCIENCES
A Valmont Industries Company

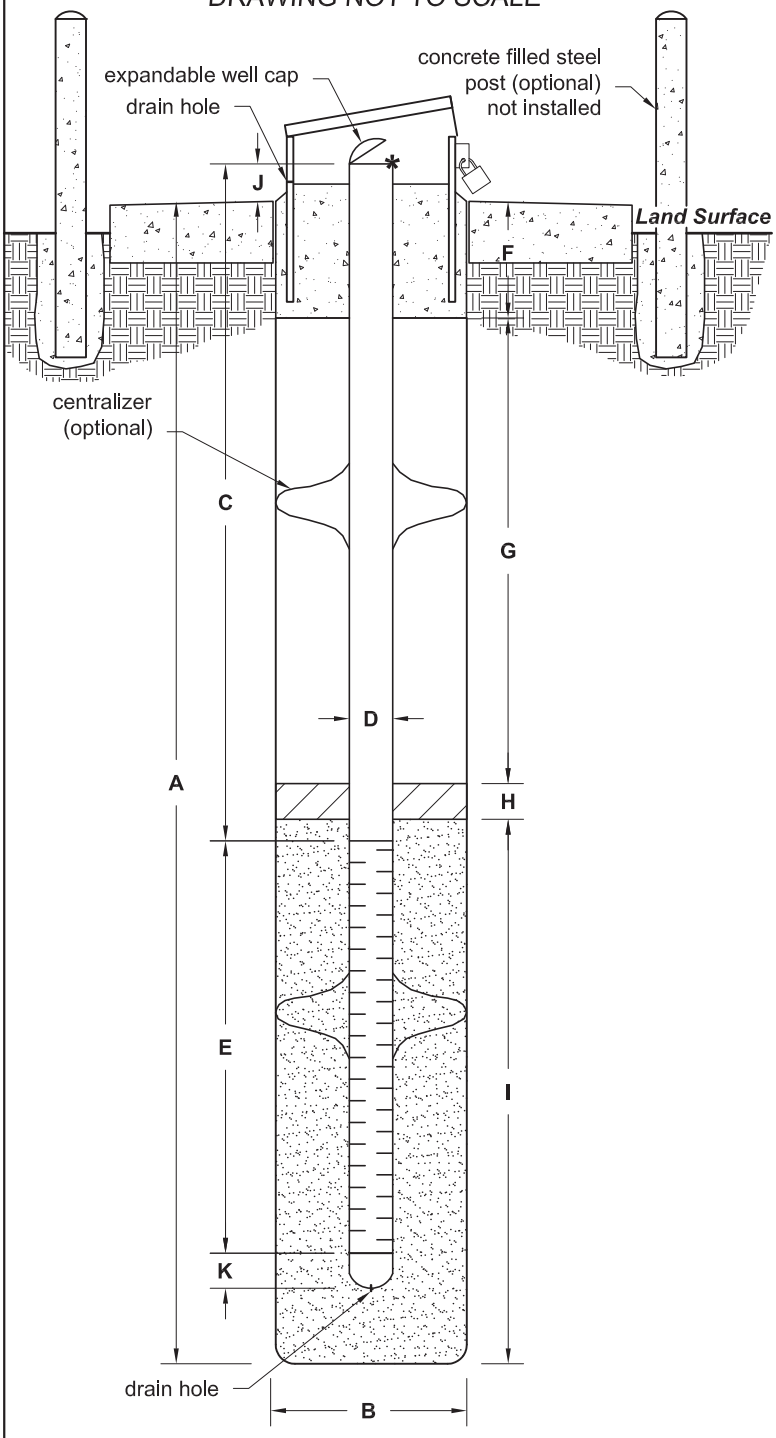
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NAME: SIA Land Application Site Monitoring Well Installation
PROJECT NUMBER: 2014230009
DATE INSTALLED: 8/21/2014
WELL PERMIT NO.: BIO-785
LOCATION: N249177.19, E2450041.46 (Washington State Plane North)
NOTES:

BORING/WELL NO.: MW-12
TOP OF CASING ELEV. AT MARK: 2352.45
GROUND SURFACE ELEV.: 2349.8
DATUM: NAVD88

WELL SCHEMATIC

DRAWING NOT TO SCALE



NOTE: Depths and intervals are measured from ground surface.

BORING INFORMATION

A. Total Depth: 26 ft.
B. Borehole Diameter: 6 in.
Drilling method: Sandvik T25KW Air Rotary

WELL CONSTRUCTION

C. Total Casing length: 28.65 ft.
Material: Schedule 40 PVC
D. Well Casing Diameter (I.D.): 2 in.
E. Well Screen
Screen length: 20 ft.
Screen interval from: 6 ft. to 26 ft.
Slot size: 0.020 in.
F. Surface Seal from: 0 ft. to 3 ft.
Seal materials: Concrete
G. Grout from: - ft. to - ft.
Grout material: -
H. Bentonite Sanitary Seal from: 3 ft. to 5 ft.
Seal materials: 3/8" Bentonite Chips
I. Filter Pack from: 5 ft. to 26 ft.
Pack material: 10/20 CSSI sand
J. Well Casing height (above grade): 2.65 ft.
K. Well Sump length: 0 ft.
Well tail piece length: 3 in.
Centralizers located at: 11 and 21 ft.

NOTES: -

S:\[Working Drafting]\2014230009 Spokane Airport\DWGs\2014230009 MW-12 LOG.dwg 11/5/2014 RKB

ECOVA Corporation

Well Installation Log

Well Number MW-1A

Client · Army Corps of Engineers | Drilling Company Fogle Pump & Supply | Date Drilled 5-10-90

Site SP Site (Task 6) | Boring Method Air Rotary | Coordinates 246670.5625 N, 2460128.4101 E

Job Number 801126 | Borehole Depth 83 Feet | Casing Elevation 2319.00'

Field Geologist R.M. Weber | Water Depth 13 Feet | Sheet 1 of 2

General: 50 feet 6" steel casing, pressure grout.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SILTY SAND (SM) – Fine– to coarse–grained sand, brown, with black basalt cuttings, damp.	
10							BASALT – Fresh, light gray, dry.	
15							Basalt – Fresh, dark gray, dry. Hard drilling. ▽ Static water level at 13 Feet. BASALT – Alternating light and dark gray, dry.	
20								
25							Dry, hard drilling.	
30							BASALT – Gray, with white and orange fragments, easier drilling, damp.	
35							WEATHERED BASALT – Same as above with minor clay, sand, and gravel.	
40							Water yielding zone at 40 feet.	
45							BASALT – Fractured, weathered, orange and white fragments, some clays, sand and gravel. BASALT – Dark gray.	
50				3				

801126-A-MW1A

* Background = 0 ppm

ECOVA Corporation

Well Installation Log

Well Number MW-1A
Date Drilled 5-10-90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 246670.5625 N
Site SP Site (Task 6)
Boring Method Air Rotary
2460128.4101 E
Job Number 801126
Borehole Depth 83 Feet
Casing Elevation 2319.00
Field Geologist R.M. Weber
Water Depth 13 Feet
Sheet 2 of 2

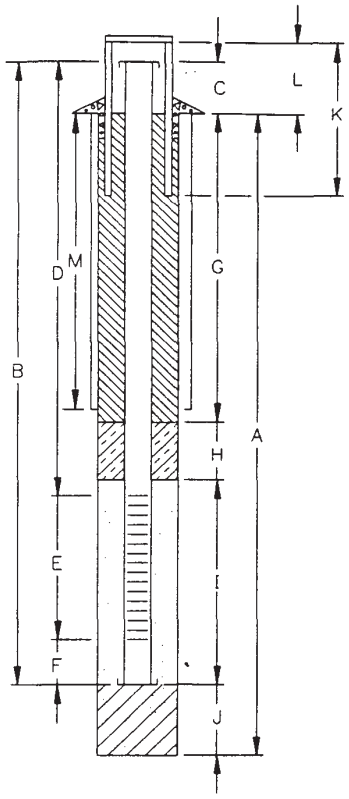
General: 50 feet 6" steel casing, pressure grout.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
55							BASALT – Black, no water, good seal on conductor casing.	
60							BASALT – Black, with dark gray clay, damp.	
							SILT AND CLAY WITH GRAVEL (GM/GC) – Black, damp.	
65							Color change to dark brown.	
							Color change to brown with increase in white and orange fragments, predominatly clay.	
70								
75							WEATHERED BASALT – Black–gray, with orange and white clasts, soft drilling, damp. Water yielding zone at 75 feet.	
							WEATHERED BASALT – Black–gray, with abundant orange and white fragments, soft drilling.	
80							BASALT – Dark gray, hard.	
							Bottom of Hole – 83 Feet	
85								
90								
95								
100								

801126-A-MW1A

* Background = _____ppm

WELL COMPLETION MW-1A



TOP OF CASING ELEVATION 2319.00'

A BORING DEPTH 83 FT.
BORING DIAMETER 6 IN.
B WELL DEPTH 79.3 FT.
C WELL STICKUP 1 FT.
D BLANK INTERVAL 66 FT.
BLANK DIAMETER 2 IN.
E SCREEN INTERVAL 65-75' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01
F SEDIMENT TRAP 5 FT.
G ANNULAR SEAL 54 FT.
MATERIAL: GROUT
H. BENTONITE SEAL 6 FT.
I SANDPACK 18 FT.
TYPE/SIZE: 20/40
J BOTOM SEAL/PACK 2 FT.
MATERIAL: SAND
K WELL COVER ____ FT.
L STICKUP ____ FT.
M CONDUCTOR CASING 50 FT.

NOT TO SCALE

DRILLING TIMES:
START 0800 - 5/10/90 FINISH 1100 - 5/11/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT: DISPLACEMENT PUMPING @ 70 CYCLES/SEC

PUMP TIME 0305 TO 0500 DATE 5/17/90

TURBIDITY AFTER DEVELOPMENT: X CLEAR ____ MOD. TURBID ____ SL. TURBID ____ TURBID

ODOR IN WATER ?

WATER DISCHARGED TO: ____ GROUND SURFACE ____ STORAGE TANK ____ STORM SEWERS ____ TANK TRUCK 3 DRUMS

DEPTH OF WATER AFTER DEVELOPMENT: 6'

MATERIALS USED

4 1/2 SACKS of 20/40 SAND
7 SACKS of PORTLAND CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
GROUT COMPOSITION #6 BENTONITE
1 SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
3 CENTRALIZERS at 31, 59, AND 78.5' BGS

WELL COVER USED: X Above Grade
____ At Grade
____ Other
X Lockable

FEB 6 1991

801126-A-MW1AW

ECOVA Corporation

Well Installation Log

Well Number MW-1B
Date Drilled 5-8-90
Client. Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 246670.3593 N
Site SP Site (Task 6)
Boring Method Air Rotary
2460138.2368 E
Job Number 801126
Borehole Depth 65.5 Feet
Casing Elevation 2318.63
Field Geologist R.M. Weber
Water Depth 5 Feet
Sheet 1 of 2

General: 6" steel casing to 5 feet.

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	Sample Description	Graphic Log
5							SILTY SAND (SM) – Fine– to coarse–grained sand, brown, black basalt gravel. ▽ Static water level at 5 feet. BASALT – Fresh, gray, dry.	
10							BASALT – Fresh, dark gray – water at 12 feet. Water yielding zone at 12 feet.	
15							BASALT – Light gray, cuttings are fine and powdery, very hard, dry.	
20								
25								
30							BASALT – Dark gray, softer drilling, damp.	
35								
40							Water yielding zone at 30 feet. WEATHERED BASALT – Dark gray, orange, and white fragments, minor clay and sand, soft.	
45								
50								

801126-A-MW1B

* Background = 0 ppm

ECOVA Corporation

Well Installation Log

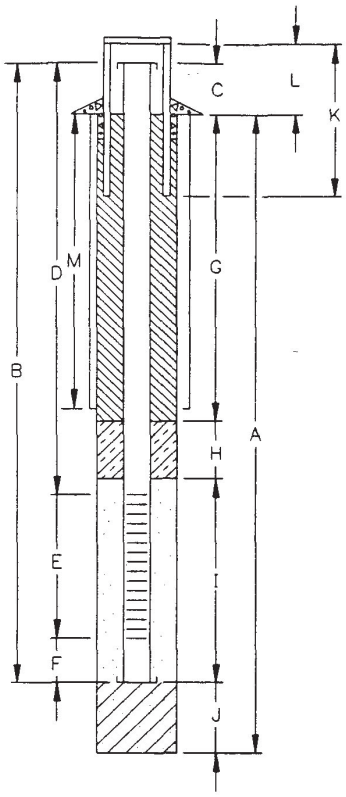
Well Number MW-1B
Date Drilled 5-8-90
Client Army Corps of Engineers
Drilling Company Fogle Pump & Supply
Coordinates 246670.3593N
2460138.2368E
Site SP Site (Task 6)
Boring Method Air Rotary
Job Number 801126
Borehole Depth 65.5 Feet
Casing Elevation 2318.63
Field Geologist R.M. Weber
Water Depth 12/39 Feet
Sheet 2 of 2

Depth (Feet)	Blow Counts	Sample No.	Recover	Organic* Vapor (ppm)	% LEL	% O_2	General: / Sample Description	Graphic Log
55							BASALT – Dark gray, hard.	
60								
65							Bottom of Hole – 65.5 Feet	
70								
75								
80								
85								
90								
95								
100								

801126-A-MW1B

* Background = 0 ppm

WELL COMPLETION MW-1B



TOP OF CASING ELEVATION 2318.63 FT.

A BORING DEPTH 65.5 FT.
BORING DIAMETER 6 IN.

B WELL DEPTH 50.0 FT.

C WELL STICKUP 0.5' FT.

D BLANK INTERVAL 66 FT.
BLANK DIAMETER 2 IN.

E SCREEN INTERVAL 2.5-32.5' 35-45' FT.
SCREEN DIAMETER 2 IN.
TYPE/SLOT SIZE 0.01

F SEDIMENT TRAP 5 FT.

G ANNULAR SEAL ____ FT.
MATERIAL: GROUT

H. BENTONITE SEAL ____ FT.

I SANDPACK ____ FT.
TYPE/SIZE: 20/40

J BOTOM SEAL/PACK 2 FT.
MATERIAL: SAND

K WELL COVER ____ FT.

L STICKUP ____ FT.

M CONDUCTOR CASING ____ FT.

NOT TO SCALE

DRILLING TIMES:
START 1245 5/8/90 FINISH 1504 5/8/90
STANDBY or DOWN TIME:

METHOD OF DECON. PRIOR TO DRILLING:

DEVELOPMENT

METHOD OF DEVELOPMENT: DISPLACEMENT PUMPING 60 CYCLES/SEC

START TIME 0820 TO 0120 DATE 5/17/90

TURBIDITY AFTER DEVELOPMENT:
____ CLEAR ____ MOD. TURBID
X SL. TURBID ____ TURBID

ODOR IN WATER ? NONE

WATER DISCHARGED TO:
____ GROUND SURFACE ____ STORAGE TANK
____ STORM SEWERS ____ TANK TRUCK
X DRUMS

DEPTH OF WATER AFTER DEVELOPMENT: 6 FEET

MATERIALS USED

9.5 SACKS of 20/40 SAND
4.5 SACKS of PORTLAND CEMENT
____ SACKS of PREMIX CONCRETE
____ GALLONS of GROUT USED
____ GROUT COMPOSITION #6 BENTONITE
____ SACKS of BENTONITE PELLETS
____ BUCKETS of BENTONITE PELLETS
____ YARDS CEMENT - SAND USED
2 CENTRALIZERS at 15' AND 36' BGS

WELL COVER USED:
X Above Grade
____ At Grade
____ Other
X Lockable

801126-A-MW1BW

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R69102

(SUBMIT ONE WELL REPORT PER WELL INSTALLED) 284357

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☑ Resource Protection

☐ Geotech Soil Boring

Consulting Firm Budinger and Associates, Inc.

Unique Ecology Well ID
Tag No. ALR 119 (MW-1)

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan Hageman

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. 2853

If trainee, licensed driller's Signature and License No. 2853

Property Owner Spokane International Airport

Site Address _____

City Airway Heights County Spokane

Location NE 1/4-1/4 SW 1/4 Sec 28 Twn 25 R 42 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 38' 5.6"

Long Deg 117 Long Min/Sec 30' 27.7"

Tax Parcel No. _____

Cased or Uncased Diameter 8" Static Level 12.2'

Work/Decommission Start Date 11/8/07

Work/Decommission Completed Date 11/26/07

Construction/Design	Well Data	Formation Description
	Monument: 6" dia., 6' long steel set in concrete to 3' below grade with locking lid and bollards	Road Fill: Gravel and Sand with Cobbles
	Riser: 2" schedule 40 pvc set to 8.5' with locking expansion plug	Sand with Silt
	Screen: 2" schedule 40 pvc (0.010" slot) set from 8.5' to 14.5' with end cap	5'
	Seal: Bentonite from 3' to 6.5'	
	Filter pack: #20-40 silica sand from 6.5' to 14.5'	
		Basalt
		15'
		End of Boring @ 15'

8 JAN -2 AM 8:47
DEPT. OF ECOLOGY
FISCAL & BUDGET

RECEIVED
JAN 03 2007
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
JAN 09 2008
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

10'

SCALE: 1"= _____

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R69102

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

284358

Construction/Decommission *(select one)*
- [x] Construction
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*
- [x] Resource Protection
- [ ] Geotech Soil Boring

Consulting Firm: Budinger and Associates, Inc.

Unique Ecology Well ID
Tag No.: ALR 120 (MW-2)

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

- [x] Driller [ ] Engineer [ ] Trainee Name (Print): Ethan Hageman
- Driller/Engineer /Trainee Signature: _____
- Driller or Trainee License No.: 2853

If trainee, licensed driller's Signature and License No.: 2853

Property Owner: Spokane International Airport

Site Address: _____

City: Airway Heights County: Spokane

Location: NE 1/4-1/4 SW 1/4 Sec 28 Twn 25 R 42 Select One [X] EWM [ ] WWM

Lat/Long (s, t, r still REQUIRED): Lat Deg 47 Lat Min/Sec 38' 8.3" Long Deg 117 Long Min/Sec 30' 28.5"

Tax Parcel No.: _____

Cased or Uncased Diameter: 8" Static Level: 12.5'

Work/Decommission Start Date: 11/8/07

Work/Decommission Completed Date: 11/26/07

Construction/Design	Well Data	Formation Description
	Monument: 6" dia., 6' long steel set in concrete to 3' below grade with locking lid and bollards Riser: 2" schedule 40 pvc set to 9.5' with locking expansion plug Screen: 2" schedule 40 pvc (0.010" slot) set from 9.5' to 14.7' with end cap Seal: Bentonite from 3' to 7' Filter pack: #20-40 silica sand from 7' to 15'	Road Fill: Gravel and Sand with Cobbles Sand with Silt 5' 10' Basalt 15' End of Boring @ 15'

RECEIVED
JAN 03 2007
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
JAN 09 2008
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

JAN -2 A8:48
DEPT. OF ECOLOGY
FISCAL & BUDGET

SCALE: 1"= _____

PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

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RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R69102

(SUBMIT ONE WELL REPORT PER WELL INSTALLED) 284359

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☑ Resource Protection

☐ Geotech Soil Boring

Consulting Firm Budinger and Associates, Inc.

Unique Ecology Well ID
Tag No. ALR 121 (MW-3)

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan Hageman

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. 2853

If trainee, licensed driller's Signature and License No. 2853

Property Owner Spokane International Airport

Site Address _____

City Airway Heights County Spokane

Location SE 1/4-1/4 NW 1/4 Sec 28 Twn 25 R 42 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 38' 11.5"

Long Deg 117 Long Min/Sec 30' 37.8"

Tax Parcel No: _____

Cased or Uncased Diameter 8" Static Level 7.5'

Work/Decommission Start Date 11/8/07

Work/Decommission Completed Date 11/26/07

Construction/Design	Well Data	Formation Description
	Monument: 6" dia., 6' long steel set in concrete to 3' below grade with locking lid and bollards Riser: 2" schedule 40 pvc set to 6.5' with locking expansion plug Screen: 2" schedule 40 pvc (0.010" slot) set from 6.5' to 8.4' with end cap Seal: Bentonite from 3' to 4.5' Filter pack: #20-40 silica sand from 4.5' to 8.5'	Silt with Sand Sand with Silt Basalt End of Boring @ 8.5'

RECEIVED
JAN 03 2007
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
JAN 09 2008
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

RECEIVED
JAN -2 A 8:48
DEPT. OF ECOLOGY
FISCAL & BUDGET

5'
10'
15'

SCALE: 1"= _____

PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

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RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R69102

(SUBMIT ONE WELL REPORT PER WELL INSTALLED) 284360

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☑ Resource Protection

☐ Geotech Soil Boring

Consulting Firm Budinger and Associates, Inc.

Unique Ecology Well ID

Tag No. ALR 122 (MW-4)

Property Owner Spokane International Airport

Site Address _____

City Airway Heights County Spokane

Location SE 1/4-1/4 NW 1/4 Sec 28 Twn 25 R 42 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg 47 Lat Min/Sec 38' 12.4"

Long Deg 117 Long Min/Sec 30' 34.6"

☑ Driller ☐ Engineer ☐ Trainee Name (Print) Ethan Hageman

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. 2853

Tax Parcel No. _____

Cased or Uncased Diameter 8" Static Level 8'

Work/Decommission Start Date 11/8/07

Work/Decommission Completed Date 11/26/07

If trainee, licensed driller's Signature and License No. 2853

Construction/Design	Well Data	Formation Description
	Monument: 6" dia., 6' long steel set in concrete to 3' below grade with locking lid and bollards Riser: 2" schedule 40 pvc set to 7.5' with locking expansion plug Screen: 2" schedule 40 pvc (0.010" slot) set from 7.5' to 12.4' with end cap Seal: Bentonite from 3' to 5.5' Filter pack: #20-40 silica sand from 5.5' to 12.5'	Silt with Sand Sand with Silt 5' 10' Basalt End of Boring @ 12.5' 15'

RECEIVED
JAN 03 2007
DEPARTMENT OF ECOLOGY
WELL CONSTRUCTION UNIT

RECEIVED
JAN 09 2008
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

RECEIVED
8 JAN -2 A8:48
DEPT. OF ECOLOGY
FISCAL & BUDGET

SCALE: 1"= _____

PAGE 1 OF 1

ECY 050-12 (Rev. 2/03)

Ecology is an Equal Opportunity Employer.

Project: SIA Stormwater	**BORING NO. MW-5**
Project Location: North end of Runway 21	
Project Number: 36310018	Sheet 1 of 1

Location:				
N 47° 38' 8.2"	Date(s) Drilled	27-May-09	Logged By	J. Sugalski
W 117° 30' 6.6"	Drill Bit Size/ Type	Air Rotary	Total Borehole Depth	20
	Drilling Contractor	Budinger	Drill Rig Type	Mobile B57
	Sampling Method(s)	SPT	Hammer Data	120 # Auto
	Level/ Date Measured	5ft	Surface Elevation	Approx 2292

Elevation (ft) / Depth (ft)	SAMPLES Type	SAMPLES ID	SAMPLES Blows/ft	SAMPLES OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0						OL	Top Soil	
						SM	Light Brown SILT with some SAND	
1								
2						SW	Light brown medium to fine grain SAND with SILT. Moist	
3								
4								
5			4					Water @ 5 ft
			5					
6			6			SP	Olive gray medium grain clean SAND, obtained sample	
			8					
7								
8								
9						GP	Coarse GRAVEL or begin bedrock	
10			50+				No recovery	3" sampler could not penetrate
11								
12								
13						BR	Basalt rock strong, difficult drilling	
14								
15			50+				No recovery	
16								
17							Highly fractured weathered bedrock	
18							Well screened from 5 to 20ft. Sand from 4 to 20ft. Bentonite from 3 to 4ft	End boring at 20'
19								Well Installed

URS

Project: SIA Stormwater	BORING NO. MW-6
Project Location: North end of Runway 21	
Project Number: 36310018	Sheet 1 of 1

Location:	Date(s) Drilled	27-May-09	Logged By	J. Sugalski
N 47° 38' 13.8"	Drill Bit Size/ Type	Air Rotary	Total Borehole Depth	20
W 117° 30' 13.5"	Drilling Contractor	Budinger	Drill Rig Type	Mobile B57
	Sampling Method(s)	SPT	Hammer Data	120 # Auto
	Level/ Date Measured	9.5 ft	Surface Elevation	Approx 2293

Elevation (ft) / Depth (ft)	SAMPLES Type	ID	Blows/ft	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0						OL	Top Soil	
						SM	Brown SILT with some sand	
1								
2								
3								
4								
			X			SC	Light Brown clayey silty and SAND	
5			X				Sampled from 4.5 to 6.5ft	
			X					
6			X					
7						SP	Olive Gray medium clean SAND	
8								
9			3				Obtained sample	
			4					Water @ 9.5 ft
10			4					
11								
12								
13								
14								
15								
			4					
16			11				Obtained sample	
			14					
17						GW	Medium fine SAND and GRAVEL	
18								
						BR	Competent Bed Rock encountered at 18.5ft, very difficult drilling	End boring at 20'
19							Well screened from 5 to 20ft. Sand from 4 to 20 ft. Bentonite from 3 to 4ft	Well Installed

URS

P:\36310018 SIA Stormwater 09\Working\Additional Well Installation\MW-6 Installation.xls(Soil Boring Log)
7/23/2009

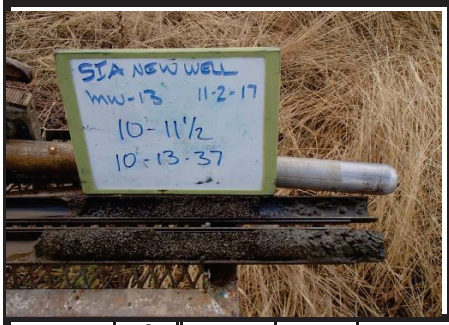
Project: SIA Stormwater	BORING NO. MW-7
Project Location: North end of Runway 21	
Project Number: 36310018	Sheet 1 of 1

Location:	Date(s) Drilled	27-May-09	Logged By	J. Sugalski
N 47° 38' 7.9"	Drill Bit Size/ Type	Air Rotary	Total Borehole Depth	20
W 117° 30' 59.7"	Drilling Contractor	Budinger	Drill Rig Type	Mobile B57
	Sampling Method(s)	SPT	Hammer Data	120 # Auto
	Level/ Date Measured	13.5 ft	Surface Elevation	

Elevation (ft) / Depth (ft)	SAMPLES Type	ID	Recvd	OVM (ppm)	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0						SW	Light Brown SAND with trace SILT and some GRAVEL, dry	
1								
2								
3								Difficult to drill
4						BR	Gray highly fractured basalt bedrock, dry	
5			50+					No Recovery
6								
7								
8								Drilling eases
9			50+					No Recovery
10								
11								
12						BR	Silty Black weathered bedrock with some sand	
13								
14								Water @ 13.5 ft
15								
16			50+					No Recovery
17								
18								
19								End boring at 19'
							Well screened from 5 to 19ft. Sand from 4 to 20 ft. Bentonite from 3 to 4ft	Well Installed

URS

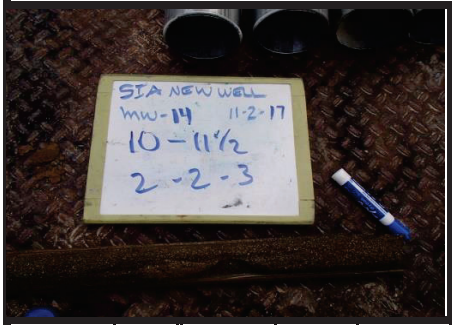
AECOM



AECOM Project Number: 60557313	Spokane International Airports, New Wells PFOA-PFOS Assessment	Boring Number: MW-13 Well Tag: BKP-258
Equipment Type/ model #: Mobile G-2400		Location NAD 83 47.6355 N, - 117.4977 W
Auger type/diameter: 8-inch Hollow Stem		
Contractor: Geologic Drill, LLC		
Sampling method: 2-inch SPT		Sheet 1 of 1
Hammer Weight: 140 Lbs		Above-Grade Monument
Free Fall: 30"		
Location of Boring: Approx. 185 feet W of east property line.		Time 830
Surface conditions/ Topsoil Depth: Grass-covered hillside.		Date 11/2/17

Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Material Description
2-2-6	100%	0		SM	Brown silty SAND with occasional gravel. Loose, Moist. With organics.
		1			
		2			
		3			
		4			
5-6-6	100%	5		SM	Brown silty SAND, Medium-dense, Moist.
		6		GM	Brown, silty GRAVEL with sand, Medium-dense, Wet.
		7			
		8			
		9		SP	Grey- brown SAND with trace silt, Medium-dense, Wet.
10-13-37	76%	10			
		11		RX	Basalt. Refusal at 11.5 feet bgs.
		12			
		13			Well constructed with 6-feet of 20-slot screen.
		14			
		15			
		16			
		17			
		18			
		19			
		20			
		21			Boring Completed at 11.5 feet BGS. Groundwater encountered at 6.8 feet bgs.

AECOM



AECOM Project Number: 60557313	Spokane International Airports, New Wells PFOA-PFOS Assessment	Boring Number: MW-14 Well Tag: BKP-259
Equipment Type/ model #: Mobile G-2400		Location NAD 83 47.6385 N, - 117.4981 W
Auger type/diameter: 8-inch Hollow Stem		
Contractor: Geologic Drill, LLC		
Sampling method: 2-inch SPT		Sheet 1 of 1
Hammer Weight: 140 Lbs		Above-Grade Monument
Free Fall: 30"		
Location of Boring: Approx. 300 feet W of east property line.		Time 1330
Surface conditions/ Topsoil Depth: Grass-covered.		Date 11/2/17

Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Material Description
2-2-4		0		SM	Brown silty SAND with occasional gravel. Loose, Moist. With organics.
		1			
		2			
		3			
		4			
3-4-5		5		SP	Grey- brown SAND with trace silt, Loose, Moist.
		6			
		7			
		8			
		9			
2-2-3		10		SP	Grey- brown SAND, Loose, Wet.
		11			
		12			
		13			
		14			
2-2-5		15		SP	Grey- brown SAND, Loose, Wet.
		16			Heaving sands-lost approximately 2-feet of boring. Boring terminated, well set.
		17			
		18			
		19			Completed well depth is 14.5- feet bgs.
		20			Well constructed with 10-feet of 20-slot screen.
		21			Boring Completed at 16.5-feet BGS. Groundwater encountered at 7.0 feet bgs.

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE 10445

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☒ Resource Protection

☐ Geotech Soil Boring

Consulting Firm URS

Unique Ecology Well ID Tag No. BHW-566 MW 321

Property Owner Spokane International Airport

Site Address South Spotted Rd

City Spokane County Spokane

Location SW 1/4-1/4 NE 1/4 Sec 28 Twn 25N R 42 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Randall E Wilder

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 2578

If trainee, licensed driller's Signature and License No. _____

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 25285.9011

Cased or Uncased Diameter _____ Static Level 8

Work/Decommission Start Date 9-9-14

Work/Decommission Completed Date 9-9-14

Construction/Design

6" Above Ground monument

2" locking cap

2' of concrete

5" 2" sch 40 PVC Riser

Top of sand pack

Top of 10' of 2" sch 40 PVC 010 screen

6" Borehole

2" Threaded Bottom cap

Well Data

Three Ballards

Bentonite seal

Formation Description

Silty Gravel

8

Basalt

15'

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OCT 10 2014

Department of Ecology
Eastern Regional Office

The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.

ECY 050-12 (Rev. 2/03) SCALE: 1"= __ Page ___ of ___ Ecology is an Equal Opportunity Employer.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. RE 10445

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well *(select one)*

☒ Resource Protection

☐ Geotech Soil Boring

Consulting Firm URS

Property Owner Spokane International Airport

Site Address South Spotted Rd

Unique Ecology Well ID Tag No. BHW-565 MW-A

City Spokane County Spokane

Location SW 1/4-1/4 NE 1/4 Sec 28 Twn 25N R 42 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____

Long Deg _____ Long Min/Sec _____

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Randall E Wilder

Tax Parcel No. 25285.9011

Driller/Engineer /Trainee Signature _____

Cased or Uncased Diameter _____ Static Level 8

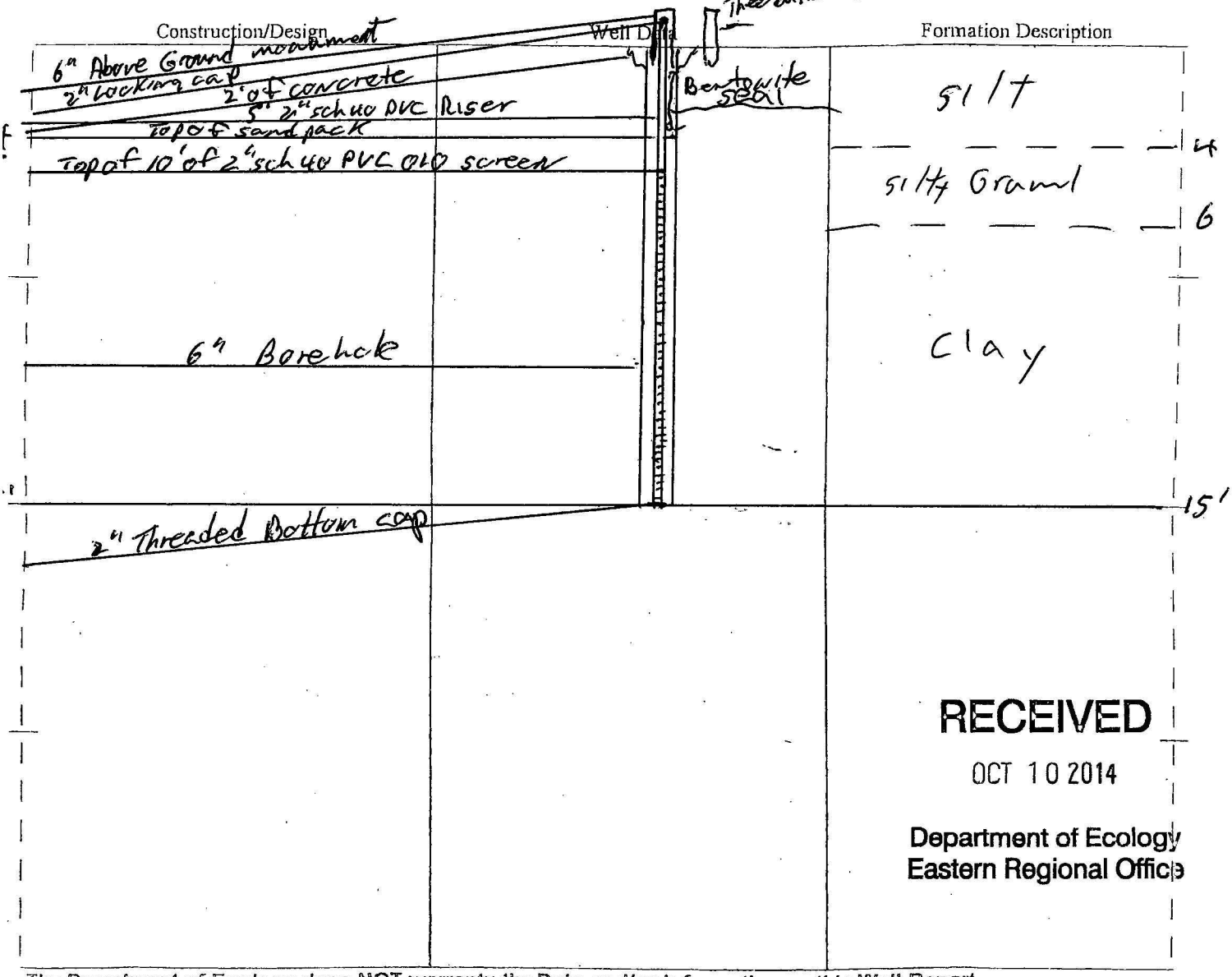
Driller or Trainee License No. 2578

Work/Decommission Start Date 9-9-14

If trainee, licensed driller's Signature and License No. _____

Work/Decommission Completed Date 9-9-14

Construction/Design



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OCT 10 2014

Department of Ecology
Eastern Regional Office

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ECY 050-12 (Rev. 2/03) SCALE: 1"= __ Page ___ of ___ Ecology is an Equal Opportunity Employer.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

					SES Project Number: 0270-001	Spokane International Airports, New Wells PFOA-PFOS Assessment
					Equipment Type/ model #: Mobile G-2400	
					Auger type/diameter: 8-inch Hollow Stem	
					Contractor: Geologic Drill, LLC	
					Sampling method: 2-inch SPT	
					Hammer Weight: 140 Lbs	
					Free Fall: 30"	
Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Location of Boring: West of SE Ammo Storage Road.	
					Surface conditions/ Topsoil Depth: Grass-covered.	
					Material Description	
2-2-4	80%	0		GM	Brown silty GRAVEL with sand. Loose, Dry. With organics.	
		1				
		2				
		3				
		4				
3-10-9	50%	5		GP	Grey- brown GRAVEL with trace silt, Loose, Moist.	
		6				
		7				
		8				
		9				
6-10-9	50%	10		GP	Grey- brown GRAVEL with trace silt, Loose, Wet.	
		11				
		12				
		13				
		14				
		15				
		16				
		17				
		18				
		19			Completed well depth is 12.0- feet bgs.	
		20			Well constructed with 5-feet of 20-slot screen.	
		21			Boring Completed at 12-feet BGS. Groundwater encountered at 10.0 feet bgs.	

Boring Number: MW-15 Well Tag: BKP-260	
Location NAD 83 47.622229 N, -117.552446 W	
Sheet 1 of 1	
Above-Grade Monument	
Time 800	
Date 7/31/18	

					SES Project Number: 0270-001	Spokane International Airports, New Wells PFOA-PFOS Assessment	Boring Number: MW-16 Well Tag: BKP-263
					Equipment Type/ model #: Mobile G-2400		Location NAD 83 47.611527 N, -117.558968 W
					Auger type/diameter: 8-inch Hollow Stem		
					Contractor: Geologic Drill, LLC		
					Sampling method: 2-inch SPT		Sheet 1 of 1
					Hammer Weight: 140 Lbs		Above-Grade Monument
					Free Fall: 30"		
Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Location of Boring: East of S. Center Road.		Time 700
					Surface conditions/ Topsoil Depth: Grass-covered.		
							Date 7/30/18
					Material Description		
2-3-2	8%	0		SM	Brown silty SAND with occasional gravel. Loose, Moist. With organics.		
		1					
		2					
		3					
		4					
6-7-7	8%	5		SM	Grey- brown SAND with trace silt, Loose, Moist.		
		6					
		7					
50/0	0%	8		RX	Refusal on Basalt.		
		9					
		10					
		11					
		12					
		13					
		14					
		15					
		16					
		17					
		18					
		19			Completed well depth is 8.5- feet bgs.		
		20			Well constructed with 2.5-feet of 20-slot screen.		
		21			Boring Completed at 8.5-feet BGS. Groundwater was not encountered.		

SES Project Number: 0270-001	Spokane International Airports, New Wells PFOA-PFOS Assessment	Boring Number: MW-17 Well Tag: BKP-262
Equipment Type/ model #: Mobile G-2400		Location NAD 83 47.604917 N, -117.552602 W
Auger type/diameter: 8-inch Hollow Stem		
Contractor: Geologic Drill, LLC		
Sampling method: 2-inch SPT		Sheet 1 of 1
Hammer Weight: 140 Lbs		Above-Grade Monument
Free Fall: 30"		
Location of Boring: South of W. Electric Avenue.		Time 1000
Surface conditions/ Topsoil Depth: Grass-covered.		
		Date 7/30/18

Blow Counts	Recovery %	Depth in Feet	Graphic Log	Soil Graph/ USCS	Material Description
		0		SM	Brown silty SAND with occasional gravel. Loose, Moist. With organics.
		1			
		2			
		3			
		4			
3-3-4	80%	5		SP	Grey- brown SAND with trace silt, Loose, Moist.
		6			
		7			
		8			
		9			
11-11-19	70%	10		SP	Grey- brown SAND with occasional gravel, Medium-dense, Moist.
		11			
		12			
		13			
		14			
15-19-26	80%	15		SP	Grey- brown SAND with occasional gravel, Medium-dense, Wet.
		16			
		17			
		18			
		19			
10-11-12	90%	20		SM	Brown silty SAND with occasional gravel. Medium-dense, Wet.
		21			Completed well depth is 25.0- feet bgs. Well constructed with 10-feet of 20-slot screen. Boring Completed at 25.0-feet BGS. Groundwater encountered at 15.5 feet bgs.