

**MONTHLY PROGRESS REPORT #275
FOR FEBRUARY 2020**

EPA REGION I ADMINISTRATIVE ORDERS SDWA 1-97-1019 and 1-2000-0014

**JOINT BASE CAPE COD (JBCC)
TRAINING RANGE AND IMPACT AREA**

The following summary of progress is for the period from 1 February to 29 February 2020.

1. SUMMARY OF REMEDIATION ACTIONS

The following is a description of Remediation Actions (RA) underway at Camp Edwards as of February 2020.

Demolition Area 1 Comprehensive Groundwater RA

The Demolition Area 1 Comprehensive Groundwater RA consists of the removal and treatment of contaminated groundwater to control further migration of explosives compounds and perchlorate. Extraction, treatment, and recharge (ETR) systems at Frank Perkins Road, Pew Road, Base Boundary, and the Leading Edge include extraction wells, ex-situ treatment processes to remove explosives compounds and perchlorate from the groundwater, and injection wells to return treated water to the aquifer.

The Frank Perkins Road Treatment Facility has been optimized as part of the Environmental and System Performance Monitoring (ESPM) program at Demolition Area 1. The treatment facility continues to operate at a flow rate of 175 gpm, with over 2.714 billion gallons of water treated and re-injected as of 29 February 2020. The following shutdown(s) of the Frank Perkins Road Treatment Facility occurred during February.

- EW-658 shut down at 0844 on 04 February 2020 due to a JBCC power outage, and was restarted at 0930 on 04 February 2020.
- EW-658 shut down at 1510 on 04 February 2020 due to a JBCC power outage, and was restarted at 1615 on 04 February 2020.
- EW-431 shut down at 1510 on 04 February 2020 due to a JBCC power outage, and was restarted at 1715 on 05 February 2020.

The Pew Road Mobile Treatment Unit (MTU) continues to operate at a flow rate of 65 GPM, with over 639.8 million gallons of water treated and re-injected as of 29 February 2020. The following shutdowns of the Pew Road MTU occurred during February.

- The MTU shut down at 0844 on 04 February 2020 due to a JBCC power outage, and was restarted at 0959 on 04 February 2020.
- The MTU shut down at 1510 on 04 February 2020 due to a JBCC power outage, and was restarted at 0826 on 05 February 2020.
- The MTU shut down at 0431 on 16 February 2020 due to a Groundwater Pump Fault, and was restarted at 0749 on 18 February 2020.

The Base Boundary MTU continues to operate at a flow rate of 65 gpm, with over 256.5 million gallons of water treated and re-injected as of 29 February 2020. No shutdowns of the Base Boundary MTU occurred during February.

The Leading Edge system continues to operate at a flow rate of 100 gpm, with over 186.0 million gallons of water treated and re-injected as of 29 February 2020. The following shutdown(s) of the Leading Edge system occurred during February:

- The MTU shut down at 1532 on 08 February 2020 due to a Phase/Voltage alarm caused by a power outage, and was restarted at 0803 on 10 February 2020.

J-2 Range Groundwater RA

Northern Plant

The J-2 Range Northern Treatment facility consists of removal and treatment of contaminated groundwater to control further migration of explosives compounds and perchlorate. The Extraction, Treatment, and Re-infiltration system includes three extraction wells, ex-situ treatment process to remove explosives compounds and perchlorate from the groundwater, and an infiltration basin to return treated water to the aquifer.

The Northern Treatment Building continues to operate at a flow rate of 225 gpm. As of 29 February 2020, over 1.219 billion gallons of water have been treated and re-injected. No shutdown(s) of the Northern Treatment Building occurred in February.

The Northern MTUs E and F continue to operate at a flow rate of 250 gpm. As of 29 February 2020, over 1.668 billion gallons of water have been treated and re-injected. The following shutdown(s) of the J-2 Range Northern system occurred during February:

- MTU F shut down at 1600 on 04 February 2020 without an alarm, possibly due to a communications error between the extraction well and the MTU, and was restarted at 0802 on 05 February 2020.

Eastern Plant

The J-2 Range Eastern Treatment facility consists of removal and treatment of groundwater to minimize downgradient migration of explosives compounds and perchlorate. The ETI system includes the following components: three extraction wells in an axial array, an ex-situ treatment process consisting of an ion exchange (IX) resin and granular activated carbon (GAC) media to treat perchlorate and explosives compounds, and three infiltration trenches located along the lateral boundaries of the plume where treated water will enter the vadose zone and infiltrate into the aquifer. The J-2 Range Eastern system is running at a combined total flow rate of 495 gpm.

The MTUs H and I continue to operate at a flow rate of 250 gpm. As of 29 February 2020, over 1.329 billion gallons of water have been treated and re-injected. No shutdown(s) of MTUs H and I occurred during February.

MTU J continues to operate at a flow rate of 120 gpm. As of 29 February 2020, over 608.7 million gallons of water have been treated and re-injected. No shutdown(s) of MTU J occurred during February.

MTU K continues to operate at a flow rate of 125 gpm. As of 29 February 2020, over 726.6 million gallons of water have been treated and re-injected. No shutdown(s) of MTU K occurred during February.

J-3 Range Groundwater RA

The J-3 Range Groundwater RA consists of removal and treatment of contaminated groundwater to control further migration of explosives compounds and perchlorate. The ETR system includes four extraction wells, ex-situ treatment process to remove explosives compounds and perchlorate from the groundwater, and use of the existing Fuel Spill-12 (FS-12) infiltration gallery to return treated water to the aquifer.

The J-3 system is currently operating at 255 gpm. As of 29 February 2020, over 1.331 billion gallons of water have been treated and re-injected. The following shutdowns of the J-3 Range system occurred during February:

- The system shut down at 1315 on 07 February 2020 due to a power outage, and was restarted at 1108 on 10 February 2020.
- The System shut down at 0804 on 24 February 2020 due to a power outage, and was restarted at 1015 on 24 February 2020.

J-1 Range Groundwater RA

Southern Plant

The J-1 Range Southern Groundwater RA consists of removal and treatment of contaminated groundwater to control further migration of explosives compounds. The ETR system includes two extraction wells, ex-situ treatment process to remove explosives compounds from the groundwater, and an infiltration trench to return treated water to the aquifer.

The Southern MTU continues to operate at a flow rate of 125 gpm. As of 29 February 2020, over 585.6 million gallons of water have been treated and re-injected. No shutdown(s) of the J-1 Range Southern system occurred during February.

Northern Plant

The J-1 Range Northern Groundwater RA consists of removal and treatment of contaminated groundwater to control further migration of explosives compounds and perchlorate. The ETR system includes two extraction wells, ex-situ treatment process to remove explosives compounds and perchlorate from the groundwater, and an infiltration trench to return treated water to the aquifer.

The Northern MTU continues to operate at a total system flow rate of 250 gpm. As of 29 February 2020, over 806.1 million gallons of water have been treated and re-injected. No shutdown(s) of the J-1 Range Northern MTU occurred during February.

Central Impact Area RA

The Central Impact Area (CIA) Groundwater treatment facility consists of removal and treatment of groundwater to minimize downgradient migration of explosives compounds and perchlorate. The ETR system includes the following components: three extraction wells, an ex-situ treatment process consisting of an ion exchange (IX) resin and granular activated carbon (GAC) media to treat explosives compounds, and three infiltration galleries to return treated water to the aquifer. The CIA systems 1, 2, and 3 continue to run at a combined total flow rate of 750 gpm. As of 29 February 2020, over 1.989 billion gallons of water have been treated and re-injected, and the following shutdowns facility occurred during February:

- System 1 shut down at 0738 on 04 February 2020 due to a JBCC power outage, and was restarted at 0805 on 05 February 2020.
- System 2 shut down at 0738 on 04 February 2020 due to a JBCC power outage, and was restarted at 0752 on 05 February 2020.

SUMMARY OF ACTIONS TAKEN

CIA

- Performed routine inspections of BEM cover to ensure cover is secure and intact.
- Monthly system process samples were collected on 06 February 2020.
- Frank Perkins Treatment Facility bag filters were exchanged on 11 February 2020, and a bag filter pressure gage replaced on 12 February 2020.
- Completed well pad clearance to detection depth
- Groundwater sampling within the CIA SPM program.

Demolition Area 1

- Monthly system process samples were collected on 03 February 2020.
- Bag filters were exchanged on 11 February 2020.
- First, focused, post-packer of D1-EW-5 hydraulic event was completed for the Leading Edge on 25 February 2020.

Demolition Area 2

- No activity.

J-1 Range

- Monthly system process samples were collected on 04 and 05 February 2020.
- J-1 South MTU bag filters were exchanged on 25 February 2020.

J-2 Range

- Reset frozen stabilizer at Building G on 3 February 2020.
- Monthly system process samples were collected on 04 and 05 February 2020.
- Replaced four fiber optic network switches (one each for the MTUs and extraction wells) on 10 February 2020.
- MTU E bag filters were exchanged on 12 February 2020.

J-3 Range

- Monthly system process samples were collected on 05 February 2020.
- Completed EM-61 Survey at four ¼-acre Barrage Rocket Area grids
- System bag filters were exchanged on 19 February 2020.

L Range

- No activity.

Small Arms Ranges

- No activity.

Training Areas

- Completed soil excavation and screening at KD Range Primary Target Grid.
- Collected post-excavation ISM samples at KD Range Primary Target Grid.
- Installed Instrument Verification Strip (IVS) in support of future geophysical surveys.
- Performed EM-61 Survey at Former E Range 20-acre Investigation Area.

Other

- Process water samples were collected from Central Impact Area, Demolition Area 1, J1 Range Northern, J1 Range Southern, J2 Range Eastern, J2 Range Northern, and J3 Range.
- Groundwater samples were collected from the Central Impact Area.
- Soil samples were collected from the KD Range.

JBCC IAGWSP Tech Update Meeting Minutes 27 February 2020**Project and Fieldwork Update**

All treatment systems are up and running and there was no breakthrough this month. Long term monitoring sampling is underway in the Central Impact Area. There is no concrete date for the drill rig to mobilize for the wells in the CIA but it is estimated to be in late March/early April.

In the Training Areas, Dawson completed excavation of the 35'x 35' grid around the primary target at the KD Range. Post-excavation samples were collected and results are expected around March 8th. They screened the stockpile (45 cubic yards) for UXO at the H Range. UXO clearance of well pads in the CIA was completed. Items recovered included a 155 liter round (8" deep) and a 4.2" mortar (4' deep). At the J-3 Range, Dawson cut vegetation, blind seeds were installed and the EM-61 survey was completed. The EM-61 crews have moved to the Former E Range where they will focus their efforts for the next several weeks. There is no fieldwork associated with the Small Arms Ranges; a completion of work report is being prepared.

Currently, there is no UXO fieldwork in the Central Impact Area. Crews will return to the site sometime in mid-March/early April (weather permitting). When they first return to the site, they will complete fieldwork from 2019 namely BIPs, consolidated shot and a few digs around BIPs. Once they finish the last few BEM shots, they will sample and inspect the liner. EPA and MassDEP will try to provide feedback on areas to be investigated in 2020 as soon as possible so that they are ready when the crews mobilize to the site.

Action Items

The action items were discussed and updated.

JBCC Cleanup Team Meeting

The next meeting of the JBCC Cleanup Team (JBCCCT) is scheduled for 11 March 2020 (previous meeting was 9 October 2019). The Cleanup Team meeting discusses late breaking news and responses to action items, as well as updates from the IAGWSP and the Installation Restoration Program (IRP). The

JBCCCT meetings provide a forum for community input regarding issues related to both the IRP and the IAGWSP.

SUMMARY OF DATA RECEIVED

Table 1 summarizes sampling for all media from 1 February to 29 February 2020. Table 2 summarizes the validated detections of explosives compounds and perchlorate for all groundwater results received from 1 February to 29 February 2020. These results are compared to the Maximum Contaminant Levels/Health Advisory (MCL/HA) values for respective analytes. Explosives and perchlorate are the primary contaminants of concern (COC) at Camp Edwards. Table 3 summarizes sampling of influent and groundwater samples for per- and polyfluoroalkyl substances (PFAS) from 16 June 2019 to present.

Twelve operable units (OU) are under investigation and cleanup at Camp Edwards. The OUs include: Central Impact Area, Demolition Area 1, Demolition Area 2, Former A Range, J-1 Range, J-2 Range, J-3 Range, L Range, Northwest Corner, Small Arms Ranges, Training Area, and Western Boundary. Environmental monitoring reports for each OU are generated each year to evaluate the current year groundwater results. These reports are available on the site Environmental Data Management System (EDMS) and at the project document repositories (IAGWSP office and Jonathan Bourne Library).

2. DELIVERABLES SUBMITTED

Deliverables submitted during the reporting period include the following:

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|---|------------------|
| • Monthly Progress Report No. 274 for January 2020 | 11 February 2020 |
| • Draft 2019 Central Impact Area Source Removal Annual Report | 12 February 2020 |
| • Final J-3 Range 2019 Annual Environmental Monitoring Report | 18 February 2020 |

3. SCHEDULED ACTIONS

The following documents are being prepared or revised during February 2020:

- 2019 Source Report
- Central Impact Area Environmental Monitoring Report
- Five-Year Review Report
- Project Note for J-2 Range PFAS detections
- Draft J-2 Range Eastern and J-2 Range Northern 2019 Environmental Monitoring Report
- Demonstration of Compliance Report for Northwest Corner
- Updated 2018 Source Report to include re-digs

TABLE 1
Sampling Progress: 1 February to 31 February 2020

Area Of Concern	Location	Field Sample ID	Sample Type	Date Sampled	Matrix	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
Central Impact Area	MW-89M3	MW-89M3_S20	N	02/27/2020	Ground Water	174	184
Central Impact Area	MW-89M2	MW-89M2_S20	N	02/27/2020	Ground Water	214	224
Central Impact Area	MW-89M2	MW-89M2_S20D	FD	02/27/2020	Ground Water	214	224
Central Impact Area	MW-89M1	MW-89M1_S20	N	02/27/2020	Ground Water	234	244
Central Impact Area	MW-208M1	MW-208M1_S20	N	02/26/2020	Ground Water	195	205
Central Impact Area	MW-105M1	MW-105M1_S20	N	02/26/2020	Ground Water	205	215
Central Impact Area	MW-85S	MW-85S_S20	N	02/26/2020	Ground Water	116	126
Central Impact Area	MW-115S	MW-115S_S20	N	02/26/2020	Ground Water	116	126
Central Impact Area	MW-115M1	MW-115M1_S20	N	02/26/2020	Ground Water	138	148
Central Impact Area	MW-111M1	MW-111M1_S20	N	02/25/2020	Ground Water	224	234
Central Impact Area	MW-88M2	MW-88M2_S20	N	02/25/2020	Ground Water	213	223
Central Impact Area	MW-88M2	MW-88M2_S20D	FD	02/25/2020	Ground Water	213	223
Central Impact Area	MW-88M1	MW-88M1_S20	N	02/25/2020	Ground Water	233	243
Central Impact Area	MW-179M1	MW-179M1_S20	N	02/24/2020	Ground Water	187	197
Central Impact Area	MW-91S	MW-91S_S20	N	02/24/2020	Ground Water	124	134
Central Impact Area	MW-91S	MW-91S_S20D	FD	02/24/2020	Ground Water	124	134
Central Impact Area	MW-91M1	MW-91M1_S20	N	02/24/2020	Ground Water	170	180
Central Impact Area	MW-91M1	MW-91M1_S20D	FD	02/24/2020	Ground Water	170	180
Central Impact Area	OW-1	OW-1_S20	N	02/24/2020	Ground Water	126	136
Central Impact Area	OW-1	OW-1_S20D	FD	02/24/2020	Ground Water	126	136
Central Impact Area	OW-2	OW-2_S20	N	02/24/2020	Ground Water	175	185
Central Impact Area	MW-180M3	MW-180M3_S20	N	02/20/2020	Ground Water	171	181
Central Impact Area	MW-95M2	MW-95M2_S20	N	02/20/2020	Ground Water	167	177
Central Impact Area	MW-95M1	MW-95M1_S20	N	02/20/2020	Ground Water	202	212
Central Impact Area	MW-629M2	MW-629M2_S20	N	02/20/2020	Ground Water	186.9	196.9
Central Impact Area	MW-629M1	MW-629M1_S20	N	02/20/2020	Ground Water	216.9	226.9
Central Impact Area	MW-184M1	MW-184M1_S20	N	02/19/2020	Ground Water	186	196
Central Impact Area	MW-184M1	MW-184M1_S20D	FD	02/19/2020	Ground Water	186	196
Central Impact Area	MW-93M2	MW-93M2_S20	N	02/19/2020	Ground Water	145	155
Central Impact Area	MW-93M1	MW-93M1_S20	N	02/19/2020	Ground Water	185	195
Central Impact Area	MW-101S	MW-101S_S20	N	02/19/2020	Ground Water	131	141
Central Impact Area	MW-101M1	MW-101M1_S20	N	02/19/2020	Ground Water	158	168
Central Impact Area	MW-101M1	MW-101M1_S20D	FD	02/19/2020	Ground Water	158	168
Central Impact Area	MW-100M2	MW-100M2_S20	N	02/18/2020	Ground Water	164	174
Central Impact Area	MW-100M1	MW-100M1_S20	N	02/18/2020	Ground Water	179	189
Central Impact Area	MW-99S	MW-99S_S20	N	02/18/2020	Ground Water	133	143
Central Impact Area	MW-99M1	MW-99M1_S20	N	02/18/2020	Ground Water	195	205
Central Impact Area	MW-695S	MW-695S_S20	N	02/18/2020	Ground Water	130	140
Central Impact Area	MW-92S	MW-92S_S20	N	02/13/2020	Ground Water	139	149
Central Impact Area	MW-98S	MW-98S_S20	N	02/13/2020	Ground Water	137	147
Central Impact Area	MW-98M1	MW-98M1_S20	N	02/13/2020	Ground Water	164	174
Central Impact Area	MW-638M2	MW-638M2_S20	N	02/13/2020	Ground Water	204.2	214.2
Central Impact Area	MW-638M1	MW-638M1_S20	N	02/13/2020	Ground Water	261.2	271.2
Central Impact Area	MW-43M2	MW-43M2_S20	N	02/12/2020	Ground Water	200	210
Central Impact Area	MW-43M1	MW-43M1_S20	N	02/12/2020	Ground Water	223	233
Central Impact Area	MW-86S	MW-86S_S20	N	02/12/2020	Ground Water	143	153
Central Impact Area	MW-86M2	MW-86M2_S20	N	02/12/2020	Ground Water	158	168
Central Impact Area	MW-86M1	MW-86M1_S20	N	02/12/2020	Ground Water	208	218
Central Impact Area	MW-39M1	MW-39M1_S20	N	02/11/2020	Ground Water	220	230
Central Impact Area	MW-203M2	MW-203M2_S20	N	02/11/2020	Ground Water	176	186
Central Impact Area	MW-03M2	MW-03M2_S20	N	02/11/2020	Ground Water	180	185
Central Impact Area	MW-204M2	MW-204M2_S20	N	02/11/2020	Ground Water	76	86
Central Impact Area	MW-204M1	MW-204M1_S20	N	02/11/2020	Ground Water	141	151
Central Impact Area	MW-204M1	MW-204M1_S20D	FD	02/11/2020	Ground Water	141	151
Central Impact Area	MW-96M2	MW-96M2_S20	N	02/10/2020	Ground Water	160	170
Central Impact Area	MW-96M1	MW-96M1_S20	N	02/10/2020	Ground Water	206	216
Central Impact Area	MW-185M1	MW-185M1_S20	N	02/10/2020	Ground Water	247	257
Central Impact Area	MW-442M2	MW-442M2_S20	N	02/10/2020	Ground Water	215.3	225.3
KD Range	SSKD0004	KD0004_PE_30C	FR	02/10/2020	Soil	0	0.25

N = Normal Sample
FD = Field Duplicate

TABLE 1
Sampling Progress: 1 February to 31 February 2020

Area Of Concern	Location	Field Sample ID	Sample Type	Date Sampled	Matrix	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
KD Range	SSKD0004	KD0004_PE_30B	FR	02/10/2020	Soil	0	0.25
KD Range	SSKD0004	KD0004_PE_30A	N	02/10/2020	Soil	0	0.25
Central Impact Area	MW-442M1	MW-442M1_S20	N	02/10/2020	Ground Water	247.6	257.6
Central Impact Area	MW-486M1	MW-486M1_S20	N	02/06/2020	Ground Water	185.7	195.7
Central Impact Area	MW-01S	MW-01S_S20	N	02/06/2020	Ground Water	114	124
Central Impact Area	CIA2-EFF	CIA2-EFF-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA2-MID2	CIA2-MID2-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA2-MID1	CIA2-MID1-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA2-INF	CIA2-INF-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	MW-01M2	MW-01M2_S20	N	02/06/2020	Ground Water	160	165
Central Impact Area	CIA1-EFF	CIA1-EFF-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA1-MID2	CIA1-MID2-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	MW-90S	MW-90S_S20	N	02/06/2020	Ground Water	118	128
Central Impact Area	MW-90S	MW-90S_S20D	FD	02/06/2020	Ground Water	118	128
Central Impact Area	CIA1-MID1	CIA1-MID1-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA1-INF	CIA1-INF-73A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA3-EFF	CIA3-EFF-44A	N	02/06/2020	Process Water	0	0
Central Impact Area	MW-90M1	MW-90M1_S20	N	02/06/2020	Ground Water	145	155
Central Impact Area	CIA3-MID2	CIA3-MID2-44A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA3-MID1	CIA3-MID1-44A	N	02/06/2020	Process Water	0	0
Central Impact Area	CIA3-INF	CIA3-INF-44A	N	02/06/2020	Process Water	0	0
Central Impact Area	MW-112M2	MW-112M2_S20	N	02/05/2020	Ground Water	165	175
J1 Range Southern	J1S-EFF	J1S-EFF-147A	N	02/05/2020	Process Water	0	0
J1 Range Southern	J1S-MID	J1S-MID-147A	N	02/05/2020	Process Water	0	0
J1 Range Southern	J1S-INF-2	J1S-INF-2-147A	N	02/05/2020	Process Water	0	0
Central Impact Area	MW-112M1	MW-112M1_S20	N	02/05/2020	Ground Water	195	205
J3 Range	J3-EFF	J3-EFF-161A	N	02/05/2020	Process Water	0	0
J3 Range	J3-MID-2	J3-MID-2-161A	N	02/05/2020	Process Water	0	0
J3 Range	J3-MID-1	J3-MID-1-161A	N	02/05/2020	Process Water	0	0
J3 Range	J3-INF	J3-INF-161A	N	02/05/2020	Process Water	0	0
Central Impact Area	MW-113M2	MW-113M2_S20	N	02/05/2020	Ground Water	190	200
Central Impact Area	MW-113M1	MW-113M1_S20	N	02/05/2020	Ground Water	240	250
J2 Range Eastern	J2E-EFF-K	J2E-EFF-K-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-2K	J2E-MID-2K-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-1K	J2E-MID-1K-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-INF-K	J2E-INF-K-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-EFF-J	J2E-EFF-J-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-2J	J2E-MID-2J-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-1J	J2E-MID-1J-137A	N	02/05/2020	Process Water	0	0
Central Impact Area	MW-38M4	MW-38M4_S20	N	02/05/2020	Ground Water	132	142
J2 Range Eastern	J2E-INF-J	J2E-INF-J-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-EFF-IH	J2E-EFF-IH-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-2H	J2E-MID-2H-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-1H	J2E-MID-1H-137A	N	02/05/2020	Process Water	0	0
Central Impact Area	MW-38M3	MW-38M3_S20	N	02/05/2020	Ground Water	170	180
J2 Range Eastern	J2E-MID-2I	J2E-MID-2I-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-MID-1I	J2E-MID-1I-137A	N	02/05/2020	Process Water	0	0
J2 Range Eastern	J2E-INF-I	J2E-INF-I-137A	N	02/05/2020	Process Water	0	0
Central Impact Area	MW-25	MW-25_S20	N	02/04/2020	Ground Water	108	118
Central Impact Area	MW-485M1	MW-485M1_S20	N	02/04/2020	Ground Water	125.32	135.32
Central Impact Area	MW-485M1	MW-485M1_S20D	FD	02/04/2020	Ground Water	125.32	135.32
J2 Range Northern	J2N-EFF-EF	J2N-EFF-EF-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-2F	J2N-MID-2F-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-1F	J2N-MID-1F-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-INF-EF	J2N-INF-EF-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-2E	J2N-MID-2E-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-1E	J2N-MID-1E-161A	N	02/04/2020	Process Water	0	0
Central Impact Area	MW-477M2	MW-477M2_S20	N	02/04/2020	Ground Water	145.62	155.62
Central Impact Area	MW-477M2	MW-477M2_S20D	FD	02/04/2020	Ground Water	145.62	155.62

N = Normal Sample
FD = Field Duplicate

TABLE 1
Sampling Progress: 1 February to 31 February 2020

Area Of Concern	Location	Field Sample ID	Sample Type	Date Sampled	Matrix	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)
J2 Range Northern	J2N-EFF-G	J2N-EFF-G-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-2G	J2N-MID-2G-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-MID-1G	J2N-MID-1G-161A	N	02/04/2020	Process Water	0	0
J2 Range Northern	J2N-INF-G	J2N-INF-G-161A	N	02/04/2020	Process Water	0	0
Central Impact Area	MW-477M1	MW-477M1_S20	N	02/04/2020	Ground Water	187.53	197.53
J1 Range Northern	J1N-EFF	J1N-EFF-76A	N	02/04/2020	Process Water	0	0
J1 Range Northern	J1N-MID2	J1N-MID2-76A	N	02/04/2020	Process Water	0	0
Central Impact Area	MW-27	MW-27_S20	N	02/04/2020	Ground Water	117	127
J1 Range Northern	J1N-MID1	J1N-MID1-76A	N	02/04/2020	Process Water	0	0
J1 Range Northern	J1N-INF2	J1N-INF2-76A	N	02/04/2020	Process Water	0	0
Central Impact Area	MW-44M1	MW-44M1_S20	N	02/03/2020	Ground Water	182	192
Central Impact Area	MW-02M2	MW-02M2_S20	N	02/03/2020	Ground Water	170	175
Demolition Area 1	PR-EFF	PR-EFF-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	PR-MID-2	PR-MID-2-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	PR-MID-1	PR-MID-1-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	PR-INF	PR-INF-167A	N	02/03/2020	Process Water	0	0
Central Impact Area	MW-02M1	MW-02M1_S20	N	02/03/2020	Ground Water	212	217
Demolition Area 1	D1-EFF	D1-EFF-115A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1-MID-2	D1-MID-2-115A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1-MID-1	D1-MID-1-115A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1-INF	D1-INF-115A	N	02/03/2020	Process Water	0	0
Central Impact Area	MW-40S	MW-40S_S20	N	02/03/2020	Ground Water	115.5	126
Demolition Area 1	D1LE-EFF	D1LE-EFF-43A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1LE-MID2	D1LE-MID2-43A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1LE-MID1	D1LE-MID1-43A	N	02/03/2020	Process Water	0	0
Demolition Area 1	D1LE-INF	D1LE-INF-43A	N	02/03/2020	Process Water	0	0
Central Impact Area	MW-40M1	MW-40M1_S20	N	02/03/2020	Ground Water	132.5	142.5
Central Impact Area	MW-107M2	MW-107M2_S20	N	02/03/2020	Ground Water	125	135
Demolition Area 1	FPR-2-EFF-A	FPR-2-EFF-A-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	FPR-2-GAC-MID1A	FPR-2-GAC-MID1A-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	FPR2-POST-IX-A	FPR2-POST-IX-A-167A	N	02/03/2020	Process Water	0	0
Demolition Area 1	FPR-2-INF	FPR-2-INF-167A	N	02/03/2020	Process Water	0	0

N = Normal Sample
FD = Field Duplicate

TABLE 2
VALIDATED EXPLOSIVE AND PERCHLORATE RESULTS
Data Received February 2020

Area of Concern	Location ID	Field Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Date Sampled	Test Method	Analyte	Result Value	Qualifier	Units	MCL/HA	> MCL/HA	MDL	RL
J2 Range Northern	J2EW0003	J2EW0003_S20	202	232	01/14/2020	SW6850	Perchlorate	0.38		µg/L	2.0		0.027	0.20
J2 Range Northern	J2EW0002	J2EW0002_S20	198	233	01/14/2020	SW6850	Perchlorate	4.2		µg/L	2.0	X	0.027	0.20
J2 Range Northern	J2EW0001	J2EW0001_S20	179	234	01/14/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.061	J	µg/L	0.60		0.034	0.20
J2 Range Northern	J2EW0001	J2EW0001_S20	179	234	01/14/2020	SW6850	Perchlorate	0.86		µg/L	2.0		0.027	0.20
L Range	MW-242M1	MW-242M1_S20	235	245	01/13/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.13	J	µg/L	0.60		0.034	0.20
L Range	MW-650M1	MW-650M1_S20	260	270	01/13/2020	SW8330	2,4,6-Trinitrotoluene	0.14	J	µg/L	2.0		0.041	0.20
L Range	MW-650M1	MW-650M1_S20	260	270	01/13/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.15	J	µg/L	0.60		0.034	0.20
L Range	90MW0031	90MW0031_S20	195.32	200.22	01/13/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.063	J	µg/L	400		0.036	0.20
L Range	90MW0031	90MW0031_S20	195.32	200.22	01/13/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.41	J	µg/L	0.60		0.034	0.20
L Range	MW-651M1	MW-651M1_S20	242.3	252.3	01/09/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.71		µg/L	0.60	X	0.034	0.20
L Range	MW-595M1	MW-595M1_S20	255.3	265.3	01/09/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	2.0		µg/L	0.60	X	0.034	0.20
L Range	MW-595M1	MW-595M1_S20D	255.3	265.3	01/09/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.9		µg/L	0.60	X	0.034	0.20
J3 Range	MW-637M2	MW-637M2_S20	214.1	224.1	01/08/2020	SW6850	Perchlorate	2.5		µg/L	2.0	X	0.027	0.20
J3 Range	MW-637M2	MW-637M2_S20D	214.1	224.1	01/08/2020	SW6850	Perchlorate	2.4		µg/L	2.0	X	0.027	0.20
J3 Range	J3EW0032	J3EW0032_S20	102	152	01/07/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.14	J	µg/L	400		0.036	0.20
J3 Range	J3EW0032	J3EW0032_S20	102	152	01/07/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.44		µg/L	0.60		0.034	0.20
J3 Range	J3EW0032	J3EW0032_S20	102	152	01/07/2020	SW6850	Perchlorate	0.51		µg/L	2.0		0.027	0.20
J3 Range	J3EW0032	J3EW0032_S20D	102	152	01/07/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.15	J	µg/L	400		0.036	0.20
J3 Range	J3EW0032	J3EW0032_S20D	102	152	01/07/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.43		µg/L	0.60		0.034	0.20
J3 Range	90EW0001	90EW0001_S20	83.1	143.83	01/07/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.050	J	µg/L	400		0.036	0.20
J3 Range	90EW0001	90EW0001_S20	83.1	143.83	01/07/2020	SW6850	Perchlorate	0.19	J	µg/L	2.0		0.027	0.20
J3 Range	J3EWIP2	J3EWIP2_S20	149.5	169.5	01/07/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.21		µg/L	400		0.036	0.20
J3 Range	J3EWIP2	J3EWIP2_S20	149.5	169.5	01/07/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.31		µg/L	0.60		0.034	0.20
J3 Range	J3EWIP2	J3EWIP2_S20	149.5	169.5	01/07/2020	SW6850	Perchlorate	1.6		µg/L	2.0		0.027	0.20
J3 Range	J3EWIP1	J3EWIP1_S20	153	193	01/07/2020	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.040	J	µg/L	0.60		0.034	0.20
J3 Range	J3EWIP1	J3EWIP1_S20	153	193	01/07/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.10	J	µg/L	400		0.036	0.20
J3 Range	J3EWIP1	J3EWIP1_S20	153	193	01/07/2020	SW6850	Perchlorate	0.35		µg/L	2.0		0.027	0.20
J3 Range	MW-636M2	MW-636M2_S20	110.5	120.5	01/06/2020	SW6850	Perchlorate	0.095	J	µg/L	2.0		0.027	0.20
J3 Range	MW-653M2	MW-653M2_S20	59.3	69.3	01/06/2020	SW6850	Perchlorate	0.072	J	µg/L	2.0		0.027	0.20
J3 Range	MW-653M1	MW-653M1_S20	147.5	157.5	01/06/2020	SW6850	Perchlorate	0.15	J	µg/L	2.0		0.027	0.20
J3 Range	MW-653M1	MW-653M1_S20	147.5	157.5	01/06/2020	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.33		µg/L	400		0.036	0.20
Demolition Area 1	MW-659M1	MW-659M1_F19	120	130	12/30/2019	SW6850	Perchlorate	0.41		µg/L	2.0		0.027	0.20
Demolition Area 1	MW-73S	MW-73S_F19	52.2	61.7	12/30/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.078	J	µg/L	0.60		0.034	0.20
Demolition Area 1	MW-19S	MW-19S_F19	52.7	62.7	12/23/2019	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.67		µg/L	400		0.036	0.20
Demolition Area 1	MW-19S	MW-19S_F19	52.7	62.7	12/23/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.6		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-19S	MW-19S_F19D	52.7	62.7	12/23/2019	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.66		µg/L	400		0.036	0.20
Demolition Area 1	MW-19S	MW-19S_F19D	52.7	62.7	12/23/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.6		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-544M3	MW-544M3_F19	77.5	87.5	12/23/2019	SW6850	Perchlorate	0.10	J	µg/L	2.0		0.027	0.20
Demolition Area 1	MW-544M2	MW-544M2_F19	112	122	12/23/2019	SW6850	Perchlorate	0.58		µg/L	2.0		0.027	0.20
Demolition Area 1	MW-544M1	MW-544M1_F19	162	172	12/23/2019	SW6850	Perchlorate	11.2		µg/L	2.0	X	0.027	0.20
Demolition Area 1	MW-31S	MW-31S_F19	98	103	12/17/2019	SW8330	2-Amino-4,6-dinitrotoluene	0.12	J	µg/L	7.3		0.020	0.20
Demolition Area 1	MW-31S	MW-31S_F19	98	103	12/17/2019	SW8330	4-Amino-2,6-dinitrotoluene	0.19	J	µg/L	7.3		0.027	0.20
Demolition Area 1	MW-31S	MW-31S_F19	98	103	12/17/2019	SW8330	2,4,6-Trinitrotoluene	0.87		µg/L	2.0		0.041	0.20

J = Estimated Result

MDL = Method Detection Limit

RL = Reporting Limit

MCL/HA= Either the MCL or Lowest Health Advisory Limit

March 05, 2020

TABLE 2
VALIDATED EXPLOSIVE AND PERCHLORATE RESULTS
Data Received February 2020

Area of Concern	Location ID	Field Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Date Sampled	Test Method	Analyte	Result Value	Qualifier	Units	MCL/HA	> MCL/HA	MDL	RL
Demolition Area 1	MW-31S	MW-31S_F19	98	103	12/17/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.2		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-31S	MW-31S_F19	98	103	12/17/2019	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	1.6		µg/L	400		0.036	0.20
Demolition Area 1	MW-76M2	MW-76M2_F19	105	115	12/17/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.098	J	µg/L	0.60		0.034	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19	120	130	12/17/2019	SW8330	2-Amino-4,6-dinitrotoluene	0.20		µg/L	7.3		0.020	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19	120	130	12/17/2019	SW8330	4-Amino-2,6-dinitrotoluene	0.29		µg/L	7.3		0.027	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19	120	130	12/17/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.96		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19	120	130	12/17/2019	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	1.4		µg/L	400		0.036	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19D	120	130	12/17/2019	SW8330	2-Amino-4,6-dinitrotoluene	0.20		µg/L	7.3		0.020	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19D	120	130	12/17/2019	SW8330	4-Amino-2,6-dinitrotoluene	0.28		µg/L	7.3		0.027	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19D	120	130	12/17/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.78		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-77M2	MW-77M2_F19D	120	130	12/17/2019	SW8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	1.4		µg/L	400		0.036	0.20
Demolition Area 1	MW-663D	MW-663D_F19	240.6	250.6	12/16/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.1		µg/L	0.60	X	0.034	0.20
Demolition Area 1	MW-663D	MW-663D_F19	240.6	250.6	12/16/2019	SW6850	Perchlorate	9.3		µg/L	2.0	X	0.027	0.20
Demolition Area 1	MW-663D	MW-663D_F19D	240.6	250.6	12/16/2019	SW6850	Perchlorate	9.5		µg/L	2.0	X	0.027	0.20
Demolition Area 1	MW-231M1	MW-231M1_F19	210.5	220.5	12/16/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.052	J	µg/L	0.60		0.034	0.20
Demolition Area 1	MW-231M1	MW-231M1_F19	210.5	220.5	12/16/2019	SW6850	Perchlorate	0.55		µg/L	2.0		0.027	0.20
Demolition Area 1	MW-341M3	MW-341M3_F19	209.5	219.5	12/16/2019	SW6850	Perchlorate	0.24		µg/L	2.0		0.027	0.20
Demolition Area 1	MW-341M2	MW-341M2_F19	264.5	269.5	12/16/2019	SW8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.60		µg/L	0.60		0.034	0.20
Demolition Area 1	MW-341M2	MW-341M2_F19	264.5	269.5	12/16/2019	SW6850	Perchlorate	0.74		µg/L	2.0		0.027	0.20

J = Estimated Result
MDL = Method Detection Limit
RL = Reporting Limit

PFAS Summary Report – Groundwater
Joint Base Cape Cod, IAGWSP
KGS 2019 PFAS MW&INF
Demolition Area 1

Location	D1-INF	FPR-2-INF	MW-258M1	MW-663D	PR-INF
Field Sample ID	D1-INF_PFAS19	FPR-2-INF_PFAS19	MW-258M1_PFAS19	MW-663D_PFAS19	PR-INF_PFAS19
Sampling Depth	0.00 - 0.00	0.00 - 0.00	109.00 - 119.00	240.60 - 250.60	0.00 - 0.00
Sampling Date	06/24/2019	06/25/2019	06/19/2019	06/24/2019	06/25/2019
SDG	320517141	320517141	320515981	320517141	320517141
Sample Type	Normal	Normal	Normal	Normal	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	18.0 U	19.0 U	20.0 U	20.0 U	20.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	9.10 U	9.50 U	9.80 U	9.80 U	9.80 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.10 U	9.50 U	9.80 U	9.80 U	9.80 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.10 U	9.50 U	9.80 U	9.80 U	9.80 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.910 U	0.950 U	0.980 U	0.980 U	0.980 U
Perfluorobutanesulfonic acid (PFBS)	0.910 U	0.950 U	0.980 U	0.980 U	0.980 U
Perfluorobutanoic acid (PFBA)	1.40 U	1.40 U	1.50 U	1.50 U	1.50 U
Perfluorodecane sulfonate	1.40 U	1.40 U	1.50 U	1.50 U	1.50 U
Perfluorodecanoic acid (PFDA)	0.910 U	0.950 U	0.980 U	2.20	0.980 U
Perfluorododecanoic acid (PFDoA)	1.40 U	1.40 U	1.50 U	1.50 U	1.50 U
Perfluoroheptanoic acid (PFHpA)	1.40 U	1.40 U	1.50 U	1.50 U	1.50 U
Perfluorohexanesulfonic acid (PFHxS)	0.910 U	0.950 U	0.980 U	0.980 U	2.00 U
Perfluorohexanoic acid (PFHxA)	0.910 U	0.950 U	0.980 U	0.980 U	0.980 U
Perfluorononanoic acid (PFNA)	1.40 U	1.40 U	1.50 U	1.00 J	1.50 U
Perfluorooctanesulfonamide (FOSA)	2.70 U	2.80 U	2.90 U	3.00 U	2.90 U
Perfluorooctanesulfonic acid (PFOS)	2.70 U	2.80 U	2.90 U	3.00 U	2.90 U
Perfluorooctanoic acid (PFOA)	1.40 U	1.40 U	1.50 U	1.50 U	1.50 U
Perfluoropentanoic acid (PFPA)	0.910 U	0.950 U	0.980 U	0.460 J	0.980 U
Perfluorotetradecanoic acid (PFTA)	2.70 U	2.80 U	2.90 U	3.00 U	2.90 U
Perfluorotridecanoic acid (PFTrDA)	2.70 U	2.80 U	2.90 U	3.00 U	2.90 U
Perfluoroundecanoic acid (PFUnA)	1.40 U	1.40 U	1.50 U	1.20 J	1.50 U
†PFOS + PFOA (EPA)	0.00	0.00	0.00	0.00	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	0.00	0.00	0.00	3.20	0.00
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	0.00	0.00	0.00	1.00	0.00

PFAS Summary Report – Groundwater
Joint Base Cape Cod, IAGWSP
KGS 2019 PFAS MW&INF
J1 Range Northern

Location	J1N-INF2	J1N-INF2	MW-136S	MW-564M1	MW-590M2
Field Sample ID	J1N-INF2_PFAS19	J1N-INF2_PFAS19R	MW-136S_PFAS19	MW-564M1_PFAS19	MW-590M2_PFAS19
Sampling Depth	0.00 - 0.00	0.00 - 0.00	107.00 - 117.00	227.00 - 237.00	238.00 - 248.00
Sampling Date	06/17/2019	07/30/2019	06/24/2019	06/24/2019	06/24/2019
SDG	320514661	320528231	320517141	320517141	320517141
Sample Type	Normal	Normal	Normal	Normal	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	19.0 U	19.0 U	20.0 U	18.0 U	19.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	9.30 U	9.60 U	9.80 U	9.20 U	9.60 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.30 U	9.60 U	9.80 U	9.20 U	9.60 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.30 U	9.60 U	9.80 U	9.20 U	9.60 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.930 U	0.960 U	0.980 U	0.920 U	0.960 U
Perfluorobutanesulfonic acid (PFBS)	0.930 U	0.960 U	0.980 U	0.920 U	0.960 U
Perfluorobutanoic acid (PFBA)	1.90 U	1.40 U	0.990 J	1.40 U	1.40 U
Perfluorodecane sulfonate	1.40 U	1.40 U	1.50 U	1.40 U	1.40 U
Perfluorodecanoic acid (PFDA)	0.930 U	0.960 U	0.980 U	0.920 U	0.960 U
Perfluorododecanoic acid (PFDoA)	1.40 U	1.40 U	1.50 U	1.40 U	1.40 U
Perfluoroheptanoic acid (PFHpA)	1.40 U	1.40 U	1.50 U	1.40 U	1.40 U
Perfluorohexanesulfonic acid (PFHxS)	0.930 U	1.90 U	2.00 U	1.80 U	0.960 U
Perfluorohexanoic acid (PFHxA)	0.930 U	0.960 U	0.980 U	0.920 U	0.960 U
Perfluorononanoic acid (PFNA)	1.40 U	1.40 U	1.50 U	1.40 U	1.40 U
Perfluorooctanesulfonamide (FOSA)	1.80 J	2.90 U	2.90 U	2.80 U	2.90 U
Perfluorooctanesulfonic acid (PFOS)	4.90	2.90 U	1.40 J	2.80 U	2.90 U
Perfluorooctanoic acid (PFOA)	1.40 U	1.40 U	2.40	1.40 U	1.40 U
Perfluoropentanoic acid (PFPA)	0.930 U	0.960 U	0.980 U	0.920 U	0.960 U
Perfluorotetradecanoic acid (PFTA)	2.80 U	2.90 U	2.90 U	2.80 U	2.90 U
Perfluorotridecanoic acid (PFTrDA)	2.80 U	2.90 U	2.90 U	2.80 U	2.90 U
Perfluoroundecanoic acid (PFUnA)	1.40 U	1.40 U	1.50 U	1.40 U	1.40 U
†PFOS + PFOA (EPA)	4.90	0.00	3.80	0.00	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	4.90	0.00	3.80	0.00	0.00
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	4.90	0.00	3.80	0.00	0.00

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J2 Range Eastern

Location	J2E-INF-I	J2E-INF-J	J2E-INF-K	MW-307M3	MW-307M3	MW-368M1
Field Sample ID	J2E-INF-I_PFAS19	J2E-INF-J_PFAS19	J2E-INF-K_PFAS19	MW-307M3_PFAS19	MW-307M3_PFAS19D	MW-368M1_PFAS19
Sampling Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	125.80 - 135.82	125.80 - 135.82	237.35 - 247.35
Sampling Date	06/20/2019	06/20/2019	06/20/2019	06/18/2019	06/18/2019	06/18/2019
SDG	320515981	320515981	320515981	320514662	320514662	320514662
Sample Type	Normal	Normal	Normal	Normal	Field Duplicate	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	19.0 U	19.0 U	20.0 U	18.0 U	19.0 U	17.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	9.70 U	9.30 U	9.80 U	9.00 U	9.60 U	8.50 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.70 U	9.30 U	9.80 U	9.00 U	9.60 U	8.50 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.70 U	9.30 U	9.80 U	9.00 U	9.60 U	8.50 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	0.850 U
Perfluorobutanesulfonic acid (PFBS)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	0.850 U
Perfluorobutanoic acid (PFBA)	1.50 U	1.40 U	1.50 U	1.80 U	1.90 U	1.70 U
Perfluorodecane sulfonate	1.50 U	1.40 U	1.50 U	1.30 U	1.40 U	1.30 U
Perfluorodecanoic acid (PFDA)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	1.40 J
Perfluorododecanoic acid (PFDoA)	1.50 U	1.40 U	1.50 U	1.30 U	1.40 U	0.450 J
Perfluoroheptanoic acid (PFHpA)	1.50 U	1.40 U	1.50 U	1.30 U	1.40 U	1.30 U
Perfluorohexanesulfonic acid (PFHxS)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	0.850 U
Perfluorohexanoic acid (PFHxA)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	0.850 U
Perfluorononanoic acid (PFNA)	1.50 U	1.40 U	1.50 U	0.880 J	0.730 J	0.650 J
Perfluorooctanesulfonamide (FOSA)	2.90 U	2.80 U	2.90 U	2.70 U	2.90 U	2.60 U
Perfluorooctanesulfonic acid (PFOS)	2.90 U	2.80 U	2.90 U	2.70 U	2.90 U	2.60 U
Perfluorooctanoic acid (PFOA)	1.50 U	1.40 U	1.50 U	1.30 U	1.40 U	1.30 U
Perfluoropentanoic acid (PFPA)	0.970 U	0.930 U	0.980 U	0.900 U	0.960 U	0.850 U
Perfluorotetradecanoic acid (PFTA)	2.90 U	2.80 U	2.90 U	2.70 U	2.90 U	2.60 U
Perfluorotridecanoic acid (PFTrDA)	2.90 U	2.80 U	2.90 U	2.70 U	2.90 U	2.60 U
Perfluoroundecanoic acid (PFUnA)	1.50 U	1.40 U	1.50 U	1.30 U	1.40 U	4.90
†PFOS + PFOA (EPA)	0.00	0.00	0.00	0.00	0.00	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	0.00	0.00	0.00	0.880	0.730	2.05
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	0.00	0.00	0.00	0.880	0.730	0.650

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J2 Range Eastern

	Location	MW-368M2	MW-667M1
	Field Sample ID	MW-368M2_PFAS19	MW-667M1_PFAS19
	Sampling Depth	202.73 - 212.73	302.30 - 312.30
	Sampling Date	06/18/2019	06/17/2019
	SDG	320514662	320514661
	Sample Type	Normal	Normal
PFAS 21 Cmps		Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)		18.0 U	18.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)		8.80 U	9.00 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		8.80 U	9.00 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		8.80 U	9.00 U
Perfluoro-1-heptanesulfonate (PFHpS)		0.880 U	0.900 U
Perfluorobutanesulfonic acid (PFBS)		0.880 U	0.900 U
Perfluorobutanoic acid (PFBA)		1.30 U	1.80 U
Perfluorodecane sulfonate		1.30 U	1.40 U
Perfluorodecanoic acid (PFDA)		0.800 J	4.30
Perfluorododecanoic acid (PFDoA)		1.30 U	1.40 U
Perfluoroheptanoic acid (PFHpA)		1.30 U	1.40 U
Perfluorohexanesulfonic acid (PFHxS)		0.880 U	0.900 U
Perfluorohexanoic acid (PFHxA)		0.880 U	0.900 U
Perfluorononanoic acid (PFNA)		1.30 U	2.80
Perfluorooctanesulfonamide (FOSA)		2.60 U	2.70 U
Perfluorooctanesulfonic acid (PFOS)		2.60 U	2.70 U
Perfluorooctanoic acid (PFOA)		1.30 U	1.40 U
Perfluoropentanoic acid (PFPA)		0.880 U	0.900 U
Perfluorotetradecanoic acid (PFTA)		2.60 U	2.70 U
Perfluorotridecanoic acid (PFTrDA)		2.60 U	2.70 U
Perfluoroundecanoic acid (PFUnA)		2.40	1.60 J
	†PFOS + PFOA (EPA)	0.00	0.00
	‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	0.800	7.10
	§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	0.00	2.80

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J2 Range Northern

Location	J2EW0001	J2EW0002	J2N-INF-E	J2N-INF-F	J2N-INF-F	J2N-INF-G
Field Sample ID	J2EW0001_PFAS19	J2EW0002_PFAS19	J2N-INF-E_PFAS19	J2N-INF-F_PFAS19	J2N-INF-F_PFAS19R	J2N-INF-G_PFAS19
Sampling Depth	179.00 - 234.00	198.00 - 233.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Sampling Date	11/20/2019	11/20/2019	06/18/2019	06/18/2019	07/30/2019	07/30/2019
SDG	320565491	320565491	320514662	320514662	320528231	320528231
Sample Type	Normal	Normal	Normal	Normal	Normal	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	19.0 U	40.0 U	19.0 U	19.0 U	19.0 U	19.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	19.0 U	20.0 U	9.30 U	9.30 U	9.60 U	9.70 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.60 U	10.0 U	9.30 U	9.30 U	9.60 U	9.70 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.60 U	10.0 U	9.30 U	9.30 U	9.60 U	9.70 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.960 U	0.370 J	0.930 U	0.400 J	0.500 J	0.970 U
Perfluorobutanesulfonic acid (PFBS)	0.960 U	1.00 U	0.930 U	0.930 U	0.960 U	1.40 J
Perfluorobutanoic acid (PFBA)	1.40 U	1.50 U	1.40 U	1.90 U	1.40 U	1.50 U
Perfluorodecane sulfonate	1.40 U	1.50 U	1.40 U	1.40 U	1.40 U	1.50 U
Perfluorodecanoic acid (PFDA)	0.960 U	1.00 U	0.930 U	0.930 U	0.960 U	0.970 U
Perfluorododecanoic acid (PFDoA)	1.40 U	1.50 U	1.40 U	1.40 U	1.40 U	1.50 U
Perfluoroheptanoic acid (PFHpA)	1.40 U	1.00 J	1.40 U	0.940 J	1.00 J	1.50 U
Perfluorohexanesulfonic acid (PFHxS)	0.960 U	11.0	0.930 U	9.90	9.00	1.90 U
Perfluorohexanoic acid (PFHxA)	0.960 U	1.30 J	0.930 U	1.20 J	1.30 J	2.30
Perfluorononanoic acid (PFNA)	1.40 U	1.50 U	1.40 U	1.40 U	1.40 U	1.50 U
Perfluorooctanesulfonamide (FOSA)	2.90 U	3.00 U	2.80 U	2.80 U	2.90 U	2.90 U
Perfluorooctanesulfonic acid (PFOS)	2.90 U	1.30 J	2.80 U	2.80 U	1.10 J	2.90 U
Perfluorooctanoic acid (PFOA)	1.40 U	1.50 J	1.40 U	1.70 J	1.50 J	1.50 U
Perfluoropentanoic acid (PFPA)	0.960 U	0.910 J	0.930 U	0.840 J	1.00 J	1.20 J
Perfluorotetradecanoic acid (PFTA)	2.90 U	3.00 U	2.80 U	2.80 U	2.90 U	2.90 U
Perfluorotridecanoic acid (PFTrDA)	2.90 U	3.00 U	2.80 U	2.80 U	2.90 U	2.90 U
Perfluoroundecanoic acid (PFUnA)	1.40 U	1.50 U	1.40 U	1.40 U	1.40 U	1.50 U
†PFOS + PFOA (EPA)	0.00	2.80	0.00	1.70	2.60	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	0.00	14.8	0.00	12.5	12.6	0.00
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	0.00	14.8	0.00	12.5	12.6	0.00

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J2 Range Northern

Location	MW-234M2	MW-313M1	MW-587M2
Field Sample ID	MW-234M2_PFAS19	MW-313M1_PFAS19	MW-587M2_PFAS19
Sampling Depth	110.00 - 120.00	255.40 - 265.40	220.00 - 230.00
Sampling Date	06/17/2019	06/19/2019	06/19/2019
SDG	320514661	320515981	320515981
Sample Type	Normal	Normal	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	18.0 U	20.0 U	19.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	8.80 U	9.80 U	9.70 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	8.80 U	9.80 U	9.70 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	8.80 U	9.80 U	9.70 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.880 U	0.980 U	0.970 U
Perfluorobutanesulfonic acid (PFBS)	0.880 U	0.980 U	0.970 U
Perfluorobutanoic acid (PFBA)	1.80 U	0.700 J	1.50 U
Perfluorodecane sulfonate	1.30 U	1.50 U	1.50 U
Perfluorodecanoic acid (PFDA)	0.880 U	1.20 J	0.970 U
Perfluorododecanoic acid (PFDoA)	1.30 U	1.50 U	1.50 U
Perfluoroheptanoic acid (PFHpA)	1.30 U	1.50 U	1.50 U
Perfluorohexanesulfonic acid (PFHxS)	0.600 J	0.980 U	0.970 U
Perfluorohexanoic acid (PFHxA)	0.880 U	0.980 U	0.970 U
Perfluorononanoic acid (PFNA)	1.30 U	1.10 J	1.50 U
Perfluorooctanesulfonamide (FOSA)	2.60 U	2.90 U	2.90 U
Perfluorooctanesulfonic acid (PFOS)	1.90 J	2.90 U	2.90 U
Perfluorooctanoic acid (PFOA)	0.550 J	1.50 U	1.50 U
Perfluoropentanoic acid (PFPA)	0.880 U	0.680 J	0.970 U
Perfluorotetradecanoic acid (PFTA)	2.60 U	2.90 U	2.90 U
Perfluorotridecanoic acid (PFTrDA)	2.60 U	2.90 U	2.90 U
Perfluoroundecanoic acid (PFUnA)	1.30 U	1.40 J	1.50 U
†PFOS + PFOA (EPA)	2.45	0.00	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	3.05	2.30	0.00
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	3.05	1.10	0.00

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J3 Range

Location	J3-INF	J3-INF	MW-163S	MW-163S	MW-163S	MW-227M2
Field Sample ID	J3-INF_PFAS19	J3-INF_PFAS19D	MW-163S_PFAS19	MW-163S_PFAS19D	MW-163S_PFAS19R	MW-227M2_PFAS19
Sampling Depth	0.00 - 0.00	0.00 - 0.00	38.00 - 48.00	38.00 - 48.00	38.00 - 48.00	110.00 - 120.00
Sampling Date	06/17/2019	06/17/2019	06/18/2019	06/18/2019	07/30/2019	06/19/2019
SDG	320514661	320514661	320514662	320514662	320528231	320515981
Sample Type	Normal	Field Duplicate	Normal	Field Duplicate	Normal	Normal
PFAS 21 Cmps	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)	Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)	19.0 U	18.0 U	17.0 U	17.0 U	19.0 U	19.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	9.40 U	9.20 U	8.60 U	8.60 U	9.30 U	9.60 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	9.40 U	9.20 U	8.60 U	8.60 U	9.30 U	9.60 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	9.40 U	9.20 U	8.60 U	8.60 U	9.30 U	9.60 U
Perfluoro-1-heptanesulfonate (PFHpS)	0.940 U	0.920 U	0.860 U	0.860 U	0.930 U	0.960 U
Perfluorobutanesulfonic acid (PFBS)	0.940 U	0.920 U	0.860 U	0.860 U	0.930 U	0.960 U
Perfluorobutanoic acid (PFBA)	1.90 U	1.80 U	1.70 U	1.70 U	0.560 J	1.40 U
Perfluorodecane sulfonate	1.40 U	1.40 U	1.30 U	1.30 U	1.40 U	1.40 U
Perfluorodecanoic acid (PFDA)	0.940 U	0.920 U	0.860 U	0.860 U	0.930 U	0.960 U
Perfluorododecanoic acid (PFDoA)	1.70 J	1.40 U	1.30 U	1.30 U	1.40 U	1.40 U
Perfluoroheptanoic acid (PFHpA)	1.40 U	1.40 U	1.30 U	1.30 U	1.40 U	1.40 U
Perfluorohexanesulfonic acid (PFHxS)	1.50 J	1.50 J	0.690 J	0.610 J	1.90 U	0.540 J
Perfluorohexanoic acid (PFHxA)	0.940 U	0.920 U	0.410 J	0.860 U	0.930 U	0.960 U
Perfluorononanoic acid (PFNA)	1.40 U	1.40 U	1.30 U	1.30 U	1.40 U	1.40 U
Perfluorooctanesulfonamide (FOSA)	2.80 U	2.80 U	2.60 U	2.60 U	2.80 U	2.90 U
Perfluorooctanesulfonic acid (PFOS)	2.80 U	2.80 U	12.0	12.0	12.0	2.90 U
Perfluorooctanoic acid (PFOA)	0.520 J	1.40 U	1.70	1.60 J	1.30 J	1.40 U
Perfluoropentanoic acid (PFPA)	0.940 U	0.920 U	0.860 U	0.860 U	0.930 U	0.960 U
Perfluorotetradecanoic acid (PFTA)	2.80 U	2.80 U	2.60 U	2.60 U	2.80 U	2.90 U
Perfluorotridecanoic acid (PFTrDA)	1.40 J	2.80 U	2.60 U	2.60 U	2.80 U	2.90 U
Perfluoroundecanoic acid (PFUnA)	1.40 U	1.40 U	1.30 U	1.30 U	1.40 U	1.40 U
†PFOS + PFOA (EPA)	0.520	0.00	13.7	13.6	13.3	0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)	2.02	1.50	14.4	14.2	13.3	0.540
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)	2.02	1.50	14.4	14.2	13.3	0.540

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J3 Range

	Location	MW-250M2
	Field Sample ID	MW-250M2_PFAS19
	Sampling Depth	145.00 - 155.00
	Sampling Date	06/20/2019
	SDG	320515981
	Sample Type	Normal
PFAS 21 Cmps		Results (ng/L)
6:2 Fluorotelomer sulfonate (6:2 FTS)		19.0 U
8:2 Fluorotelomer sulfonate (8:2 FTS)		9.70 U
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)		9.70 U
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)		9.70 U
Perfluoro-1-heptanesulfonate (PFHpS)		0.970 U
Perfluorobutanesulfonic acid (PFBS)		0.970 U
Perfluorobutanoic acid (PFBA)		0.710 J
Perfluorodecane sulfonate		1.40 U
Perfluorodecanoic acid (PFDA)		0.970 U
Perfluorododecanoic acid (PFDoA)		1.40 U
Perfluoroheptanoic acid (PFHpA)		1.40 U
Perfluorohexanesulfonic acid (PFHxS)		0.970 U
Perfluorohexanoic acid (PFHxA)		0.970 U
Perfluorononanoic acid (PFNA)		1.40 U
Perfluorooctanesulfonamide (FOSA)		2.90 U
Perfluorooctanesulfonic acid (PFOS)		2.90 U
Perfluorooctanoic acid (PFOA)		1.40 U
Perfluoropentanoic acid (PFPA)		0.970 U
Perfluorotetradecanoic acid (PFTA)		2.90 U
Perfluorotridecanoic acid (PFTrDA)		2.90 U
Perfluoroundecanoic acid (PFUnA)		1.40 U
†PFOS + PFOA (EPA)		0.00
‡PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA (MassDEP)		0.00
§PFOS + PFOA + PFHpA + PFHxS + PFNA (Mass ORSG)		0.00

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Notes:

ng/L = nanograms per liter; ug/kg = micrograms per kilogram; U = not detected; J = estimated; UJ = estimated non detect

The LOQ value will be used to report non-detects when blank contamination occurs

Bolded results indicate detections of PFAS

Bolded and highlighted results indicate detection of PFAS above the EPA Lifetime Health Advisory: PFOS + PFOA > 70 ng/L.

Bolded and highlighted results indicate detection of PFAS above the MassDEP: PFOS + PFOA + PFDA + PFHpA + PFHxS + PFNA > 20 ng/L

Bolded and highlighted results indicate detection of PFAS above the MassDEP Office of Research and Standards Guideline (ORSG): PFOS + PFOA + PFHpA + PFHxS + PFNA > 70 ng/L

† Lifetime Health Advisory, US Environmental Protection Agency, May 2016

‡ Final PFAS-Related Revisions to the Massachusetts Contingency Plan ("MCP", 310 CMR 40.0000), Massachusetts Department of Environmental Protection, December 27, 2019

‡ PFAS Maximum Contaminant Level (MCL) Proposed Amendment & Public Comment ("MCL", 310 CMR 22.00 PFAS MCL Amendments), Massachusetts Department of Environmental Protection, December 27, 2019

§ MassDEP Office of Research and Standards Final Recommendations for Interim Toxicity and Drinking Water Guidance Values, Massachusetts Department of Environmental Protection, June 8, 2018