NRC ALASKA, LLC
MOOSE CREEK FACILITY
THERMAL REMEDIATION OF PFAS-CONTAMINATED SOIL
SEPTEMBER 2019 - Revised

INTRODUCTION

The Moose Creek Facility was established in North Pole, Alaska in 1990 by OIT, Inc. (OIT) to thermally remediate contaminated soils and other related materials. The Moose Creek Facility was acquired by NRC, Alaska, LLC in April of 2019. In November of 2017 OIT completed a preliminary test trial of the thermal remediation of PFAS-contaminated soil. The test trial was completed to demonstrate proof of concept and to evaluate operational requirements to thermally remove Per and Poly Fluoroalkyl Substances (PFAS) from contaminated soil on a commercial scale. Following positive results from the preliminary trial, a second test trial was completed in May of 2018 to evaluate operating capacities, establish operational procedures, and quantify air emissions. Data collected from the 2018 test trial was used to prepare permit applications to comply with Alaska Department of Environmental Conservation (ADEC) Division of Air Quality and Division of Spill Prevention and Response (SPAR) regulatory requirements. An Air Quality Control Minor Permit (AQ0325MSS02) was issued in March of 2019, and the existing ADEC SPAR Operations Plan was revised to allow remediation of PFAS-contaminated soils and was subsequently approved in April of 2019. Following regulatory approval, the facility has begun commercial operations to treat PFAS-contaminated soil.

Remediation of PFAS-contaminated soil began in May of 2019 and commenced coincident with the completion of an air emissions source test in compliance with the facility's Air Quality Control Minor Permit. Pre- and post-remediation testing of this initial volume of PFAS-contaminated soil was completed in compliance with the SPAR Operations Plan and the Air Quality Minor Permit. A general description of the facility, a summary of the 2018 test trial, and a summary of the 2019 compliance source test and commercial operations soil remediation results is provided in the following sections.

FACILITY DESCRIPTION

The thermal treatment unit consists of a 17-million British thermal unit per hour (Btu/hr) refractory-lined rotary kiln primary combustion unit that exposes waste material to temperatures of up to 1500°F (815°C). The temperature required and feed rate needed to achieve desorption of contaminants is established based on the soil characteristics, moisture content, level of contamination, and ambient conditions. Waste materials are loaded into a hopper that directly feeds into the kiln. Treated waste exits the kiln where it is rehydrated in an open water bath and then moved to a clean waste storage location for final testing before being removed from the treatment area for re-use.

Gasses from the kiln are directed to a refractory-lined 8 million Btu/hr secondary combustion unit, referred to as the oxidizer, where they are exposed to temperatures of up to 2200°F (1200°C). Exhaust gasses from the oxidizer are directed through a quench tower where they, and the particulate matter carried in the exhaust stream, are cooled. The treated gasses are then directed through a baghouse filter where remaining particulate matter is removed before being exhausted through an approximately 60-foot-tall stack. Following this test trial, a packed tower wet scrubber has been installed downstream from the baghouse to further control facility emissions.

MAY 2018 TEST TRIAL

The 2018 test trial was completed in cooperation with Eielson Air Force Base (EAFB), ADEC, and the facility Owner, OIT, Inc. Approximately 89.7 tons (estimated 81.5 cubic yards) of PFAS-contaminated soil generated at EAFB was delivered to the facility for the test trial. All PFAS-contaminated soil was treated at a temperature and feed rate established based on the characteristics and requirements necessary for that specific material. Kiln temperature can vary from 800°F (425°C) to 1500°F (815°C) and feed rate can vary from 1 ton per hour to 6 tons per hour based on the conditions identified for the material being treated. Secondary combustion chamber temperatures were maintained between 1800°F (980°C) and 2200°F (1200°C). The test trial project consisted of multiple trial runs to generate representative exhaust emissions for sample and data collection. All samples collected from pre-treatment soils were analyzed for 24 different PFAS compounds by SGS laboratories using their analytical method 537M.

Pre-Treatment Soils Analysis

A total of 28 soil samples (including four blind field duplicate samples for QA/QC purposes) were collected from the pre-treatment stockpiles to evaluate initial PFAS concentrations. A review of the analytical results from samples collected from the pre-treatment stockpiles indicated that all soil samples collected exceeded ADEC target cleanup levels (CULs) for PFOS (0.0030 mg/kg) and PFOA (0.0017 mg/kg). The highest concentration of PFOA detected was 0.0765 mg/kg, and the highest concentration of PFOS detected was 7.24 mg/kg. Nineteen other PFAS compounds were detected in the pre-burn stockpiles.

Post-Treatment Soils Analysis

A total of 18 soil samples (including two blind field duplicate samples for QA/QC purposes) were collected from the post-treatment stockpiles to evaluate final PFAS concentrations. An additional eight soil samples (including one blind field duplicate) were collected from stockpiles containing bag house fines. All samples collected from post-treatment soils were analyzed for 24 different PFAS compounds by SGS laboratories using their analytical method 537M.

A review of the analytical results from the samples collected from the post-treatment stockpiles indicated that the soil and bag house fines composite samples were non-detect for all PFAS compounds with the following exceptions: PFHxS was detected in two bag house fines samples (0.000372 mg/kg, 0.000383 mg/kg) and PFOS was detected in nine stockpile samples and three bag house fines samples at concentrations less than ADEC CULs, ranging from 0.000300 mg/kg to 0.002200 mg/kg. It was later determined that the water used to cool exhaust gasses and to rehydrate post-treatment soils was contaminated with low levels of PFAS. The potential influence from the presence of background levels of PFAS was not addressed in the quantification of PFAS compounds found in the ash collected from the baghouse or in the post-treatment soils.

At the time of the test trial, ADEC had established CULs for soil for PFOS and PFOA. In October of 2018 ADEC proposed new (lower) CULs for PFOS and PFOA and CULs for four additional PFAS compounds. At this time these proposed CULs are not being considered for implementation by the State of Alaska. While the 2018 test trial results demonstrated compliance with the existing soil CULs, some reported values were higher than the proposed CULs. In anticipation of implementation of the additional and lower CULs at some point in the future, the Moose Creek Facility SPAR Operations Plan includes the requirement to comply with the more stringent proposed soil clean up standard. Operational modifications have been made to ensure post-treatment soils analytical results will comply with the proposed CULs.

Source Test Analysis

A comprehensive source test of facility air emissions was completed by Alaska Source Testing, LLC as part of the 2018 test trial. All air emissions samples were analyzed for 24 different PFAS compounds by SGS laboratories using analytical method 537. A review of the air emission analytical results determined that 10 of the 21 PFAS compounds found in the pre-treatment soils were detected in the air emissions samples. Air emission analytical results determined that PFOA was being released at an average rate of 0.0185 mg/hr during the test trial, and PFOS was not detected in the stack emissions. PFTeA was not detected in the pre-burn stockpiles but was detected in the exhaust emissions with an average air emission result of 0.0031 mg/hr. The combined sum of the average air emission rates of the 11 PFAS compounds detected in the facility exhaust was 0.0791 mg/hr. It should be noted here that in subsequent tests XAD traps used in the source test sample collection train have been identified as a source of PFAS contamination. It is not known if the specific XAD traps used for the 2018 source test were PFAS contaminated. It has also been determined that the fresh water used in the quench tower and to rehydrate treated soils had low levels of PFAS contamination. These sources of PFAS contamination were identified following the 2019 source test and are likely to have also been present during the 2018 test trial. The potential influence from the presence of background levels of PFAS were not addressed in the quantification of PFAS compounds in facility air emissions during the 2018 source test.

The 2018 source test included the evaluation of several other constituents in the facility air emissions during the test trial, the results of which are provided below.

- Hydrogen Fluoride (HF) was detected in the exhaust emissions at an average rate of 0.072 mg/scf or 0.048 lbs/hr (8,760 hrs of operation = 420.48 lbs/yr; 5,840 hrs of actual operation = 280.32 lbs/yr).
- Fluorine (measured as Total Fluorine) was detected in the exhaust emissions at an average rate of 0.343 mg/scf and 0.252 lbs/hr (8,760 hrs of operation = 2,207.52 lbs/yr; 5,840 hrs of actual operation = 1,471.68 lbs/yr).
- Particulate matter (PM) was detected in the exhaust emissions at an average concentration of 0.032 gr/scf, 0.063 gr/scf when corrected to 12% CO_2, and 1.38 lbs/hr.

Conclusion

The analytical results referenced above indicate that the thermal remediation process is effective at remediating PFAS contaminated soils; however, the process as tested on the specific inputs and processes of this trial resulted in stack emissions of trace levels of 11 PFAS compounds, HF, Fluorine, Sulfur Dioxide, and Carbon Dioxide. All pollutants identified in the facility emissions were below established permit limits for those compounds. Subsequent analysis indicated that background levels of PFAS were potentially present in the XAD traps used in the collection of air samples and were present in the water used to cool exhaust gasses and to rehydrate treated soils. While it is likely the presence of background levels of PFAS influenced the test trial air emissions, ash, and post-treatment soils analytical results, the degree to which these results were impacted has not been evaluated.

Based on the results of the test trial it was concluded by ADEC that the installation of a packed tower wet scrubber was necessary to control HF emissions. The wet scrubber would also decrease PM emissions, other acid gasses, and could have the potential effect of further reducing PFAS and other PFAS-related emissions.

MAY 2019 REMEDIATION RESULTS AND SOURCE TEST

The Moose Creek Facility is currently permitted to remediate PFAS-contaminated soil under the ADEC-approved Air Quality Control Minor Permit AQ0325MSS02 and the amended ADEC SPAR Operations Plan.

Commercial Operations Soil Remediation

The PFAS-contaminated soil that was treated concurrent with the completion of the 2019 air emissions source test originated from a construction project completed at EAFB in the fall of 2018. The soil was excavated, stockpiled, and confirmed contaminated with levels of PFOS in excess of ADEC regulatory limits. The contractor's consultant completed an ADEC Division of Spill Prevention and Response Transport, Treatment, and Disposal Approval Form (TT&DA Form) for Contaminated Media in May of 2019 to allow the contaminated soil to be delivered to the Moose Creek Facility for thermal treatment.

As required by Alaska Statute the soil was tested for PFOS and PFOA by the contractor and confirmed to have a concentration of PFOS between 0.000640 mg/kg and 0.010 mg/kg. Five of the seven characterization samples collected were above the ADEC regulatory limit of 0.0030 mg/kg for PFOS. In addition to the analysis for PFOS and PFOA (analytical method 537M), the soil was also tested for gasoline range organics (GRO), diesel range organics (DRO), and residual range organics (RRO) by analytical methods AK 101, AK 102, and AK 103 respectively; for volatile organic carbon (VOCs) by analytical method SW8260C; for polycyclic aromatic hydrocarbons (PAHs) by analytical method SW8270D; and for metals by analytical method SW6020A, including mercury by analytical method SW7471. The results from these additional analyses did not identify actionable concentrations of any of these contaminants. Following characterization of the contaminated soil, ADEC approved the TT&DA Form and the material was subsequently moved to the Moose Creek Facility for treatment.

The contaminated soil was identified as "gravel fill" originally placed as cover material in a utilidor on EAFB. The material was fed into the primary combustion chamber at a rate of between 1 and 6 tons per hour and exposed to temperatures ranging from 800°F (425°C) to 1500°F (815°C), as required based on the specific conditions identified for the incoming material. After thermal treatment the material was discharged into an open water bath where it was rehydrated and then stockpiled for post-treatment analysis. The exhaust gasses were routed from the primary combustion chamber to a secondary combustion chamber where they were exposed to temperatures ranging from 1800°F (980°C) to 2200°F (1200°C) before being treated through the primary quench tower, baghouse, secondary quench, and then the packed tower wet scrubber before being exhausted to the atmosphere.

As required in the facilities SPAR Operations Plan, the treated material was segregated into 50-ton piles, blended with the fines collected from the exhaust, and then tested for all compounds as directed by ADEC. In this particular case the only identified contaminant in the pre-treated soil was PFOS. However, to ensure the Moose Creek Facility will be able to treat soil to anticipated future regulatory levels, the facility SPAR Operations Plan includes stipulations to test all treated PFAS-contaminated soils for the six PFAS compounds for which ADEC has proposed regulatory limits (PFBS 1.4 mg/kg, PFHpA 0.00024 mg/kg, PFHxS 0.00029 mg/kg, PFNA 0.00041 mg/kg, PFOS 0.00053 mg/kg, and PFOA 0.00029 mg/kg). The proposed standards include four additional PFAS compounds and lower CULs for PFOS (currently 0.0030 mg/kg) and PFOA (currently 0.0017 mg/kg). All PFAS-contaminated soils treated at the Moose Creek Facility must meet the proposed ADEC soil clean-up standards.

Approximately 200 tons of PFAS contaminated soils was treated and segregated into four 50-ton post-treatment soils stockpiles. One grab sample was collected from each of the post-treatment soil stockpiles for a total of four samples. The post-treatment soil samples were analyzed for the six ADEC proposed regulated PFAS compounds, and PFOS was found (below proposed regulatory levels) in two of the samples (0.00023 mg/kg and 0.00028 mg/kg). All samples were non-detect for all other PFAS compounds. ADEC has provided concurrence that the remediated soil meets applicable clean up criteria and the soil is no longer considered contaminated. Following successful treatment, the generator was provided a certificate of destruction as proof the soil was successfully treated, and the soil was then considered suitable for use as clean construction fill.

Air Quality Emissions Source Test

In March of 2019 OIT installed a packed tower wet scrubber at the Moose Creek Facility in compliance with its ADEC Air Quality permitting requirements. In May of 2019 the Moose Creek facility began commercial remediation of PFAS-contaminated soil and completed its second air emissions compliance source test. The source test was completed by Alaska Source Testing, LLC (AST) and all collected samples were submitted to Eurofins TestAmerica for analysis.

The data produced from the 2019 source test demonstrated significant reductions in regulated air pollutants (specifically HF) to levels substantially below regulatory thresholds as well as reductions in total fluorine and particulate matter. The evaluation of PFAS compounds showed comparable results from the 2019 test when compared to the 2018 test. Identification of background PFAS contamination from the XAD traps used in the source test sample train and in the quench and scrubber water strongly suggests that at least some of the identified PFAS in the emissions samples originates from this background contamination. Because XAD traps and the same source water was used in both the 2018 and 2019 tests, it is likely that there was some effect on the results of both tests. The effect from the background contamination of PFAS in the XAD traps was mathematically eliminated from the final results produced in this source test; however, it was not possible to complete the same correction for the presence of PFAS in the source water.

Source Test Results

Currently the Moose Creek Facility is regulated through the ADEC Air Quality Minor Permit program under an emissions limit for the Hazardous Air Pollutant, HF. While there are no numerical air emissions standards for PFAS, the facility is required to measure and report PFAS emissions in anticipation of some future standard. AST Tested for HF using EPA Method 26A, total fluorine using EPA Method 5 and 202, particulate matter using EPA Method 5, and PFAS using a modified EPA Method 0010 (MM-5).

PFAS Compounds

An initial evaluation of the analytical results identified two notable issues. First, the QC samples confirmed that the resin in the XAD traps used in the source test sample collection equipment were contaminating the samples and producing detections of PFAS where there would otherwise be no PFAS present. Further, it was confirmed after the source test that the fresh water being used in the facility downstream from the thermal treatment process had low concentrations of PFAS compounds.

This water was used upstream from the air emissions sample collection point in the primary quench vessel, the secondary quench vessel, and in the packed tower wet scrubber. Due to issues with the initial operation of the newly installed wet scrubber that were being addressed during the source test, water droplets were exiting the scrubber, entering the exhaust stack, and directly contacting the air emissions test probe. It is highly probable that the source test analytical results were further influenced by the additional background contamination present in the water entering the test probe.

Because the analytical results were so low for any identified PFAS compound in the facility emission, these sources of background contamination (XAD traps and source water) were producing a disproportionate quantitation of PFAS in the exhaust gasses. In the first table below, *PFAS Summary of Results*, the corrected values from the 2019 source test (values from the blanks produced from the XAD traps were removed from the total results) and the uncorrected 2018 emissions totals are both provided for comparison. In the second table, *PFAS Back Half XAD traps, Breakthrough XAD traps, and Sample Blank XAD traps Comparison*, a comparison of the emissions results and the blank results from the XAD traps is provided.

Due to the installation of the wet scrubber the stack exhaust became highly saturated. While the scrubber was equipped with a mist eliminator, it was determined during the source test that the mist eliminator was allowing water droplets to enter the stack and influence the results of the source test. Samples of the scrubber water were collected and analyzed and confirmed there was PFAS in the scrubber water. A sample of the source water was collected and also confirmed the presence of PFAS. The table below, titled *PFAS in Scrubber and Source Water,* compares the PFAS compounds found in the scrubber water and the source water with the PFAS found in the from half of the source test sample collection train. While this analysis is not sufficiently comprehensive to determine the actual effect background contamination is having on the emissions results, it does imply the presence of these contaminants is likely influencing the source test emissions analysis.

PFAS Summary of Results,
2018 and 2019 Summary of Results Comparison

PFAS Analyte	2019		2018	
	mg/hr	lb/hr	mg/hr	lb/hr
Perfluorobutanoic acid (PFBA)	0.0044	9.72E-09	0.0041	9.05E-09
Perfluoropentanoic acid (PFPeA)	ND	ND	0.0108	2.37E-08
Perfluorohexanoic acid (PFHxA)	0.0072	1.59E-08	0.0127	2.80E-08
Perfluoroheptanoic acid (PFHpA)	0.0054	1.20E-08	0.0042	9.33E-09
Perfluorooctanoic acid (PFOA)	0.0436	9.61E-08	0.0185	4.08E-08
Perfluorononanoic acid (PFNA)*	0.0037	8.15E-09	0.0012	2.55E-09
Perfluorodecanoic acid (PFDA)	0.0025	5.60E-09	0.0033	7.18E-09
Perfluorododecanoic acid (PFDoA)	0.0029	6.34E-09	0.0034	7.41E-09
Perfluorotridecanoic acid (PFTriA)	ND	ND	ND	ND
Perfluorotetradecanoic acid (PFTeA)	ND	ND	0.0031	6.93E-09
Perfluorobutanesulfonic acid (PFBS)	ND	ND	0.0134	2.95E-08
Perfluorooctanesulfonamide (FOSA)	ND	ND	0.0044	9.75E-09
Perfluoroundecanoic acid (PFUnA)	0.0028	6.19E-09	ND	ND
Perfluoropentanesulfonic acid (PFPeS)	ND	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	0.0016	3.55E-09	ND	ND
Perfluoroheptanesulfonic Acid (PFHpS)	ND	ND	ND	ND
Perfluorooctanesulfonic acid (PFOS)	0.0031	6.73E-09	ND	ND
Perfluorononanesulfonic acid (PFNS)	ND	ND	ND	ND
Perfluorodecanesulfonic acid (PFDS)	ND	ND	ND	ND
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)*	0.0019	4.22E-09	ND	ND
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)*	0.0022	4.94E-09	ND	ND
4:2 FTS	ND	ND	ND	ND
6:2 FTS	0.0018	3.96E-09	ND	ND
8:2 FTS	ND	ND	ND	ND

ND= Non-Detect

* = Please note that the front half of the sample train contributed to the majority of the PFAS hits excluding three analytes that were found in the back half of the sample train. These three analytes are marked with an "*" asterisk. It is also possible that the PFAS identified in the scrubber water contributed to the front half PFAS hits.

PFAS Back Half XAD traps, Breakthrough XAD traps, and Sample Blank XAD traps Comparison

PFAS Analyte	AST XAD Run AVE	XAD QC Blank AVE	Difference of AVEs
	ng	ng	ng
Perfluorobutanoic acid (PFBA)	31.35	32.80	1.45
Perfluoropentanoic acid (PFPeA)	1.13	1.07	0.06
Perfluorohexanoic acid (PFHxA)	32.10	32.27	0.17
Perfluoroheptanoic acid (PFHpA)	37.85	40.53	2.68
Perfluorooctanoic acid (PFOA)	15.48	15.83	0.35
Perfluorononanoic acid (PFNA)	ND	ND	ND
Perfluorodecanoic acid (PFDA)	7.71	8.25	0.54
Perfluorododecanoic acid (PFDoA)	ND	ND	ND
Perfluorotridecanoic acid (PFTriA)	ND	ND	ND
Perfluorotetradecanoic acid (PFTeA)	ND	ND	ND
Perfluorobutanesulfonic acid (PFBS)	2.58	2.49	0.09
Perfluorooctanesulfonamide (FOSA)	ND	ND	ND
Perfluoroundecanoic acid (PFUnA)	ND	ND	ND
Perfluoropentanesulfonic acid (PFPeS)	ND	ND	ND
Perfluorohexanesulfonic acid (PFHxS)	0.74	0.88	0.14
Perfluoroheptanesulfonic Acid (PFHpS)	ND	ND	ND
Perfluorooctanesulfonic acid (PFOS)	1.32	1.42	0.10
Perfluorononanesulfonic acid (PFNS)	ND	ND	ND
Perfluorodecanesulfonic acid (PFDS)	ND	ND	ND
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND	ND	ND
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND	ND	ND
4:2 FTS	ND	ND	ND
6:2 FTS	1.14	1.02	0.12
8:2 FTS	ND	ND	ND

ND=Non-Detect

PFAS in Scrubber and Source Water

PFAS Analyte	AST Front Half	Source Water	Scrubber Sample
	ng	ng	ng
Perfluoroheptanoic acid (PFHpA)	1.650	ND	4.225
Perfluorooctanoic acid (PFOA)	13.123	ND	15.655
Perfluorononanoic acid (PFNA)	0.846	ND	0.788
Perfluorobutanesulfonic acid (PFBS)	ND	0.412	1.280
Perfluorohexanesulfonic acid (PFHxS)	0.503	3.67	3.715
Perfluorooctanesulfonic acid (PFOS)	0.923	5.45	3.880

ND= Non-Detect

Hydrogen Fluoride, Total Fluorine, and Particulate Matter

The final results from the measurement of HF, total fluorine, and PM have shown substantial decreases in these emissions when compared to the 2018 source test. A comparison of the 2018 and 2019 HF, total fluorine, and PM emissions are provided in the tables, *Summary of Results for HF*, *Summary of Results for Fluorine*, *Summary of Results for Particulate Matter*, included below. Total fluorine emissions in the 2019 source test were 94.6 percent lower than the total fluorine emissions in the 2018 source test. Likewise, the HF emissions in the 2019 source test were 93.5 percent lower that the HF emission in the 2018 source test. Total particulate matter was 90 percent lower in the 2019 source test. While the reductions in HF and total fluorine may be, at least to some degree, the result of lower concentrations of PFAS in the contaminated material, it is also a demonstration of the effectiveness of the packed tower wet scrubber in controlling these emissions.

Summary of Results for HF

Date	Run	HF - 2019		HF - 2018
		Concentration, mg/scf	Emissions, lb/hr	Emissions, lb/hr
5/21/2019	1	0.0032	0.0027	0.035
	2	0.0066	0.0054	0.076
	3	0.0061	0.0048	0.035
	Average	**0.0053**	**0.0043**	**0.048**

Summary of Results for Fluorine

Date	Run	2019 Fluorine Concentration, mg/scf	2019 Fluorine Emissions, lb/ hr	2018 Fluorine Emissions, lb/ hr
5/22/2019	1	0.022	0.018	0.568
	2	0.029	0.024	0.151
	3	0.000	0.000	0.038
	Average	**0.017**	**0.014**	**0.252**

Summary of Results for Particulate Matter

Date	Run	2019 PM Concentration, gr/scf	2019 PM Concentration Corrected to 12% CO_2, gr/scf	2019 PM Emissions, lb/hr	2018 PM Emissions, lb/hr
5/21/2019	1	0.005	0.008	0.259	1.06
	2	0.002	0.003	0.079	1.50
	3	0.001	0.003	0.072	1.60
	Average	**0.003**	**0.005**	**0.137**	**1.38**

Conclusion

The analytical results produced from the May 2019 PFAS-contaminated soil remediation effort and air emissions source test demonstrated the successful removal of regulated PFAS-compounds from contaminated soil to levels below the ADEC proposed CULs. The evaluation of air emissions demonstrates that minute quantities of PFAS compounds are present in the exhaust gasses produced from the thermal treatment of PFAS-contaminated soil. Future tests will be executed in a manner that will eliminate the identified background levels of PFAS contamination (as identified in the XAD traps and the source water), which will likely have the effect of further reducing the PFAS levels in the facility air emissions.

The operation of the packed tower wet scrubber is successfully reducing emissions of HF and total fluorine to nominal levels. However, the effectiveness of the wet scrubber to remove PFAS compounds present in the exhaust stream is inconclusive but appears to likely be insignificant based on the available data. As a final point to note, the detection limits for PFAS compounds have been decreasing as laboratory analytical techniques improve. While some additional PFAS compounds were identified in the 2019 source test that were not present in the 2018 source test, there are indications that these compounds were present in the 2019 analytical results due to these lower detection limits. While this may be the case, the total volume of PFAS emission on a milligrams per hour basis was 0.0791 in 2018 and 0.0831 in 2019 or a 5 percent increase. As a calculation to determine the Moose Creek Facility's potential to emit PFAS, assuming the facility is emitting 24 hours a day, 7 days a week, 365 day per year, the 2018 source test would produce 0.024 pounds per year and the 2019 source test would produce 0.026 pounds per year of total PFAS.