

Memorandum

To: [REDACTED] *Head of Functions, daa*

From: [REDACTED] *PhD., PE., [REDACTED]*

Date: 12/09/2024

Subject: *Preliminary Results for PFAS Leaching in CBGM for Apron 5H Works Project*

Introduction

Fehily Timoney Ltd (FT) and CDM Smith Ireland Ltd. (CDM Smith) was engaged by Dublin Airport Authority (daa) to conduct a technical review of a proposal by a works Contractor (WPS, 2023) to reuse crushed concrete from the Dublin Airport Apron 5H works area. The purpose of the review assessment is to assess the potential for leaching of per- and poly-fluoroalkyl substances (PFAS) from the crushed concrete, which is currently being stockpiled near the works area.

daa is considering reusing the excavated and crushed concrete on-site in the following ways:

- Crushing concrete to grade suitable for addition with cement and water to produce a cement-bound granular mixture (CBGM).
- CBGM to be used in construction of pavements for Apron 5H to specification, as follows:
 - 350 millimeters (mm) or 200 mm of pavement quality concrete or 230 mm of asphalt course
 - The CBGM will be used beneath a layer of high-quality concrete at least 200 mm thick or an asphalt course 230 mm thick limited to the Apron only.
 - Above the CBGM and beneath the concrete a sealant is applied

Based on the review of the proposal by the Works Contractor, it was concluded that additional leaching studies were needed to assess the extent of PFAS leaching from the crushed concrete, CBGM, and CBGM amended with sorbents. The study was performed using standard UK methods to determine the leaching flux and reduction potential of the sorbents. The findings of the study provide information about the potential leaching of PFAS from the stockpiled materials and intended use as CBGM. These findings help make informed recommendations on the best reuse options.

Scope and Objectives

CDM Smith and Fehily Timoney were scoped to collect representative samples of the Apron 5H crushed concrete, which would be used as the CBGM mix. The mix had to meet the same specifications as the Apron 5H construction specification, using the same source materials, including cement. The aim was to evaluate the potential leaching of PFAS from the crushed concrete and CBGM. The objectives of the studies were to:

- Evaluate PFAS leaching from the crushed concrete, CBGM, and CBGM with sorbents Fluorosorb and particulate activated carbon (PAC) using United Kingdom (UK) leaching standard method BS EN 12457
- Evaluate and model PFAS leaching from the CBGM and evaluate the performance of sorbents to reduce PFAS leaching flux using UK standard method EA NEN 7375 to obtain PFAS mass flux and leaching kinetics
- Evaluate the significance of PFAS precursors as unmeasured sources of PFAS using the total oxidisable precursor (TOP) assay and evaluate their leaching characteristics
- Make a recommendation regarding reuse of the crushed concrete and adding sorbents to reduce leaching flux.

Summary of Conclusions

- Based on sample test results, reported PFAS were below the method detection limit in the solid crushed concrete and CBGM samples, with detection limits at approximately 1 microgrammes per kilogram ($\mu\text{g}/\text{kg}$) for 18 PFAS reported. Concentrations less than 1 $\mu\text{g}/\text{kg}$ are within the range, albeit on the low end of the range reported in previous characterisation studies (WSP, 2023). These previous studies suggested PFAS dry weight concentrations individually of below detection to 5.5 $\mu\text{g}/\text{kg}$ and the sum of 20 PFAS ('PFAS20') ranged from 2.2-32 $\mu\text{g}/\text{kg}$.
- According to the results of leaching tests, crushed concrete and CBGM samples released PFAS at levels that are close to, and sometimes above, the 100 nanogrammes per liter (ng/L) PFAS20 screening level used as a standard for drinking water intended for human consumption.
- PFAS precursors 8:2FTS and 6:2 FTS, which are not included in the PFAS20 sum, were also leached (Table 1) increasing the fluorine equivalent mass by 72-87%. These precursors are known to transform into carboxylic acids such as PFPA, PFHxA, PFHpA, and PFOA, which are included in the PFAS20 sum.
- It is important to note that these precursors have the potential to become a source of regulated PFAS in the future i.e. PFAS20 sum. This is because they have been shown to transform into regulated PFAS such as PFPA, PFHxA, PFHpA, and PFOA, which was demonstrated during the TOP assay oxidation.
- There was no significant difference between the levels of PFAS leached from the crushed concrete and the CBGM. This suggests that adding cement to the crushed concrete mix does not reduce leaching of PFAS.

- The results of the semi-dynamic tank testing conducted on the CBGM samples indicate consistent leaching of PFAS in the solution. The concentrations of PFAS20 range from 15-25 ng/L, with only PFOS and 8:2 FTS detected at low levels of 1-3.4 ng/L over the first four days of the study.
- Further tank testing sample results are pending that will be used to calculate PFAS (and precursor) flux and kinetics for desorption or diffusion from the CBGM.
- Results suggest that the PFAS observed in the crushed concrete and CBGM will unlikely leach at concentrations exceeding the PFAS20 screening threshold. Any crushed concrete with higher PFAS levels than those used in the study may pose a greater risk of leaching. Ongoing tank test evaluations are being conducted to determine the threshold levels in crushed concrete and CBGM below which leaching flux would be below the PFAS 20.
- The addition of the sorbents Fluorosorb and powdered activated carbon (PAC) to the CBGM reduced PFAS leaching to below detection limits in all the leachate samples except one.
- In the context of the proposed reuse site, groundwater samples from individual monitoring wells on the site indicate that the PFAS concentrations range from 15-1,078 ng/L for PFAS20. The locations closest to the Apron 5H had concentrations ranging from 16-766 ng/L.
- Soil samples collected beneath the Apron 5H area show relatively high concentrations of PFAS. For example, PFOS concentrations ranged from ND at 568 µg/kg, and the sum of all other PFAS (excluding PFOS) was as high as 415 µg/kg near the 5H Apron (WSP, 2023).

Recommendations

It is recommended to move forward with the plan to reuse the Apron 5H crushed concrete despite the observed PFAS leaching. The rationale is as follows:

- The PFAS levels observed in the crushed concrete are relatively low, with concentrations less than 32 µg/kg. These samples also leached PFAS at concentrations below or periodically above the PFAS20 screening. However, the leaching test is very conservative and does not accurately represent the leaching occurring with the emplaced CBGM in situ.
- Two methods were used to evaluate leaching PFAS concentrations, the BS EN 12457 leachate test and the EA NEN 7375 tank test. The EA NEN 7375 tank test study of the CGBM shows that the leaching PFAS concentrations are lower than those measured with the BS EN 12457 leachate test. The tank test more accurately represents what is likely to occur in situ. However, some uncertainty in the analysis remains due to the relatively low levels of PFAS observed in the crushed concrete and CBGM of the observed range.
- Groundwater and soils beneath Apron 5H area have PFAS concentrations that are much higher than those observed in the CBGM or leachates. Therefore, CBGM leaching would not worsen current site environmental conditions.

- The CBGM will be placed beneath a layer of sealant and pavement to prevent infiltration and potential leaching. This will significantly reduce infiltration to and through the CBGM. In addition, given that the groundwater table elevation is significantly below the emplaced CBGM, it is unlikely to pose any leaching risk.
- Both Fluorosorb and PAC significantly reduced PFAS leachate concentrations to below method detection levels when mixed at various concentrations in the CBGM. These amendments can be considered as part of a future re-use scenario, to reduce leaching flux, if necessary, and supported by a value engineering assessment.

The CBGM tank analytical results are pending, which will allow calculating the kinetic PFAS flux rate from the CBGM samples. This can be used to evaluate the expected leaching flux across the range of PFAS concentrations observed in the crushed concrete and CBGM. This can provide a defensible basis for re-use and support future decision-making. The CBGM tank analytical results evaluating PFAS precursors is also pending. These results will allow for evaluating and calculating the kinetic precursor flux rate from the CBGM samples.

Review of Contractor Proposal

CDM Smith reviewed the works Contractor) proposal to reuse crushed concrete from the Dublin Airport Apron 5H works area (WPS, 2023). The Contractor analyzed five composite samples from the crushed concrete stockpile and samples were sent to a laboratory in the UK for PFAS analysis. The samples were analysed for PFAS in both solids and leachate (although the method used for leachate sampling was not provided). The dry weight concentrations of the sum of all PFAS analysed ranged from 2.2-32 µg/kg, with a PFOS exceedance of 5.5 µg/kg based on the Australian leachable criteria for solids (Australian EPA, 2023). The leachate concentrations ranged from non-detect (ND) to 350 ng/L for the sum of 30 PFAS, and with a PFOS leachate concentration of 85 ng/L.

Based on the Contractor proposal to reuse the crushed concrete (WSP, 2023), CDM Smith made the following initial observations:

- The primary risk associated with onsite use of contaminated soil/concrete is likely to be the leaching to water (e.g., stormwater and groundwater) pathways. Risk is higher when or where groundwater is shallow. Vertical migration of PFAS to groundwater is the 'primary risk driver' for reusing impacted media onsite.
- In the Contractor proposal (WSP, 2023), the detection limits for the reported samples were relatively high (ranging from 20-50 ng/L). In addition, the method for doing leaching tests was not provided.
- The South Australian guidelines referenced by the Contractor are specific to Australian Standard Leaching Procedures (ASLP), with US EPA Method 1320 accepted as an alternative method for leachate testing. In addition, the UK has method BS EN 12457. Other methods of leachate analysis would not necessarily allow direct comparison to Australian guidelines. As such, clarification of laboratory methodology, including leachate buffers, would be required to qualify the use of Australian criteria.

- Leaching concentrations should also be evaluated relative to any applicable Irish or EU screening criteria. The only applicable screening threshold currently is 100 ng/L for PFAS20.
- The Interim PFAS criteria (EPA 1130/23 – South Australia, dated July 2023) are noted to be the maximum values that EPA South Australia may accept. Therefore, any exceedance of these concentrations (such as SP-CON 4) would not automatically facilitate re-use (in South Australia) without further site-specific-risk assessment -see 'Using Australian Guidance' below. In addition, large-scale 're-use' projects within Australia generally do not commence without prior consultation with Regulatory Authorities and other relevant stakeholders, including the provision of pertinent work approvals and/or permits.
- Account for PFAS precursors in contaminated media to be retained onsite (TOP, TOF analysis). Precursor compounds are PFAS that are not reported in standard analytical methods but transform in the environment to regulated PFAS and represent a potential unseen (i.e., unmeasured) source for leaching in the concrete.
- Consideration (and relevant modeling) of aggregate/soil to leachate to water pathways, including site-specific hydrogeological properties. This will be important where groundwater is shallow and/or surface water bodies are in close proximity to the site.
- Provision of a complete risk-based conceptual site model to support retention of PFAS material onsite.
- Methods that can be validated and used to establish a leaching model were recommended using leachate testing in accordance with BS EN 12457 and a semi-dynamic leaching test in accordance with EA NEN 7375 to derive mass flux rates and effective diffusion coefficients accurately.
- If leaching is unacceptable, then amendments are available that can be mixed into the CBGM that can sorb PFAS and prevent leaching flux.

Overview of Methods

Sample Preparation and Shipping

- Approximately 1 tonne of dry mix of CBGM was batched on-site using the on-site batcher currently being used for the works
- Minimum 600 kilograms (kg) of the dry mix was loaded by machine into ½ or 1-tonne capacity bags and shipped to CE Geochem lab in Chesterfield, Derbyshire
- 50kg of bags of cement were also delivered to CE Geochem lab in Chesterfield, Derbyshire
- CE Geochem mixed the samples of CBGM per the specification, along with amendments Fluorosorb and PAC as described in Exhibit 1.

	MD No.	Aggregate	MC	BINDER (wt. %)	SORBENT
CBGM	MD1	0/32mm Recycl.	NMC	4.4% CEMI	-
	MD2	0/32mm Recycl.	NMC	4.4% CEMI	1% Fluorosorb
	MD3	0/32mm Recycl.	NMC	4.4% CEMI	2% Fluorosorb
	MD4	0/32mm Recycl.	NMC	4.4% CEMI	3% Fluorosorb
	MD5	0/32mm Recycl.	NMC	4.4% CEMI	5% Fluorosorb
	MD6	0/32mm Recycl.	NMC	4.4% CEMI	1% PAC
	MD7	0/32mm Recycl.	NMC	4.4% CEMI	2% PAC
	MD8	0/32mm Recycl.	NMC	4.4% CEMI	3% PAC
	MD9	0/32mm Recycl.	NMC	4.4% CEMI	5% PAC

1	Assume Natural Moisture Content (NMC) would be preferable to Optimum Moisture Content (OMC) as it will reflect the likely conditions achievable during the construction phase
2	4.4 wt.% binder addition calculated from aggregate mass and binder rate (110 kg/m ³) used in previous trials
3	Organosorbent application rates chosen to encompass maximum likely application rate required to allow interpolation of optimum application rate based on observed performance
4	0/32mm Recycled Concrete shall be used as received without further amendment
5	Additional sorbent systems may be tested on request. Reagents to be supplied by CD Smith.
6	Mix Design strategy assumes only recycled concrete will require treatment as a CBGM however should underlying soils require treatment a similar mix design matrix may applied for soil stabilisation techniques

**All mix designs to be manufactured for TT + 1 duplicate for MD1 = 10 No. specimens
MD 1, MD 2, MD3, MD5, MD6 MD7 & MD 9 to be manufactured for Geotech Testing.**

Exhibit 1. Experimental Matrix for Semi-Dynamic Leaching Studies

Laboratory Studies

Detailed methods will be provided in the final report.

- Leaching was evaluated using UK leaching standard method BS EN 12457
- Semi-Dynamic Tank Testing UK standard method EA NEN 7375

Analytical Sampling Matrix

Detailed methods will be provided in the final report.

- PFAS expanded suite analysis reported 47 PFAS
- PFAS standard analysis in soil reported 18 PFAS
- PFAS low-detection limit method (reported 21 PFAS)
- Total oxidizable precursor (TOP) assay methods analyze the concentration of PFAS pre- and post-oxidation. TOP Assay and reported 20 PFAS

Results

Soils

Samples of the crushed concrete and the CBGM were collected in triplicate and sent to the analytical laboratory (ALS) for PFAS and TOP Assay analysis. All sample results were below the method detection limit (approximately 1 µg/kg).

Leachate

The drinking water standard (DWS) of 100 nanogrammes per liter (ng/L) for the “Sum of 20 PFAS” (PFAS20). This is stipulated in the European Union (Drinking Water) Regulations 2023 (S.I. No. 99/2023), noting that the DWS applies to all waters intended for human consumption¹. The PFAS20 are identified in the regulations and include:

- Perfluorobutanoic acid (PFBA)
- Perfluoropentanoic acid (PFPeA)
- Perfluorohexanoic acid (PFHxA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorooctanoic acid (PFOA)
- Perfluorononanoic acid (PFNA)
- Perfluorodecanoic acid (PFDA)
- Perfluoroundecanoic acid (PFUnA)
- Perfluorododecanoic acid (PFDoA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluoropentanesulfonic acid (PFPeS)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluoroheptanesulfonic acid (PFHpS)
- Perfluorooctanesulfonic acid (PFOS)
- Perfluorononanesulfonic acid (PFNS)
- Perfluorodecanesulfonic acid (PFDS)
- Perfluorododecanesulfonic acid (PFDoS)
- Perfluorotridecanesulfonic acid (PFTrDS)
- Perfluoroundecane sulfonic acid (PFUnDS)

Table 1 presents the individual and PFAS20 for the leachate samples from crushed concrete, CBGM, Fluorosorb, and PAC-amended CBGM. In addition to the PFAS20 presented in Table 1, the individual and sum of fluorotelomer sulfonates (6:2 FTS and 8:2 FTS) is provided in Table 1.

¹ Following first detection of PFAS above this screening value in August 2021, the affected well owners were provided with an alternative water supply. In August 2021 bottled water was provided until 4 no. properties were connected to a piped well supply from the airport in December 2021 and a fifth property in March 2022. Details of dates of ‘do not consume’ notices and water connections are included in the Stage 1 Preliminary Site Assessment Report, FT 2022.

Triplicate samples were collected, and results are also presented in Figures 1 and 2 for the crushed concrete and CBGM. The reported detection limits were generally elevated (10-20 ng/L). Samples were re-leached and re-analyzed to achieve lower detection limits. PFBA, PFOA, PFHxS, and PFOS 6:2 FTS and 8:2 FTS were detected in both analyses. Table 1 includes both results for these compounds. The PFAS20 calculation (see Table 1) presents the minimum, maximum, and average concentrations for these compounds detected in both analyses.

Prior to oxidation, PFOS predominated the samples with a sum of detections ranging from an average (average between the original result and the low detection limit result) of 17 to 38 ng/L in crushed concrete and an average of 28 to 44 ng/L in CBGM. 6:2 FTS and 8:2 FTS were also detected at relatively high concentrations, ranging from an average concentration range of 6:2 FTS of 34 to 47 ng/L in crushed concrete and 26 to 49 ng/L in the CBCM. For 8:2 FTS, the concentrations range from 45 to 76 ng/L in crushed concrete and 45 to 125 ng/L in the CBCM.

Many PFAS used globally are precursors to PFCAs or PFSA's and are subject to biotic or abiotic transformation to these terminal end products (Washington 2015a). For example, some precursor polyfluoroalkyl substances, such as fluorotelomer alcohols and perfluoroalkane sulfonamido ethanols, transform to PFOA or PFOS, respectively, as a terminal degradation product. The potential for precursors to act as future sources of regulated PFAS has been considered in the current report.

The TOP assay is a semi-quantitative method that estimates oxidizable precursors that can transform to regulated in aqueous and solid matrices by evaluating the subjecting samples to a robust oxidation that is intended to chemically drive the oxidation of precursors to PFCAs that can be quantified using target PFAS methods. The increase in PFCAs measured after the TOP assay, relative to before, estimates the total concentration of PFCA precursors present in a sample because not all PFAS present will be subject to quantitation or oxidation, and some will remain undetected PFAS.

Following oxidation, precursor compounds such as 6:2 FTS and 8:2 FTS were depleted, and transformation products PFBA, PFPA, PFHxA, PFHpA, and PFOA were detected (Figures 1 and 2). This suggests the presence of significant precursor compounds. A fluorine mass balance was calculated to assess the total change before and after oxidation (Figure 3). For the crushed concrete, the total fluorine was 63 ng/L equivalent before and 119 ng/L fluorine equivalent after oxidation. For the CBGM, the total fluorine was 82 ng/L before and 140 ng/L after oxidation. This suggests an 82% and 72% increase in total measured fluorine support significant precursors leaching from the concrete.

Semi-Dynamic Tank Testing

The objective of the semi-dynamic tank testing (method EA NEN 7375) is to accurately determine the leaching trends for PFAS as a function of cumulative mass flux over cumulative time in stabilised monoliths. Results are used to calculate the mass flux rate in units of mg/m²/s and obtain the upper leaching limits, defective diffusion coefficient, and sorption coefficient (K_d). An 8-fraction 16-day testing protocol was implemented with sampling at 0.083, 0.25, 2.25, 4,6.25, 9, and 16 days. The CBGM monoliths are submerged, drained at the sampling time intervals, and analyzed for PFAS. There is an option to extend the trials to 64 days. PFAS results have been obtained from the first four days of the leaching study and are shown in Figure 4. Duplicate samples were evaluated, and concentrations of the PFAS20 were relatively consistent at 15-25 ng/L for all time intervals. Only PFOS and 8:2 FTS were detected above the method detection limits, and concentrations were relatively low (ranging from approximately 1-3.4 ng/L). In general, the tank testing is considered more representative of leaching than the leaching tests, which tend to represent leaching under extreme conditions.

Sum of 20 (1/2 Detection Limit)

Compound	Cas No.	Method	Units	Reporting Limit	Crushed Concrete			CBGM			1% Fluorosorb			2% Fluorosorb			5% Fluorosorb			1% PAC			2% PAC			5% PAC						
					A231204CEN	A231204CEN	A231204CEN	A231204MD	A231204MD	A231204MD	A231204MD2-1	A231204MD2-1	A231204MD2-1	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3		
Perfluorocarboxylic Acids																																
PFBA	375-22-4	TM434	ng/l	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20				
PFBA (re-run)	375-22-4	TM434	ng/l	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4			
PFPA	2706-90-3	TM434	ng/l	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
PFHxA	307-24-4	TM434	ng/l	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
PFHxA	375-85-9	TM434	ng/l	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
PFDA	335-67-1	TM434	ng/l	<8.5	<8.5	7.62	7.19	6.93	7.61	7.78	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5		
PFDA (re-run)	335-67-1	TM434	ng/l	<0.85	2.92	1.88	1.87	1.82	1.83	1.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85		
PFNA	375-65-1	TM434	ng/l	<1	2.52	2.42	2.4	2.14	2.11	1.89	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFDA	335-76-2	TM434	ng/l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
PFDA	2058-84-8	TM434	ng/l	<1	1.47	1.12	1.4	1.01	1.22	<1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
PFDA	307-55-1	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFTeA	376-06-7	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Perfluorosulfonic Acids																																
PFBS	375-73-5	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFPeS	2706-91-4	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFHxS	355-46-4	TM434	ng/l	<10	<10	<10	10.2	<10	10.7	10.2	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
PFHxS (re-run)	355-46-4	TM434	ng/l	<1	2.78	2.59	2.45	2.52	2.83	2.86	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFHxS	375-82-8	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Total PFOS	1763-23-1	TM434	ng/l	<8.5	<8.5	35.5	44.8	61.3	33.5	32.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5		
Total PFOS (re-run)	1763-23-1	TM434	ng/l	<0.85	34.2	30.42	31.08	27.02	30.87	23.96	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85		
PFNS	68259-12-1	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFDS	335-77-3	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFDoS	79780-39-5	TM434	ng/l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
PFUDS	174675-49-1	TM434	ng/l	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
PFUDS	749786-16-1	TM434	ng/l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Sum of 20 -1/2 Detection Limit - Minimum					15.6	46.8	49.7	43.0	48.8	44.1	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	
Sum of 20 -1/2 Detection Limit - Maximum					53.5	59.7	78.6	84.4	65.5	65.9	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15
Sum of 20 -1/2 Detection Limit - Average					34.6	53.2	64.1	63.7	57.2	55.0	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15	13.15

Sum of FTS's (1/2 Detection Limit)

Compound	Cas No.	Method	Units	Reporting Limit	Crushed Concrete			CBGM			1% Fluorosorb			2% Fluorosorb			5% Fluorosorb			1% PAC			2% PAC			5% PAC						
					A231204CEN	A231204CEN	A231204CEN	A231204MD	A231204MD	A231204MD	A231204MD2-1	A231204MD2-1	A231204MD2-1	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3	A231204MD3			
Fluorotelomer Sulfonates (PFCA Precursors)																																
8:2 FTS	39108-34-4	TM434	ng/l	<20	<20	78.9	89.1	190	59.6	49.5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			
8:2 FTS (re-run)	39108-34-4	TM434	ng/l	<2	85.6	57	63.8	61	74.4	40.3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
8:2 FTS	27619-97-2	TM434	ng/l	<20	<20	11.1	13.9	14.8	23	12.6	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			
8:2 FTS (re-run)	27619-97-2	TM434	ng/l	<2	9.62	8.9	8.73	8.64	9.06	8.71	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Sum of FTS's -1/2 Detection Limit - Minimum					6.0	65.9	72.5	69.6	68.9	49.0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
Sum of FTS's -1/2 Detection Limit - Maximum					98.2	90.0	103.0	204.9	97.4	62.1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Sum of FTS's -1/2 Detection Limit - Average					52.1	78.0	87.8	137.3	83.1	56.6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

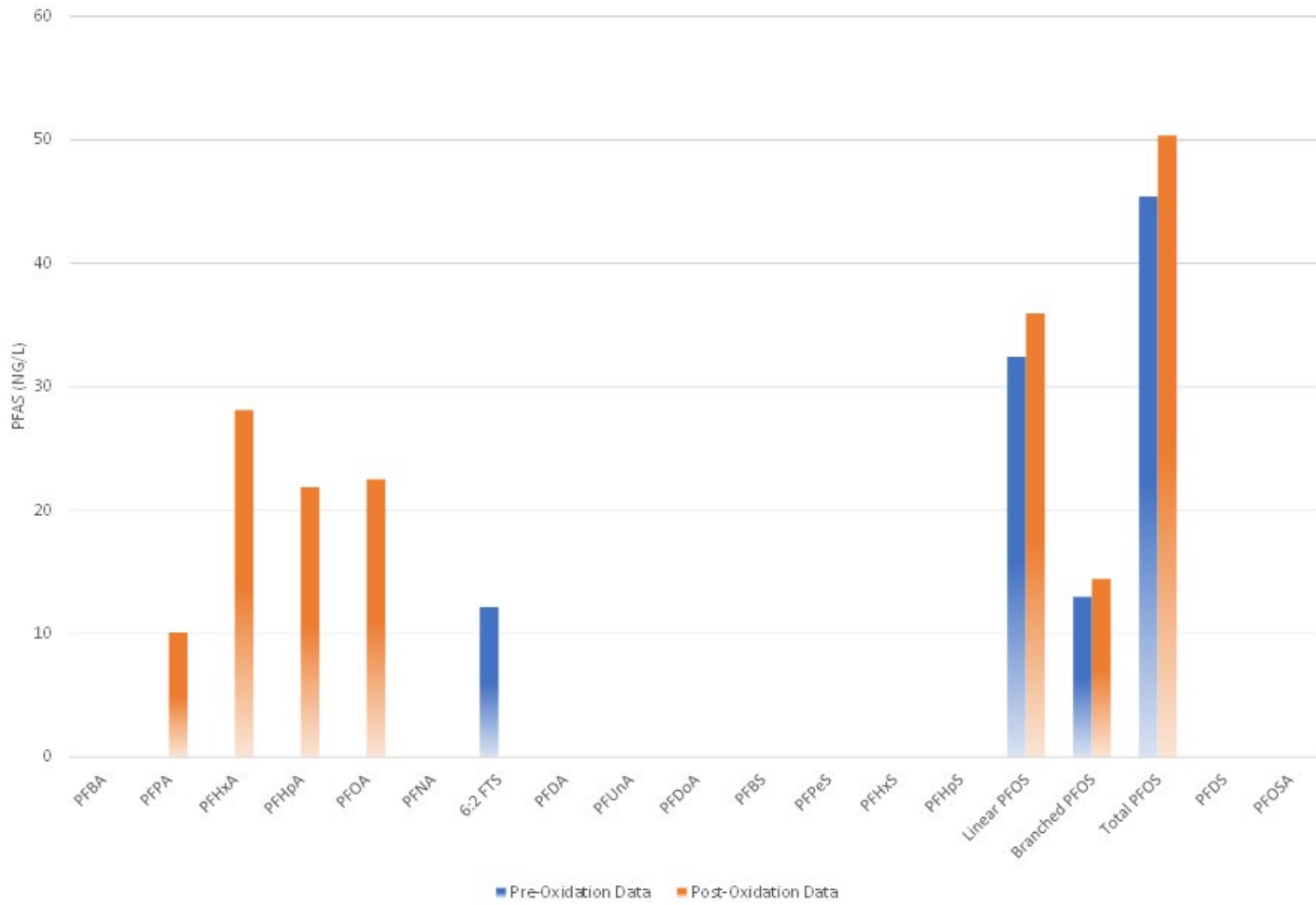
Notes: PFBA, PFOA, PFNS PFOS, 8:2 FTS and 6:2 FTS had detections in either the original result (dashed extract high detection limits) and/or the re-analyzed and extracted sample used for lower detection limits. Only one result for each of these compounds was used to calculate the sums.

Compound	CAS Number	Conversion Factor: MWF/MWPFAS* f (ngf/ngPFAS)	Crushed Concrete												CBGM															
			A231204CEM-1				A231204CEM-2				A231204CEM-3				A231204MD1-1				A231204MD1-2				A231204MD1-3							
			Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Average Pre-Oxidation	Average Post-Oxidation	Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Pre Oxidation (ng/L)	Post Oxidation (ng/L)	Pre-Oxidation Fluorine Mass (ng/L)	Post-Oxidation Fluorine Mass (ng/L)	Average Pre-Oxidation	Average Post-Oxidation
PFBA	375-22-4	0.62138	<20	<20	--	--	<20	<20	--	--	<20	<20	--	--	ND	ND	<20	<20	--	--	<20	<20	--	--	<20	<20	--	--	ND	ND
PFPA	2706-90-3	0.64761	<10	<10	--	--	<10	10.10	<6.47	6.54	<10	<10	--	--	ND	10.10	<10	13.80	<6.47	8.94	<10	10.70	<6.47	8.93	<10	18.20	<6.47	11.79	ND	14.23
PFNA	307-24-4	0.69550	<10	33.70	<6.65	22.43	<10	25.20	--	16.77	<10	25.50	<6.65	16.97	ND	28.13	<10	35.40	<6.65	23.56	<10	39.90	<6.65	26.55	<10	34.90	<6.65	23.23	ND	36.73
PFDA	375-85-9	0.67946	<10	23.10	<6.78	15.87	<10	24.50	--	16.82	<10	18.00	<6.78	12.21	ND	21.87	<10	30.00	<6.78	20.35	<10	31.00	<6.78	21.03	<10	26.20	<6.78	13.77	ND	27.10
PFDA	355-07-1	0.69029	<6.5	18.50	<4.47	12.55	<6.5	20.00	<4.47	14.32	<6.5	21.20	<4.47	14.59	ND	22.50	<6.5	28.10	<4.47	19.34	<6.5	27.60	<4.54	19.00	<6.5	22.00	<4.54	15.14	ND	25.90
PFNA	375-95-1	0.69600	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
6,2 FTIS	27819-97-2	0.57687	12.70	<10	--	--	11.60	<10	6.69	<5.76	<10	<10	--	--	12.15	ND	11.50	<10	6.63	6.77	18.60	<10	10.70	<5.77	13.90	<10	8.02	<5.77	14.67	ND
PFDA	335-78-2	0.70223	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFDA	2959-94-8	0.70733	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFDA	307-05-1	0.71161	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFBS	375-73-5	0.59981	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFHxS	2700-91-4	0.59696	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFHxS	355-46-4	0.61731	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFHxS	375-62-6	0.63316	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
Linear PFOS	1763-23-1	0.64903	28.30	38.60	18.92	23.64	38.30	37.70	24.67	24.35	28.00	33.50	19.20	21.64	32.43	35.93	33.10	43.80	21.30	28.60	30.40	45.90	19.63	23.10	43.80	33.10	34.75	20.73	30.16	37.17
Branched PFOS	1763-23-1	0.64903	9.94	13.90	6.42	8.98	17.10	15.90	11.04	10.01	11.90	13.90	7.69	8.90	12.98	14.43	13.70	15.00	8.85	9.69	15.40	13.00	9.85	8.40	17.90	13.40	11.56	8.65	13.67	13.90
Total PFOS	1763-23-1	0.64903	39.30	60.50	25.38	32.61	65.20	63.20	35.65	34.36	41.70	47.40	26.93	30.61	45.40	50.37	46.80	68.80	30.22	37.78	45.80	49.00	29.68	31.65	71.70	45.60	46.31	29.39	54.77	51.00
Ratio n-PFOS to PFOS			2.95	2.63	2.85	2.63	2.23	2.43	2.23	2.43	2.69	2.41	2.50	2.41	2.59	2.49	2.42	2.90	2.42	2.90	1.97	2.76	1.97	2.76	3.01	2.40	3.01	2.40	2.50	2.69
PFOS	335-77-3	0.60483	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND	<10	<10	--	--	<10	<10	--	--	<10	<10	--	--	ND	ND
PFOSA	754-91-6	0.64710	<20	<20	--	--	<20	<20	--	--	<20	<20	--	--	ND	ND	<20	<20	--	--	<20	<20	--	--	<20	<20	--	--	ND	ND
ELM F Mass					63.47	123.61			80.29	125.40			66.37	107.41					89.50	166.42			71.86	139.60			103.64	125.09	124.70	204.63

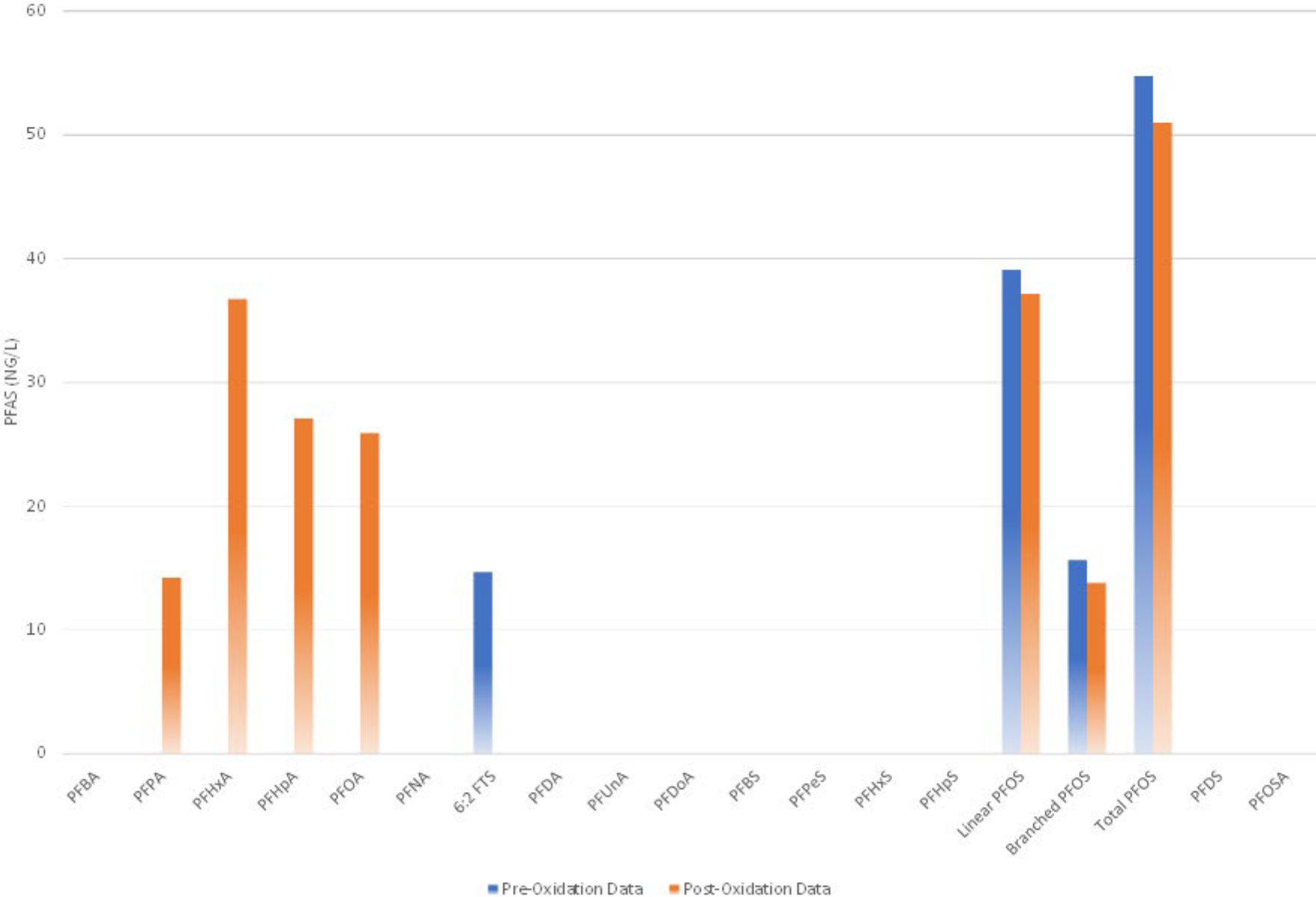
Av. Fluorine
SDEV

Crushed Concrete	Concrete (post-ox)	% Difference	CBGM	CBM (post-oxidat)	% Difference
63.4	118.8	87.2	81.7	140.3	71.8
14.7	9.9		19.1	15.7	

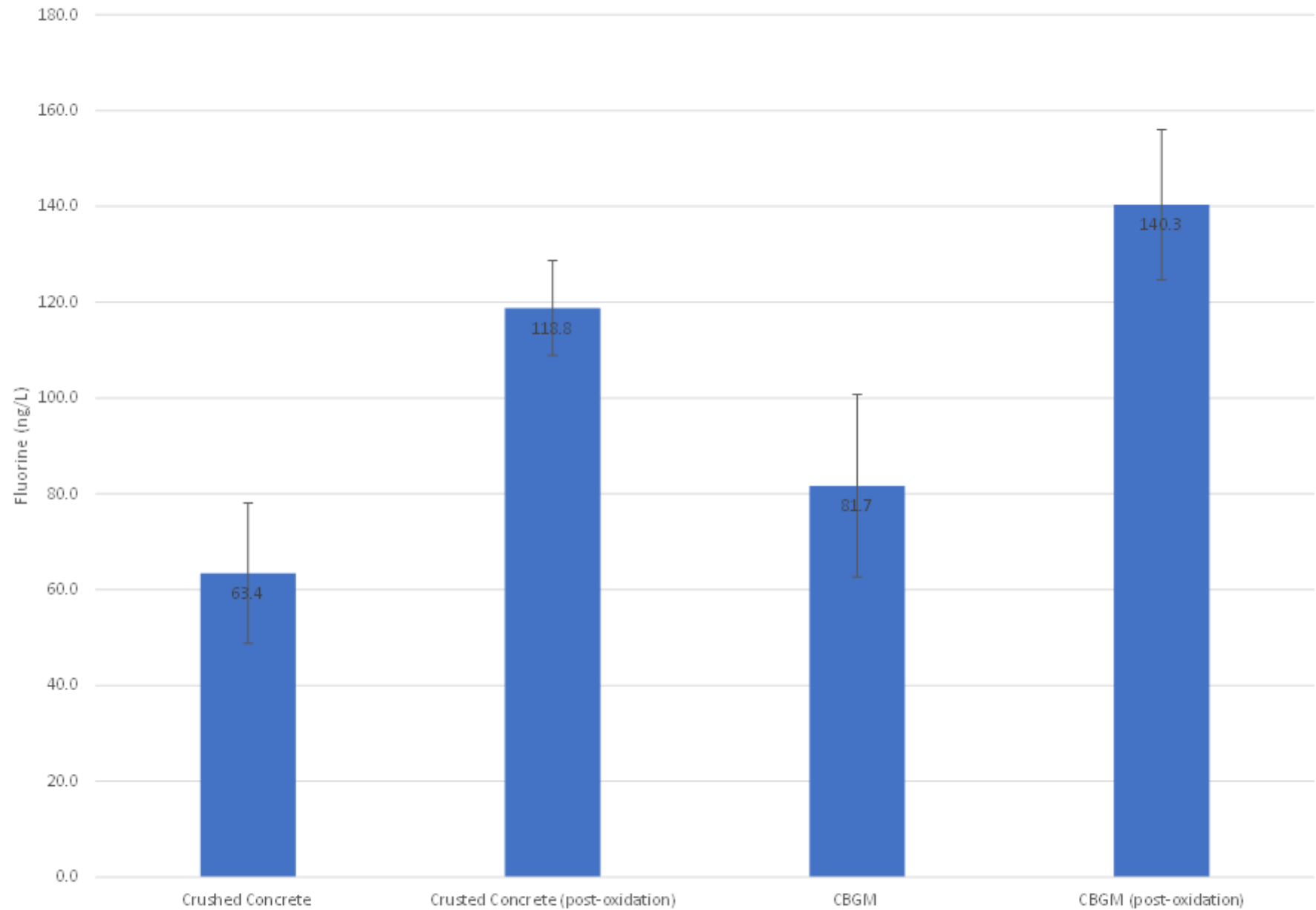
CRUSHED CONCRETE



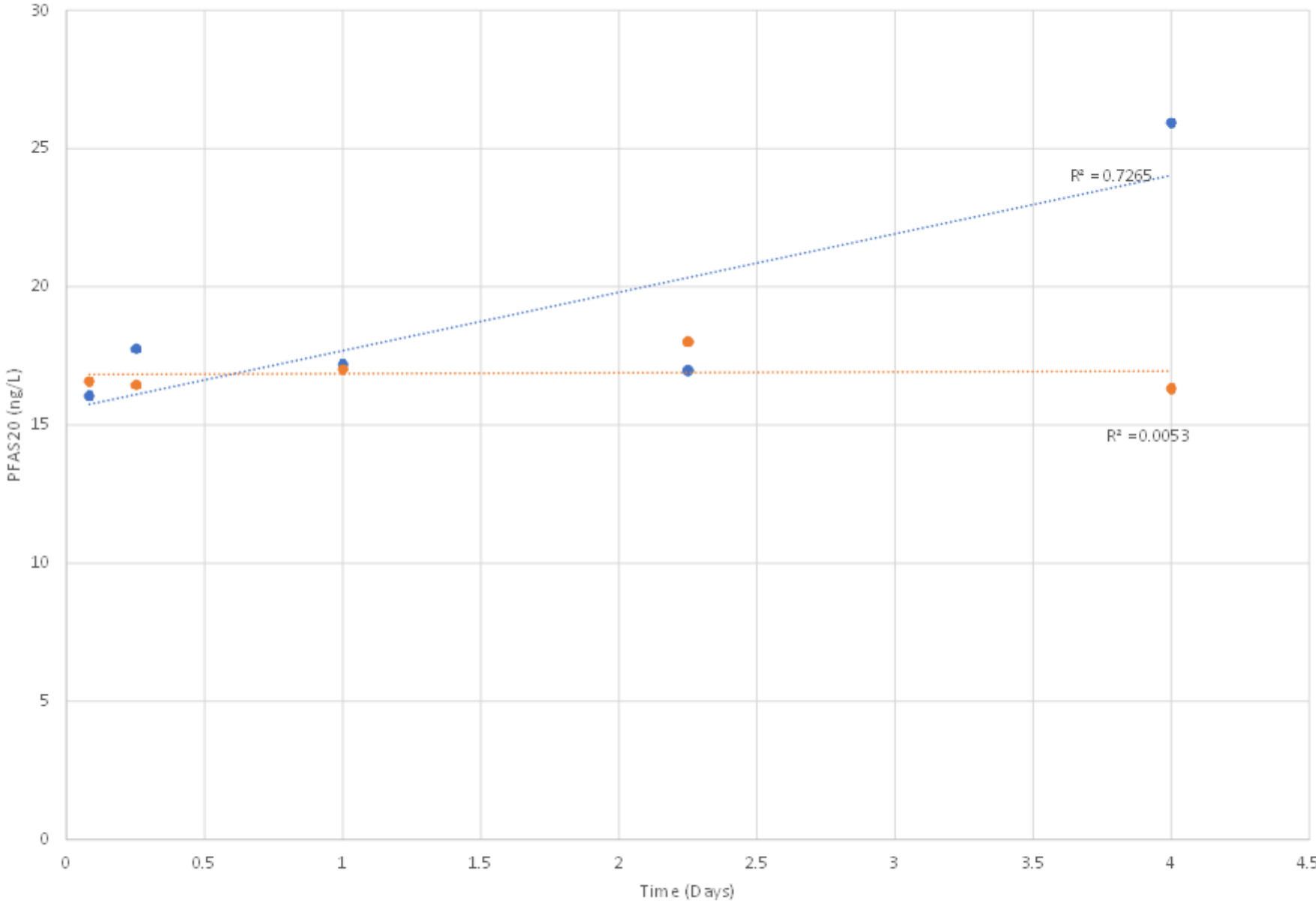
CBGM



Fluorine Leaching



CBGM



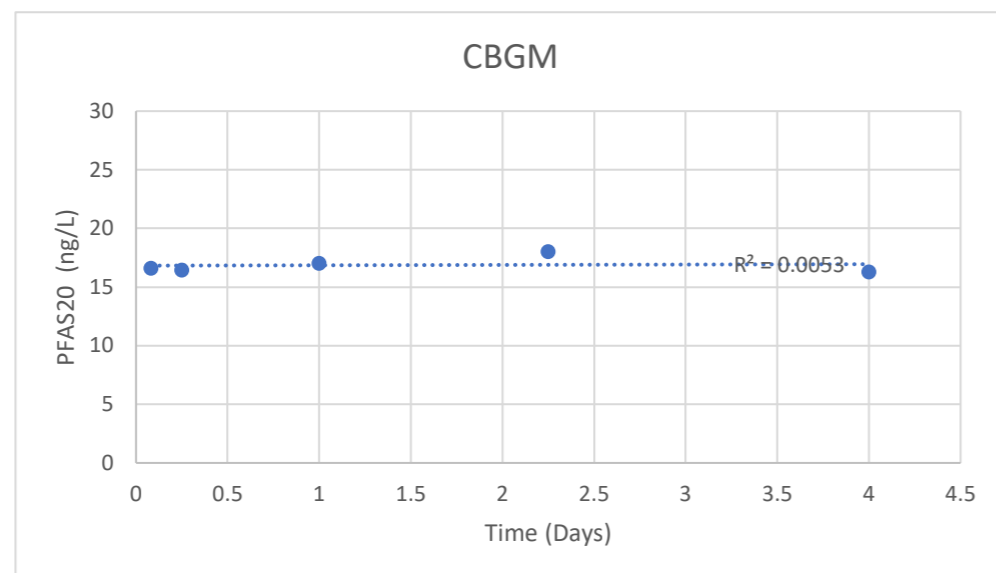
Data

Mix Design 1 - CBGM

Compound	Cas Number	A231204MD1AF1	A231204MD1AF2	A231204MD1AF3	31204MD1AF4	31204MD1AF5	A231204MD1BF1	A231204MD1BF2	A231204MD1BF3	A231204MD1BF4	A231204MD1BF5
PFBA	375-22-4	<5	<5	<5	<6.5	<5.0	<5	<5	<5	<5.0	<5.0
PFPA	2706-90-3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.0
PFHxA	307-24-4	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.0
PFHpA	375-85-9	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.0
PFOA	335-67-1	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<1.95
PFNA	375-95-1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00
PFDA	335-76-2	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.0
PFUnA	2058-94-8	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFDoA	307-55-1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.0
PFTeA	376-06-7										
PFBS	375-73-5	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFPeS	2706-91-4	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFHxS	355-46-4	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFHpS	375-92-8	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Total PFOS	1763-23-1	1.47	1.19	2.1	2.39	2.07	1.32	2.5	2.02	2.84	1.96
PFNS	68259-12-1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFDS	335-77-3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFDoS	79780-39-5	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
PFTrDS	174675-49-1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PFUnDS	749786-16-1	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
8:2 FTS	39108-34-4	3.29	3.41	3.1	3.05	2.41	2.92	3.41	3.34	2.31	<2.00
Linear PFOS	1763-23-1	1.47	1.19	1.4	1.6	1.35	1.32	1.71	1.26	1.67	1.22
Branched PFOS	1763-23-1	<0.65	<0.65	0.7	0.79	0.72	<0.65	0.79	0.76	1.17	0.74
6:2 FTS	27619-97-2	<1.00	<1.00	<1.00	1.21	<1.00	<1.00	<1.00	1.11	1.13	1.09

Sum of 20 Results Not detect = 1/2 DL

Compound	Mix Design	CBGM					CBGM Duplicate				
	Fraction (Days)	0.083	0.25	1	2.25	4	0.083	0.25	1	2.25	4
	Cas Number	A231204MD1AF1	A231204MD1AF2	A231204MD1AF3	A231204MD1AF4	31204MD1AF5	A231204MD1BF1	A231204MD1BF2	A231204MD1BF3	A231204MD1BF4	A231204MD1BF5
PFBA	375-22-4	2.5	2.5	2.5	3.25	2.5	2.5	2.5	2.5	2.5	2.5
PFPA	2706-90-3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
PFHxA	307-24-4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
PFHpA	375-85-9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
PFOA	335-67-1	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.975
PFNA	375-95-1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
PFDA	335-76-2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
PFUnA	2058-94-8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFDoA	307-55-1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
PFTeA	376-06-7										
PFBS	375-73-5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFPeS	2706-91-4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFHxS	355-46-4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFHpS	375-92-8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total PFOS	1763-23-1	1.47	1.19	2.1	2.39	2.07	1.32	2.5	2.02	2.84	1.96
PFNS	68259-12-1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFDS	335-77-3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFDoS	79780-39-5	1	1	1	1	1	1	1	1	1	1
PFTrDS	174675-49-1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFUnDS	749786-16-1	1	1	1	1	1	1	1	1	1	1
8:2 FTS	39108-34-4	3.29	3.41	3.1	3.05	2.41	2.92	3.41	3.34	2.31	1
Sum of 20 Total		16.585	16.425	17.025	18.015	16.305	16.065	17.735	17.185	16.975	25.935



Sample ID	Description	PFAS	Top Assay	Matrix	Laboratory PFAS Results Results Received		Geotechnical Parameters
					Standard Detection Limits	Standard Detection Limits	
A231204ST01	Source term solid. Sample sieved and geocrushed <10 mm.	YES	YES	Solid	yes	In Process	Not Received
A231204ST02	Source term solid. Sample sieved and geocrushed <10 mm.	YES	YES	Solid	yes	In Process	Not Received
A231204ST03	Source term solid. Sample sieved and geocrushed <10 mm.	YES	YES	Solid	yes	In Process	Not Received
A231204CEM-1	Leachate BS EN 12457-4, No CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204CEM-2	Leachate BS EN 12457-4, No CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204CEM-3	Leachate BS EN 12457-4, No CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204MD1-1	Leachate BS EN 12457-4, CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204MD1-2	Leachate BS EN 12457-4, CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204MD1-3	Leachate BS EN 12457-4, CEM I and NO treatment	YES	NO	Leachates	yes	In Process	NA
A231204MD2-1	Leachate BS EN 12457-4, CEM I + Fluorosorb 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD2-2	Leachate BS EN 12457-4, CEM I + Fluorosorb 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD2-3	Leachate BS EN 12457-4, CEM I + Fluorosorb 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD3-1	Leachate BS EN 12457-4, CEM I + Fluorosorb 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD3-2	Leachate BS EN 12457-4, CEM I + Fluorosorb 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD3-3	Leachate BS EN 12457-4, CEM I + Fluorosorb 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD5-1	Leachate BS EN 12457-4, CEM I + Fluorosorb 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD5-2	Leachate BS EN 12457-4, CEM I + Fluorosorb 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD5-3	Leachate BS EN 12457-4, CEM I + Fluorosorb 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD6-1	Leachate BS EN 12457-4, CEM I + PAC 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD6-2	Leachate BS EN 12457-4, CEM I + PAC 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD6-3	Leachate BS EN 12457-4, CEM I + PAC 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD6-4	Leachate BS EN 12457-4, CEM I + PAC 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD6-5	Leachate BS EN 12457-4, CEM I + PAC 1%	YES	NO	Leachates	yes	In Process	NA
A231204MD7-1	Leachate BS EN 12457-4, CEM I + PAC 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD7-2	Leachate BS EN 12457-4, CEM I + PAC 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD7-3	Leachate BS EN 12457-4, CEM I + PAC 2%	YES	NO	Leachates	yes	In Process	NA
A231204MD9-1	Leachate BS EN 12457-4, CEM I + PAC 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD9-2	Leachate BS EN 12457-4, CEM I + PAC 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD9-3	Leachate BS EN 12457-4, CEM I + PAC 5%	YES	NO	Leachates	yes	In Process	NA
A231204MD1AF1	Tank test F1 for PFAS - Mix design Baseline A	YES	NO	Tank Test	yes	yes	NA
A231204MD1AF2	Tank test F2 for PFAS - Mix design Baseline A	YES	NO	Tank Test	yes	yes	NA
A231204MD1AF3	Tank test F3 for PFAS - Mix design Baseline A	YES	NO	Tank Test	yes	yes	NA
A231204MD1AF4	Tank test F4 for PFAS - Mix design Baseline A	YES	NO	Tank Test	yes	yes	NA
A231204MD1AF5	Tank test F5 for PFAS - Mix design Baseline A	YES	NO	Tank Test	yes	yes	NA
A231204MD1BF1	Tank test F1 for PFAS - Mix design Baseline B	YES	NO	Tank Test	yes	yes	NA
A231204MD1BF2	Tank test F2 for PFAS - Mix design Baseline B	YES	NO	Tank Test	yes	yes	NA
A231204MD1BF3	Tank test F3 for PFAS - Mix design Baseline B	YES	NO	Tank Test	yes	yes	NA
A231204MD1BF4	Tank test F4 for PFAS - Mix design Baseline B	YES	NO	Tank Test	yes	yes	NA
A231204MD1BF5	Tank test F5 for PFAS - Mix design Baseline B	YES	NO	Tank Test	yes	yes	NA

PFBA	375-22-4
PFPA	2706-90-3
PFHxA	307-24-4
PFHpA	375-85-9
PFOA	335-67-1
PFNA	375-95-1

PFDA	335-76-2
PFUnA	2058-94-8
PFDoA	307-55-1
PFBS	375-73-5
PFPeS	2706-91-4
PFHxS	355-46-4
PFHpS	375-92-8
Linear PFOS	1763-23-1
Branched PFC	1763-23-1
Total PFOS	1763-23-1
PFDS	335-77-3
6:2 FTS	27619-97-2
PFOSA	754-91-6