

Appendix E

Theoretical model of residual PFAS

Appendix E1 Indicative PFAS model
Total PFOS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Discharge from 800mm pipe (g/yr Total PFOS - assumption 1 to 3)	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51

Assumptions

Historical model - emerging water, years 0 to 40.

The indicative residual PFAS model assumes:

- 1 Measured average discharge rates from the 800mm diameter pipe are in the order of 1 l/s, from which an annual discharge volume of
- 2 Analysis data has been used to establish maximum PFOS concentration for the emerging water =
- 3 On the basis of assumptions 1 and 2, the annual rate of total PFAS discharge from the 800mm pipe can be estimated as:

3E+07 litres/year can be derived.

16 ng/l Table 7

0.51 g/yr

- 4 Of the discharge from the 800mm dia pipe, not all will have impacted the soils at Victoria North. The model makes the following assumption regarding the discharge to the sewer over time and therefore, the residual discharge to ground:
 - a First 10 years after ad hoc drainage installed - 80% reached sewer 20% discharged to soil
 - b Year 11 to 20 - 60% reached sewer (deterioration in ad hoc system) 40% discharged to soil
 - c Year 21 to 35 - 40% reached sewer (further deterioration in ad hoc system) 60% discharged to soil
 - d Year 36 (2020) and 37 - flytipping - 10% reaches sewer 90% discharged to soil
 - e Year 38 (2022) to 40 - 0% reaches sewer (BAM on site) 100% discharged to soil
 - f After year 40 (2025) - 100% to sewer 0% discharged to soil

The model assumes that once the permanent discharge consent is in place (assumed year 40 - 2024), all the water from the 800mm pipe will be discharged to combined sewer and subsequently, there will be no further discharge of emerging water to ground. Given that discharge to sewer commenced in June 2023 under a temporary discharge consent, this is conservative.

- As discussed in the report text, for the purposes of the indicative model, the proportion of infiltrating water directly passing through the made ground has been assumed as zero. This assumption results in a worst-case assessment of historical PFAS impact being taken forward into future assessments of risk.

- 7 Selected value for leachable fraction of PFOA =

1% Table 38

Historical model - diffuse PFOS

- 8 Max diffuse leachable PFOS across Red Bank plateau after remediation of outlier, carriage shed and TP405A, is

13 ng/l Table 35

Assume 0.88 m/yr rainfall = 0.0024 m/d
Assume site area = 50,000 m2 (top of Red Bank plateau)
Assume infiltration is 80 %

Infiltration volume = 35200 m3 / yr = 3.5E+07 l / yr

Assuming 13 ng/l leached by the infiltrating water= 1E-08 g/l

Leachable PFAS = 0.458 g/yr

0.46 g/yr

Future indications - both sources

- 9 The potential for future leaching varies as infiltration varies - see assumption 12

Current proposals for remediation and enabling works do not include any significant areas of hardstanding (road pavement etc) within the site. Provision has been made however, for made ground across the site to be provided with a hydroseeded temporary protection layer as a precaution against the risk of asbestos fibre release from the exposed surface. Given the current proposals therefore, the permeability of the site surface will not differ significantly from the existing site conditions. Assumptions regarding historical rainfall infiltration will therefore, continue to be valid for the period following remediation and enabling works.

- 11 Infiltration will reduce the PFAS mass in the area of the emerging water (by removal of the leachable proportion) and will continue to release leachable PFAS from diffuse accumulations across the site. Assumptions regarding historical leachable proportions will therefore, continue to be valid for the period following remediation and enabling works.

Following completion of the remediation and enabling works, it is assumed that site development will take place over a period of ten years (to year 52). Development will introduce areas of hardstanding across the site which will reduce infiltration and therefore, reduce the potential for PFAS in the made ground to be removed by leaching. The reducing in infiltration assumed for the model is as follows:

Assume remediation starts year 40 (2024) and takes 2 years to complete
Assume development starts in year 43 (2027) and takes 10 years

Infiltration will reduce as development progresses and consequently, leachable proportion will reduce.

On this basis, infiltration will be:

For emerging water

a Before year 45	100% of pre-development infiltration	1.00% leachable assumed for model
b Yr 45 to 47 (incl)	75% of pre-development infiltration	0.75% leachable assumed for model
c Yr 48 and 49	50% of pre-development infiltration	0.50% leachable assumed for model
d Yr 50 to 52 incl	25% of pre-development infiltration	0.25% leachable assumed for model
e From year 53	10% of pre-development infiltration	0.10% leachable assumed for model

For diffuse PFAS

a Before year 45	100% of pre-development infiltration	0.46 g/yr leachable assumed for model
b Yr 45 to 47 (incl)	75% of pre-development infiltration	0.345 g/yr leachable assumed for model
c Yr 48 and 49	50% of pre-development infiltration	0.23 g/yr leachable assumed for model
d Yr 50 to 52 incl	25% of pre-development infiltration	0.115 g/yr leachable assumed for model
e From year 53	10% of pre-development infiltration	0.046 g/yr leachable assumed for model

44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.37	8.29	8.23	8.16	8.10	8.06	8.02	8.00	7.98	7.96	7.95	7.95	7.94	7.93	7.92	7.91	7.91	7.90	7.89	7.88	7.87	7.87	7.86	7.85	7.84	7.83	7.83
0.0637	0.0622	0.0617	0.0612	0.0405	0.0403	0.0201	0.0200	0.0200	0.0080	0.0080	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079	0.0078	0.0078	0.0078
8.287	8.2251	8.1634	8.1022	8.0617	8.0214	8.0013	7.9813	7.9614	7.9534	7.9455	7.9375	7.9296	7.9217	7.9137	7.9058	7.8979	7.89	7.8821	7.8743	7.8664	7.8585	7.8507	7.8428	7.835	7.8271	7.8193
0.46	0.345	0.345	0.345	0.23	0.23	0.12	0.12	0.12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.544	0.4072	0.4067	0.4062	0.2705	0.2703	0.1351	0.135	0.135	0.054	0.054	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0539	0.0538	0.0538	0.0538

Appendix E2 Indicative PFAS model
Total PFOA

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Discharge from 800mm pipe (g/yr Total PFOA - assumption 1 to 3)	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	
Proportion of discharge from pipe discharged to soil (g/yr) assumption 4)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.37	
Emerging water: Cumulative load in soil before leaching (g) (becomes residual soil load after input stops in year 40)	0.08	0.15	0.20	0.24	0.28	0.30	0.32	0.34	0.36	0.37	0.46	0.53	0.59	0.64	0.67	0.70	0.73	0.75	0.76	0.77	0.86	0.94	1.00	1.04	1.08	1.11	1.14	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.34	
Emerging water: Leachable load released from soil each year (assumption 7 - g/yr)	0.0164	0.0286	0.0401	0.0498	0.0552	0.0606	0.0649	0.0684	0.0711	0.0733	0.0915	0.1061	0.1177	0.1271	0.1345	0.1405	0.1452	0.1491	0.1521	0.1546	0.1729	0.1876	0.1994	0.2088	0.2164	0.2224	0.2272	0.2311	0.2341	0.2368	0.2386	0.2402	0.2414	0.2424	0.2432	0.2695
Emerging water: Residual load in soil after leaching (g)	0.07	0.1183	0.16	0.194	0.221	0.242	0.26	0.2735	0.28453	0.293	0.366	0.4243664	0.471	0.508	0.538	0.562	0.581	0.596	0.608	0.618	0.652	0.751	0.795	0.835	0.865	0.89	0.909	0.924	0.937	0.946	0.954	0.961	0.966	0.97	0.973	1.074
Diffuse PFOA: Additional load from site-wide leaching (assumption 8 and 9 - g/yr)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Total mobile load (g/yr)	0.936	0.95	0.96	0.969	0.975	0.981	0.985	0.98838	0.99113	0.993	1.012	1.0260916	1.038	1.047	1.055	1.06	1.065	1.069	1.072	1.075	1.093	1.108	1.119	1.129	1.136	1.142	1.147	1.151	1.154	1.157	1.159	1.161	1.162	1.163	1.189	

Assumptions

Historical model - emerging water, years 0 to 40.

The indicative residual PFAS model assumes:

- Measured average discharge rates from the 800mm diameter pipe are in the order of 1 l/s, from which an annual discharge volume of

3E+07 litres/year can be derived.
- Analysis data has been used to establish a maximum PFOA concentration for the emerging water =

13 ng/l Table 7
- On the basis of assumptions 1 and 2, the annual rate of PFOA discharge from the 800mm pipe can be estimated as:

0.41 g/yr
- Of the discharge from the 800mm dia pipe, not all will have impacted the soils at Victoria North. The model makes the following assumption regarding the discharge to the sewer over time and therefore, the residual discharge to ground:

a

First 10 years after ad hoc drainage installed - 80% reached sewer

20% discharged to soil

b

Year 11 to 20 - 60% reached sewer (deterioration in ad hoc system)

40% discharged to soil

c

Year 21 to 35 - 40% reached sewer (further deterioration in ad hoc system)

60% discharged to soil

d

Year 36 (2020) and 37 - flytipping - 10% reaches sewer

90% discharged to soil

e

Year 38 (2022) to 40 - 0% reaches sewer (BAM on site)

100% discharged to soil

f

After year 40 (2025) - 100% to sewer

0% discharged to soil

The model assumes that once the permanent discharge consent is in place (assumed year 40 - 2024), all the water from the 800mm pipe will be discharged to combined sewer and subsequently, there will be no further discharge of emerging water to ground. Given that discharge to sewer commenced in June 2023 under a temporary discharge consent, this is conservative.
- As discussed in the report text, for the purposes of the indicative model, the proportion of infiltrating water directly passing through the made ground has been assumed as zero. This assumption results in a worst-case assessment of historical PFAS impact being taken forward into future assessments of risk.
- Selected value for leachable fraction of PFOA =

20% Table 38

Historical model - diffuse PFOs

- Max diffuse leachable PFOA across Red Bank plateau after remediation of outlier, carriage shed and TP405A, is

26 ng/l Table 35

Assume 0.88 mlyr rainfall = 0.0024 m/d
Assume site area = 50,000 m² (top of Red Bank plateau)
Assume infiltration is 80 %
Infiltration volume = 35200 m³ / yr = 3.5E+07 l / yr
Assuming 26 ng/l leached by the infiltrating water = 3E-08 g/l
Leachable PFAS = 0.915 g/yr

0.92 g/yr

Future indications - both sources

- The potential for future leaching varies as infiltration varies - see assumption 12
- Current proposals for remediation and enabling works do not include any significant areas of hardstanding (road pavement etc) within the site. Provision has been made however, for made ground across the site to be provided with a hydroseeded temporary protection layer as a precaution against the risk of asbestos fibre release from the exposed surface. Given the current proposals therefore, the permeability of the site surface will not differ significantly from the existing site conditions. Assumptions regarding historical rainfall infiltration will therefore, continue t valid for the period following remediation and enabling works.
- Infiltration will reduce the PFAS mass in the area of the emerging water (by removal of the leachable proportion) and will continue to release leachable PFAS from diffuse accumulations across the site. Assumptions regarding historical leachable proportions will therefore, continue to be valid for the period following remediation and enabling works.
- Following completion of the remediation and enabling works, it is assumed that site development will take place over a period of ten years (to year 53). Development will introduce areas of hardstanding across the site which will reduce infiltration and therefore, reduce the potential for PFAS in the made ground to be removed by leaching. The reducing in infiltration assumed for the model is as follows:

Assume remediation starts year

40 (2024)

and takes 2 years to complete

Assume development starts in year

43 (2027)

and takes 10 years

Infiltration will reduce as development progresses and consequently, leachable proportion will reduce.

On this basis, infiltration will be:

For emerging water

a

Before year 45

100% of pre-development infiltration

20.00% leachable assumed for model

b

Yr 45 to 47 (incl)

75% of pre-development infiltration

15.00% leachable assumed for model

c

Yr 48 and 49

50% of pre-development infiltration

10.00% leachable assumed for model

d

Yr 50 to 52 incl

25% of pre-development infiltration

5.00% leachable assumed for model

e

From year 53

10% of pre-development infiltration

2.00% leachable assumed for model

For diffuse PFAS

a

Before year 45

100% of pre-development infiltration

0.92 g/yr leachable assumed for model

b

Yr 45 to 47 (incl)

75% of pre-development infiltration

0.69 g/yr leachable assumed for model

c

Yr 48 and 49

50% of pre-development infiltration

0.46 g/yr leachable assumed for model

d

Yr 50 to 52 incl

25% of pre-development infiltration

0.23 g/yr leachable assumed for model

e

From year 53

10% of pre-development infiltration

0.092 g/yr leachable assumed for model

Year																																		
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	
2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	
0.41	0.41	0.41	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0.37	0.41	0.41	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.44	1.57	1.66	1.74	1.39	1.11	0.89	0.71	0.57	0.49	0.41	0.35	0.32	0.28	0.27	0.26	0.24	0.24	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.18	0.18	0.18	0.17		
0.2888	0.3132	0.3327	0.3483	0.2787	0.2228	0.1763	0.1427	0.0896	0.0728	0.0618	0.0390	0.0315	0.0142	0.0135	0.0128	0.0049	0.0048	0.0047	0.0046	0.0045	0.0044	0.0043	0.0042	0.0041	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036	0.0036	0.0035		
1.155	1.253	1.331	1.393	1.115	0.892	0.713	0.571	0.4851	0.4123	0.3505	0.3154	0.2839	0.2697	0.2562	0.2434	0.2385	0.2338	0.2291	0.2245	0.22	0.2156	0.2113	0.2071	0.2029	0.1989	0.1949	0.191	0.1872	0.1834	0.1798	0.1762	0.1728	0.1692	
0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.69	0.69	0.69	0.46	0.46	0.23	0.23	0.23	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		
1.209	1.233	1.253	1.268	1.199	1.143	1.098	1.063	0.7756	0.7628	0.7518	0.495	0.4915	0.2442	0.2435	0.2428	0.0969	0.0968	0.0967	0.0966	0.0965	0.0964	0.0963	0.0962	0.0961	0.0961	0.096	0.0959	0.0958	0.0957	0.0956	0.0955	0.0955		

Theoretical model of residual PFAS

E3. Estimates of potential impact on the River Irk associated with residual PFAS concentrations at Red Bank plateau, after dilution in the river, years 40+.

A preliminary assessment of the potential impact of residual PFOS from the site on the river has been undertaken as follows:

For the River Irk:

- Average flow at Collyhurst Weir – $1.7\text{m}^3/\text{s}$.²³ This equals, 5.4×10^{10} litres/yr
- Use 10% of average flow in subsequent assessment: 5.4×10^9 litres/yr

For year 42 - PFOS:

- 0.55g/yr PFOS (both sources: **Figure 13**) = $5.5 \times 10^8\text{ng/yr}$
- $5.5 \times 10^8 / 5.4 \times 10^9$ litres/yr = 0.10ng/l .

For year 42 - PFOA:

- 1.14g/yr PFOA (both sources: **Figure 14**) = $1.14 \times 10^9\text{ng/yr}$
- $1.14 \times 10^9 / 5.4 \times 10^9$ litres/yr = 0.21ng/l .

For year 53 – PFOS:

- 0.05g/yr PFOS (both sources: **Figure 13**) = $5.0 \times 10^7\text{ng/yr}$
- $5.0 \times 10^7 / 5.4 \times 10^9$ litres/yr = 0.01ng/l .

For year 53 – PFOA:

- 0.1g/yr (both sources: **Figure 14**) = 1.0×10^8 ng/yr
- $1.0 \times 10^8 / 5.4 \times 10^9$ litres/yr = 0.02ng/l .

E4. Estimates of current annual PFAS mass in the existing River Irk, upstream of the Victoria North site.

A preliminary assessment of the existing potential mass of PFAS in the river upstream of the siter has been undertaken as follows:

For PFOS:

- Average flow at Collyhurst Weir – $1.7\text{m}^3/\text{s}$. This equals, 5.4×10^{10} litres/yr
- Average PFOS concentration in the river water upstream of the site is 7ng/l
- $7 \times 5.4 \times 10^{10}$ litres/yr = 378g/yr .

For PFOA:

- Average flow at Collyhurst Weir – $1.7\text{m}^3/\text{s}$. This equals, 5.4×10^{10} litres/yr
- Average PFOA concentration in the river water upstream of the site is 7.3ng/l
- $7.3 \times 5.4 \times 10^{10}$ litres/yr = 392g/yr .

²³ Calculated as average value from data downloaded from www.environment.data.gov.uk/hydrology/station/98e517e4-c709-4d16-b334-251677af1750 accessed 14 April 2023