ecoloop

Stockholm 2019-10-24
Microplastic dispersal from Bergavik IP, Kalmar

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Kalmar kommun

SVENSK DÄCKÅTERVINNING

RAGN SELLS

CONTENTS

1. RESULTS FROM SAMPLING OF MICROPLASTICS

The tables below present the amount of microplastics of respective plastic types.

1.1. *Sampling point 1 – Drainage water*

ELEMENT	SAMPLE	Water from the artificial turf							
Sampling Date		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2019-06-04	2019-09-05	2019-10-03
filtered amount	amount/l	260	170	250	250	250	250	250	250
org. particles, e.g. PP, PE, PS	amount/l	1124	189	36	40	72	16	16	26
org. particles, e.g. PMMA, PUR, PET	amount/l	239	177	40	24	56	8	<4	<4
org. particles, with silicon, e.g. plastic, rubber	amount/l	70	24	20	<4	<4	<4	<4	<4
org. particles, with chlorine, e.g. PVC	amount/l	<18	<6	<4	<4	<4	<4	<4	<4
org. particles, with fluorine, e.g. PTFE	amount/l	18	12	<4	<4	<4	<4	<4	<4
Number of particles		1451	402	96	64	128	24	16	26

1.2. *Sampling point 2 – Surface water*

ELEMENT	SAMPLE	Water from Asphalt							
Sampling Date		2018-10-17	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2019-06-04	219-09-05	2019-10-03
filtered amount	ml	410	215	250	250	250	250	250	250
org. particles, e.g. PP, PE, PS	amount/l	101	351	32	257	28	68	20	34
org. particles, e.g. PMMA, PUR, PET	amount/l	121	559	20	56	40	60	<4	<10
org. particles, with silicon, e.g. plastic, rubber	amount/l	10	132	<4	4	<4	<4	<4	10
org. particles, with chlorine, e.g. PVC	amount/l	<5	<11	<4	<4	<4	<4	<4	<10
org. particles, with fluorine, e.g. PTFE	amount/l	<5	<11	<4	<4	<4	<4	<4	<10
Number of particles		232	1042	52	317	68	128	20	44

1.3. *Sampling point 3 – Collecting well*

ELEMENT	SAMPLE	Collecting well								
Sampling Date		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2019-06-04	2019-09-05 A	2019-09-05 B	*2019-10-03*
filtered amount	ml	175	170	250	250	250	250	250	250	*250*
org. particles, e.g. PP, PE, PS	amount/l	165	912	96	76	84	20	28	36	70
org. particles, e.g. PMMA, PUR, PET	amount/l	120	718	116	68	60	16	4	<4	<4
org. particles, with silicon, e.g. plastic, rubber	amount/l	177	<19	44	4	4	<4	<4	<4	<4
org. particles, with chlorine, e.g. PVC	amount/l	<6	<19	<4	<4	<4	<4	<4	<4	<4
org. particles, with fluorine, e.g. PTFE	amount/l	<6	58	4	<4	4	<4	<4	<4	<4
Number of particles		462	1688	260	148	152	36	32	36	70

1.4. *Sampling point 4 – Stormwater pool*

ELEMENT	SAMPLE	Stormwater pool							Stormwater pool reference sample		
Sampling Date		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2019-06-04	2019-09-05	2018-05-15	2018-06-18	2018-08-16
filtered amount	ml	110	68	180	30	58	100	55	40	250	46
org. particles, e.g. PP, PE, PS	amount/l	100	879	28	67	294	10	<18	160 +1930	653	1368
org. particles, e.g. PMMA, PUR, PET	amount/l	36	546	11	67	225	20	<18		-	174
org. particles, with silicon, e.g. plastic, rubber	amount/l	54	606	17	<33	173	<10	<18	320	-	<22
org. particles, with chlorine, e.g. PVC	amount/l	<9	<30	<6	<33	<17	<10	<18	N/A	-	<22
org. particles, with fluorine, e.g. PTFE	amount/l	<9	<30	<6	<33	<17	<10	<18	N/A	17	22
Number of particles		190	2031	56	134	692	30	0	320	670	1564

Calculation process

1) **Total number of particles**
the number of particles per litre x the number of cubic metres of water x 1,000
(as 1m3 is 1,000 litres of water)

2) **Total cubic plastic dispersal**
Particle size (volume) x number of particles x density

3) **Total kg plastic dispersal**
Total cubic plastic dispersal x 1,000 (as 1 cubic is 1,000 litres) x density

2. DISPERSAL VIA PLAYERS

Sampling occasion		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
ELEMENT	SAMPLE	**Players**																						
Sampling date		2018-10-20	2018-11-03	2018-11-18	2018-11-18	2018-11-24	2018-12-08	2018-12-15	2018-12-15	2018-12-16	2019-01-09	2019-01-20	2019-01-28	2019-01-28	2019-01-29	2019-01-31	2019-02-04	2019-02-05	2019-02-07	2019-02-10	2019-03-03	2019-03-10	2019-04-14	N/D
Amount of particles	gram	7.0	31.0	9.0	26.0	108.0	15.0	16.0	14.0	33.0	49.0	4.0	42	34	4	51	7	9	27	10	26	61	0	62
Number of players	Persons	15	14	24	17	20	17	11	13	15	12	17	15	15	20	17	18	17	16	9	14	23	22	15
Training time	Min	90	90	90	90	120	90	90	120	90	90	120	90	90	60	90	90	90	90	90	90	105	90	N/D
Weather (dry/wet)	T/B		Dry	Humid	Dry	Dry	Snowfall	Cloudy	Drizzle	Fair	Light rain	Fair	Fair	Rainy	Rainy	Snow/ frost	Wet	Quite humid	Fair, slushy	Humid, wet	Cloudy	Humid	Humid	Dry
Grams per player	gram/spelare		0.47	2.21	0.38	1.53	5.40	0.88	1.45	1.08	2.20	4.08	0.24	2.80	2.27	0.20	3.00	0.39	0.53	1.69	1.11	1.86	2.65	0.00
Total amount	**grams total**									259.0	308.0	312.0	354.0	388.0	392.0	443.0	450.0	459.0	486.0	496.0	583.0	583.0	583.0	645.0

Average for fair weather, i.e. not wet is 0.91 gram/player (has been measured on 12 occasions)

Average for humid/wet conditions is 2.70 gram/player (has been measured on 11 occasions)

Total average from the measurements is 1.72gram/player

Total number of players	**players total**	146	158	175	190	205	225	242	260	277	293	302	339	339	361	**376**
Average amount per player	**grams/player**	1.77	1.95	1.78	1.86	1.89	1.74	1.83	1.73	1.66	1.66	1.64	1.72	1.72	1.61	**1.72**

3. DISPERSAL VIA MAINTENANCE VEHICLE AND IMPLEMENT

Sampling Date		2019-02-26	2019-03-07	2019-06-04	2019-09-04	2019-09-17	2019-10-01	2019-10-07
Amount of particles	grams	33.0	1613	1916	5,0	7,0	1775	5100
Time on the pitch	min	30	20-25	20	45	150	120	90
Weather (dry/wet)	D/W	Sunny, calm	Drizzle	Fair	Sunny	Cloudy	Sunny	Sunny
The granulate's dampness		Dry	Wet	Wet	Dry	Dry	Dry	Wet

Average brush+blow (g/occasion)	Average solely blow (g/occasion)
Wet	Wet
510	176
Dry	Dry
177.5	2

Assumptions: 90% of all material is from the brush, operation takes place 70 times per year and in 50/50% wet/dry conditions		**Assumptions**: 90% of all material is from the brush, operation takes place 70 times per year and only in dry conditions in accordance with Svff's recommendations	
Total potential distribution brush + blow (kg/year)	**Total potential distribution blow excl. brushing (kg/year)**	**Total potential distribution brush + blow (kg/year)**	**Total potential distribution blow excl. brushing (kg/year)**
24.1	**6.2**	**12.4**	**0.1**

The potential distribution from the implement/brush is about 9 times greater than via the vehicle. A simple way to avoid dispersal of microplastics from the brush is to leave it on the pitch.

4. WATER FLOW

	from 19th December	January	February	March	April	May	June	July	August	September	Up to 3rd October	Accumulated
Recorded Water flow Drainage water (m3)	854	404	347	122	0	118	32	166	467	192	1	2703
Precipitation (mm)	21.1	50.1	60.5	59.5	4.8	43.9	54.7	42.7	51.8	47	0.3	436.4
Max pot. Surface water (m3)	23.9	56.9	68.7	67.5	5.4	49.8	62.1	48.5	58.8	53.3	0.3	495.2

Water cubic total -> 3,198 cubic

Max potential surface water is based on all precipitation which reaches the long sides around the artificial turf pitch reaching the open stormwater drains and thereby the surface water drain.

The pitch is 69m wide & 111m long. Asphalt on the long sides is about 4.90m wide and the short sides are 2.35/2.45m wide

Formula 2 x (111 + 2.35 + 2.45) x 4.9

Weather data for precipitation has been derived from SLU (2019).

The table below shows the water flow per six months, which has been used to calculate microplastic dispersal during the first and second six months respectively after installation.

WATER FLOW	20 Sep - 18 Dec 2018	19th Dec 18 – 31st March 19	**Tot Six months 1**	**Six months 2** (Apr 19 – 3rd Oct 19)
Precipitation (mm)	75.6	266.8	342.4	225.3
Max pot. Water cubic	689.9	N/A	N/A	N/A
Water cubic measured	N/A	1944.0	N/A	1252.9
Max pot. + measured m3	N/A	N/A	2633.8	N/A
Surface water	85.8	217.0	302.8	278.3
Drainage water	604.1	1727	2331.1	976

5. RESULTS FROM SAMPLES OF ELEMENTS (METALS)

The tables below present the amounts of elements identified at respective sample point.

5.1. *Sampling point 1 – Drainage water*

ELEMENT	SAMPLE	Drainage water								
Sampling Date		2018-09-20	2018-12-19	2019-03-12		2019-04-11		2019-05-06	2019-06-04	2019-10-03
				A	B	A	B			
Ca	mg/l	11.4	18.9	14.8	14.4	13.5	14	13.8	15.9	40.3
Fe	mg/l	0.00424	<0.004	0.021	0.0066	0.00608	0.00496	0.0111	<0.004	<0.004
K	mg/l	21.8	13.3	12.2	11.8	12.6	12.9	11.8	15.3	17.5
Mg	mg/l	14.1	6.77	4.22	4.2	4.26	4.4	3.88	4.51	8.66
Na	mg/l	1550	350	267	270	307	307	220	288	142
Al	µg/l	22.4	9.34	110	45.3	51.9	30.9	36.6	37.1	8.03
As	µg/l	7.44	1.49	4.94	3.94	6.4	4.79	2.49	3.45	1.17
Ba	µg/l	57,2	87.9	86.1	82.1	89.3	89.6	79.6	102	123
Cd	µg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Co	µg/l	0,579	0.169	0.272	0.215	0.221	0.199	0.233	0.118	0.135
Cr	µg/l	<0,5	7.51	13	1.77	7.19	4.07	<0.5	<0.5	<0.5
Cu	µg/l	2.22	4.96	10.5	10.5	8.3	8.48	43.1	10.1	7.9
Hg	µg/l	<0,02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	µg/l	<0.2	2.48	7.48	0.339	0.424	0.336	0.562	<0.2	0.292
Ni	µg/l	1.48	<0.5	<0.5	0.695	<0.5	0.608	0.844	<0.5	<0.5
Pb	µg/l	<0.2	0.238	0.931	0.234	0.47	<0.2	<0.2	<0.2	<0.2
Zn	µg/l	6.99	2.3	2.45	<2	2.15	<2	6.33	3.45	12.1
Mo	µg/l	28.2	3.89	4.51	4.6	4.13	4.36	3.76	6.17	6.14
V	µg/l	28.7	5.24	7.41	6.76	9.64	10.3	7.7	11	4.91
S	mg/l				5.45		6.78	9.02	10.7	

5.2. *Sampling point 2 – Surface water*

ELEMENT	SAMPLE	Surface water								
Sampling Date		2018-10-17	2018-12-19	2019-03-12		2019-04-11		2019-05-06	2019-06-04	2019-10-03
				A	**B**	**A**	**B**			
Ca	mg/l	85.7	86.4	125	123	63.6	65	14.5	5.72	2.44
Fe	mg/l	0.0262	0.0574	0.0310	0.021	0.0354	0.0194	0.145	0.299	0.0286
K	mg/l	17.1	50.9	20.4	20.3	8.63	8.92	4.04	2.68	2.99
Mg	mg/l	8.89	8.65	13.2	13.3	6.88	7.05	2.76	0.821	0,439
Na	mg/l	54.7	76.4	101	105	49.5	50.2	33.5	8.53	2,79
Al	µg/l	45.8	32.4	35.7	12.3	34.5	16.1	102	58.4	34.9
As	µg/l	0.531	1.87	0.591	<0.5	0.675	<0.5	<0.5	<0.5	<0.5
Ba	µg/l	89.9	108	172	169	88.3	85	24.1	11.4	4.55
Cd	µg/l	<0.05	<0.05	0.0941	0.0753	0.0644	0.0664	0.0581	<0.05	<0.05
Co	µg/l	0.911	0.297	0.537	0.462	0.615	0.115	3.04	1.91	0.641
Cr	µg/l	<0.5	9.49	11,0	2.53	7.02	1.94	<0.5	<0.5	<0.5
Cu	µg/l	8.45	11.2	21.8	22.6	22.6	25	33.8	19.1	15.8
Hg	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	µg/l	63.6	22	298	297	267	146	239	81	14.7
Ni	µg/l	0.759	0.933	2.32	1.96	1.78	2.72	2.58	1.71	0.888
Pb	µg/l	<0.2	0.236	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zn	µg/l	143	66.5	119	121	230	246	496	309	390
Mo	µg/l	4.67	3.98	5.34	4.71	3.37	3.24	0.884	<0.5	<0.5
V	µg/l	1.55	7.29	1.09	1.08	1.18	0.954	1.9	2.8	4.25
S	mg/l				32.5		19.3	10.4	4.67	

5.3. *Sampling point 3 – Collecting well*

ELEMENT	SAMPLE	Collecting well								
Sampling Date		2018-09-20	2018-12-19	2019-03-12		2019-04-11		2019-05-06	2019-06-04	2019-10-03
				A	B	A	B			
Ca	mg/l	15.6	28.6	25.1	27.4	14.1	14.6	16.9	15.8	37.1
Fe	mg/l	0.0049	0.00462	0.0129	0.00615	0.00962	0.00743	0.0276	0.0131	<0.004
K	mg/l	24.5	14.5	12.9	12.6	12.4	12.6	12	13.4	16.8
Mg	mg/l	15.4	7.43	5.03	5.3	4.18	4.29	4.02	4.09	8.13
Na	mg/l	1510	337	246	245	300	299	201	233	139
Al	µg/l	32.8	10.9	67.3	34.1	62.3	41.3	36.4	44.9	10.9
As	µg/l	6.92	1.68	4.46	3.8	5.59	4.69	2.25	3.21	1.11
Ba	µg/l	74.4	93.9	93.4	92.1	82.7	81.2	65.9	83.8	118
Cd	µg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Co	µg/l	0.438	0.145	0.301	0.232	0.223	0.241	0.52	0.199	0.177
Cr	µg/l	<0.5	<0.5	8.13	4.09	8.06	3.77	<0.5	<0.5	<0.5
Cu	µg/l	3.82	5.61	11.2	11.2	8.25	9.39	60.9	10.4	9.48
Hg	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	µg/l	0.309	17.2	19.5	1.04	0.929	<0.2	79.8	2.75	0.35
Ni	µg/l	0.762	1.05	1.18	0.84	4.45	5.49	4.33	1.91	<0.5
Pb	µg/l	<0.2	0.211	0.725	<0.2	0.411	<0.2	<0.2	<0.2	<0.2
Zn	µg/l	6.07	8.73	6.67	<2	3.25	<2	117	33.4	21.3
Mo	µg/l	28.2	4.22	4.23	4.03	3.96	4.5	3.27	5.19	6.26
V	µg/l	27.1	5.38	6.88	7.44	10	9.93	7.04	8.74	5.33
S	mg/l				8.84		6.76	10.1	9.42	

5.4. *Sampling point 4 – Stormwater pool*

ELEMENT / SAMPLE		Stormwater pool								Stormwater pool reference sample		
Sampling Date		2018-09-20	2018-12-19	2019-03-12		2019-04-11		2019-05-06	2019-06-04	2018-05-15	2018-06-18	2018-08-16
				A	B	A	B					
Ca	mg/l	20.2	18.1	33.4	32.8	46.6	47.3	41.5	27.7	37.4	30.9	11.4
Fe	mg/l	0.0325	0.209	0.457	0.153	0.215	0.00885	0.132	0.0509	1.4	1.12	0.409
K	mg/l	3.88	3.64	5.81	5.8	7.6	7.97	7.76	5.09	5.75	4.84	3.55
Mg	mg/l	4.12	2.97	5.38	5.42	8.08	8.24	6.97	4.64	6.24	5.52	1.88
Na	mg/l	52	52.8	55.1	55.6	48.1	49.4	48.9	31.9	40.8	38.2	15.6
Al	µg/l	<2	11.4	33	12.3	6.51	<2	13.4	2.46	145	16.1	15.9
As	µg/l	0.536	<0.5	<0.5	<0.5	<0.5	<0.5	0.661	<0.5	0.554	0.654	<0.5
Ba	µg/l	25.5	22.3	27	25.4	23.1	21.4	20.7	18.3	26.2	33.8	9.63
Cd	µg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.05
Co	µg/l	<0.05	0.0565	0.288	0.0543	0.258	0.0759	0.511	0.198	0.581	0.236	0.122
Cr	µg/l	<0.5	0.582	8.23	2.75	8.6	1.21	<0.5	<0.5	<0.9	0.338	<0.5
Cu	µg/l	<1	2.26	3.3	3.66	1.66	3.59	3.31	1.1	3.93	0.876	2.21
Hg	µg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mn	µg/l	0.468	0.453	55.2	1.1	2.1	0.464	3.96	111	158	172	135
Ni	µg/l	0.678	<0.5	2.14	2.21	1.49	1.3	3.2	1.16	1.89	1.25	1.13
Pb	µg/l	<0.2	0.296	0.501	<0.2	<0.2	<0.2	<0.2	<0.2	0.912	0.217	0.386
Zn	µg/l	2.81	20.8	22.4	19.5	2.98	5.11	18.2	4.27	27.8	15.8	11.7
Mo	µg/l	1.3	0.696	1.25	1.4	1.26	1.52	2.43	1.21	1.35	0.681	0.625
V	µg/l	0.326	0.558	0.669	0.416	0.37	0.314	0.41	0.3	1.43	0.642	0.951
S	mg/l				14.1		21.2	17	8.71	xxx	xxx	xxx

6. RESULTS FROM SAMPLES OF PAH

The tables below present the amounts of different PAHs at respective sample point. The guidelines for stormwater discharge are available for benzo(a)pyrene (BaP) and in Västerås City are 0.1 µg/l (Stormwater policy in Västerås)[2].

6.1. *Sampling point 1 – Drainage water*

ELEMENT Sampling Date	SAMPLE	Drainage water				
		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06
naphthalene	µg/l	0.057	<0.030	<0.030	<0.030	<0.030
acenaphthylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
acenaphthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	µg/l	<0.020	<0.020	<0.020	<0.020	<0.020
anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benz(a)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(ghi)perylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-cd)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, total 16	µg/l	0.057	<0.095	<0.095	<0.095	<0.095
PAH, total carcinogenic	µg/l	<0.035	<0.035	<0.035	<0.035	<0.035
PAH, total other	µg/l	0.057	<0.060	<0.060	<0.060	<0.060
PAH, total L	µg/l	0.057	<0.030	<0.030	<0.030	<0.030
PAH, total M	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030
PAH, total H	µg/l	<0.040	<0.040	<0.040	<0.040	<0.040

6.2. *Sampling point 2 – Surface water*

ELEMENT Sampling Date	SAMPLE	Surface water				
		2018-10-17	2018-12-19	2019-03-12	2019-04-11	2019-05-06
naphthalene	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030
acenaphthylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
acenaphthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	µg/l	<0.020	<0.020	<0.020	<0.020	<0.020
anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluoranthene	µg/l	0,01	<0.010	<0.010	<0.010	<0.010
pyrene	µg/l	0,016	0,01	<0.010	<0.010	<0.010
benz(a)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(ghi)perylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-cd)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, total 16	µg/l	0,026	0,01	<0.095	<0.095	<0.095
PAH, total carcinogenic	µg/l	<0.035	<0.035	<0.035	<0.035	<0.035
PAH, total other	µg/l	0,026	0,01	<0.060	<0.060	<0.060
PAH, total L	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030
PAH, total M	µg/l	0,026	0,01	<0.030	<0.030	<0.030
PAH, total H	µg/l	<0.040	<0.040	<0.040	<0.040	<0.040

6.3. *Sampling point 3 – Collecting well*

ELEMENT / Sampling Date	SAMPLE	Collecting well				
		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06
naphthalene	µg/l	0.060	<0.030	<0.030	<0.030	<0.030
acenaphthylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
acenaphthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluorene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	µg/l	<0.020	<0.020	<0.020	<0.020	<0.020
anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benz(a)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(ghi)perylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-cd)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, total 16	µg/l	0.060	<0.095	<0.095	<0.095	<0.095
PAH, total carcinogenic	µg/l	<0.035	<0.035	<0.035	<0.035	<0.035
PAH, total other	µg/l	<0.060	<0.060	<0.060	<0.060	<0.060
PAH, total L	µg/l	0.060	<0.030	<0.030	<0.030	<0.030
PAH, total M	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030
PAH, total H	µg/l	<0.040	<0.040	<0.040	<0.040	<0.040

6.4. *Sampling point 4 – Stormwater pool*

ELEMENT	SAMPLE	Stormwater pool					Stormwater pool reference sample		
Sampling Date		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2018-05-15	2018-06-18	2018-08-16
naphthalene	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
acenaphthylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
acenaphthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.030
fluorene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
phenanthrene	µg/l	<0.020	<0.020	0,021	<0.020	<0.020	<0.020	<0.020	<0.020
anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
fluoranthene	µg/l	<0.010	0,012	0,031	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	µg/l	<0.010	0,011	0,024	<0.010	<0.010	<0.010	<0.010	<0.010
benz(a)anthracene	µg/l	<0.010	0,011	0,013	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	µg/l	<0.010	<0.010	0,011	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b)fluoranthene	µg/l	<0.010	0,018	0,015	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(ghi)perylene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-cd)pyrene	µg/l	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PAH, total 16	µg/l	<0.095	0.052	0.12	<0.095	<0.095	<0.095	<0.095	0.030
PAH, total carcinogenic	µg/l	<0.035	0.029	0.039	<0.035	<0.035	<0.035	<0.035	<0.035
PAH, total other	µg/l	<0.060	0.023	0.076	<0.060	<0.060	<0.060	<0.060	0.030
PAH, total L	µg/l	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.030
PAH, total M	µg/l	<0.030	0.023	0.076	<0.030	<0.030	<0.030	<0.030	<0.030
PAH, total H	µg/l	<0.040	0.029	0.039	<0.040	<0.040	<0.040	<0.040	<0.040

7. RESULTS FROM SAMPLES OF PHENOLS

The tables below present the amounts of phenols in respective sample point.

7.1. *Sampling point 1 – Drainage water*

ELEMENT	SAMPLE	Drainage water				
Sampling Date		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06
phenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
o-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
m-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
p-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.4-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.5-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.6-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3.4-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3.5-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,5-trimethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,6-trimethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
4-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-isopropylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-n-propylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
4-n-propylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3-t-butylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10

7.2. *Sampling point 2 – Surface water*

ELEMENT	SAMPLE	Surface water				
Sampling Date		2018-10-17	2018-12-19	2019-03-12	2019-04-11	2019-05-06
phenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
o-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
m-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
p-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2,3-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2.4-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2.5-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2.6-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
3.4-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
3.5-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2,3,5-trimethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2,3,6-trimethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
3-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
4-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2-isopropylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
2-n-propylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
4-n-propylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10
3-t-butylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10

7.3. *Sampling point 3 – Collecting well*

ELEMENT / Sampling Date	SAMPLE	Collecting well				
		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06
phenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
o-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
m-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
p-cresol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.4-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.5-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2.6-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3.4-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3.5-dimetylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,5-trimethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,6-trimethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
4-ethylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-isopropylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
2-n-propylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
4-n-propylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10
3-t-butylphenol	µg/l	<0.10	<0.10	<0.10	<0.10	<0.10

7.4. *Sampling point 4 – Stormwater pool*

ELEMENT / Sampling Date	SAMPLE	Stormwater pool					Stormwater pool reference sample		
		2018-09-20	2018-12-19	2019-03-12	2019-04-11	2019-05-06	2018-05-15	2018-06-18	2018-08-16
phenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
o-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
m-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
p-cresol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,3-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2.4-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2.5-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2.6-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3.4-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3.5-dimetylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,5-trimethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,3,6-trimethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4-ethylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2-isopropylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2-n-propylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4-n-propylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
3-t-butylphenol	µg/l	<0.10	N/A	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

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