

**Seasonal variation and removal efficiency of microplastics in wastewater treatment: A  
year-long study across three municipal water reclamation plants**

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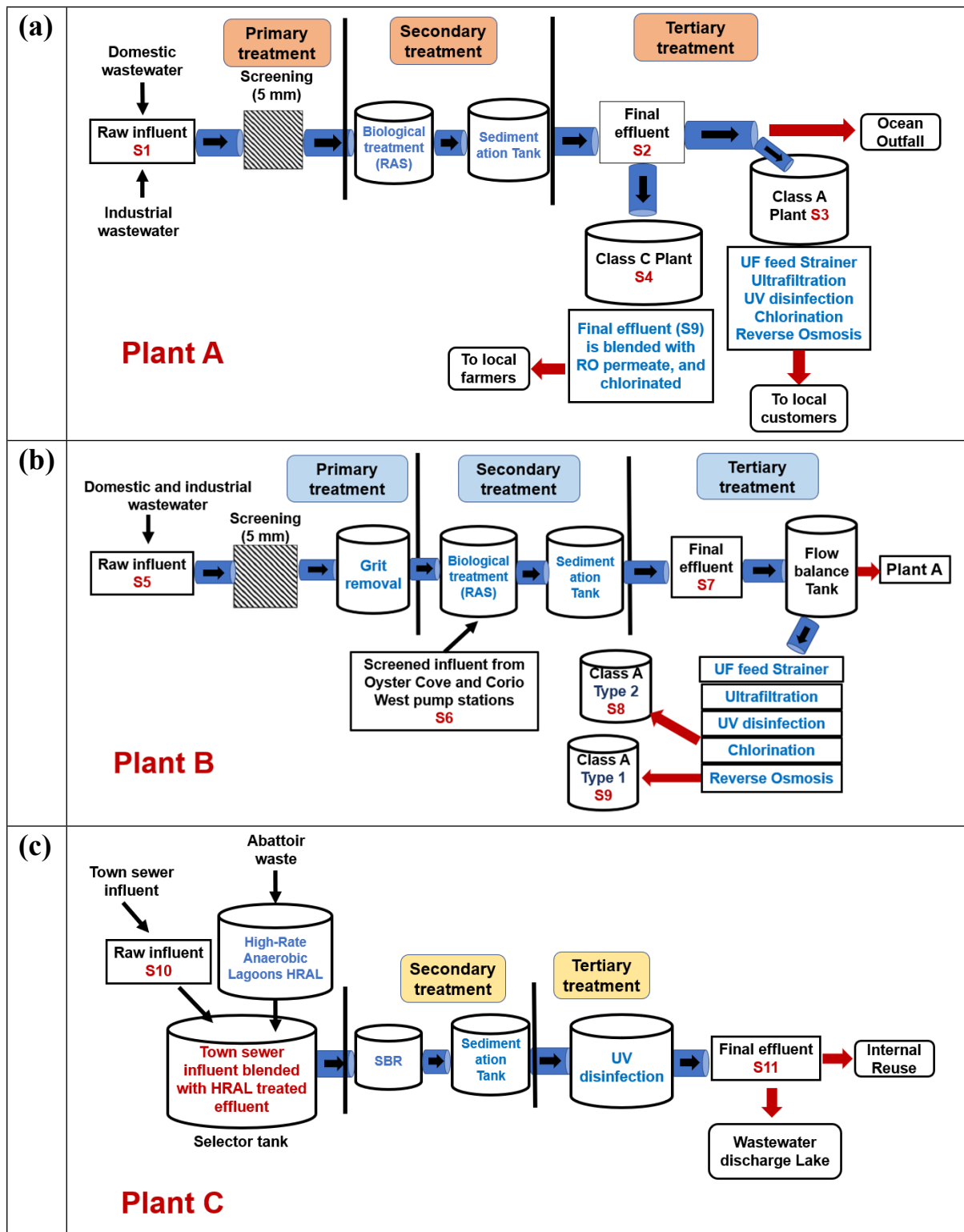
## Supplementary Information

**Table S1: Specifications and operating conditions of the water reclamation plants.**

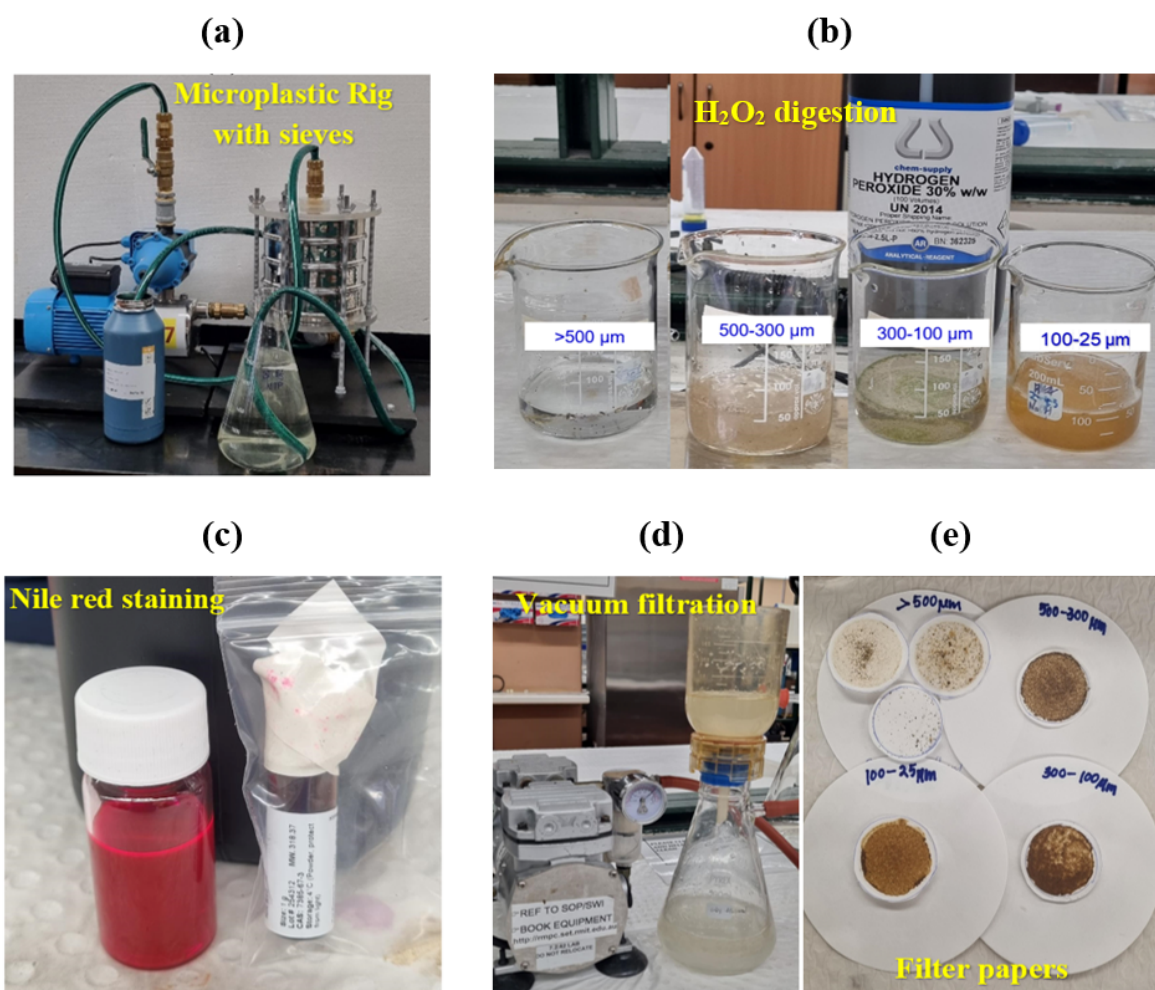
<b>WRP</b>	<b>Catchment description</b>	<b>Treatment processes</b>	<b>Plant inflow/d</b>	<b>Permanent Population</b>	<b>Peak Population</b>	<b>Total sewer connections</b>
<b>Plant A</b>	Domestic (~85%) and industrial (~15%)	Screening, biological treatment, sedimentation, UF, RO, UV disinfection, , chlorination	<b>60-170 ML (yearly average of 77 ML)</b>	<b>305,178</b>	<b>452,420</b>	<b>134,707</b>
<b>Plant B</b>	Domestic (up to 30%) and industrial including trade waste inputs (~70-100%)	Screening, grit removal (DAF), biological treatment, sedimentation, UF, UV disinfection, RO, chlorination	<b>3-11 ML (average of 6 ML)</b>	<b>0</b>	<b>45,570</b>	<b>13,675</b>
<b>Plant C</b>	Domestic (~75%) and industrial including trade waste inputs (~25%)	Screening, biological treatment, UV disinfection	<b>2-17 ML (average of 6 ML)</b>	<b>11,790</b>	<b>17,760</b>	<b>5,643</b>

<b>WRP</b>	<b>Sampling period</b>				<b>Sampling Method</b>	<b>Sample volume</b>	<b>Field Blank</b>
	<b>Autumn 2023</b>	<b>Winter 2023</b>	<b>Spring 2023</b>	<b>Summer 2023-2024</b>			
A	10-16 May	15-22 Aug	7-14 Nov	1-7 Feb	Grab samples from each location to make composite samples	3L	3L
B	11-17 May	15-21 Aug	1-7 Nov	5-12 Feb		3L	3L
C	11-18 May	14-28 Aug	2-9 Nov	3-10 Feb		3L	3L

**Table S2: Wastewater sample collection dates and methods.**

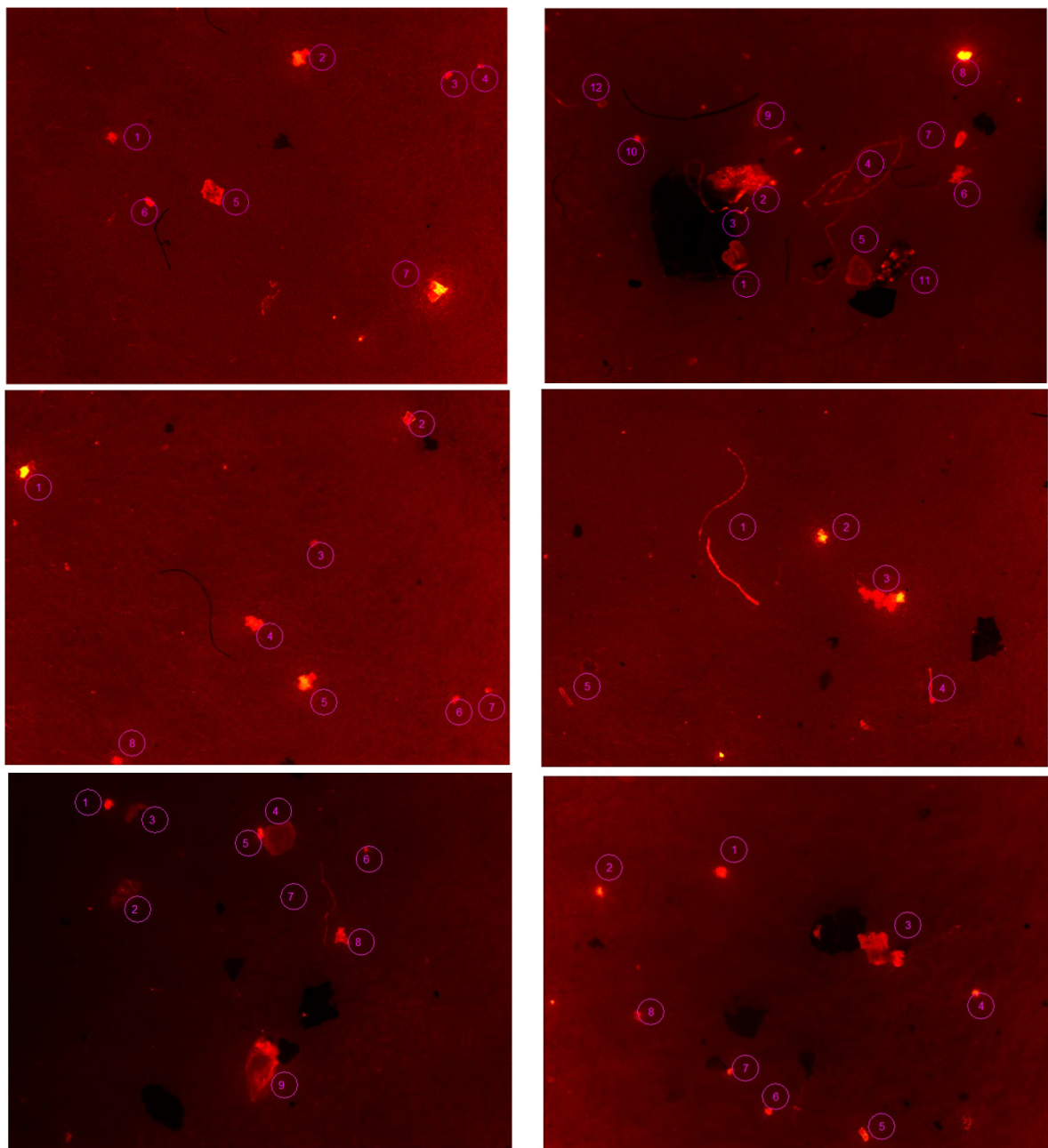


**Figure S1:** The schematic diagram of water reclamation plants: (a) plant A, (b) plant B and (c) plant C. All The three plants have different processes for wastewater treatment in the primary, secondary and tertiary treatment stages. The sampling points are showing as S1, S2, S3 and S4 for plant A, S5, S6, S7, S8 and S9 for plant B and S10 and S11 for plant C.



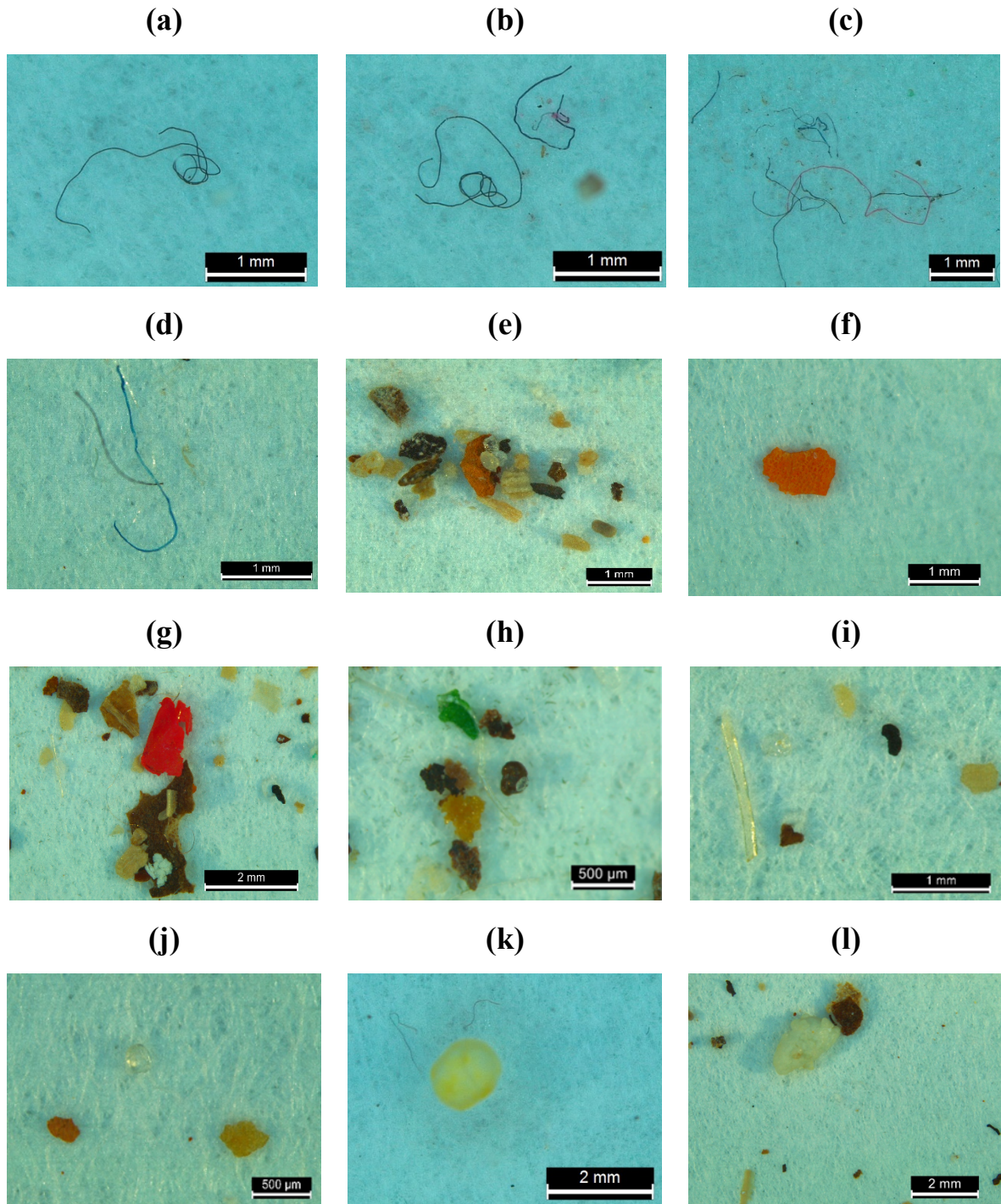
**Figure S2:** (a) Wastewater samples were sieved using a microplastic fractionation rig with a series of stainless-steel sieves with different mesh sizes, (b) organic matter removal by digestion method using  $H_2O_2$ , (c) particles staining by Nile red dye, (d) separating particles by vacuum filtration system and (e) dried filter papers.

### Microplastics identification using Nile red dye



**Figure S3:** Microplastics identification and quantification by Nile red staining.



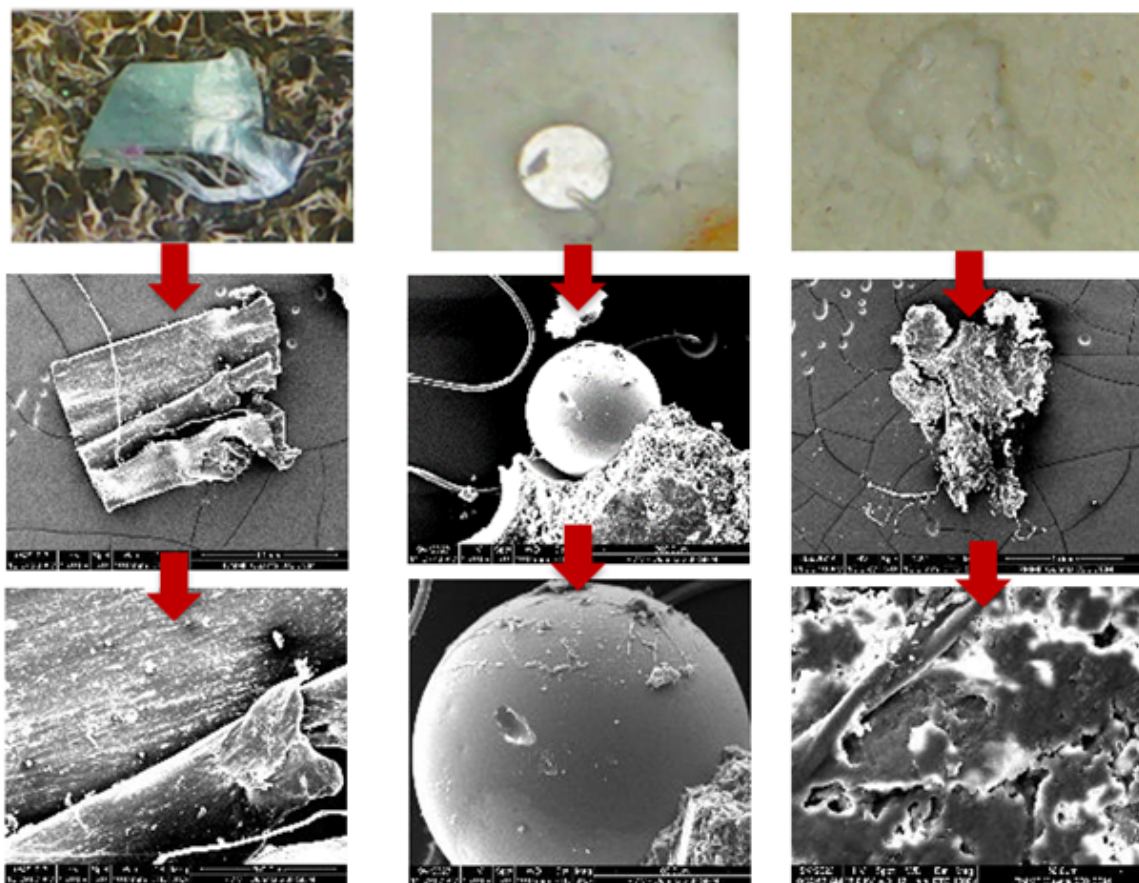
**Microplastics identification using optical microscope**

**Figure S4:** Presence of microplastic particles in different stages of each water reclamation plant detected by an optical microscope: (a, b, c, d) black, blue, and red fibers, (e, f, g) orange

and red fragments, (h) yellow and green films, (i) yellow films and transparent bead, (j) transparent bead and (k, l) yellow/white foams.

**Table S3: The proportion of each polymer type in samples taken from each plant.**

Type	Analyte	Abbreviation	Plant A		Plant B		Plant C	
			Min	Max	Min	Max	Min	Max
Influent	Polyethylene terephthalate	PET	3	12	5	11	4	8
	Polyester fabric	PES	8	23	10	20	7	17
	Polystyrene foam	PS	2	11	1	5	2	8
	Polyethylene	PE	2	9	1	7	1	5
	Polypropylene	PP	1	6	0	4	0	2
	<b>Microplastic Particles</b>	<b>MP/L</b>	<b>16</b>	<b>61</b>	<b>17</b>	<b>47</b>	<b>14</b>	<b>40</b>
Effluent	Polyethylene terephthalate	PET	0	1	0	0	0	1
	Polyester fabric	PES	2	4	0	1	2	2
	Polystyrene foam	PS	0	0	0	0	0	0
	Polyethylene	PE	0	0	0	0	0	0
	Polypropylene	PP	0	0	0	0	0	0
	<b>Microplastic Particles</b>	<b>MP/L</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>



**Figure S5:** Surface roughness of the MPs detected in overall wastewater samples collected from three water reclamation plants.