



BACWA MICROPLASTICS WORKGROUP UPDATE

18 March 2016

THE ASSIGNMENT

“To characterize and quantify microplastics in wastewater effluent”

Definition of microplastics: plastic particles retained on sieve size 1mm to 0.125mm

Workgroup goal – to develop a sampling and analytical protocol

- Doable
- Reproducible
- Has robust, defensible QA/QC
- Assumptions and uncertainty clearly documented
- Inter-laboratory comparison



SAMPLING

- Four sieves: 5 mm, 1mm, 355um and 125 um
- 24- hour composite sampling possible, but optimize for plant.
 - EBMUD 1 gallon/minute
 - CCCSD 1 liter/minute
- Plant conditions will affect sampling
- Avoid contamination



Sampling setup



335 um



125 um



SAMPLES



355 um sieve after 24 hrs



Sample transferred and filtered



355 um sieve

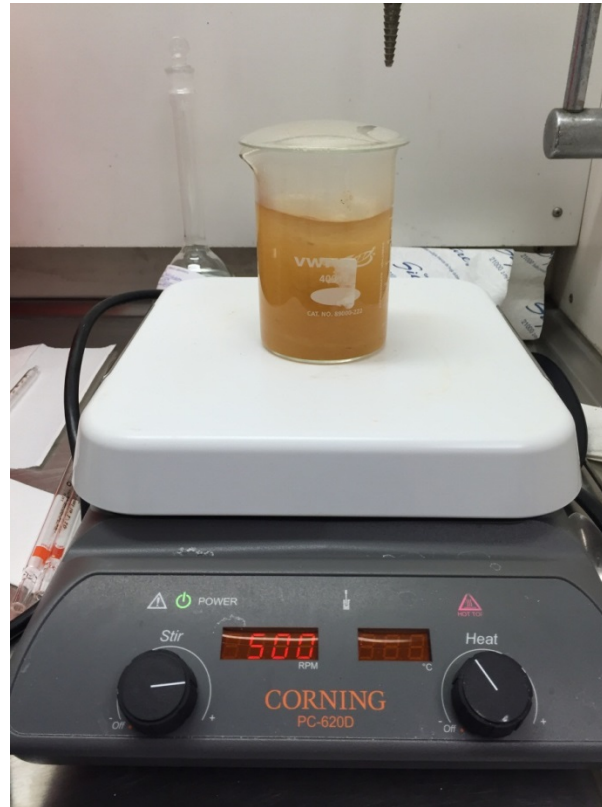


VERIFYING METHOD

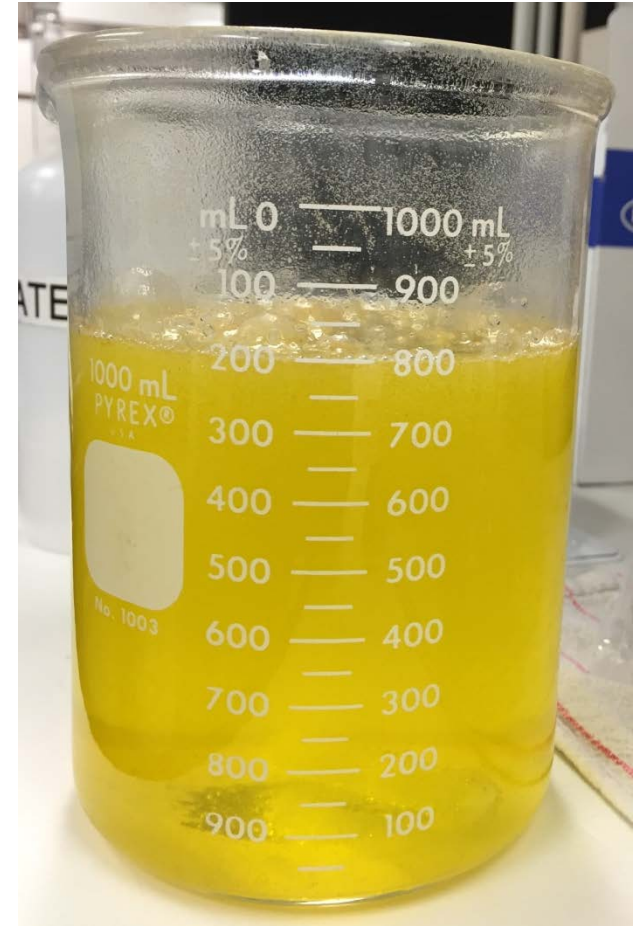
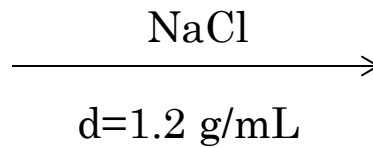
- NOAA – Laboratory Methods for the Analysis of Microplastics in the Marine Environment
- Same method followed by SFEI analytical partner (Sherry Mason's lab)



WET PEROXIDE OXIDATION



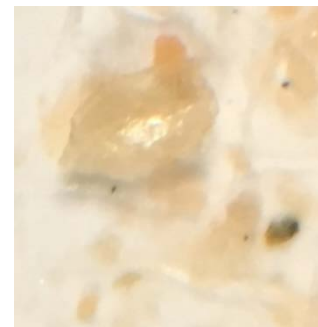
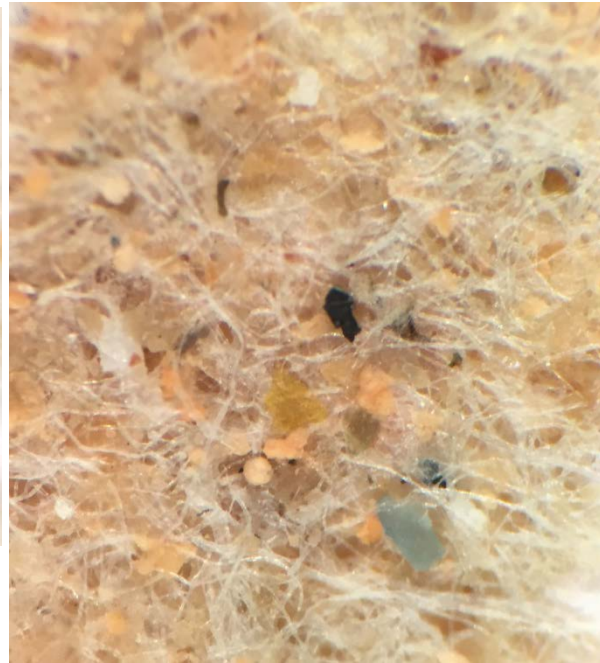
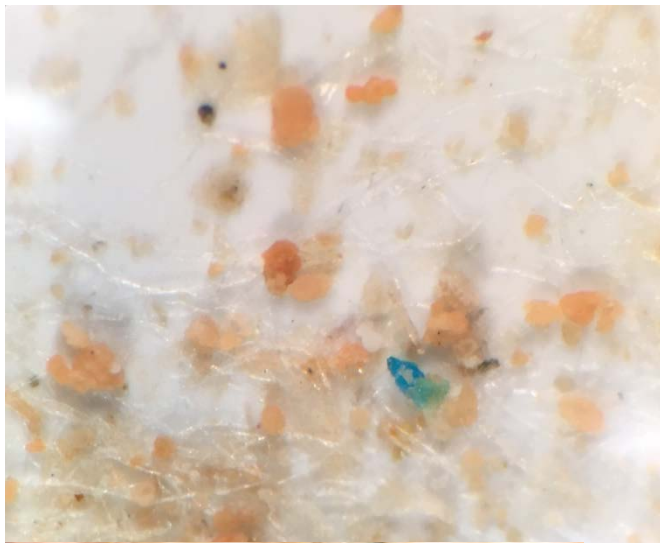
DENSITY SEPARATION



- Top layer was removed with a serological pipette and transferred onto a 90mm membrane filter (Buchner funnel filtration).
- The remaining sample was transferred onto a separate 90mm membrane filter

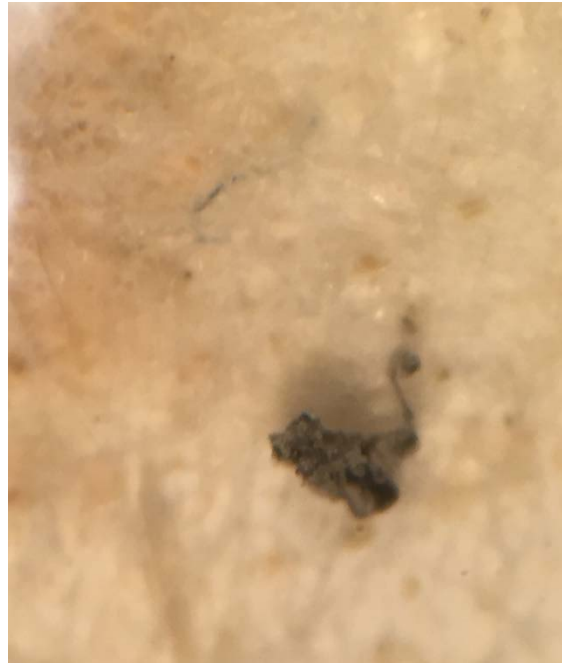
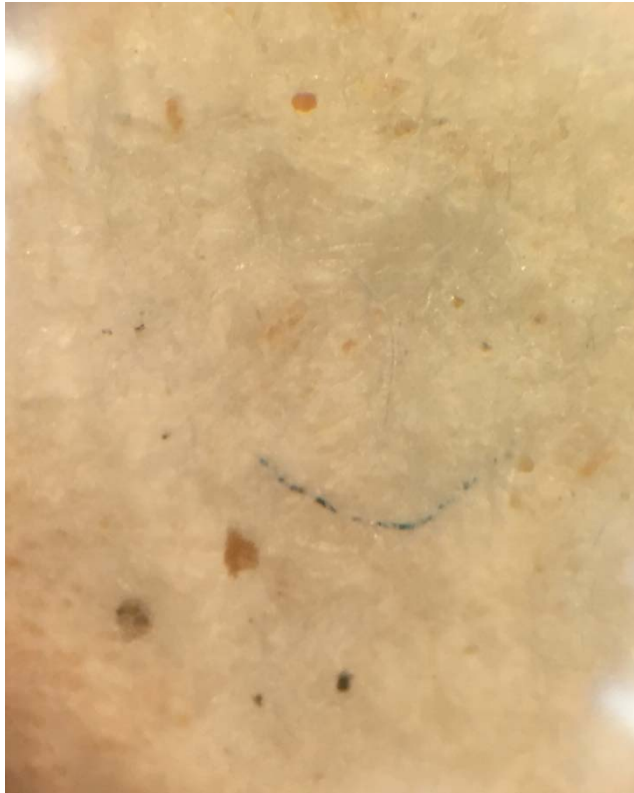
EFFLUENT (125 UM SIEVE, COLLECTED 12/23/15)

Top layer ($d \leq 1.2 \text{ g/mL}$)



EFFLUENT (125 UM SIEVE, COLLECTED 12/23/15)

Bottom layer

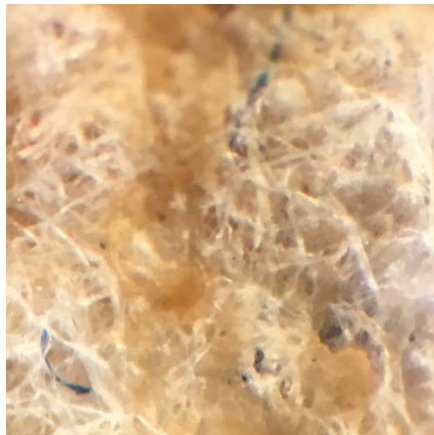
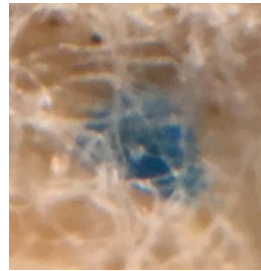


VERIFYING METHOD

- Insufficient destruction of organic material
- Gravity separation: both floaters and sinkers need to be identified
- Drying not recommended; instead filter to separate solids.

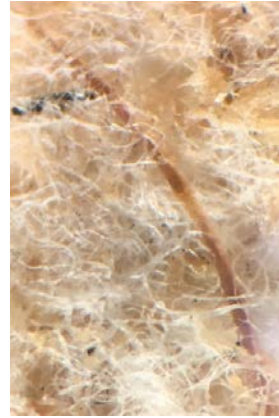


DIGESTION WITH INCREASED H_2SO_4



DI WATER SPIKED WITH NON-MICROPLASTICS

Sample



Toilet paper



Human hair



Clothing



SPIKED BLANK

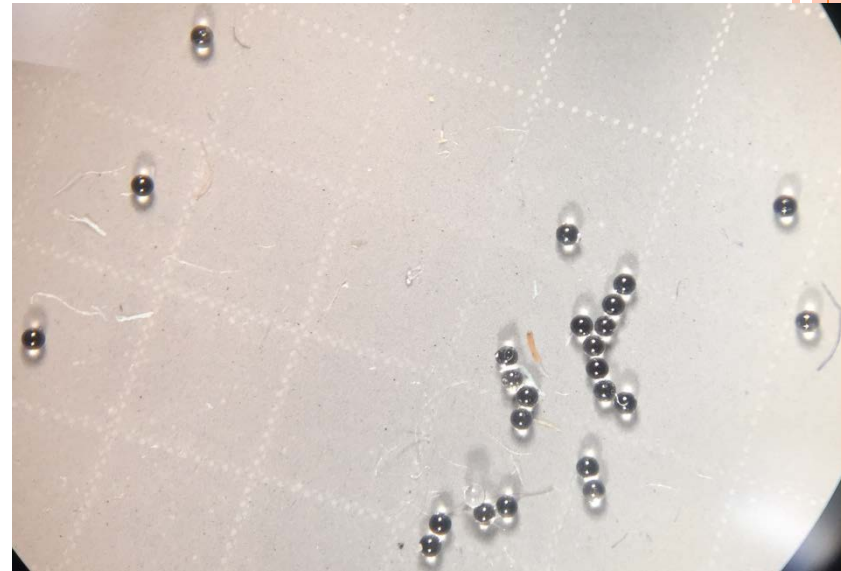
Spiked beads



27 beads

WPO
→
NaCl
density separation

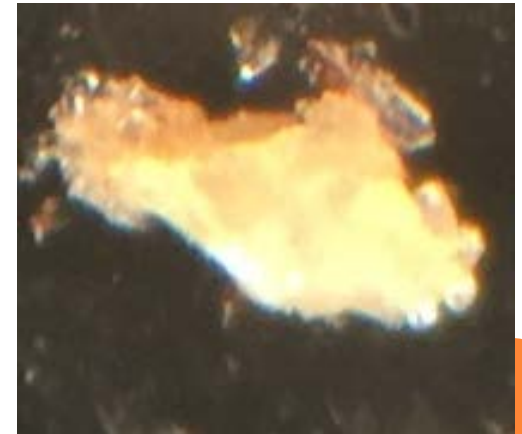
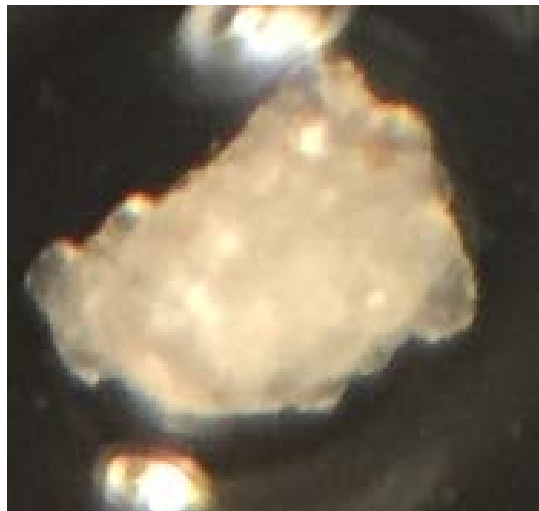
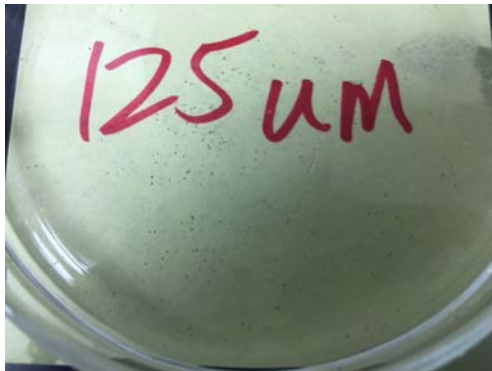
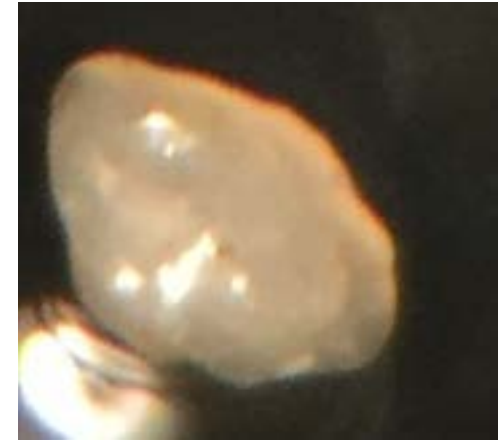
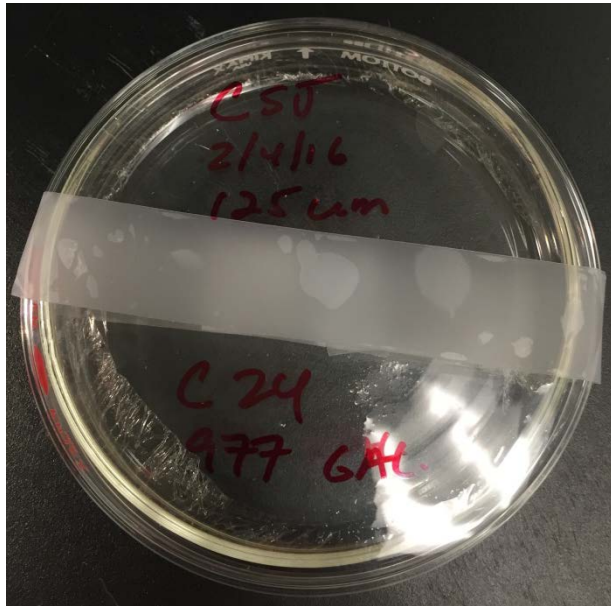
Recovered beads



24 beads, **89% recovery**



SAN JOSE WWTP EFFLUENT (125 UM SIEVE)



CONCLUSIONS AND NEXT STEPS

- 24-hour composite sampling is possible without clogging the sieves
- Method works in a relatively clean matrix, as seen in ‘spiked blank’
- More aggressive digestion – similar to procedure used for destroying fish tissue is needed for WWTP final effluent
 - Verify cellulose fibers are destroyed and microplastics are not destroyed
- Do not use reflective surface (glass) to examine samples
- Raman spectroscopy for positive identification
- SFEI sponsored microplastics workshop: June 29



THANK YOU FOR YOUR SUPPORT

San Jose – Noel Enoki

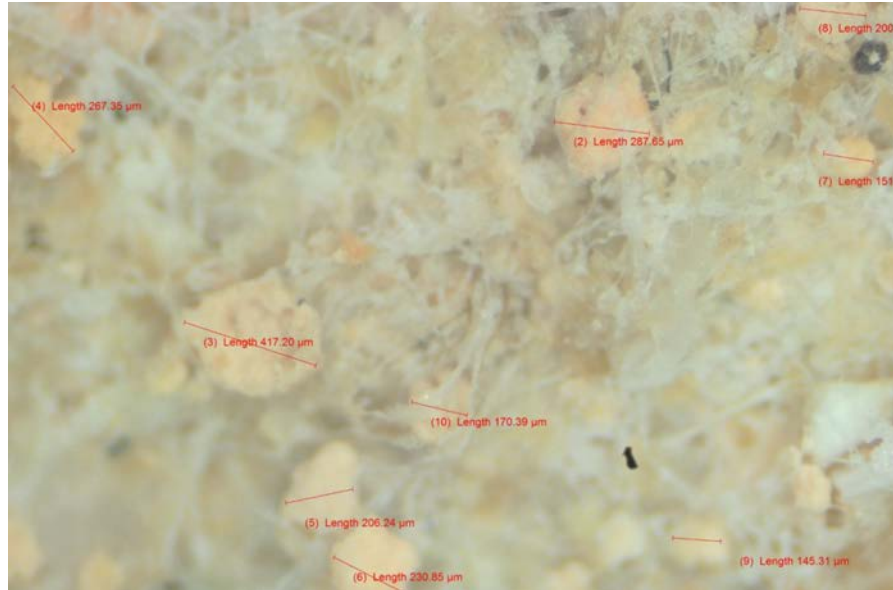
CCCSD – Jim Wan

SFPUC – Ken Lee

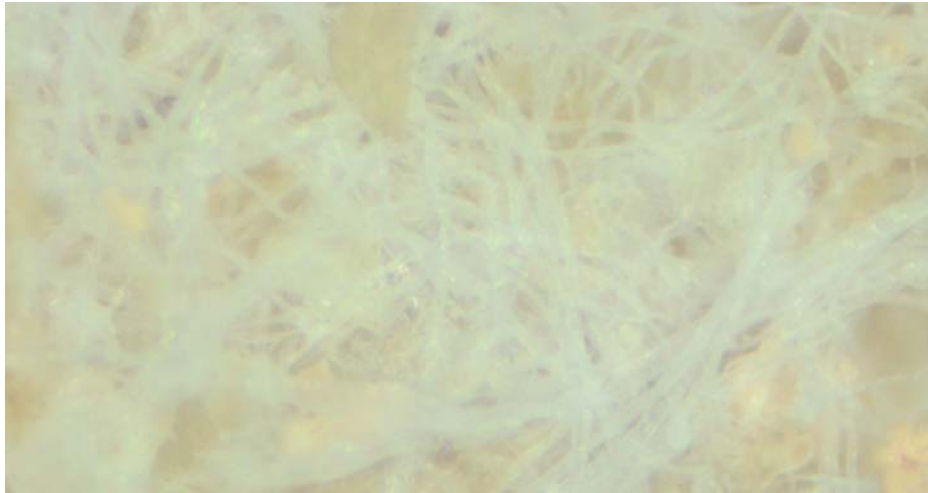
Union Sanitary District – Guy Moi

Hayward – Farid Remezanzadeh

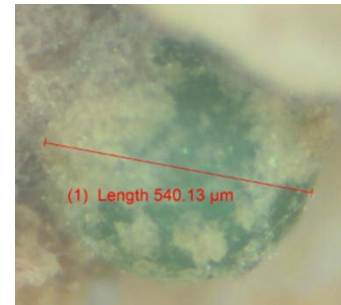
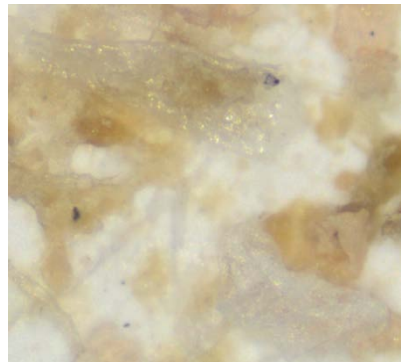
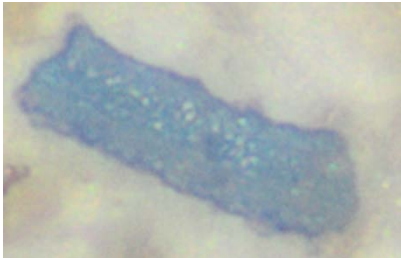
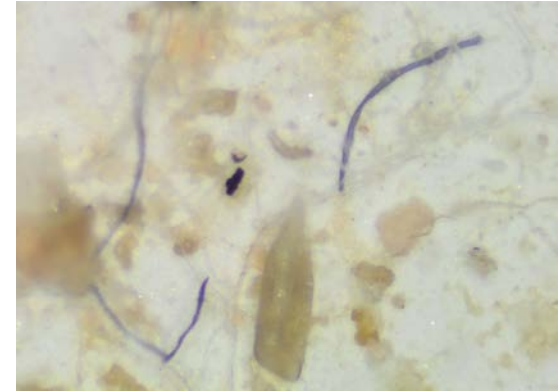
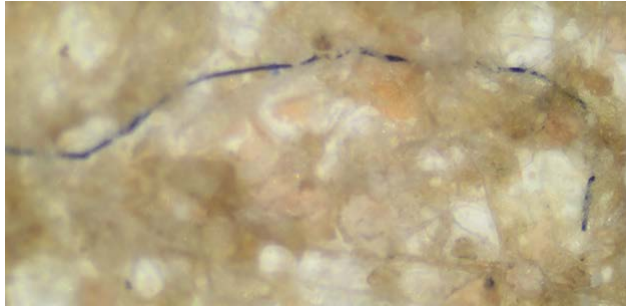
SINCE MARCH - OIL AND GREASE CONFIRMED BY FTIR



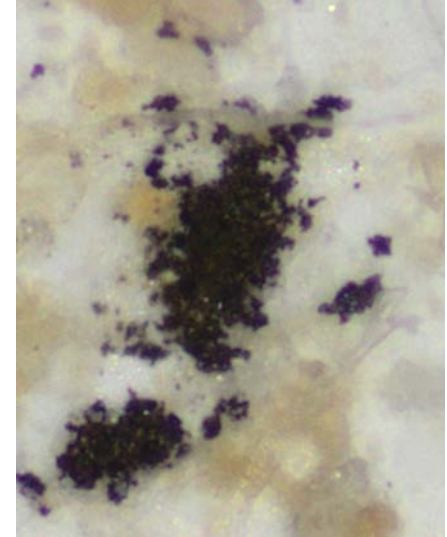
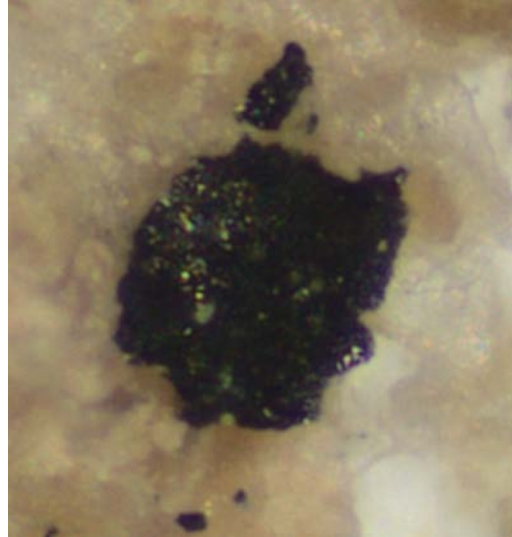
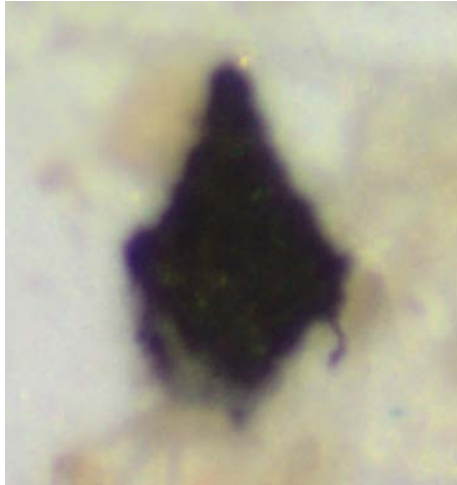
CELLULOSE FIBERS – CONFIRMED BY RAMEN



PLASTIC



NEEDS TO BE IDENTIFIED



ACKNOWLEDGEMENTS – EBMUD STAFF

- Artem Dyachenko
- Jason Mitchell

