

## WASTE CHARACTERIZATION PROTOCOL – FOR A DEEPER DIVE

**Purpose:** To create a standard operating procedure to characterize and quantify the debris found in Seabins deployed along the Great Lakes. This SOP is intended for any group interested in quantifying and characterizing the anthropogenic debris found in a Seabin. The data collected using this SOP can be synthesized across locations to quantify our total impact and compare across sites since it is collected in a systematic way. *We suggest following this protocol for at least 5-10 bins each season to obtain an accurate representation of the contents in your Seabins. Aim to capture 1 – 2 wet events per season (to be considered a wet event, the amount of rainfall must be > 10mm over 24h). When measuring a wet event, ensure that there are 5 days in-between each wet event to ensure enough debris has collected on the streets.*

### Safety Notes:

- Prior to walking on the dock to obtain the Seabin put on your lifejacket.
- When collecting the debris from each Seabin, ensure that the power is off so the Seabin is no longer pumping in water.
- When retrieving the bin use an extension pole or pike pole.
- When sorting through debris **DO NOT** place your hand in and grab debris to put it on the tarp, instead dump the entire bag onto the tarp to ensure you do not grab anything unexpectedly.
- Wear gloves while sorting through the debris and be cautious when submerging arm into 5-gallon bucket (wear elbow-high gloves for this).
- If dangerous materials are found dispose of it with care; e.g., a used syringe should be placed in a Sharps Container.

### Materials

- Reusable gloves (e.g. garden /dishwashing gloves)
- 1-gallon Ziploc bag per bin (pre-weighed)
- 1 clean pre-weighed jars/small plastic urine collection cups
- Luggage scale
- Kitchen scale (which can go to 2 decimal places)
- Clipboard
- Datasheets on waterproof paper
- Pencils/Sharpies
- Label tape
- Large rectangular >2mm sieve
- 2 x 28cm diameter sieves with mesh 2-3cm wide.
- Squirt bottle(s)
- Camera
- First aid kit
- 2 x 5-gallon buckets
- Elbow high rubber/latex gloves
- Sharps Container (or used yogurt or butter tub)
- 2 x Tweezers
- Metal spoon
- Tarp
- Garbage bags
- Sunscreen, water, hat, sunglasses
- Hose

## Methods:

### Step 1: *Before collecting any debris from a Seabin:*

1. Ensure your small plastic jars (without the lid) and Ziploc bags are pre-weighed and recorded on the datasheet. Label each with location, Bin ID, Time, Date, and your initials. Label the Ziploc “large debris” and the jar “small debris”.
2. Record the time and date at which the bins were last emptied, and the time and date the bins will be removed.
3. Note the weather and wind conditions now; note whether it was a dry event or wet event while the bin was deployed (to be considered a wet event, the amount of rainfall must be > 10mm over 24h).
4. Use your Personal Protective Equipment (PPE), including gloves.

### Step 2: *Extract catch bag from Seabin:*

5. Use an extension pole or pike pole to retrieve the catch bag. Beware while extracting the catch bag when full to the brim, it may require two people as it can become very heavy. Once catch bag is extracted, give it a good shake to remove the majority of the water.
6. Weigh the bin containing all the contents and record it on a datasheet.
7. Record how full the catch bag was (full to the brim, half full, quarter full).
8. Make sure to fill out the rest of the top part of your datasheet, i.e. Name, Date and Time bin retrieved, when the bin was last emptied, what are the current wind and weather condition and if there was a wet event in the last 24 hours.
9. Take a picture from the top.
10. Place a tarp down on the area you will be sorting through debris.

### Step 3: *Characterizing the anthropogenic debris from the Seabin*

11. Attach hose to a water source.
12. After weighing the full catch bag, dump all of its contents onto the tarp. Depending on how compact the plant material is, you may have to help guide the material out (with gloves). When all the material removed from the catch bag, shake the empty catch bag 3 times over the tarp to remove any debris stuck to the sides.
13. Weigh the empty bin and mark it on the datasheet.
14. Once all the material is laid out on the tarp, place the catch bin back into the barrel of the Seabin.
15. Take a picture of the debris on the tarp.

#### *Quantify and characterize the large anthropogenic debris (bigger than a Toonie)*

16. Begin going through the plant material section by section to remove any large debris entangled inside.
17. For each piece of large debris: Record a new type (material & item; e.g., bottle cap, cigarette butt, plastic straw, paper receipt) on the datasheet and tally types of debris that have already been listed. Rinse it with a squirt bottle if it is dirty or has small debris attached to it and place it in the Ziploc bag. Make sure you don't miss any large debris entrained in organic plant material. If you have a lot of large debris, you may need another Ziploc.

#### *Quantify and characterize the small anthropogenic debris (smaller than a toonie and >2mm)*

18. Once cleaned of the large debris, take 2 large handfuls of plant material and place at the bottom of the 5-gallon bucket.
19. Place the hose inside the bucket with plant material and turn it on at a high pressure.
20. Begin filling up the 5-gallon bucket, spraying down the plant material while doing so until the bucket is just over  $\frac{3}{4}$  full. This will allow the plant material to loosen up and release any small debris entangled inside.

NOTE: If any sharp/dangerous materials are seen floating in the bucket, dispose of them immediately (and log it on your datasheet if anthropogenic). If there are any large natural debris that can be easily removed without removing any anthropogenic material, e.g. sticks, branches etc. floating at the top of the bucket, remove them and rinse each piece into the bucket. Leave the rest of the plant material/natural debris such as algae in the bucket.

21. Once the bucket is filled  $\frac{3}{4}$  full, let it settle for about ~1 minute to allow small debris to float to the surface.
22. If there are any large pieces of debris found floating that were missed in the initial removal, place them in your Large Debris Ziploc bag and tally it on your datasheet.

23. Place the 28cm diameter sieve into the bucket and slowly push it down toward the bottom of the bucket, to wherever it becomes stuck.
24. Wait for another minute or so to allow the small debris to resurface through the sieve while the plant material is bound to the bottom of the bucket.
25. Place the 2mm sieve on the ground and slowly pour the contents of the bucket into the sieve, **avoid any splashing** as this will cause small debris to be lost from the sample. Pour until the bucket is empty.
26. Once the bucket is empty and all that remains is the plant material, repeat steps 18 - 24 twice more. In total you will rinse each bunch of plant material 3 times. Once triple-rinsed, remove the organic material from the bucket and place to the side where it can later be properly disposed of.
27. Next, repeat steps 18 – 25 until you have extracted debris from the whole pile of organic material.
28. Throw all extracted plant materials into the garbage bin, **DO NOT THROW BACK INTO THE WATER.** This is because small pieces of debris (sometimes many pieces) will likely remain attached to the plant material even after 3 rinses.
29. Now all that should remain on the 2mm sieve are small pieces of anthropogenic debris and SOME small pieces of plant material.
30. Decide whether counting all of your small anthropogenic debris is possible. If there are too many pieces (e.g., more than 50-100), you can subsample. If so, go down to the “**Subsampling your small debris**” steps below. If not, check No under “Did you subsample” on your datasheet and go straight to step 31.
31. Gather all your small pieces of debris in a pile on the sieve, make sure to scrape the sides of the sieve with a metal spoon to get all the small debris in the center.
32. Remove the pile from the sieve and onto the tarp.
33. Begin to count all small pieces and tally as hard fragment, foam, pellet, film or if another category of small anthropogenic debris, fill out in other.
34. Once tallied, place the counted small anthropogenic debris in the clean pre-weighed plastic cup.
35. Next, weigh the plastic jar with the small debris inside without the lid on and record on your datasheet under “Weight of small debris sample in jar”.
36. Fill in the rest of your datasheet, including “Final Count” of each category, the “Total count of small debris” which is the sum of all your final counts, and “Final weight of subsample/sample” which is “Weight of the small debris sample” minus “Weight of the plastic jar”.

***Subsampling your small debris:***

37. If there are too many pieces in your sieve to count (more than 50-100), check Yes under “Did you subsample” on your datasheet.
38. To subsample, gather all the debris in the center of the sieve into a small pile ensuring you scrape the corners and sides of the sieve with a metal spoon. Once it’s all in a pile, divide it into four smaller equal piles.
39. To reduce bias, have another person pick which pile you will quantify and characterize, this will be your subsample.
40. Remove the subsample onto the tarp and place the three remaining debris piles into the garbage.
41. Begin to count all small pieces and tally as hard fragment, foam, pellet, film or if another category of small anthropogenic debris, fill out in other.
42. Once tallied, place all counted small anthropogenic debris into the pre-weighed plastic cup. Weigh and record on your datasheet under “Weight of sample/subsample”. Next calculate your final weight as stated in step 36 and extrapolate your subsample weight by multiplying your “Final weight of subsample/sample” by 4. Record this extrapolated number under “Extrapolated weight of subsample” on your datasheet.
43. Next multiply the count of each type of debris by 4 to represent the total amount of small debris in the full bin.
44. Now that you have collected all large debris, weigh it and record the weight under “Weight of large debris in Ziploc”. To fill in “Final weight of large debris” subtract “Weight of large debris in Ziploc” from “Weight of Ziploc”.

**Step 4: Upload data**

At the end of the day, enter all your data from your datasheets onto an excel spreadsheet. Please use the template provided. At the end of the season you will send us the excel spreadsheet you have compiled.