Supplemental Materials for "A Pump-Based Method to Sample Midwater Microplastic Pollution"

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SM-A: Interview Instruments

Neil Blake and Fam Charko

Interviewer instruction:
This is a semi-structured interview. Start with short preamble. You can skip further elaboration on our project, since Neil and Fam are our project mentors. This is meant to be a conversation about the work they have done so far in addressing microplastic pollution. Some potential questions to ask are listed below. Interview Neil and Fam separately. Make sure one team member is focused on conversing with interviewee, while others are taking notes. Discuss notes shortly after.

Preamble:
Hi Neil/Fam, the goal of this interview is to hear from you directly about your work on microplastic pollution. We already have a good understanding from reading EcoCentre reports, but we figure that through conversation we will gain further insight.

Questions:

1. Do you think residents of Melbourne are aware of the microplastic pollution problem?
2. Where do you think microplastic pollution research is moving in the future?
3. How long have you been researching microplastic pollution in and around Port Phillip Bay?
    a. Were there any moments throughout your research experience that stick out? A moment where you were shocked by the extent of the problem or where you felt your work was rewarded?
4. Why do you believe microplastic pollution should be researched?
5. What happened when you first began to conduct the surface level trawls of microplastics?
    a. Why did you choose this trawling design?
    b. Was it pre-made or did you custom design and build it?
    c. What problems did you run into?
6. What are the most important qualities of a microplastic collection method?
7. What sections or sample sites have you determined along the Patterson River, the Yarra River, and the Maribyrnong River? And at what depths are you looking to capture at each site? Why?

Anthony Despotellis

Interviewer instruction:
This is a semi-structured interview. Start with preamble. This is meant to be a conversation about potential microplastic collection device designs. If Anthony denies voice recording, have one team member conversing with interviewee, while others take notes. Discuss notes shortly after.

Preamble:
We are students from Worcester Polytechnic Institute located in the United States. As you already know, we are conducting a project on measuring microplastic pollution at lower depths in the waterways flowing into Port Phillip Bay, and we'd appreciate your assistance in learning about possible design options for sampling. We've been focusing on a portable pump system that can fit in a backpack and push water up to 10 m above the river level. The results of our project will be published on our University's website and shared with the EcoCentre. If you are willing to do our roughly 20-minute interview, you can end the interview at any time, and you can pass on answering any of the questions you wish. We would like to record this interview to ensure accuracy in our report, but you have the right to deny this request. In our report, you will be referred to by name, unless you would like us to use a pseudonym. If you have any questions about our project or would like to read our final report, please contact us at gr-B19eco@wpi.edu or our WPI faculty advisors Professor Lorraine Higgins at ldh@wpi.edu or Professor Lindsay Davis at lgdavis@wpi.edu.

Questions:

1. What university do you attend and what are you studying?
2. Can you describe your work with microplastics?
    a. What is your goal in researching microplastic pollution?
    b. How long have you been doing this research?
3. Fam showed us your current sampling device, can you tell us a little bit about this design?
    a. What qualities did you pursue in your sampling design?
    b. What problems have you run into in the design process?
    c. **If he mentions parts of his device that we were also interested in, ask about the price, and where he acquired the part**
4. Do you have any knowledge of pump designs (submersible vs out of water)?
    a. If so, describe our two designs to Anthony. Do you have any suggestions for us regarding these designs?
5. Where have you trialed your device and why?

a. Do you have any suggestions for sites where our portable pump would be most effective in gathering data on the total load of microplastics flowing in Port Phillip Bay?

Captain Blair Stafford

Interviewer instruction:
This is a semi-structured interview. Start with preamble. This is meant to be a conversation about the conditions of the rivers, potential sites for microplastic collection, and potential pump designs. Some questions to ask are listed below. Make sure one team member is focused on conversing with interviewee, while others are taking notes. Discuss notes shortly after.

Preamble:
We are students from Worcester Polytechnic Institute located in the United States. We are working with the Port Phillip EcoCentre to identify ways to collect microplastics in the waterways flowing into Port Phillip Bay. We would like to interview you to gain your insights on optimal microplastic sampling methods, as well as on the conditions of the rivers flowing into the bay. The results of our project will be published on our University's website and shared with the EcoCentre. If you are willing to do our roughly 20-minute interview, you can end the interview at any time, and you can pass on answering any of the questions you wish. In our report, you will be referred to by name, unless you would like us to use a pseudonym. If you have any questions about our project or would like to read our final report, please contact us at gr-B19eco@wpi.edu or our WPI faculty advisors Professor Lorraine Higgins at ldh@wpi.edu or Professor Lindsay Davis at lgdavis@wpi.edu.

Questions:

1. We plan on sampling at the following sites along the Yarra, Maribyrnong, and Patterson rivers (show him the map), have you boated in these areas?
    a. What are the maximum depths of the water in these areas?
    b. What are the currents like?
    c. Are there obstacles or wildlife to avoid here?
    d. Are there any sites you know of with a high concentration of microplastics?
2. Have you ever had experience with pump system sampling? Show him our design or outline it for him.
    a. If you have used a pump: how effective was it?
    b. What recommendations do you have for using it?
    c. If not: would you consider a pump to be an appropriate sampling device?
    d. Given our design, and your knowledge of the river, would you anticipate any problems with our device?

EcoCentre Staff

Interviewer instruction:
This is a semi-structured interview. Interview any combo of the following EcoCentre staff: Neil Blake, Fam Charko, April Seymore, and Karen Jones. Questions are listed below. Make sure one team member is focused on conversing with interviewee, while others are taking notes. Discuss notes shortly after.

EcoCentre Staff questions:

1. Who will be using the instructional materials regarding our sampling method?
2. Do you believe a written document, visual representation, or video would be most appropriate? Or a combination of these?
3. If we make a video, would you like us to include information on why microplastic pollution is a problem the public should care about?

SM-B: EcoCentre Microplastic Sample Analysis Method

Materials required:

- Sample
- Desk
- Blank piece of paper (as big as a tablecloth)
- Tweezers
- Poking tools
- Headlamp
- Litter category sheet
- Plastic bag
- Paper bag
- Ruler with millimeter markings
- Scale

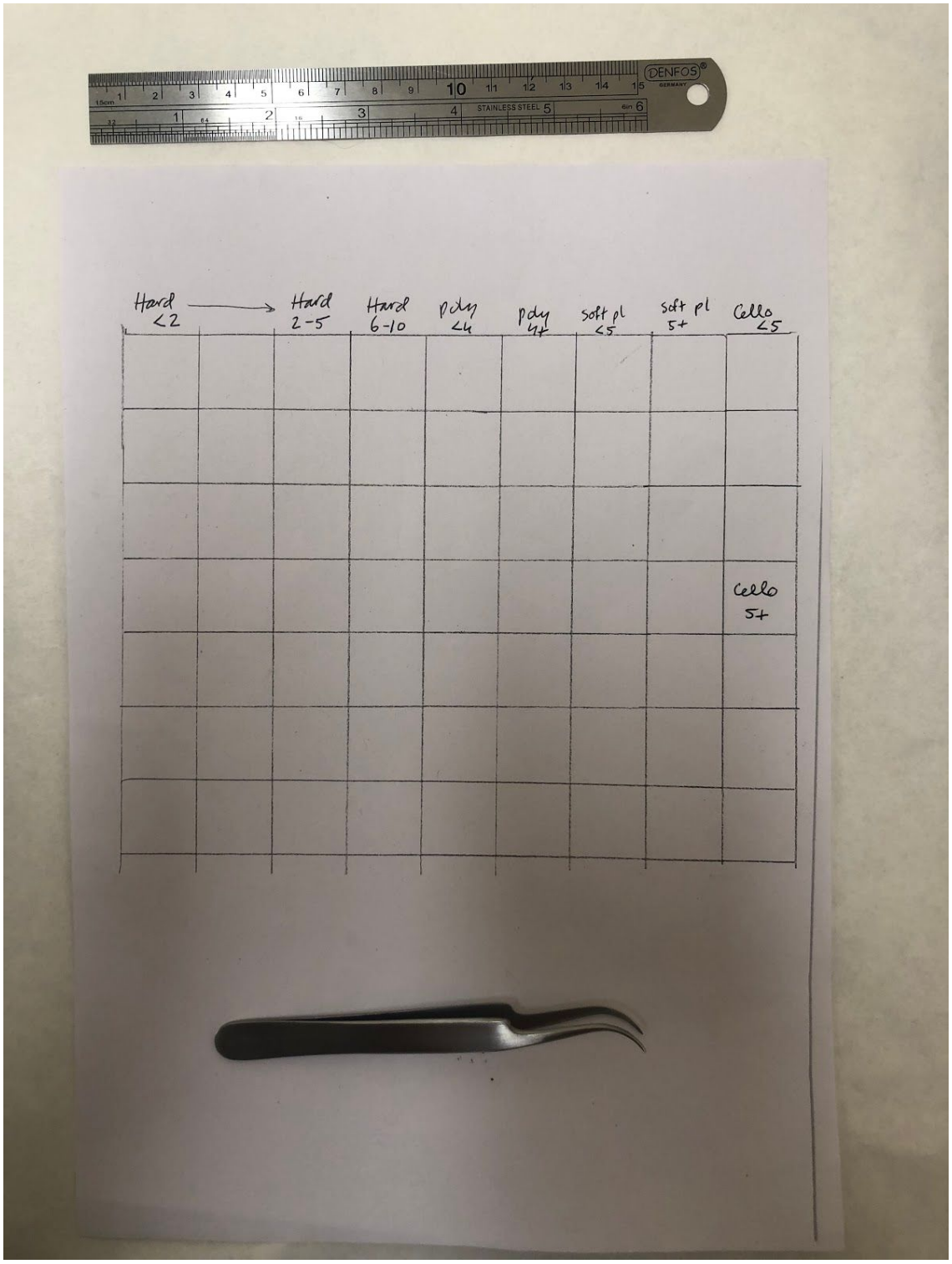
Procedure:

1. Weigh the entire sample in its container, record this number
2. In a closed room, where the sample will not be distrubed by the environment, set up a large piece of paper on a desk with the sample in the middle
3. Use a headlamp, ruler, poking tools, and tweezers to identify which litter items belong in which categories
4. Place the items in the correct boxes on the litter category sheet
5. Have someone who is trained in microplastic analysis check your work
6. Count and record how many of each litter item there is
7. Weigh a plastic bag
8. Put all of the plastic litter items into the bag and reweigh, record these numbers
9. Weigh a paper bag
10. Put all of the organic items into the bag and reweigh it, record these numbers
11. Weigh the empty container that the sample came in, record this number

Litter item categories:

Microplastics	Macroplastics	Non-plastic Litter Items
Hard plastic pieces <2mm	Hard plastic pieces 6-10 mm	Sponges
Hard plastic pieces 2-5mm	Hard plastic pieces >10mm	Other
Nurdles	Polystyrene beads >4mm	
Polystyrene beads <4mm	Plastic bottle caps	
Soft plastic <5mm	Plastic straws	
Cellophane <5mm	Soft plastics >5mm	
	Cellophane >5mm	
	Twine/fishing line	
	Cigarette butts	

Example set-up with litter category sheet, ruler, and tweezers:



Example of a sorted sample:

SM-C: Task Analysis Instrument

Instructions: Fill out this table when observing a user with our sampling device/instructional materials. Have at least two people observing and then compare results. Share results with the participant to discuss and confirm your observations.

Task #	Description of physical and cognitive activities involved in task	Data and information necessary to complete task	Task duration	Problems associated with task
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

SM-D: McWap Instruction Manual

The McWap

(Microplastic Collector with a Pump)

Instruction Manual

Worcester Polytechnic Institute
Interactive Qualifying Project
Prepared by: Kathleen Donovan, Spencer Hoagland,
Thomas Lipkin, and Eric Stultz
Advisors: Professor Lorraine Higgins and Lindsay Davis
Sponsor: The Port Phillip EcoCentre
13 December 2019

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INTRODUCTION

The McWap is a portable device for collecting microplastics at various depths within waterways. It was created by a team of four students from Worcester Polytechnic Institute who were collaborating with the Port Phillip EcoCentre. The purpose of this manual is to illustrate how to build, operate, and maintain the McWap. Links to further information, including a how-to video showing the device, are located at the end of this manual.

SAFETY

- After the pump assembly is complete make sure the battery is a safe distance away from ledges/the water
- Do not touch both terminals of the battery at the same time
- If the forecast shows promise of rain, bring a tarp to drape over the pump and battery power station
- Bring sunscreen or a jacket and hat
- Be mindful of your surroundings, do not set up the pump in an area that would disturb the local ecosystem

REQUIRED PARTS

 Mesh Filter (1x)	 40mm to 25mm PVC Coupling (1x)	 40mmø x 11 cm PVC Pipe (1x)
 25mmø PVC Threaded Fitting (2x)	 25mmø x 3m Tube (2x)	 17-32mmø Hose Clamps (4x)
 25mmø Outlet Tube (1x)	 13mmø x .25m Tube (1x)	 13mmø x .13m Tube (1x)

 25mmø Barbed Threaded Fitting (2x)	 13mmø Barbed Threaded Fitting (2x)	 Female-Female Quick Disconnect (1x)
 Threaded 25mmø Male Quick Disconnect (2x)	 22mm-32mmø Easy Hose Clamps (4x)	 16mm-27mmø Easy Hose Clamps (4x)
 11mm-16mmø Hose Clamps (4x)	 PTFE (Teflon) Tape (1x)	 Holman Flow Meter(1x)

 Ozito 12V Pressure Pump & Wires (1x)	 90° Barbed Pump Inlet Fitting (1x)	 Barbed Pump Outlet Fitting (1x)
 Battery Terminal Adapters (2x)	 12V Power Battery Station (1x)	 12V Exide Endurance 40CMF Battery (1x)
 36in x 5/16in⌀ (0.914m x 0.794cm⌀) Threaded Zinc Plated Steel Rod (3x)	 Tripod (1x)	 Projecta 12V Automatic Battery Charger (1x)

 Gorilla Clear Epoxy (1x)	 Wood Plywood with 7cm Hole (1x)	 Pipe Saddle Bracket (1x)
 Mesh Transport Containers	 Elastic Bands (2x)	 5/16in⌀ (0.794cm⌀) Hex Couplers (8x)

ASSEMBLY

Step 1: Creating the Filter

Parts needed: 40mm to 25mm PVC Coupling, 330 µm mesh, and Gorilla 25mL Clear Epoxy Glue

1. Cut a circular piece of 330 µm mesh to the size of the coupling's bigger inner diameter (in this case 40mm)
    a. When cutting it is better to use slightly more fabric than you need, rather than less
    b. Be sure to trim the mesh in order for it to lay flat on the inner lip of the coupling
2. Clean the inside of the 40mm to 25mm PVC Coupling with a wet towel or napkin, then let dry
3. Dispense a small amount (approximately 1 tbsp) of Gorilla 25mL Clear Epoxy Glue onto a piece of paper, or any disposable surface to mix
4. Once mixed well, spread the epoxy along the inner lip of the coupling, then lay mesh on top being sure to push the mesh firmly onto the edges with epoxy
5. Add a little more epoxy onto the net above the lip
6. Let dry overnight or for at least 8 hours
7. Add tape to the outside of the coupling to help differentiate it from the coupling that does not have a filter inside
    a. Any sort of marking that will not rub off of the coupling works
    b. Make several filter pieces to use at various depths during one sample session

Assembled Filter

Step 2: Creating the Power Station

Parts needed: 2x Battery Terminal Adapters, 12V Exide Endurance 40CMF Battery, 12V Power Battery Station

1. Place 40CMF Battery within the Power Battery Station
2. After removing the protective caps, connect the Battery Terminal Adapters to the battery as shown below. Loosen the screws in order to fit the terminal adapters to the battery, then tighten to hold **Do not touch both terminals simultaneously with your hands or with metal**
    a. The terminals and adapters vary in size, so we marked ours with + and - signs. Put the + adapter on the + terminal and vise versa for negative to ensure the best fit
    b. Place terminal adapter facing in towards the center of the battery and tighten with a wrench so they are not loose

c. The adapters should be flush to the top of the terminal, or as close to flush as possible to ensure they do not fall offThe adapters do not need to be all the way down the terminal, just enough so they will not fall off

3. Connect leads from battery station to battery
    a. Unscrew wing nuts and hold the bolt in place from the bottom of the adapter. Place corresponding connectors* on bolt and tighten the wing nuts
        i. ***Be sure to connect Black(-) to Black(-) and Red(+) to Red(+)**
    b. Cross the cables over each other to allow the lid to close
4. Place Power Battery Station cover back on, you may need to move the cables inside around to make sure the cover rests properly on the rest of the station
5. To check your connection, press the white button on top of the station
    a. One of the battery level lights will light up if set up properly
6. Read the level of the battery using the white button on top to ensure it is charged. An optimal reading would be 'Medium (11.9-12.6V)' as the battery being used is only 12V and the gauge goes up to 13V
    a. If the charge reads lower than 'Medium (11.9-12.6V)', or you notice a performance drop in the pump, charge the battery using the Projecta 12V Automatic Battery Charger
7. Tighten strap around the device, holding the cover on. The power station is now ready


Assembled Power Station

Step 3: Pump Inlet Connection

Parts needed: 11mm-16mm⌀ Hose Clamps, 90° Barbed Pump Inlet Fitting, 13mm⌀ x .13m Tube

1. Put the barbed end of the 90° Barbed Pump Inlet Fitting into one side of the 13mm⌀ x .13m Tube (the barbed end is facing down in the picture above)
2. Put a 11mm-16mm⌀ Hose Clamp around the tube and over the barbed fitting and tighten using a wrench or flat head screwdriver to prevent any leaks

Assembled Pump Inlet Connection

Step 4: Pump Outlet Connection

Parts needed: 11mm-16mm⌀ Hose Clamps, Barbed Pump Outlet Fitting, 13mm⌀ x .25m Tube

1. Put the barbed end of the Barbed Pump Outlet Fitting into one side of the 13mm⌀ x .25m Tube (the barbed end is facing right in the above picture)
2. Put a 11mm-16mm⌀ Hose Clamp around the tube and over the barbed fitting, and tighten using a wrench to prevent any leaks

Assembled Pump Outlet Connection

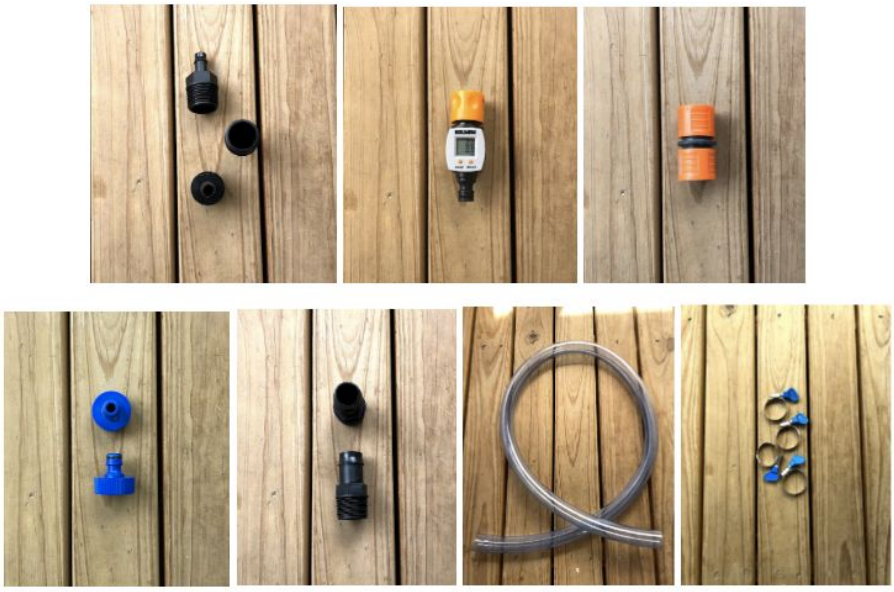
Step 5: Connecting Inlet and Outlet to Pump

Parts needed: Previously constructed Pump Inlet and Outlet Fittings, and Ozito 12V Pressure Pump & Wires

1. Connect the Pump Inlet Fitting to the 12V Pressure Pump by sliding down the stopper on the side and firmly pushing the fitting in, then slide the stopper back over
    a. Ensure this fitting is connected to the side opposite of the arrow on the front face of the pump
2. Connect the Pump Outlet Fitting to the 12V Pressure Pump by sliding down the stopper on the side and firmly pushing the fitting in, then slide the stopper back over
    a. Ensure this fitting is connected to the side with the arrow on the front face of the pump

Assembled Pump with inlet and outlet

Step 6: Flow Meter and Outlet Tube

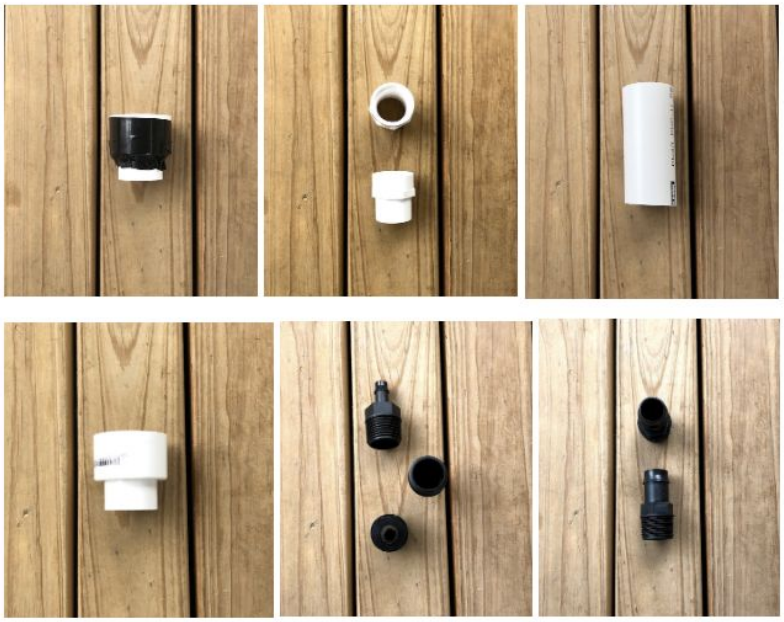


Parts needed: 13mm⌀ Barbed Threaded Fitting, Holman Flow Meter, Female-Female Quick Disconnect, (2x) Threaded 25mm⌀ Male Quick Disconnect, 25mm⌀ Barbed Threaded Fitting, 25mm⌀ Outlet Tube, and 25mm-32mm⌀ Easy Hose Clamps

1. Connect the Female-Female Quick Disconnect to the underside of the Flow Meter
    a. **For all quick disconnect parts: Push the parts together firmly until you hear clicks in order to prevent leaks**
2. Attach one Threaded 25mm⌀ Male Quick Disconnect to the Female-Female Quick Disconnect
3. Screw in the 25mm⌀ Barbed Threaded Fitting to the Threaded 25mm⌀ Male Quick Disconnect and then push the 25mm⌀ Outlet Tube (precut to a desired length of approximately 1m) onto the barbed section
    a. Ensure the threads are screwed in fully in order to prevent leaks
4. Connect the other Threaded 25mm⌀ Male Quick Disconnect to the top of the Flow Meter, then screw on the 13mm⌀ Barbed Threaded Fitting

Assembled Flow Meter and Outlet Tube

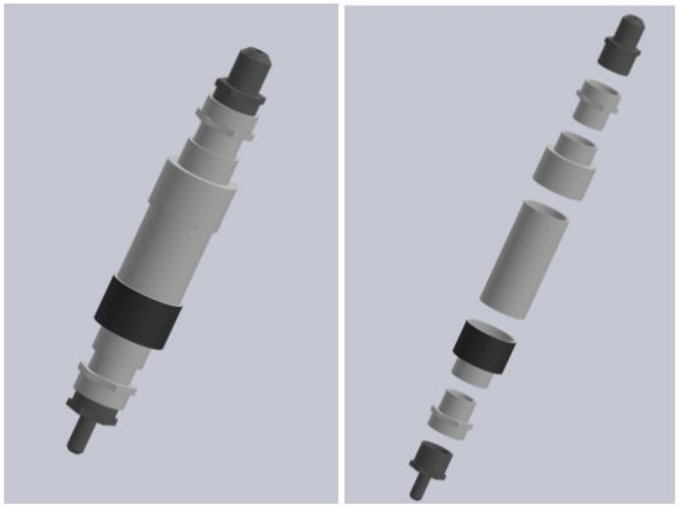
Step 7: Filter Assembly



Parts needed: Mesh Filter, (2x) 25mmø PVC Threaded Fitting, 11mm long x 40mmø PVC Pipe, 40mm to 25mm PVC Coupling, 13mmø Barbed Threaded Fitting, and 25mmø Barbed Threaded Fitting

Note: When connecting PVC fittings, use enough force so they do not come apart, but do not over press them preventing them from being detached in the future ***especially for the parts connecting directly to the Mesh filter***

1. Hold the Mesh Filter piece with the larger 40mm side facing upward
2. Attach a 25mmø PVC Threaded Fitting to the 25mm side of the coupling
3. Attach the 40mmø PVC Pipe to the 40mm side of the coupling
4. Place the 40mm to 25mm PVC Coupling on top of the PVC pipe
5. Attach the second threaded fitting to the top of this coupling
6. Screw the 13mmø Barbed Threaded Fitting into the threaded fitting connected to the mesh filter, and the 25mmø Barbed Threaded Fitting to the other coupling



Assembled Filter Assembly

Step 8: Inlet Tube

Parts needed: 25mm⌀ x 3m Tube, at least (2x) 36in x 5/16in⌀ Zinc Plated Threaded Steel Rod, for every rod junction (2x) 11mm-16mm⌀ Hose Clamps, (4x) 17-32mm⌀ Hose Clamp, 22mm-38mm⌀ Easy Hose Clamp, Pipe Saddle Bracket, and (8x) 5/16in⌀ (0.794cm⌀) Hex Couplers

1. Before connecting any 36in x 5/16in⌀ Zinc Plated Threaded Steel Rods, mark every 0.25m on the rod with a 5/16in⌀ (0.794cm⌀) Hex Couplers
    a. After measuring out where the coupler will go put a thin layer of epoxy on the rod make sure each .25m is located at the bottom of the bolt
        i. Measure up to each coupler starting at the bottom of the rod to make sure you are as accurate as possible
        ii. Place marks on the couplers to indicate what depth they are when assembling all rods
    b. Then mark the approximate overlap of the rods (approximately 7cm) with whatever is available
        i. The overlap is demonstrated below with tape

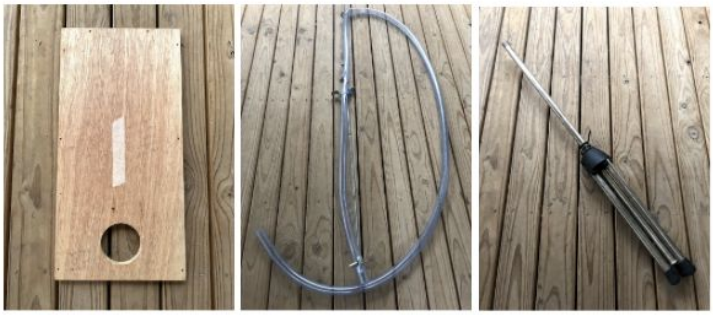
2. Connect two rods together by overlapping them the predetermined amount and putting two 11mm-16mm⌀ Hose Clamps on the ends of the overlap, then tighten
3. Take one end of the 25mm⌀ x 3m Tube and hold it against one 36in x 5/16in⌀ Zinc Plated Threaded Steel Rod, place 4-6 (2 per rod) 17-32mm⌀ Hose Clamps around the rod and tubing
4. Spread out 17-32mm⌀ Hose Clamps along the rod keeping tube as straight as possible

a. Use about two clamps per rod with one at the lowest point of the tube and highest point of the tube

5. Next assemble the connection between the inlet hose fixture and the plywood holder. Take one 11mm-16mmø Hose Clamp and tighten around the Pipe Saddle Bracket, then connect a 22mm-38mmø Easy Hose Clamp to the 11mm-16mmø Hose Clamp in order to connect to the rod and tube
    a. Don't tighten the 22mm-38mmø Easy Hose Clamp all the way yet as you will move it around once you determine your desired sample depth

Assembled Inlet Tube

Step 9: Final Assembly



Parts needed: Wood Plywood with 7cm Hole, Inlet Tube Assembly, Filter Assembly, Tripod, Elastic Bands, Pump System, Power Battery Station, Flow Meter and Outlet Assembly

1. The final step in the assembly process is assembling all previously constructed parts. First attach the Filter Assembly to the Tripod using two Elastic Bands, once secured push the inlet tube onto the 25mm barbed fitting at the top of the filter

2. Push the inlet to the Pump System to the 13mm Barbed Threaded Fitting on the underside of the filter, make sure the 90° Barbed Fitting is pointed up to the filter to avoid crimps in the tubing
3. Force the outlet tube onto the 13mm Barbed Threaded Fitting attached to the Flow Meter, make sure the connection is tight enough
4. Carefully place the Inlet Tubing Assembly on the inside of the circle of the Wood Plywood with 7cm Hole so the Pipe Saddle Bracket sits on the top of the plywood
    a. Slide the hose and rod through the Pipe Saddle Bracket so the desired sample depth is at the surface of the water and tighten the hose clamp
5. Plug the Pump power cord into the Power Battery Station, you are now ready to begin pumping. **Be sure to consult the entire pumping process on the following pages before turning the switch on**

Assembled Filter Stand and Final Assembly

PUMPING PROCESS

Prior To Arriving at Sampling Sight

In practice, we have found it best to carry each component assembled, but not connected to each other to the sampling sight. Pack the pump's inlet and outlet, the filter assembly, flow meter assembly (outlet tube detached), and power station pre-assembled, but not connected to each other. Step 5, step 8 (besides marking distances on rods and predetermining the rod overlap), and step 9 of assembly should be done on-sight.

Set-Up

1. Put the Inlet Tube at the desired depth by sliding the Saddle Pipe Bracket to the top of the plywood and the desired sample depth measurement on the rod is on the surface of the water
2. Check that everything is set up correctly and check the safety/warning section on Page 2
3. Have a timer ready to time the process and determining the average flow rate later

Pumping

1. Plug pump in and flip the cord's on/off switch to begin pumping
2. Start timer once the flow meter begins showing a volume count
3. Monitor the system for clogs and leaks
4. If necessary, hold onto the metal rod connected to inlet tube to make sure the tube goes straight down
5. Turn off system when desired volume or time is reached, making sure to stop the timer once the pump is turned off

Disassembly

1. Remove the top 25mm⌀ PVC threaded fitting attached to the inlet tube to let the pump drain the water in the filter
    a. Turn pump off immediately after filter is clear of water and unplug it from the battery, making sure to keep the cord away from water

    b. **Do not remove inlet tube from water until detached from the system**
    c. Make sure the inlet tube does not fall in the water while disassembling the rest of the system
2. Detach the 90° barbed pump inlet fitting from the pump and let drain if needed
3. Finally, remove the bottom 25mm⌀ PVC threaded fitting from the mesh filter and the PVC tube with the 40mm to 25mm PVC coupling
    a. Take a picture of what is caught in the mesh to have a photographic evidence
    b. Now with the mesh filter detached from the rest of the system, place it in a safe container for transportation to avoid outside contamination
4. Abide by the maintenance steps 1 and 2 after each use

CARE & MAINTENANCE

1. Wash flow meter with fresh water after each use
2. Wash other metallic parts that were submersed with fresh water
3. Do not run pump for long periods of time without water flowing through it
4. Drain water out of pump after each use by tipping it on each side
5. Regularly check the pump function without the rest of the system
    a. Use a bucket of fresh water and the inlet and outlet connections with appropriate tubing
    b. Check for slow running or abnormal noises coming from the motor

TROUBLESHOOTING

Teflon tape and PVC cement: Teflon tape may be added to threadings and hose clamps may be added to barbed fittings if issues with suction or leaks occur. PVC cement can be added to the PVC parts if further sealing is needed (do not add to filter piece since this part needs to be removed regularly). PVC cement should be a final resort as it is permanent and the parts that you cement together will not come apart again.

Further loss of suction (if not fixed by Teflon Tape and PVC Cement): Check if the inlet is blocked by debris. If no debris is present, see if there is blockage in the tubes or filter. If nothing found, dismantle pump to see if anything is inside it, refer to the pump manufacturer's manual for more instructions.

Inlet "blowing bubbles": The inlet and outlet of the hoses might be reversed, check arrow on the front of the pump to make sure everything is set up correctly as shown in steps 5 and 9 (pg 12 and 21).

Pump is not running or running slow: Check battery level by pressing the white button on top, if on any level other than "Medium 11.9-12.6V", charge the station before pumping. There is also a chance the battery may be low on power and still display "Medium 11.9-12.6V", so if you experience any issues, charging the battery should be the first solution to try. If the battery is sufficiently charged and the pump is still not running or running slow, the motor or wiring could be broken, refer to the pump manufacturer's manual for more instructions.

COST

Part	Supplier	Cost (AUD)	Quantity Required
300 micron mesh	Allied Filter Fabrics	N/A	1
40mm to 25mm PVC Coupling	Holman	3.69	5
40mm PVC Pipe	Holman	5.00	1
25mm PVC Threaded Fitting	Holman	3.50	2
25mm x 3m Tube	Pope	25.34	1-2
13mm x 3m Tube	Pope	20.91	1
25mm Outlet Tube	Pope	(use from left over 25mm x 3m tube)	1
25mm Barbed Threaded Fitting	Pope	2.70	3
13mm Barbed Threaded Fitting	Pope	2.30	2
Female-Female Quick Disconnect	Holman	7.00	1
Threaded 25mm Male Quick Disconnect	Gardena	6.20	2
22mm-32mm Easy Hose Clamps	Prime	1.79	6
16mm-27mm Easy Hose Clamps	Prime	1.77	6
11mm-16mm Hose Clamps	Prime	1.32	6
17mm-32mm Hose Clamps	Prime	1.50	6

Teflon Tape	EnduraSeal	1.80	1
Holman Flow Meter	Holman	19.80	1
Ozito 12V Pressure Pump	Ozito	109	1
90° Barbed Pump Inlet Fitting	Ozito	N/A (included)	1
Barbed Pump Outlet Fitting	Ozito	N/A (included)	1
(2) Battery Terminal Adapters	Projecta	15.00	1
12V Power Battery Station	Projecta	64.00	1
12V Exide Endurance 40CMF Battery	Exide	98	1
Projecta 12V Automatic Battery Charger	Projecta	45.85	1
Elastic Bands	N/A	1.00	2
Gorilla Clear Epoxy	Gorilla Glue	15.90	1
36in x 5/16in⌀ Zinc Plated Threaded Steel Rod	N/A	3.78	3+
Pipe Saddle Bracket	Kinetic	9.70 (pack of 10)	1
Hex Couplers	Pinnacle	2.74	1
TOTAL PRICE		561.35	
TOTAL WEIGHT		9.3kg without the battery	21.3kg with the battery

TOTAL SIZE LIMIT		35L Backpack (carrying the battery separately)	

FURTHER INFORMATION

How To Use the McWAP Video
https://wp.wpi.edu/melbourne/projects/ and search for "A Pump-Based Method to Sample Midwater Microplastic Pollution"

Making the McWAP Booklet
https://wp.wpi.edu/melbourne/projects/ and search for "A Pump-Based Method to Sample Midwater Microplastic Pollution"

Have questions?
gr-b19eco@wpi.edu

Want to get involved with the EcoCentre's research?
https://ecocentre.com/tags/participate

SM-E: Contributions

Task:	Completed by:
Research	
Microplastic creation	Eric
Microplastic effects	Eric
Geography	Spencer
The EcoCentre	Kathleen
Clean Bay Blueprint	Kathleen
Microplastic Sampling Methods	Thomas
Microplastic Analysis	Kathleen
Animation Software	Spencer
Introduction	
Writers	Kathleen, Spencer, Thomas, Eric
Editors	Kathleen, Thomas
Background	
Microplastics: What Are They and How Are They Harmful?	
Writers	Kathleen, Eric
Editors	Kathleen
Collection Sites Around Port Phillip Bay	
Writers	Spencer
Editors	Kathleen
The EcoCentre: Driving Policy Changes to Mitigate Microplastic Pollution	
Writers	Kathleen
Editors	Kathleen
Microplastic Sampling Methods	
Writers	Thomas, Eric
Editors	Kathleen, Thomas
Adapting a Method for the EcoCentre's Purposes	
Writers	Kathleen, Eric
Editors	Kathleen
Methods/Results	
Objective 1 Writer	Kathleen
Objective 2 Writer	Kathleen

Objective 3 Writer	Kathleen, Thomas, Eric
Objective 4 Writer	Kathleen
Graphic Designer	Kathleen
Editors	Kathleen, Thomas, Eric
Conclusion and Recommendations	
Writers	Kathleen, Thomas
Editors	Kathleen, Thomas, Eric
Acknowledgements	
Writer	Thomas, Eric
Editors	Kathleen
Interviews	
Instrument creation	Kathleen, Eric
Liaison to interviewee	Eric
Interviewer	Kathleen, Spencer, Thomas, Eric
Minute-taker	Spencer, Thomas
Pump Design	
Primary designers	Spencer, Thomas, Eric
Shoppers	Thomas, Eric
Assemblers	Thomas, Eric
Field Testers	Spencer, Thomas, Eric
How-To Video	
Videographer	Eric
On-screen characters	Kathleen, Thomas
Producer	Spencer, Eric
Editor	Spencer
Written Manual	
Writers	Thomas, Eric
Photographer	Thomas
Editors	Thomas, Eric
Informative Video	
Animator	Spencer
Editor	Spencer
Guitarist	Spencer
Booklet	
Designer	Kathleen
Editor	Kathleen