



2159 Kings Ave, West Vancouver, BC V7V 2B9

## Memo

**To:** Alison Wood, Chair, Ocean Ambassadors Canada

**From:** [Hamza Malik](#), Lead Engineer, Ocean Ambassadors Canada

**Date:** Tuesday, November 29, 2022

**Subject:** Research Progress Report on the Great Pacific Garbage Patch Cleanup

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### 1.0 Project Parameters

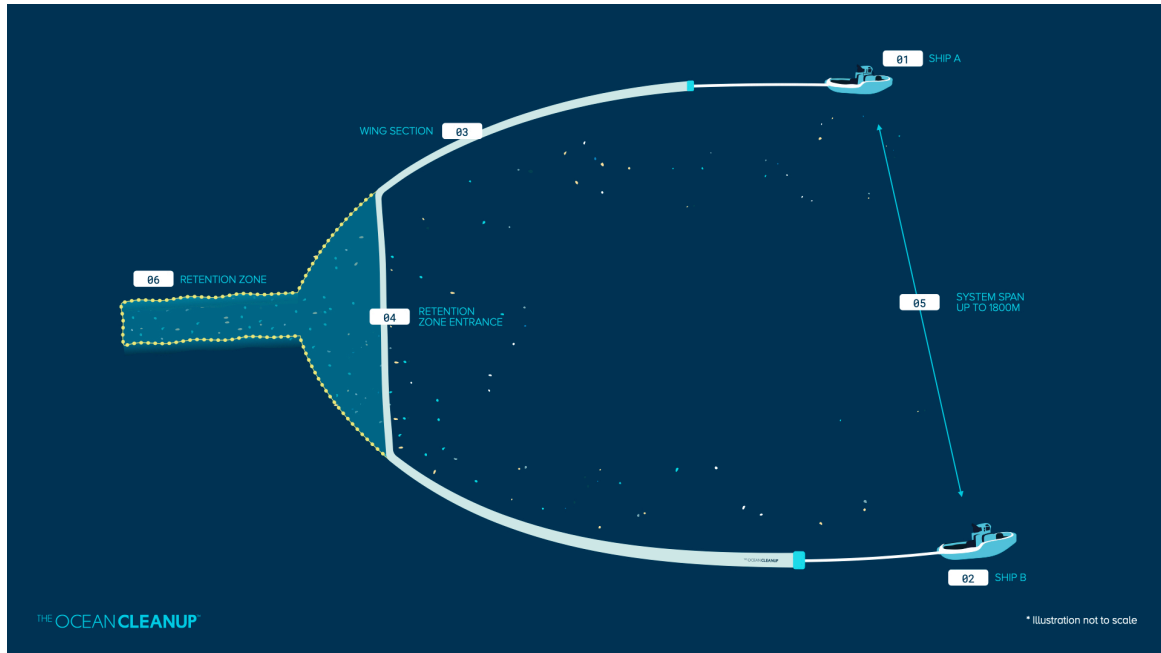
Project Subject:	Plastic Waste Accumulation in Great Pacific Garbage Patch
Possible Solution:	System 002, large-scale cleanup technology to collect marine debris/floating plastic in the ocean.
Job Position:	Lead Engineer, Ocean Ambassadors Canada

### 2.0 Completed Research Sections

#### Progress on Topic #1: **Background**

The Background of System 002 has been summarized below:

System 002, also known as Jenny, is the first large-scale cleanup solution presented by The Ocean Cleanup in July 2021; figure one shows a prototype of the system (The Ocean Cleanup, n.d.). This system consists of two vessels slowly dragging an 800-meter-long, tensioned artificial coastline along plastic-rich regions of the ocean surface (The Ocean Cleanup, n.d.). The boundary extends three meters beneath the ocean's surface, allowing floating plastic fragments and marine debris to get caught in the artificial coastline (CNET, 2021). System 002 incorporates a large opening in its center that facilitates easy wildlife passage for fish and other marine life (CNET, 2021). As water flows through the system, debris moves toward the center, which serves as a collection area referred to as the retention zone (Designboom, 2021). Upon reaching the maximum capacity of the retention zone, the debris is offloaded and subsequently transported to waste-sorting facilities and recycled accordingly (Designboom, 2021).



**Figure 1.** Prototype of System 002. The numbers indicate the process by which the system works (The Ocean Cleanup, n.d.)

#### References:

CNET. (2021, November 2). The Ocean Cleanup begins cleaning the Great Pacific Garbage Patch. [Www.youtube.com. https://www.youtube.com/watch?v=tLcnJEMnlTs](https://www.youtube.com/watch?v=tLcnJEMnlTs)

Designboom. (2021, October 12). the ocean cleanup tests its massive system 002 to great success. Designboom | Architecture & Design Magazine. <https://www.designboom.com/technology/the-ocean-cleanup-system-002-test-10-12-2021/>

The Ocean Cleanup. (2021, July 27). *System 002 Troubleshooting & Promising First Plastic Catch | Cleaning Oceans | The Ocean Cleanup.* <https://www.youtube.com/watch?v=RU6H0BF-XOU>

The Ocean Cleanup. (n.d.). System 002 • Milestones • The Ocean Cleanup. The Ocean Cleanup. Retrieved October 31, 2022, from <https://theoceancleanup.com/milestones/system-002/#:~:text=System%20002%20is%20our%20first>



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### Progress on Topic #2: **Advantages**

The Advantages of System 002 are summarized by the following list:

- **Refined cleanups:** System 002 facilitates large-scale cleanups without harming marine life by collecting marine debris/plastic up to 1000 kilograms a day (The Ocean Cleanup, n.d.). As of July 2021, System 002 has removed over 169,565 kilograms of marine debris, covering nearly 4,453 square kilometres (The Ocean Cleanup, n.d.).
- **Enhanced systems:** With System 002, operators can move more efficiently and quickly to clean dense areas, resulting in lower plastic removal costs and larger surface area covered (The Ocean Cleanup, n.d.). The technology is capable of cleaning a soccer pitch-sized area of the ocean every 15 seconds (Menezes, 2021).
- **Monitored conditions:** The system is continually assessed to help adapt to weather forecasts and reduce the load if there are rough seas (Designboom, 2021). If a severe storm occurs, the system can easily be suspended and deposited onto a vessel (The Ocean Cleanup, n.d.).

### References:

Designboom. (2021, October 12). *the ocean cleanup tests its massive system 002 to great success*. Designboom | Architecture & Design Magazine.  
<https://www.designboom.com/technology/the-ocean-cleanup-system-002-test-10-12-2021/>

Menezes, F. (2021, July 14). *A Faster Way to Clean the Oceans: The Ocean Cleanup System 002 Technology Update*. BrightVibes. <https://www.brightvibes.com/a-faster-way-to-clean-the-oceans-the-ocean-cleanup-system-002-technology-update/>

The Ocean Cleanup. (n.d.). *System 002 • Milestones • The Ocean Cleanup*. The Ocean Cleanup. Retrieved October 31, 2022, from <https://theoceancleanup.com/milestones/system-002/#:~:text=System%20002%20is%20our%20first>

### Progress on Topic #3: **Disadvantages:**

The Disadvantages of System 002 are summarized by the following list:

- **Environmental Impacts:** While System 002 effectively reduces marine debris and floating plastic fragments across the ocean surface, the two vessels which propel the system require extensive fueling, resulting in fossil fuel consumption and frequent shore excursions (Lavars, 2021). Recent studies have demonstrated that plastic waste derived from the ocean can be converted to marine diesel through hydrothermal liquefaction (Coxworth, 2011), which occurs at extremely high temperatures, where ocean plastic fragments are liquefied into oils (Lavars, 2021).
- **Floating structural Impacts:** Floating structures can cause a fish aggregating device effect where small fishes can get attracted to marine debris such as ropes (NOAA FISHERIES, 2017), which is why it is essential to empty the retention zone on a biweekly basis, and the entire system must be disposed of after four weeks to prevent harming marine life (The Ocean Cleanup, n.d.). This increases the cost of cleanups as a new system is required to keep the ecosystems balanced (The Ocean Cleanup, n.d.).
- **Marine life Impacts:** Although most marine life can swim below the retention zone, some sea creatures like sea turtles can get stuck between the retention zone's inner and outer mesh (The Ocean Cleanup, 2022). Figure two shows a pair of Juvenile Loggerhead Turtles found deceased among the plastic catch in the retention zone, which may have suffered from extensive plastic exposure (The Ocean Cleanup, 2022).



**Figure 2.** Two Juvenile Loggerhead Turtles found deceased among the plastic catch (The Ocean Cleanup, 2022)

References:

Coxworth, B. (2011, July 5). The plastic2Oil process turns plastic waste into fuel. New Atlas. [https://newatlas.com/plastic2oil-converts-plastic-to-fuel/19108/?itm\\_source=newatlas&itm\\_medium=article-body](https://newatlas.com/plastic2oil-converts-plastic-to-fuel/19108/?itm_source=newatlas&itm_medium=article-body)

Lavars, N. (2021, November 3). Can ocean cleanup boats power themselves by turning plastic into fuel? New Atlas. <https://newatlas.com/environment/ocean-cleanup-boats-plastic-blue-diesel-fuel/>

NOAA FISHERIES. (2017, November 30). Fishing Gear: Fish Aggregating Devices | NOAA Fisheries. NOAA. <https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-fish-aggregating-devices#:~:text=Fish%20aggregating%20device>.

The Ocean Cleanup. (2022, January 10). System 002: Mid-Term Evaluation • Updates • The Ocean Cleanup. <https://theoceancleanup.com/updates/system-002-mid-term-evaluation/>



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The Ocean Cleanup. (n.d.). Will the systems have a Fish Aggregating Device (FAD) effect? • FAQs • The Ocean Cleanup. The Ocean Cleanup. Retrieved November 23, 2022, from <https://theoceancleanup.com/faq/will-the-systems-have-a-fish-aggregating-device-fad-effect/>

### 3.0 Remaining Research

Provide a percentage estimating your completed research portion to date.	90%
What are your remaining research sections to prepare for your final recommendation report?	Further research will take place on the Environmental plans and ways to improve the retention zone in order to reduce marine life from further harm while enhancing the system to be more eco-friendly.