Clarkston Marina Survey Project

Our team had a unique opportunity to use our skills on a real-world problem at the Clarkston Port and Marina.

OUR TEAM

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01. Project Overview

Throughout the world, people rely on boats to transport goods from place to place. In every place where you find boats, there's sure to be docks. Without docks, people would struggle to bring goods into towns and cities, because a boat can only get so close to shore. So what happens if a dock piling is rotting, or a gas tank on the dock begins to leak? It can be extremely expensive to hire a diving team to investigate, especially if the problem is only hypothetical. Our project involves inspecting damage dock pilings, checking for possible oil leaks, and mapping the depths of our marina, all of which we do with the use of our R.O.V.

02. Background

After winning 3rd place in the 2021 Waterway Cleanup Challenge, our local Port director asked us if we could inspect dock pilings at the Marina and determine the depth of the water throughout the inlet. Our team was eager to help and put our skills to use in a real world way. We decide to create a new R.O.V. that would need to be able to withstand the harsher environment of the Snake River (rather than a swimming pool.) We also knew we needed to attach a camera to allow recording of underwater activity and permit real-time observation by the team on the dock. With this set-up we were able to inspect the dock pilings, making sure the bases were stable, as well as check for a possible gas leak around the docks. Not only were we doing an inspection with our R.O.V, but we also planned on using sonar to create a data graph of the depths of the marina. Using connections with the Asotin Lions Club, we were able to use a fishing boat and sonar technology to run back and forth across the marina and collect Data.

03. Research

Before beginning the project, the team had to research and gain more information on the task at hand. First, we researched what happens in the event of a gas leak. We found it takes a lot of work and resources to both repair a broken gas tank, and clean up any fuel spills. First, All suspected leaks must be reported to local authority. Then one must attempt to absorb any fuel using oil absorbent pads. If a leak were to occur, it is important to work on it immediately, so it does not spread to other parts of the waterway. **The best way to protect the ecosystem from fuel spills is to stop them from occurring in the first place.**

When it comes to broken or rotting dock pilings, we found out there are a couple of repair options, each with their own pros and cons. These options include:

- Placing a metal sleeve or shell around the piling, and filling any air space with a filler such as epoxy grout.
- Taking out the whole piling and replacing it

Placing a sleeve is much cheaper, and takes less manual labor & time than replacing the whole thing, but it may not last as long. *(Note: There are multiple other options for repairing pilings, but they all revolve around the central ideas of these two options. Variance may occur)*

04. Our R.O.V. Design/Aproach

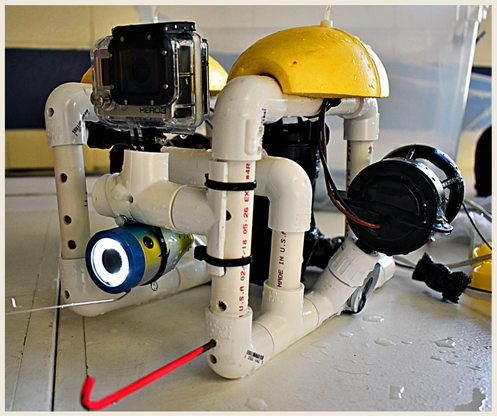
During the SeaPerch Competitions, our team would build our R.O.V. to be fast and hydrodynamic, but when operating in the river with a real current, we have to take a very different approach. We made a whole new frame, including:

- Larger PVC Pipe
- Larger Motors
- 3D Printed Kort Nozzles and removable screens
- A real-time underwater camera
- Bouye material flotation
- Compass visible in camera
- Hook visible in camera for orientation
- Go Pro camera for recording

These alterations allowed us to make a sturdy R.O.V. that wouldn't get tangled up in river plants or pushed around by any current.

Dimensions/Weight

- 29cm long
- 31cm wide
- 22cm high
- 2.2kg (weight with both cameras attached)
- 2kg (weight with only fish-finder camera attached)



Thrusters are 500 gallons per hour (gph) bilge pump cartridges. Each fitted with 3D printed kort nozzles and removable screens, or "motor covers"

Fishfinder video camera used to view underwater in real time. Waterproof and has LEDs built in.

05. Results/Findings

Underwater Observation

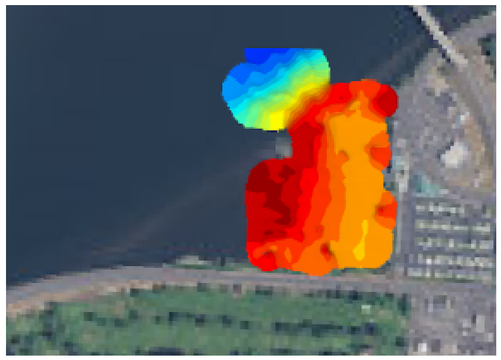
We found all pilings we inspected to be sturdy below the surface of the water. We found the water sample to be clean of gas, and found no punctuation in the gas tank out on the dock. Our R.O.V. found the Gas tank to be sealed all around, eliminating our suspicions of a gas leak.

Because of our findings, the port district does not have to hire a team to repair the docks or the tank, saving money and resources. They are keeping an eye out for any other signs of damage and will contact our team if they need us.

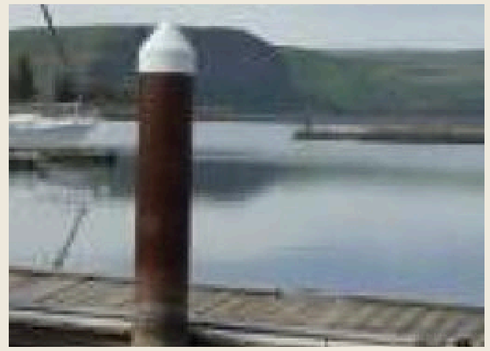
Sonar depths

Marina depths ranged from 2 feet (dark red) at the entrance to the marina to nearly 12 feet (yellow) at the Southeast corner. Excursions displayed out towards the river channel show depths of 40 feet.

There are some parts of the marina that are much too shallow for most large boats. The port director is now able to look into drudging the marina based on our graph. While this is important, the marina is only shallow in certain parts, meaning drudging is not top priority at the moment. They will make sure large boats know where the especially shallow parts of the water are, to keep them, and the water ecosystem, safe.



The data was gathered by a Humminbird Helix 7 Mega SI GPS Ge fishfinder sonar and plotted with the Humminbird AutoChart Pro program.



Dock piling at the Red Wolf Marina. We checked several pilings throughout the docks, many varying in structure and appearance above the surface.

06. Reflection and Next Steps

Our team is very happy to have been part of this project. We got to learn new skills and programs, as well as find a real world application for what we do in the pool. We hope to continue Sonar and Marina surveys with the **Lewiston Port District** in the near future. Then we can expand on our current design, allowing our ideas to evolve, and become more advanced.

One area in particular we would like to evolve on is the use of the **SeaSense** sent to us by the SeaPerch/Robonation team. This would be used to get more advanced readings in our waterways and investigate the salinity, O2 levels, temperatures, and turbidity of our waters. The use of this tool would allow us to better understand the safety of our waters for both humans, and marine life.

A new specific area we may try to pursue in the future is aiding in the prevention of **invasive species**. This is a topic many organizations in our area work on, and we would love to learn from them and help in any way we can.