

# Pool Courses – Overview & Rules

2023 International SeaPerch Challenge

[www.seaperch.org](http://www.seaperch.org)

## Pool Course Events Overview

This year's competition will include two in-pool components: an obstacle course and a mission course.

Both courses will be suspended from the pool's lane dividers with the lower frames for the courses being approximately five to six feet below the water surface.

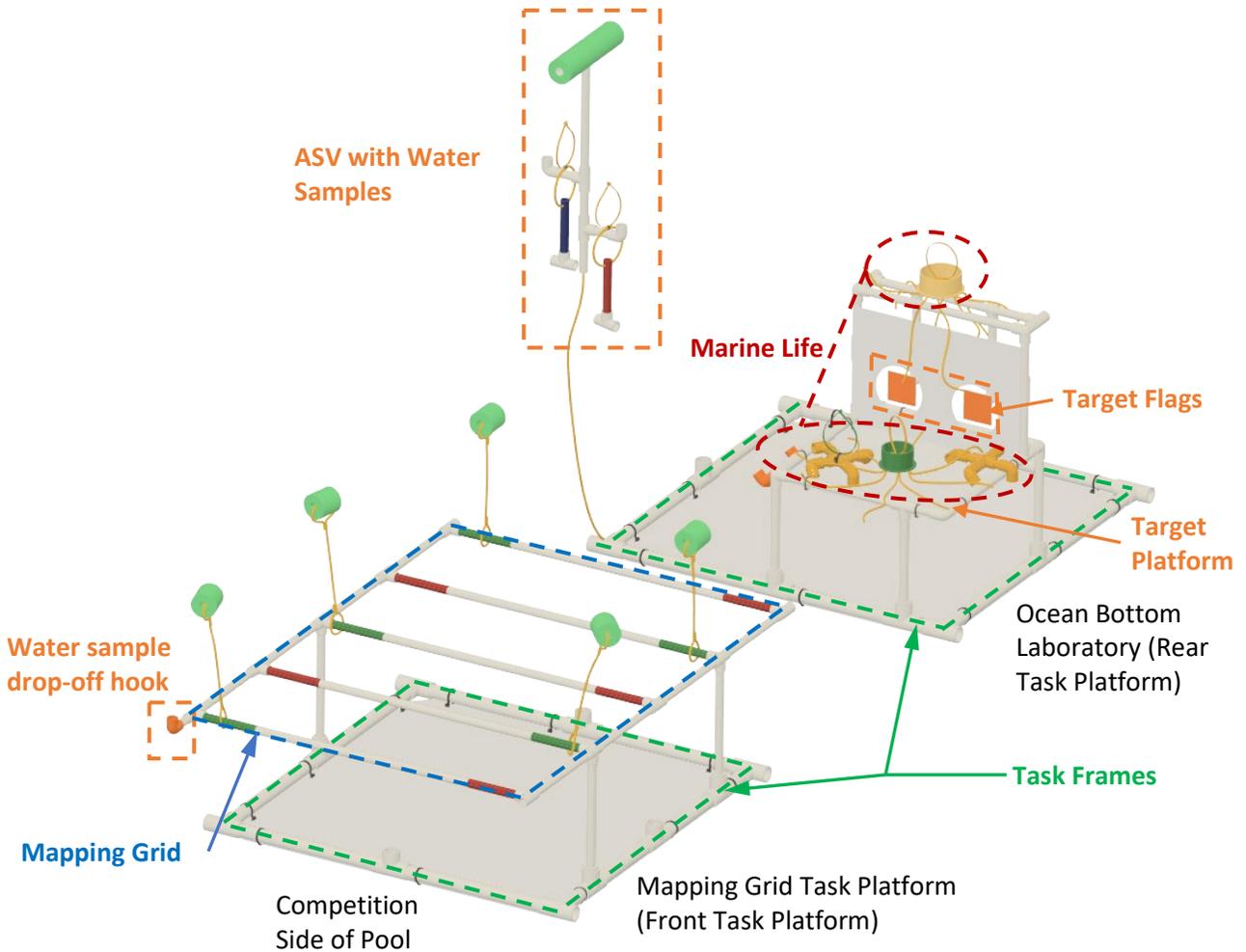
Both courses will be positioned approximately five to six feet from the side of the pool.

Please check with your local regional host for information related to the courses that will be used at your qualifying competition as well as how those courses may be oriented in the pool.

**The Obstacle Course** tests high-speed maneuverability and requires the SeaPerch Remotely Operated Vehicle (ROV) to navigate the course as quickly as possible.

**The Mission Course** incorporates a mission that teams must complete with their SeaPerch ROV related to Ocean Exploration. The Ocean Exploration Mission is a simulation of the tasks and environment that an ROV might encounter while operating as a part of a multi-vehicle team with an Autonomous Surface Vehicle (ASV). Specific tasks include:

1. *Mapping the Seafloor:* We use acoustic sonars both mounted on research vessels and on other autonomous underwater and surface vehicles to map the seafloor, but there are also times when a map can be created using either lidar or other technologies on ROVs. To ensure that these seafloor maps have adequate coverage, researchers use these technologies to drive back and forth over the target area in a grid pattern, as if "mowing a lawn". For this task, the ROV will navigate a course by moving grid line indicators (floats attached with ropes) along grid lines (pipes) in a pattern to mimic mapping the seafloor. The floating lines provide a visual indication of keeping on track.
2. *Marine Life Interaction:* Marine life frequently settles on target areas, ocean bottom laboratory structures, and other equipment. This may impede operations or be unsafe for the marine life. This task will involve the careful removal and relocation of sea creatures.
3. *Water Sample Collection:* This task includes sending the ROV to the regions below the ASV to collect water samples and returning them to the sample collection area. The ROV must first activate a target flag before retrieving a water sample and transporting it to a drop-off hook on the front of the mapping grid.



## General Pool Event Rules

### ROV, Spare Parts, and Adjustments

1. The team must use the same ROV that was presented at compliance for both pool events.
2. Each team must have their own ROV – teams are not allowed to share an ROV.
3. Teams are not allowed to share ROV attachments or devices.
4. Spare parts are allowed; however, spare ROVs are not allowed.
5. Any design or structural modifications made to the ROV after a compliance check requires the team to re-submit the ROV for a compliance check.
6. No parts or materials, except as noted in this section, may be added to or removed from the ROV between pool events. The ROV must compete in both pool events with the same attachments and parts connected. Violations will result in disqualification.
7. Attachments and parts may be repositioned between the two pool events.
8. The ROV may be worked on or adjusted during competition. This may include adjusting buoyancy, adding, or removing buoyancy materials, or adding materials like tape or cable ties necessary to secure parts. However, the run timer will continue.
9. Replacement of failed or damaged parts is permitted. Teams replacing failed or damaged parts

must re-submit their ROV for a compliance check conducted by staff at the Triage or ROV Poolside First Aid Station.

10. Passing compliance checks does not guarantee the right to compete. Lead judges in the competition area have the final say on safety and compliance issues and may require teams that have already passed the compliance check to fix issues prior to competing.

### **Auxiliary Equipment, Batteries, and Power Supplies**

1. 12-volt direct current (VDC) power connections for the standard SeaPerch power cable alligator clips will be supplied for each competition lane. This power connection is for the ROV only; no auxiliary equipment may be connected to this power connection.
2. Teams may provide their own battery for the ROV.
3. Teams may provide an additional battery for auxiliary equipment such as cameras, advanced controllers, and electromechanical ROV attachments.
4. Team supplied batteries must not be larger than 6.5" long x 3" wide x 4" high and must be 12 VDC maximum with a 9-amp hour maximum rating.
5. Teams may not bring anything to the pool deck that requires 110-volt power.

### **Diver Assistance and ROV Tether Handling**

1. The ROV must move only under its own power. Teams will incur a two-minute penalty if they pull or otherwise maneuver the ROV by the tether.
2. If the ROV or tether becomes tangled on the course structure or is otherwise unable to move on its own power, a team member must notify the judge that they would like to try to free the ROV, or request diver assistance to free or retrieve the ROV. Under this circumstance teams may pull on the tether; however, the run timer will continue, and a two-minute penalty will be added to the elapsed time. If the ROV is pulled by the tether or moved by a diver, the ROV must be returned to the location that it was moved from before it may continue competing.

### **On Deck**

1. Prior arrangements are required for waivers to any of the following rules to accommodate special needs. Any special accommodations must be made in advance of the starting date of the International SeaPerch Challenge.
2. Pool passes are required to enter the pool area.
3. A maximum of four (4) pool passes will be issued for each team. Any team with more than four members in the pool area without special accommodations risks disqualification from the event.
4. Only two (2) student team members (competing team members) are allowed at the competition lane.
5. Only competing team members are allowed to communicate with the judges.
6. The competing team members may switch drivers at any time and as many times as they choose.
7. Once the pool event run starts, the competing and non-competing members are not allowed to switch positions.
8. The team may decide how to use the additional two pool passes for non-competing members. Non-competing members can be other students (competing later in either the obstacle or mission course), parents, coaches, teachers, or chaperones.
9. The non-competing members will be assigned a place to sit or stand away from the competition lanes.
10. Competing and non-competing members are expected to be respectful of other competitors, spectators, volunteers, judges, and staff.

11. Those not complying with instructions from judges, volunteers, or event staff will be asked to leave the pool area and may risk disqualification of their team from the event.
12. All team members must wear shoes with rubber soles while on the pool deck.
13. Teams will be given a two-minute set-up period after arriving at the competition lane. The two non-competing team members may help with setup but must exit the competition lane before the course run starts. During this set-up period, teams should adjust the ROV's buoyancy and make any other necessary adjustments. The lane judges will start the run timer at the end of the set-up period even if the team is not ready. If the team experiences an equipment failure, they must notify the judge. The team will be allowed to move away from the lane to make repairs and will be given an alternate time slot if time permits.

### Equipment Failure

1. In the event of equipment failure between pool events, a team will be allowed to work on their ROV at an ROV First Aid Station or at Triage.
  - a. The ROV First Aid Station is intended for *quick repairs* that can be accomplished in 15 minutes or less. The station will not be equipped with electrical power, so soldering is not allowed.
  - b. After successful repairs, the team will reenter the competition queue in the front of the line.
  - c. If repairs are not accomplished in the 15-minute time limit, the team must proceed to the pool check-in station and notify the staff that they require Triage. Teams completing repairs in Triage will check-in at the pool check-in station and enter the staging area.
2. While competition staff will attempt to accommodate all participants, teams not completing repairs by the last pool event time slots may not be able to compete.
3. If an ROV or equipment malfunctions before attempting the first mission task or passing the first obstacle course hoop, the team may elect to stop their run without incurring a time penalty. The team will be allowed to make repairs as described in item 1 of this section.
4. If an ROV or equipment malfunctions after attempting the first mission task or passing through the first obstacle course hoop, the team may elect to stop their run. The judge will record the current run time and notify the lead judge. The lead judge or technical director will evaluate the issue and decide a course of action. If the team is allowed to make repairs and restart their run, they may incur a time penalty equal to their initial run time at the time they stopped their initial run.

### Disputes, Challenges, and Redress Request

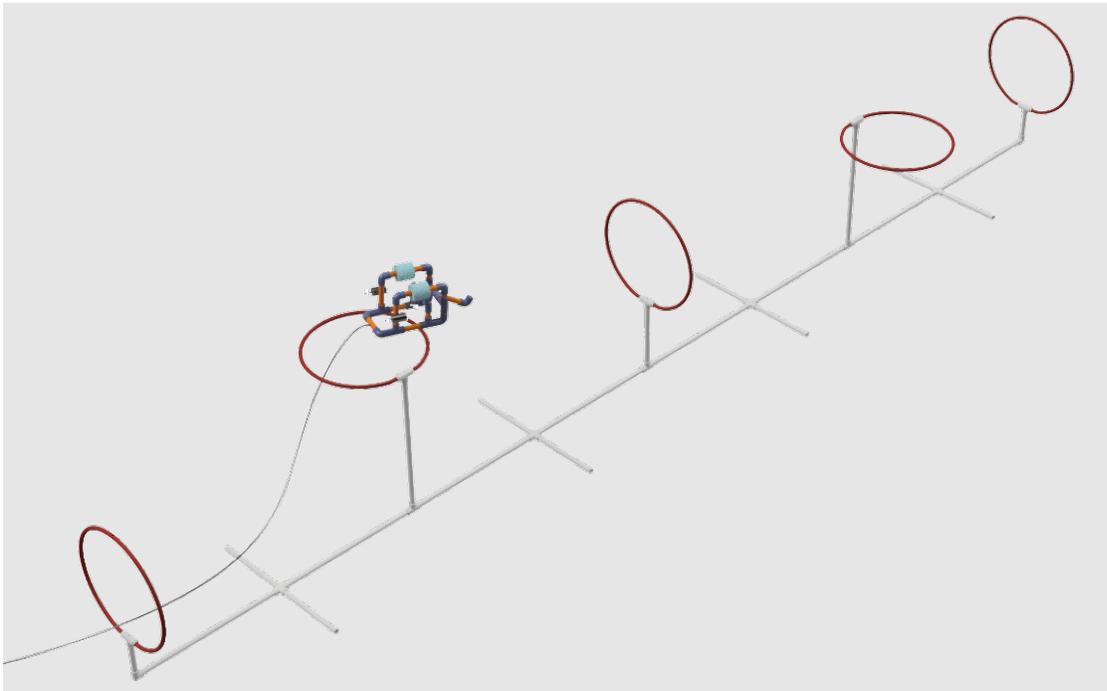
1. Sportsmanship is always expected.
2. Team members and advisors are responsible for the conduct of all members and adults accompanying the team. Unsportsmanlike conduct of registered student team members or chaperones is grounds for the disqualification of a team.
3. Teams may not raise questions concerning other competing vehicles or other teams' scores.
4. Only the two competing team members may approach or speak to lane judges. Exceptions to this rule are only allowed if prior arrangements have been made to accommodate special needs.
5. Team members or spectators may not speak to the divers.
6. Team members will verify the time on the scoresheet reflects the time on the stopwatch. If there is a discrepancy, then a team member may ask the lane judge for a second opinion. Timing disputes such as a team member claiming the judge did not start or stop the stopwatch at the correct time are not allowable disputes.

- Disputes should be resolved at the time the alleged grievance occurs. However, if students are not able to articulate the alleged grievance, they may ask to speak to the lead course judge. The lead course judge will provide a redress request card that will allow the student and adult team members to meet with the technical director or lead judge to resolve the dispute. *Decisions of the technical director or lead judge are final, and the same dispute will not be heard again.*
- If an ROV or the course is inadvertently interfered with during the competition, the competing team members should alert the lane judge and ask for a ruling by the lead judge or technical director. These situations will be addressed on a case-by-case basis.

## Obstacle Course Task Description & Rules

The Obstacle Course consists of five 18" hoops oriented at different angles and suspended 5-5 ½ feet below the water surface. Please note *there is no guarantee of the position of the hoops when the course is deployed in the pool at the International SeaPerch Challenge and may not appear as pictured below.* Operators should not try to memorize actions such as in playing a video game but should instead practice a variety of general high-speed maneuvers.

Time allotted for the obstacle course run is dependent on venue, number of teams, and other factors and will be released prior to the event.



### Obstacle Course Navigation and General Rules:

- Start of run:** The ROV must be surfaced, within six inches (6") of the wall, and under its own power. Team members are not allowed to touch the ROV after the lane judge begins the countdown to start the run.
- The ROV is required to pass through each of the five obstacle course hoops in order starting at the hoop closest to the pool wall.
- The ROV must surface after clearing the hoop furthest from the pool wall. Surfacing is considered complete when any part of the ROV breaks the surface of the water.
- The ROV must re-submerge and head back to the pool wall by passing through each of the

five hoops in reverse order.

5. *End of run:* The run is complete when the ROV touches the pool wall while surfaced (any part of the ROV breaks the surface of the water). The run will be aborted if the allotted time expires even if the ROV has not completed the course.

## Mission Course Task Description & Rules

The Mission Course consists of three tasks across two task frames and will be suspended 5-5 ½ feet below the water surface.

Time allotted for the mission course run is dependent on venue, number of teams, and other factors and will be released prior to the event.

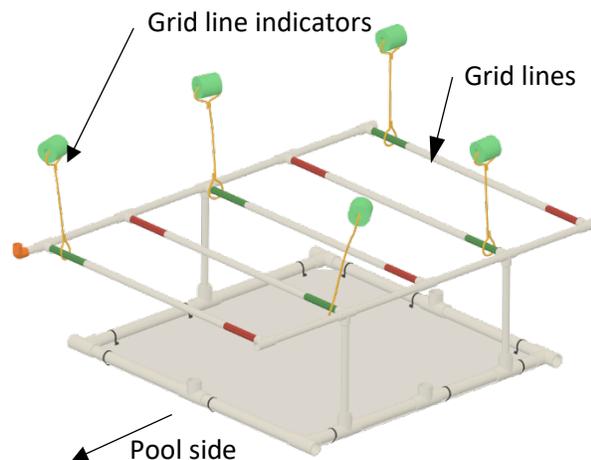
### Mission Course General Rules:

1. *Start of run:* The ROV must be surfaced, within six inches (6") of the wall, and under its own power. Team members are not allowed to touch the ROV after the lane judge begins the countdown to start the run.
2. Objects falling past the suspended task frame are out of play and the ROV is not allowed to attempt to retrieve them.
3. *End of run:* The run is complete when the ROV touches the pool wall while surfaced (any part of the ROV breaks the surface of the water). The run will be aborted if the allotted time expires even if the ROV has not completed the course.

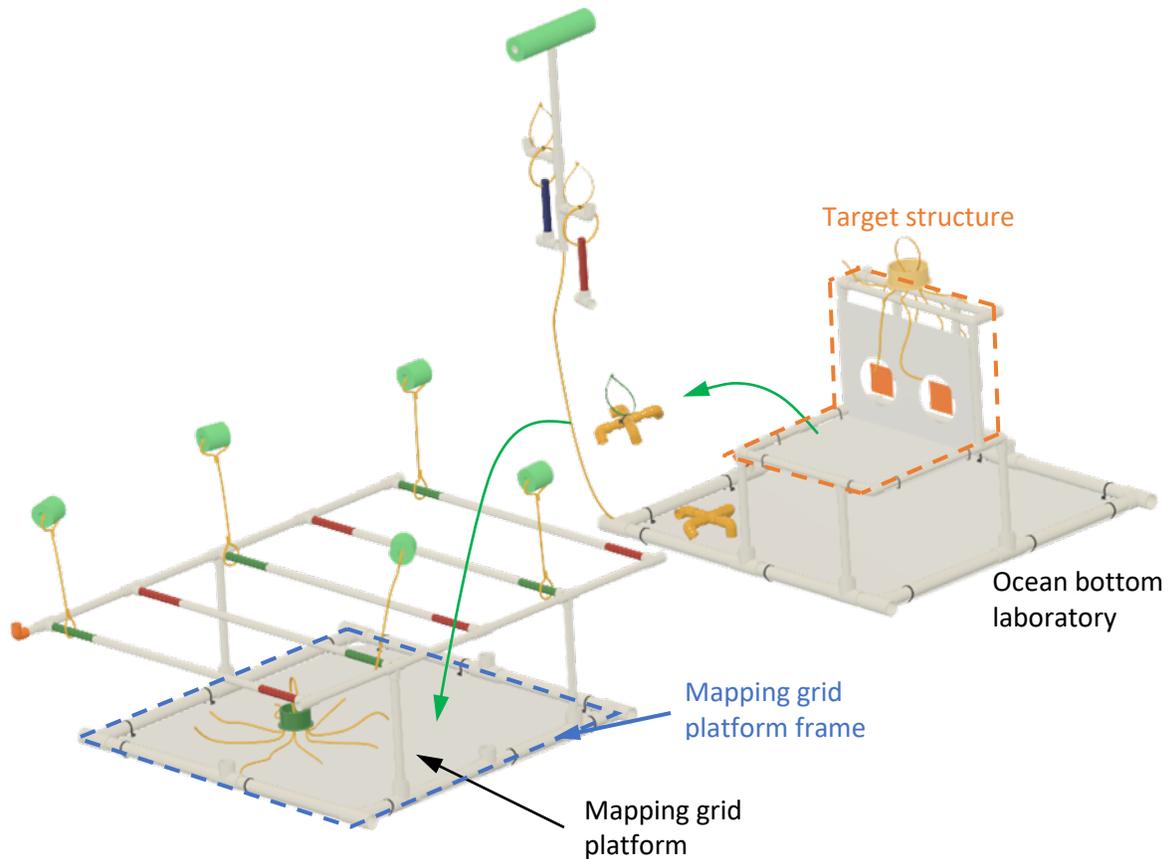
### Mission Course Navigation:

#### Task 1: Map the Seafloor

1. The ROV must attempt the mapping task before moving on to the other two tasks. If the mapping task is abandoned before completing all five grid lines, points will only be awarded for each grid line completed. Teams will not be allowed to return to complete any remaining grid lines.
2. The grid line indicators must be moved from the starting position (green end) on each grid line to the end position (red end). Points will only be awarded if the rope loop around the grid line indicator is completely on the red end of the pipe. The grid line indicator does not have to touch the fitting at the end of the grid line pipe.
3. The grid lines must be completed in order starting at the grid line closest to the competition side of the pool.
4. The ROV can be used to push or pull the grid line indicator.
5. The tether cable may not be used to push or pull the grid line indicators.



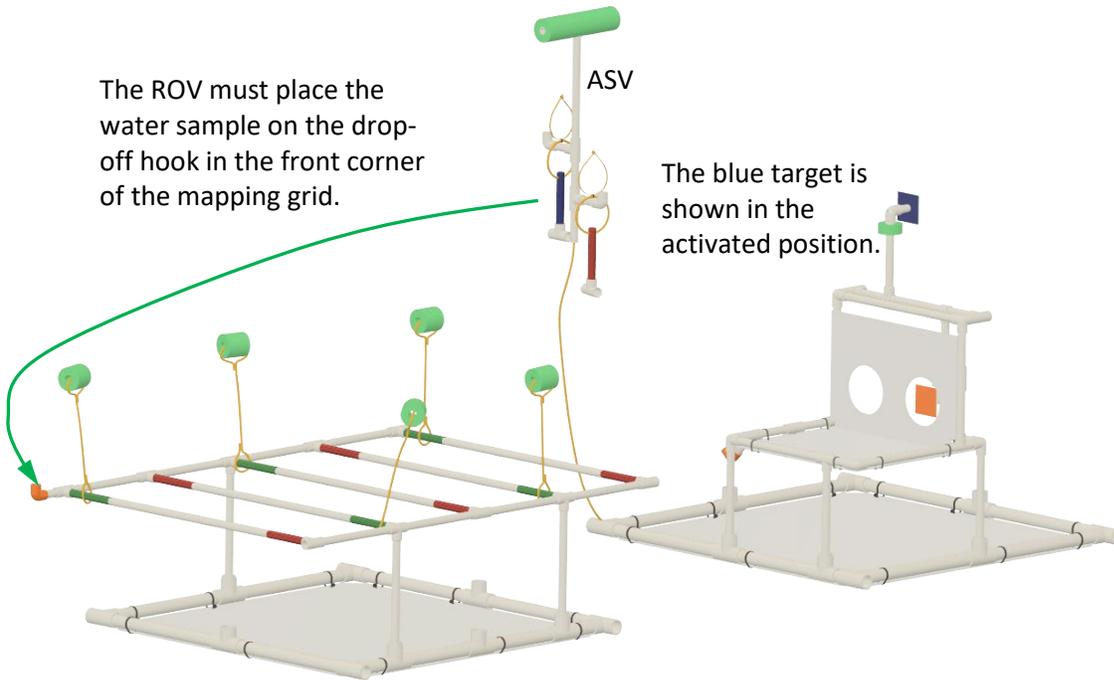
### Task 2: Marine Life Interaction



1. The marine life (up to four species) must be removed from the ocean bottom laboratory and transported to the mapping grid platform. Placement and orientation of sea creatures may vary from what is shown.
2. Multiple marine life species may be transported at the same time.
3. Points are awarded when marine life is *removed* from target structure. Marine life may be removed by lifting, pushing, or pulling. Points will not be awarded if any part of the body of the marine remains on the target structure (On grid platform and not the grid).
4. Points are awarded when marine life is *relocated* to the mapping grid platform. Points will not be awarded if any part of the creature is partially resting on the mapping grid platform frame.

**Note: Task 2 and Task 3 can be completed in any order.**

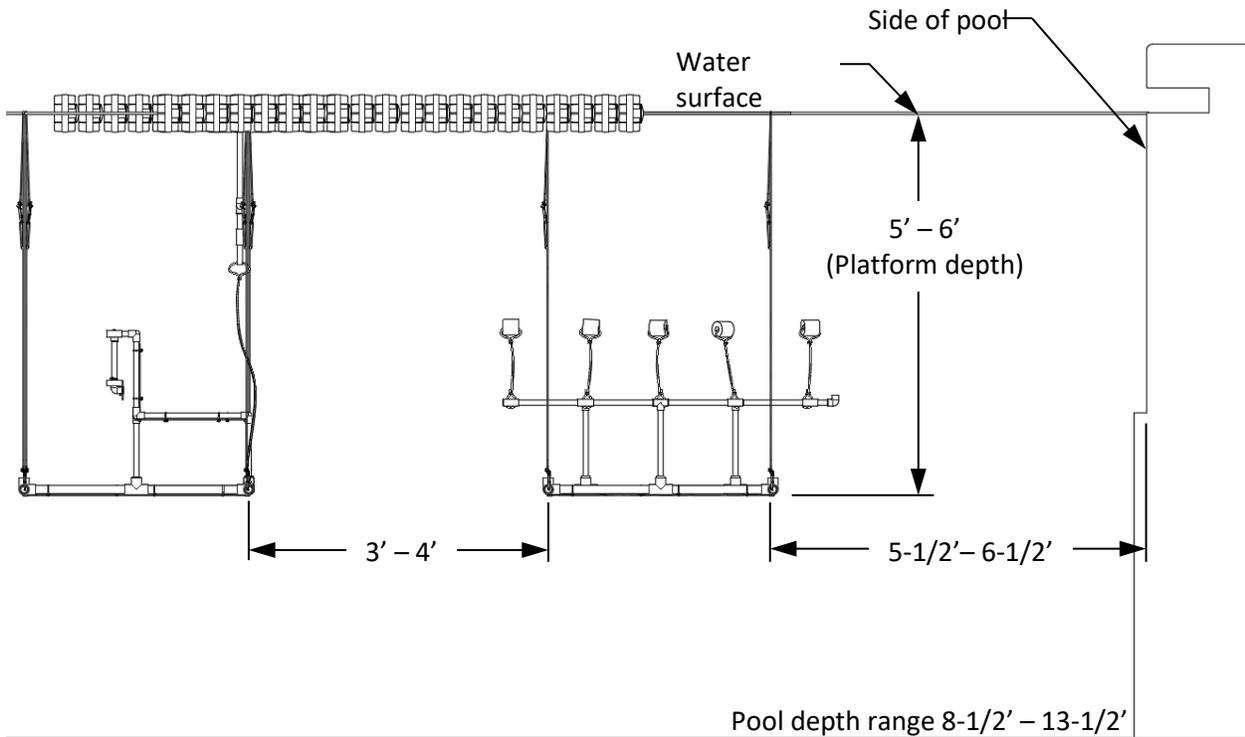
### Task 3: Water Sample Collection



1. The SeaPerch ROV must push (activate) either one of the target flags to reveal the color on the back of the flag (red or blue) *before retrieving a water sample*. If the ROV cannot activate a target flag, points will not be awarded if a water sample is retrieved.
2. The flags may activate if the ROV hits the flag with marine life or by thrust from the ROV. The team will receive points for unintentional activations.
3. If both flags are activated, the lane judge will determine which color water sample the team will collect based on which flag the judge believes was activated first.
4. The water sample does not have to be retrieved and transported immediately after activating a target flag; the team can choose to remove marine life before retrieving the water sample.
5. The SeaPerch ROV will then travel to the zones below the ASV to collect either the red or the blue water sample.
6. Points will be awarded for retrieving the water sample as long the ROV is in control of the water sample and has moved at least one foot away from the ASV. Points will not be awarded for knocking the water sample off the ASV or if the water sample falls within one foot of the ASV. The lane judge's ruling on this is final.
7. If the water sample falls below the task platform, it is out of play and the ROV is not allowed to go below the task platform depth to retrieve it. The team can attempt to retrieve the remaining water sample, transport it, and place it on the drop-off hook. Points are awarded for only one water sample removal.
8. The ROV must transport the water sample to the drop-off hook at the front of the mapping grid. Points are awarded for successfully placing the water sample on the drop-off hook

after the ROV has moved at least one foot away from the drop-off hook. Points will not be awarded if the water sample falls while moving away from the drop-off hook within the first one foot of movement. The lane judge's ruling on this is final.

The mission course and obstacle course are both suspended at a depth of five to six below the surface of the water. Both courses are spaced approximately five to six and one half from the side of the pool.



Mission Course Pool Setup – Side View