

Cloud

Introduction

Hefring Cloud is a browser-based cloud-connected system for glider mission control.

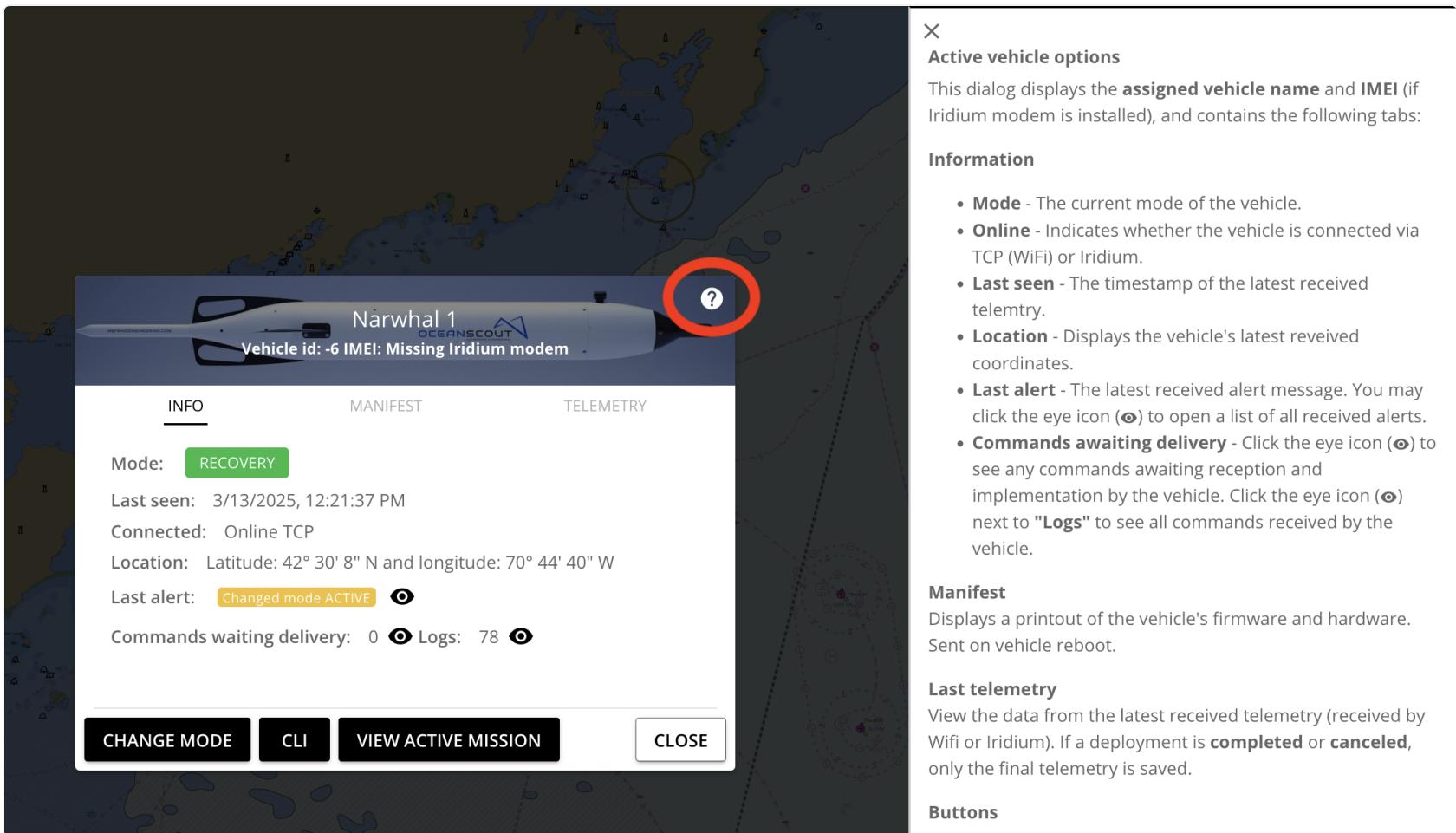
Mobile Cloud App

A mobile cloud app is available in the regular Apple and Google app stores. It enables easy deployment, monitoring, and control of your Oceanscout mission from a smartphone or tablet. The mobile app does not have route creation features.

 Don't forget to download the mobile app for easy Hefring Cloud access on your phone or tablet!

Cloud Inline Help Guide

Cloud has a built-in help guide accessible by clicking the question mark buttons in the upper right corner of pages and dialog boxes. This guide explains functions and use throughout the system. Check inline help first, as it may contain more detail and newer updates than this user manual. When initially becoming familiar with the system, or if ever in doubt, remember to check inline help for useful explanations and tips.



The screenshot shows the Hefring Cloud interface with a vehicle summary card for "Narwhal 1". The card displays the vehicle's name, ID, and status ("Missing Iridium modem"). Below the card are three tabs: INFO (selected), MANIFEST, and TELEMETRY. The INFO tab shows the vehicle's mode (RECOVERY), last seen (3/13/2025, 12:21:37 PM), connection status (Online TCP), location (Latitude: 42° 30' 8" N and longitude: 70° 44' 40" W), and last alert (Changed mode ACTIVE). It also shows the number of commands waiting delivery (0) and logs (78). At the bottom of the card are buttons for CHANGE MODE, CLI, VIEW ACTIVE MISSION, and CLOSE. A question mark icon in the top right corner of the card is circled in red. To the right of the card is a help guide titled "Active vehicle options". It describes the dialog as displaying the assigned vehicle name and IMEI (if Iridium modem is installed) and contains tabs for Information, Manifest, and Last telemetry. The Information tab lists vehicle modes, online status, last seen timestamp, location, alerts, and command logs. The Manifest tab displays a printout of the vehicle's firmware and hardware. The Last telemetry tab views the latest received telemetry data.

Active vehicle options

This dialog displays the **assigned vehicle name** and **IMEI** (if Iridium modem is installed), and contains the following tabs:

Information

- **Mode** - The current mode of the vehicle.
- **Online** - Indicates whether the vehicle is connected via TCP (WiFi) or Iridium.
- **Last seen** - The timestamp of the latest received telemetry.
- **Location** - Displays the vehicle's latest received coordinates.
- **Last alert** - The latest received alert message. You may click the eye icon (👁️) to open a list of all received alerts.
- **Commands awaiting delivery** - Click the eye icon (👁️) to see any commands awaiting reception and implementation by the vehicle. Click the eye icon (👁️) next to "**Logs**" to see all commands received by the vehicle.

Manifest

Displays a printout of the vehicle's firmware and hardware. Sent on vehicle reboot.

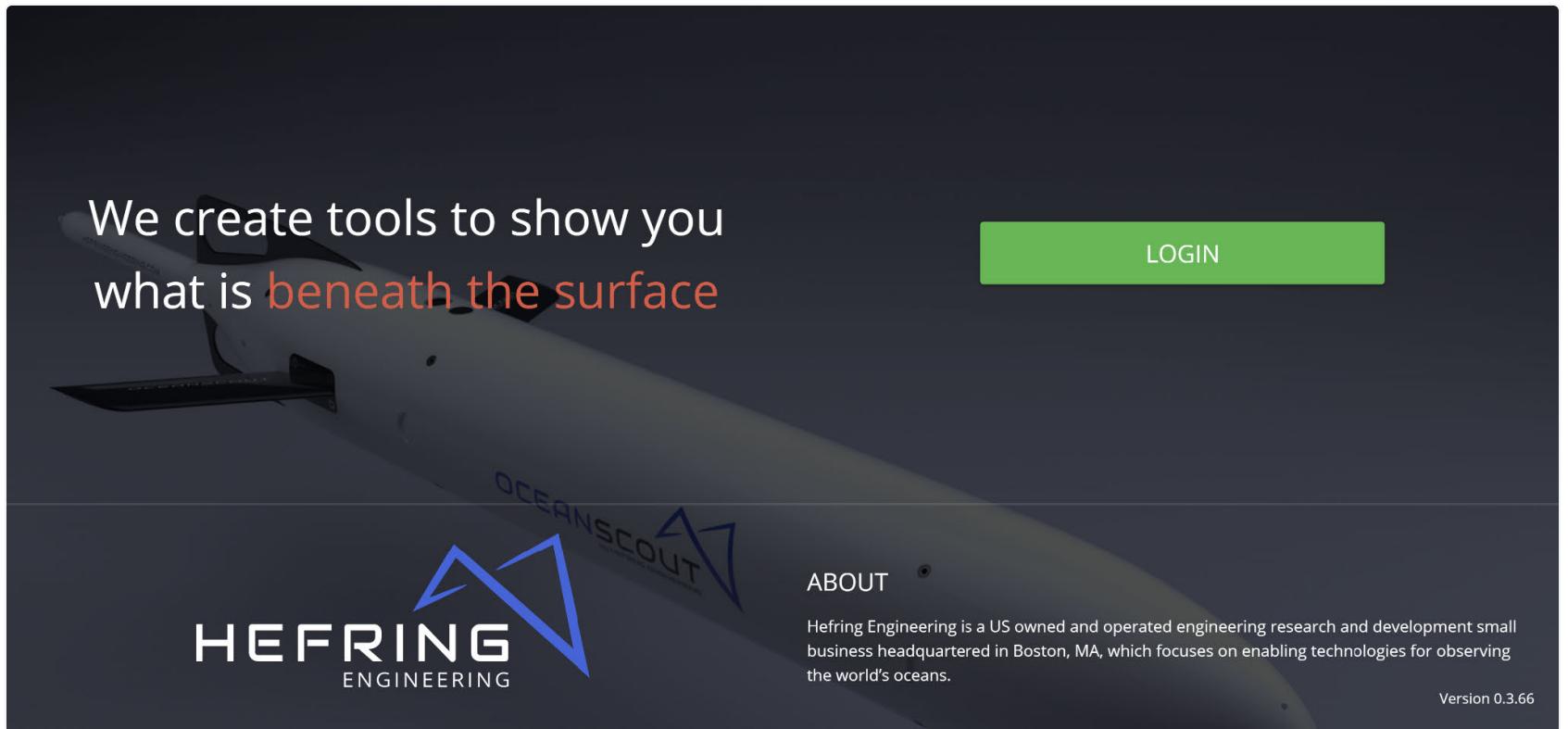
Last telemetry

View the data from the latest received telemetry (received by WiFi or Iridium). If a deployment is **completed** or **canceled**, only the final telemetry is saved.

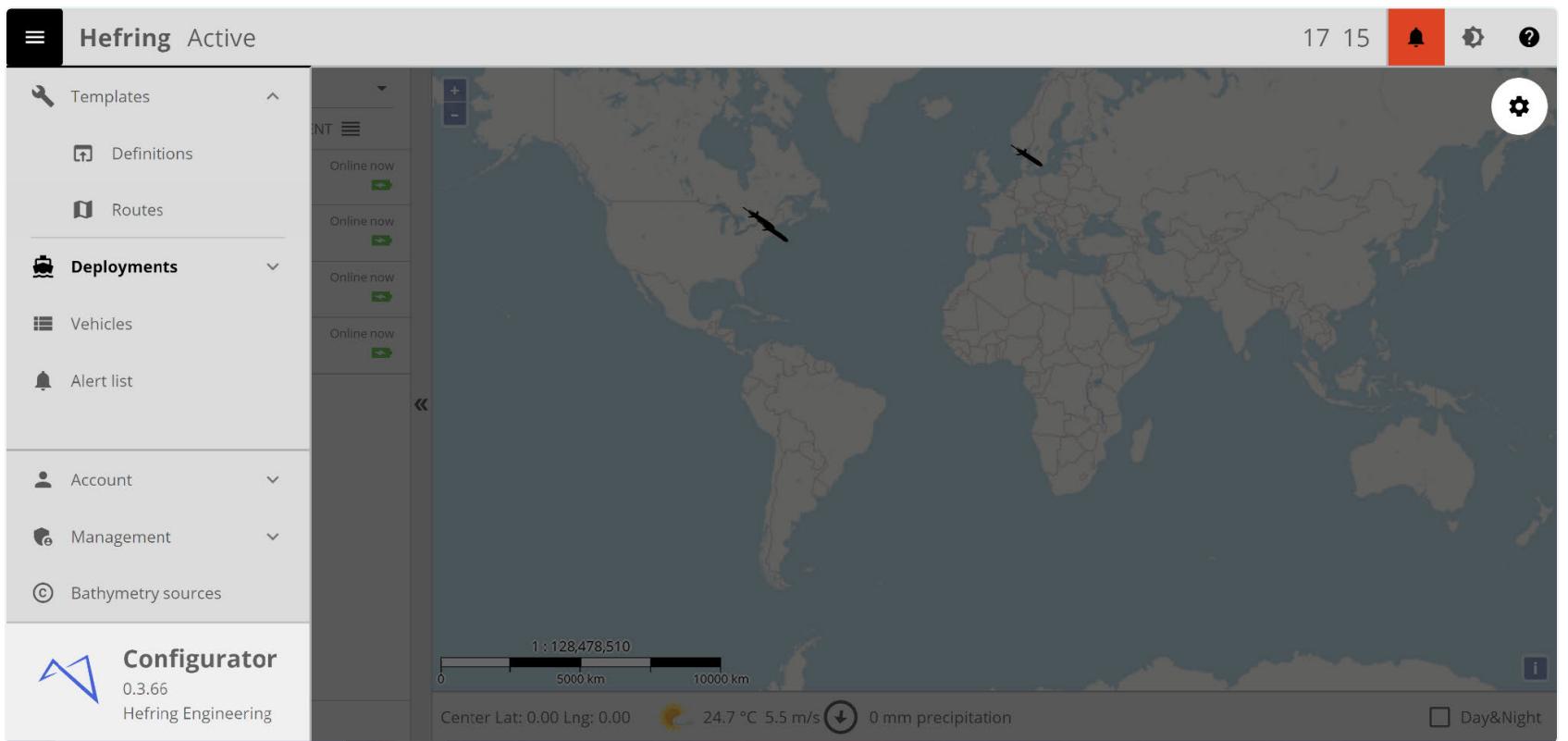
Buttons

Login

Login at [user site].hefring.cloud (example <https://cornell.hefring.cloud/>). Presently you will need to contact Hefring Engineering to sign an email up with a user profile and temporary password which can then be changed. See "getting started" section for setup information.

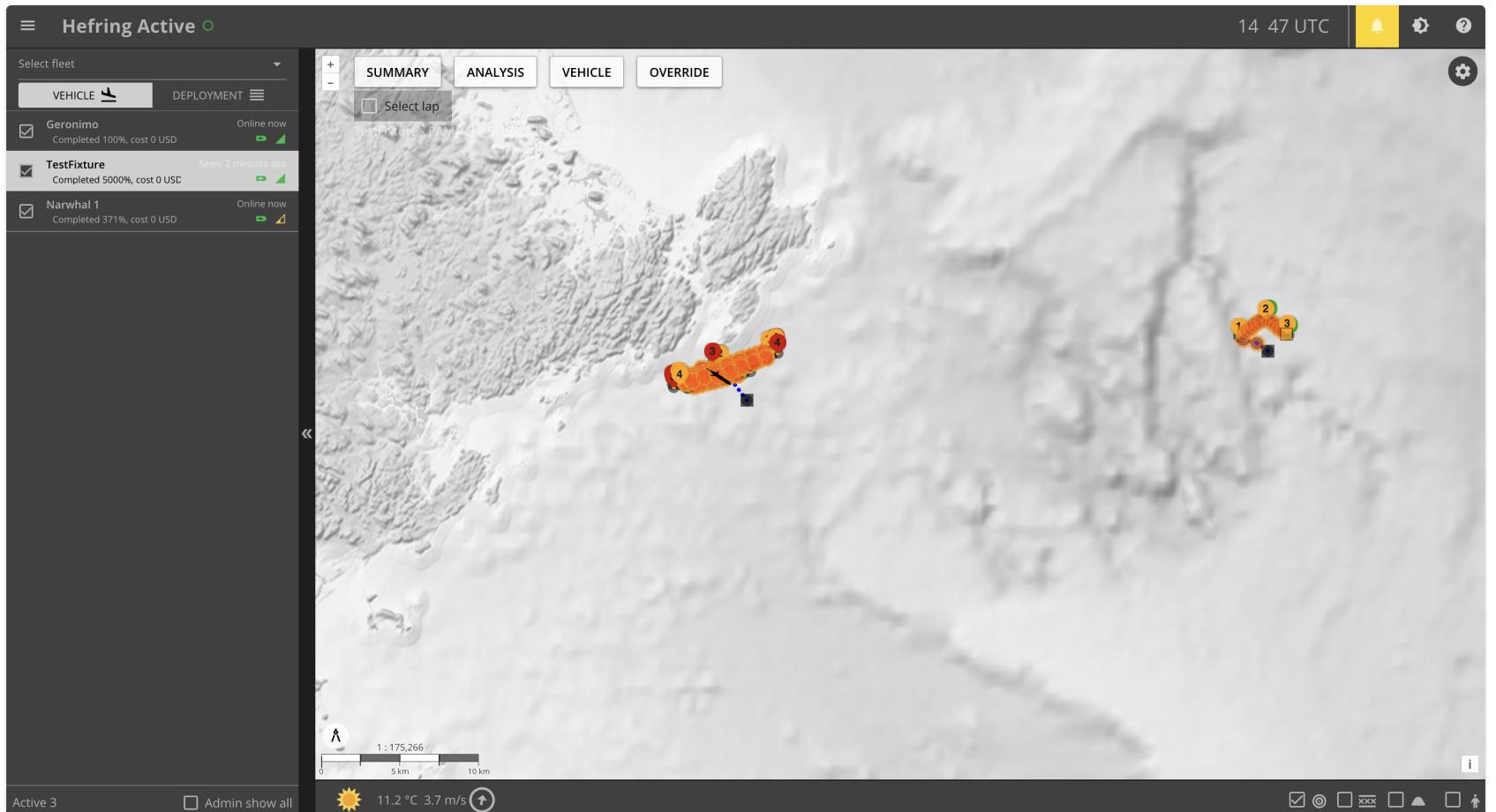


Once logged in, select the 3 bars in the upper left corner to open the menu. Here you can navigate between existing vehicles, active and past deployments, and the template for creating new mission routes for the glider to run. Clicking on templates and selecting "Routes" will bring you to a list of all existing routes that have already been created to deploy a glider on. These can be searched through or sorted by name, date, distance, and number of waypoints. "Vehicles" displays vehicles in your fleet. Under "Deployments" you can view active deployments, past deployments, or start a new one.



A note on Telemetry Intervals: It is important to understand telemetry intervals, and set appropriate Idle, Abort, and Recovery telemetry intervals for your mission. Please refer to Telemetry Intervals in the Firmware section. Long telemetry intervals may introduce unwanted control delays.

Map View



This map serves as the central hub for mission planning and monitoring within the application. It allows you to create, view, and edit deployments, giving you real-time insights into vehicle positions and statuses. In addition

to deployment management, the map provides access to weather forecasts, detailed map data, and tools for analysis.

Here, you can get an overview of all active deployments and view a dynamic map displaying every vehicle on a mission. Click any vehicle for detailed mission insights and current status.

Use the navigation panel on the left to view all active vehicles or deployments. The Fleet dropdown menu allows you to filter the display by specific fleet criteria.

Access is limited to vehicles and deployments within your assigned fleets. Contact your administrator to get access to your vehicles.

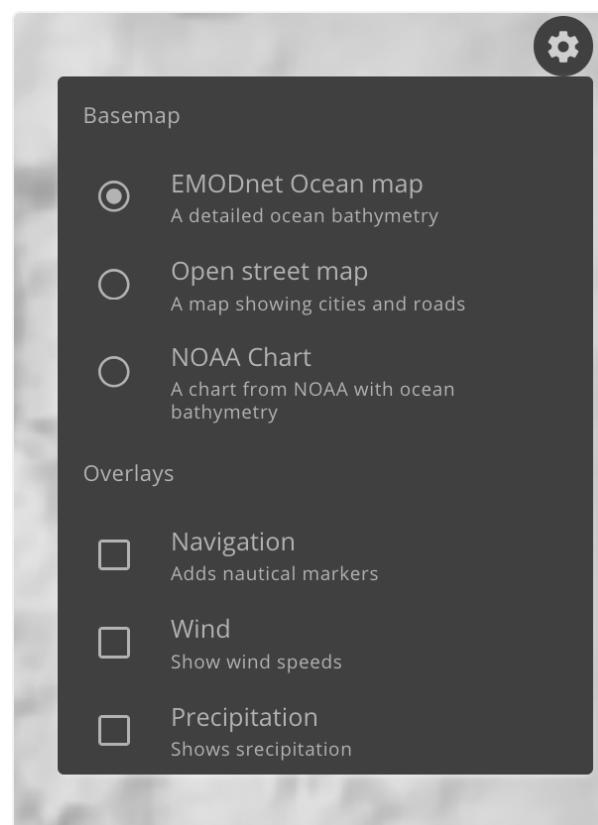
Administrators can view all vehicles and deployments across fleets by selecting the appropriate checkbox at the bottom of the navigation panel. (Only visible for administrators).

For a detailed record of past missions, visit the All Deployments section for a historical overview.

Map View Tools

To measure distances:

- Click the divider measuring tool icon in the bottom left corner of the map to activate it. Then click on the map to set the starting point. Click again to set the endpoint. This will display the coordinates of each point along with the distance and compass bearing between them. You can move either point by clicking and dragging. To deactivate the tool, click the measuring tool icon again.
- The checkboxes in the lower right toggle day/night cycles, written segment definitions, user position, and surfacing prediction visualization.
- Click the gear in the upper right to select map and weather layers. Note: Displayed weather forecasts cover the upcoming hours and are centered on the map's focal point. Click the weather icon for detailed forecasts.



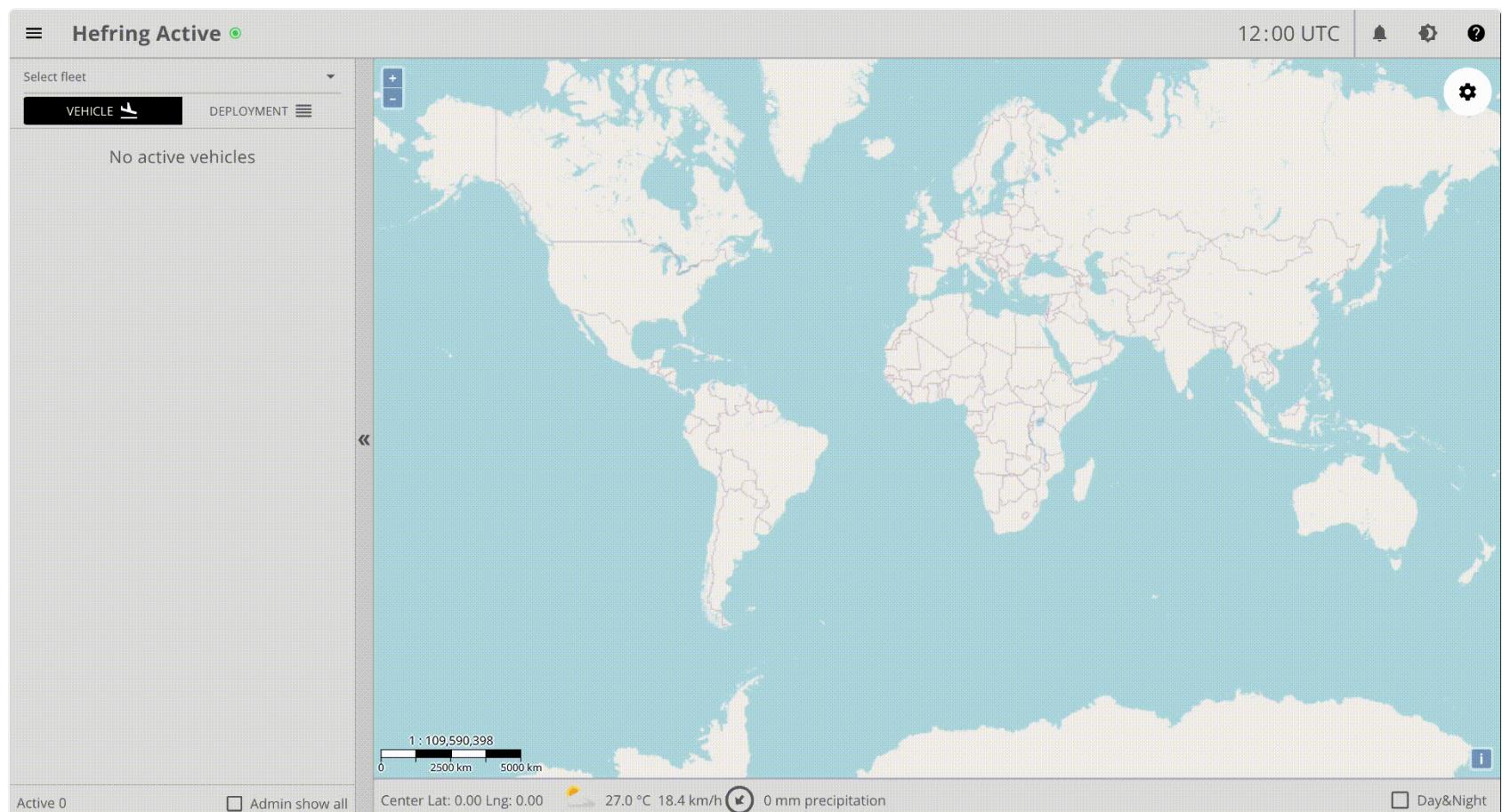
Creating a Route



For easier map navigation, [allow GPS geolocation in your browser](#).

Plotting a course with the Hefring interactive map (quick start):

1. Navigate to "Deployments" > "New / deploy"
2. Click "New" in the route template selection dialogue
3. Navigate to the desired map location
4. Click the button to start plotting your route
5. Click on the map to start drawing. Each click creates a **waypoint**.
6. Double click to finish drawing
7. To edit your **route**, click the button, and click anywhere on a **line segment** to create a new waypoint, or click an existing waypoint to move it
8. Click segments to set segment definitions (depth, yo count, sensors etc.)
9. Click waypoints to set waypoint definitions (attainment radius size, mode, etc.)



Detailed route creation

To create a new route simply click on "Routes" then on the "New Route" button in the upper right hand corner.

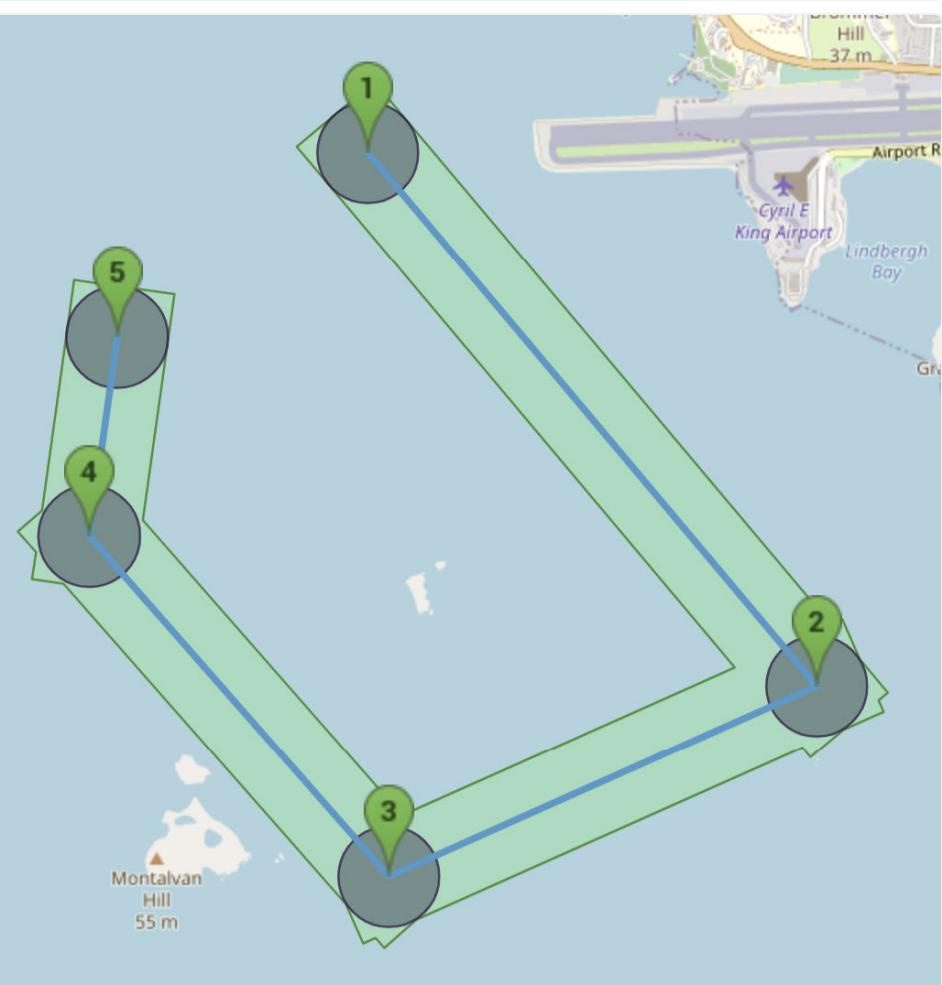
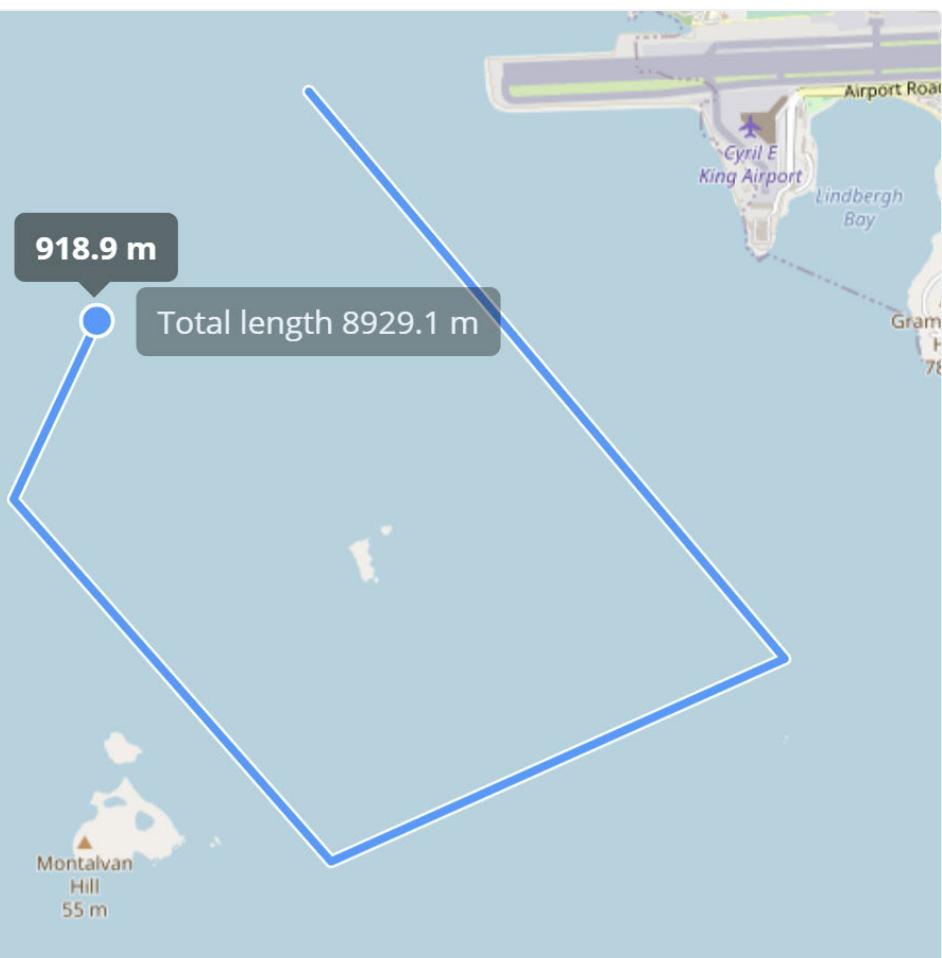
**NEW ROUTE**

Name	# waypoints	Length (m)	↓ Updated
OttawaSimTest	6	3912	7/11/2023
Gloucester Narrow Ocean Loop	12	6357	6/29/2023
Upper Mystic 10m Dives with 1 Seg Quiet	5	960	6/6/2023
SIM GLOUCESTER	2	211	6/2/2023
Quick PAM Test Gloucester Harbor	2	64	5/24/2023

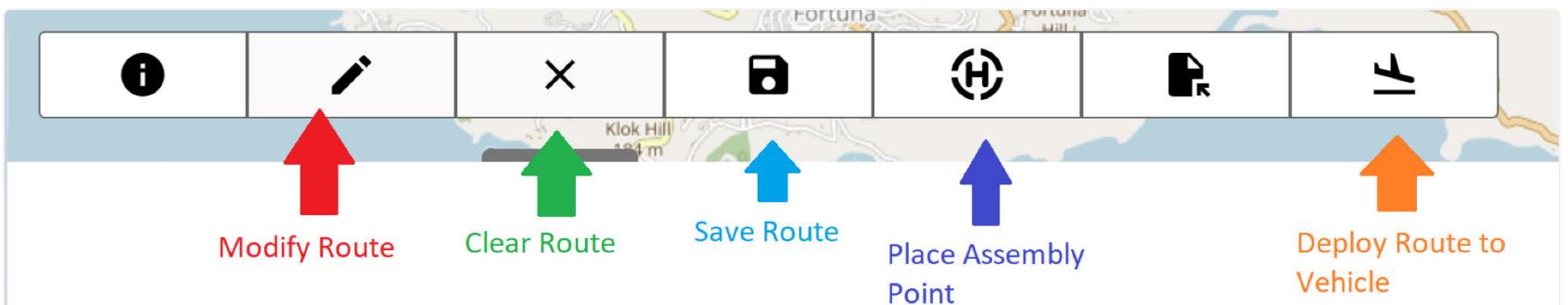
Then move the map to the body of water and region you wish to deploy the vehicle in. From here you may begin placing waypoints at desired locations by clicking the 'Draw New Route' button in the upper left.

After clicking "Edit Waypoints", more waypoints can be added after initial placement by clicking anywhere on a segment. In this mode, waypoints can be moved by dragging them. To delete a waypoint, click on it while holding the ALT key. Note that you must have selected "edit waypoints" to create, move, or delete waypoints after initially drawing the route. To delete all waypoints and start over, select "Clear Route."





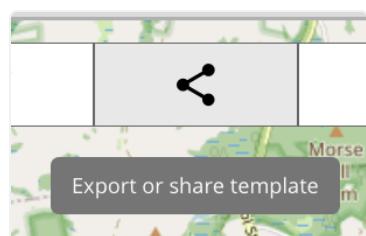
To edit an existing route, open it and select "Modify Route." To save, click save.



Saving, exporting, uploading, and duplicating routes

To save the route you have designed, select "Save Route as Template." Make sure to save frequently as you are creating your route to avoid lost progress.

To export/download a mission, click the "Export or share template" button. This will download a .mission file containing your route.

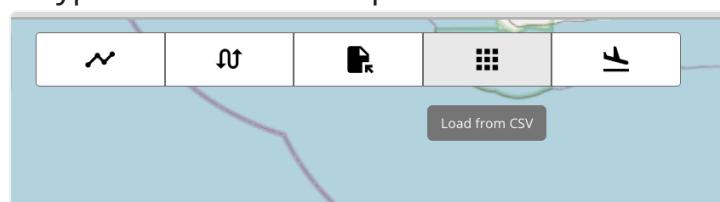


To upload a saved route file, click "Load route template" then "Import".

Currently, saving a route overwrites the previous save, even if the name has been changed. It does not create a duplicate version. To duplicate a route or create varied versions of the same route, export the mission file then re-upload the file with a new name and edit the copy.

Uploading waypoints from a .CSV file

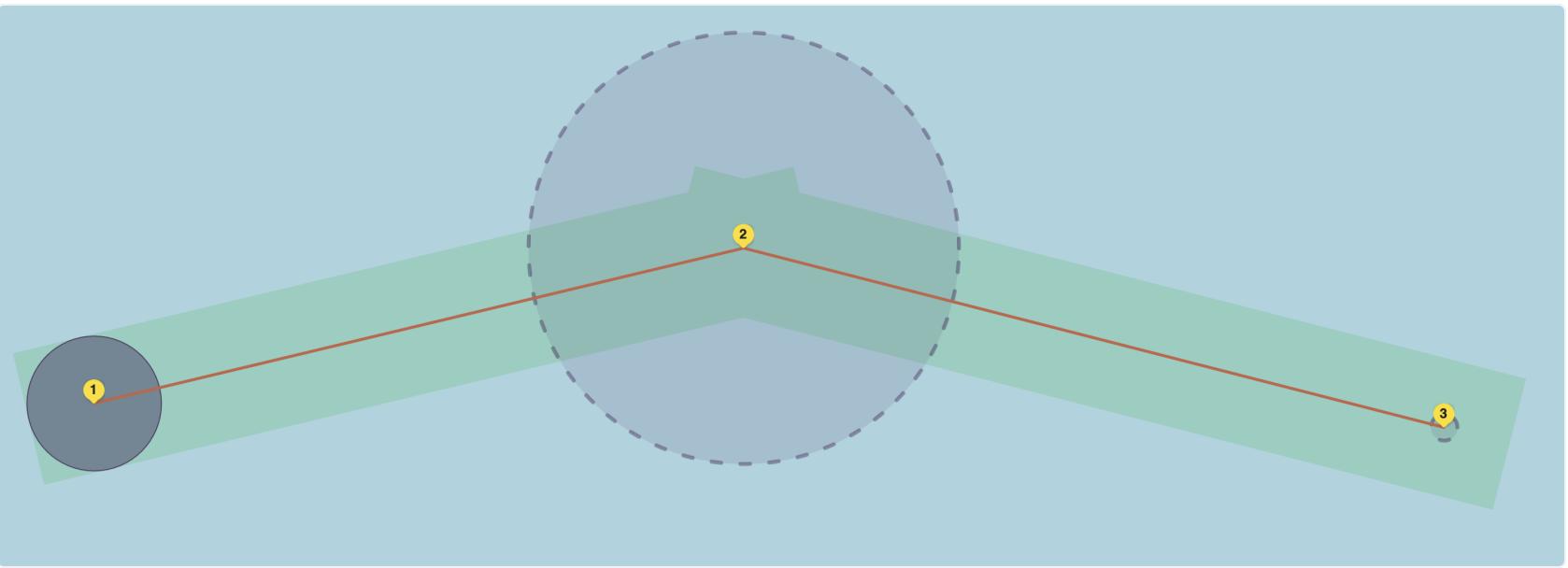
Waypoints can also be uploaded from a .CSV file using the load from CSV button.



Waypoints

Waypoints are target positions where the glider navigates along its route.

Waypoint Settings



Precise waypoint positioning: Waypoint locations can be "drawn" freehand as described above. Alternately, if you have a specific GPS position in mind for a waypoint in the route this can be configured as well. Draw a rough version of the route, then simply click on the waypoint you want to edit, click on the current GPS coordinates for the point, and it will allow you to edit, paste, or type your own.

Id: 3312ed4a-146a-46e6-a26f-00d8c7613648

La: Jude: -64.9919

Ty:

Depth: 30.0 m

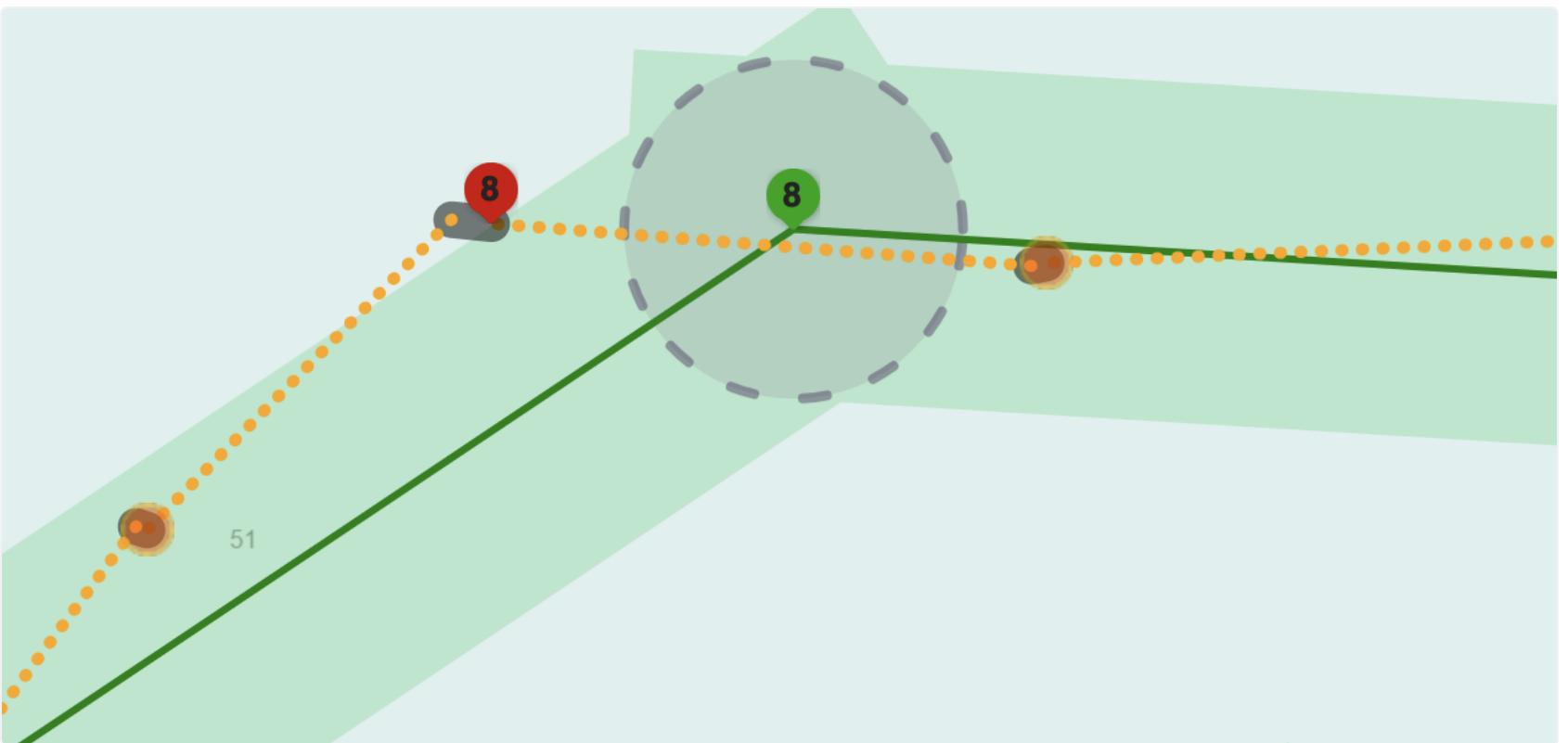
Definition: Default waypoint

A screenshot of a software dialog box for editing a waypoint. It shows the waypoint's ID, latitude, longitude, depth, and definition options. The latitude field contains the value "18.336177389015432".

Each waypoint has an **Attainment Radius** around it. When the glider reaches this circle, it considers the waypoint successfully reached and continues on to the next waypoint. Note that a definition of 500m attainment RADIUS produces a circle around the waypoint with a diameter of 1000m. The radius size setting should correspond to mission parameters. Use a smaller radius when running shallow, low-yo-count lake or coastal missions, and larger radii for deep, high-yo-count, open ocean missions. Generally the radius should be as large as practical to ensure the glider can easily reach it. 50m is the minimum, 250m is default, 5000m is the maximum.

Select a waypoint to edit its definition, which includes the attainment radius and other settings.

If the glider surfaces beyond a waypoint attainment radius (eg. due to deep, multi-yo dives and a starting point near the radius) it will bypass that waypoint and continue to the next point rather than try to return to the circle.



Strict Attainment: If you enable **Strict Attainment Mode** for a waypoint, the glider will modify its behavior to reach that waypoint exactly. It will reduce its count on the last dive of the segment to prevent overshooting the attainment radius and ensure that it surfaces inside the circle. It also will refuse to bypass the waypoint even if it over/undershoots several times or is pushed away by current, insisting on reaching the attainment radius before moving on to the next waypoint. On the map, strict attainment radii are darker grey than regular radii.

Perform Hovering makes the vehicle stop and do additional measurements, params can be defined. There are safe ranges (e.g. 10-11 m is too small). The larger the interval, the more likely it will be successful. Hover timeout sets the time the vehicle will try to attain position before giving up and continuing route.

Perform drift is "hover", but at the surface. Used to measure surface currents.

Assembly Point: An assembly point is a separate waypoint where the glider travels after completing a mission or in the event of a problem. You can place an assembly point if you intend for the vehicle to be retrieved at a different location than the endpoint. When an assembly point is placed, you can also halt the mission and instruct the vehicle to return to the assembly point at any time. Assembly points are optional and not necessary on all missions. Assembly points always have strict attainment mode on.

Assembly Point Navigation

Once placed, click on the assembly point to open settings. Note that in the assembly point settings dialog you set the dive definition for how the glider will travel to the assembly point, as normally done on a segment (see next section for segment definitions).

Navigation

Glider navigation can be configured based on vehicle defaults or specific depth settings.

Max Depth

This parameter sets the maximum depth the vehicle will reach before executing a turnaround maneuver. The maximum depth is capped at 200 meters.

Apogee Depth

If the vehicle is not intended to surface at the end of a yo, it will initiate a turnaround at this specified depth.

Min Distance to Seabed

This parameter defines the minimum distance the vehicle will maintain from the seabed during navigation.

Surface After

Glider navigation can follow vehicle defaults or be configured to specify the number of yos before surfacing.
(Currently under development and disabled.)

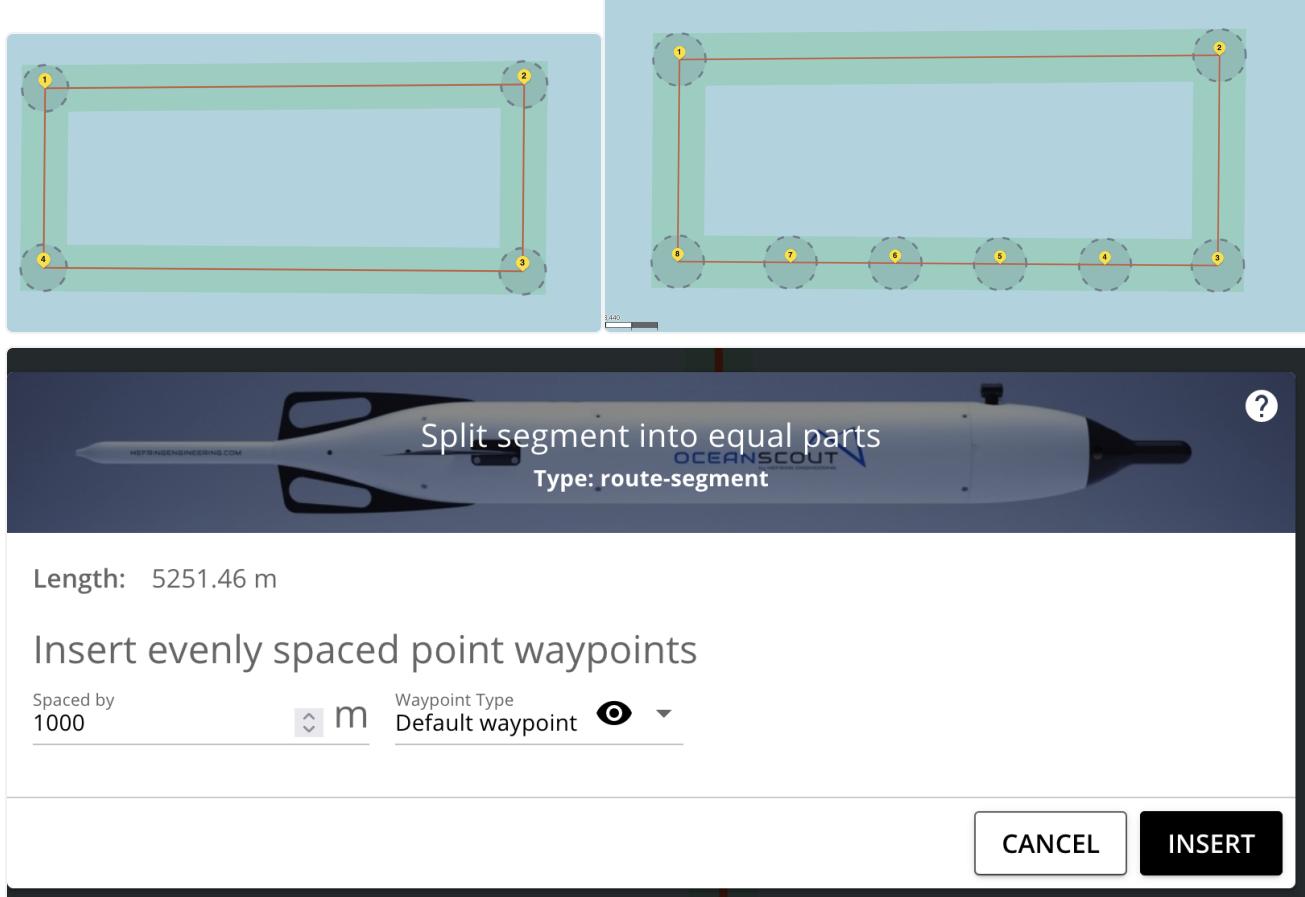
Safety Zone

The safety zone defines a buffer area around the travel line leading to the assembly point. If the vehicle ventures outside this zone, it will reorient itself towards the travel line before proceeding to the assembly point.

Segments

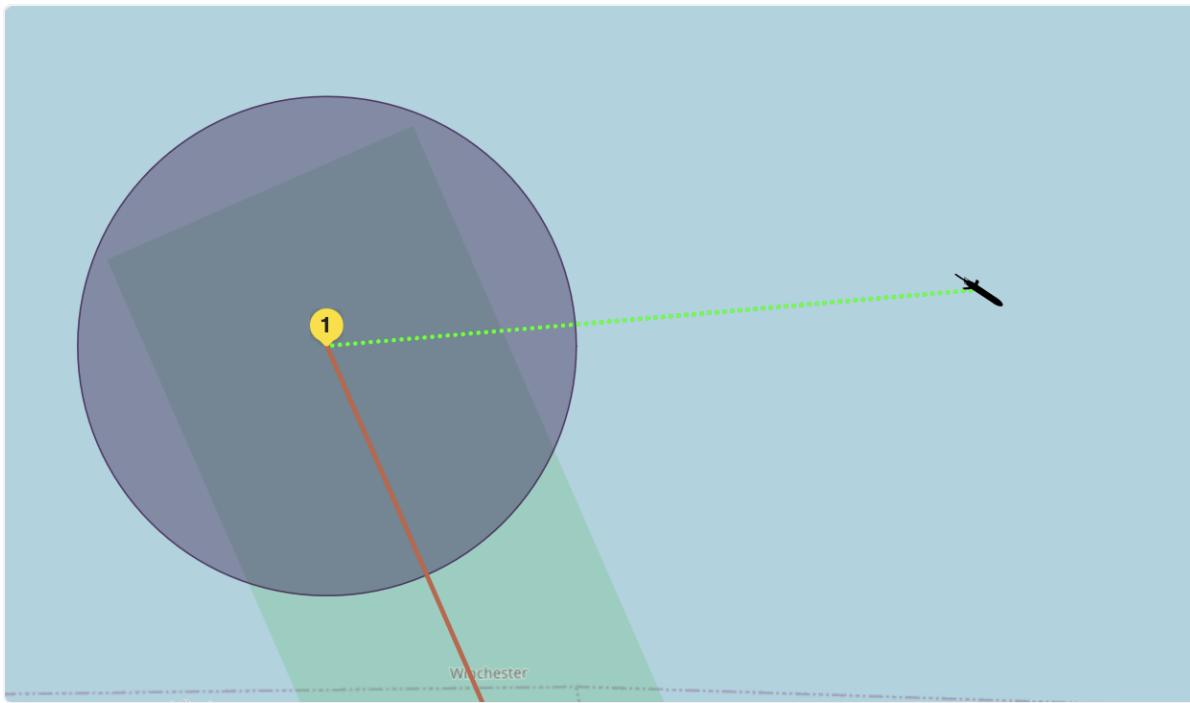
Segments are travel lines between waypoints. Each segment has settings (definitions) that define navigation and sensor sampling parameters. Click on a segment to define settings.

Tip: Control-clicking a segment line allows you to divide that segment with evenly spaced waypoints if desired.



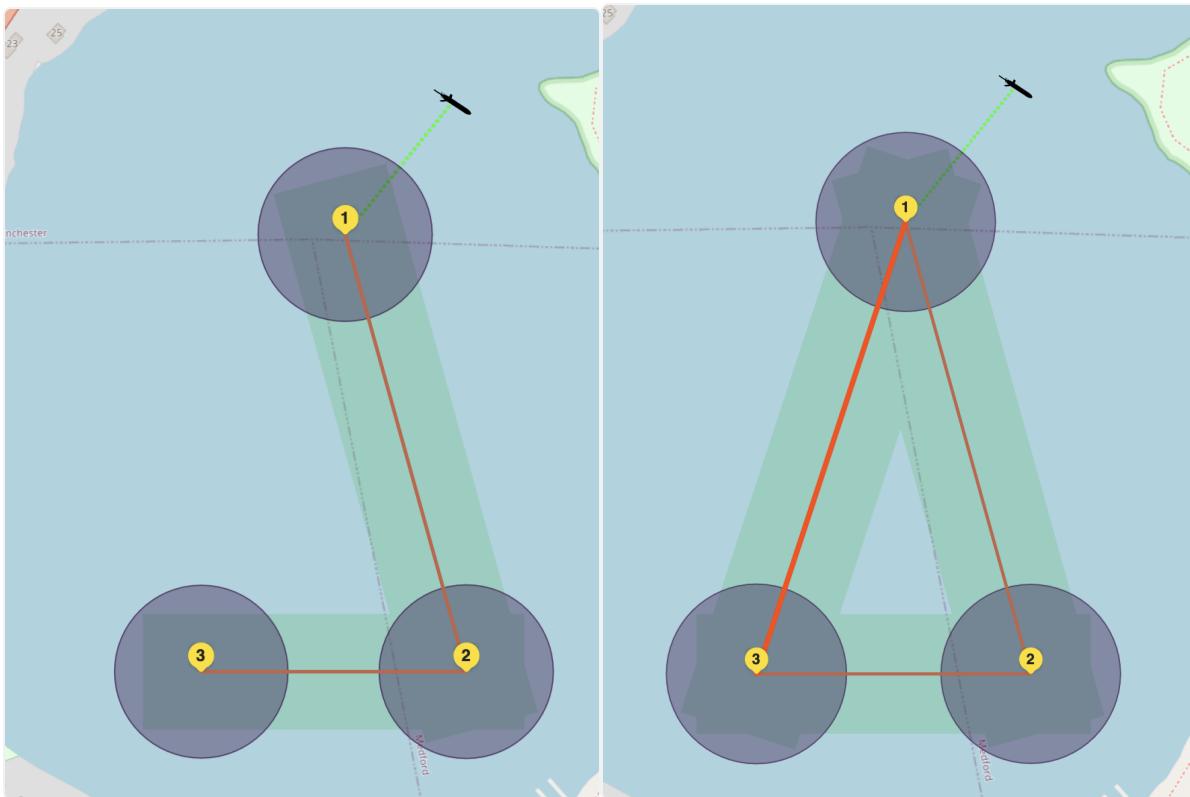
Travel Segment and Loop Segment

The **travel segment** is automatically generated between the glider's position and the waypoint where the mission begins. It updates as the glider moves until starting your mission. If the glider is deployed outside of the attainment radius it will use this segment and definition to reach its first waypoint. If the glider is deployed within the attainment radius of its first waypoint the travel segment is not used.



The green dotted line indicates a travel segment from the glider's last telemetry location and the designated mission start waypoint.

The **loop segment** is automatically generated between the first and last waypoint of a mission when loop mode is selected when creating your route. The glider will travel around the route in laps until stopped.

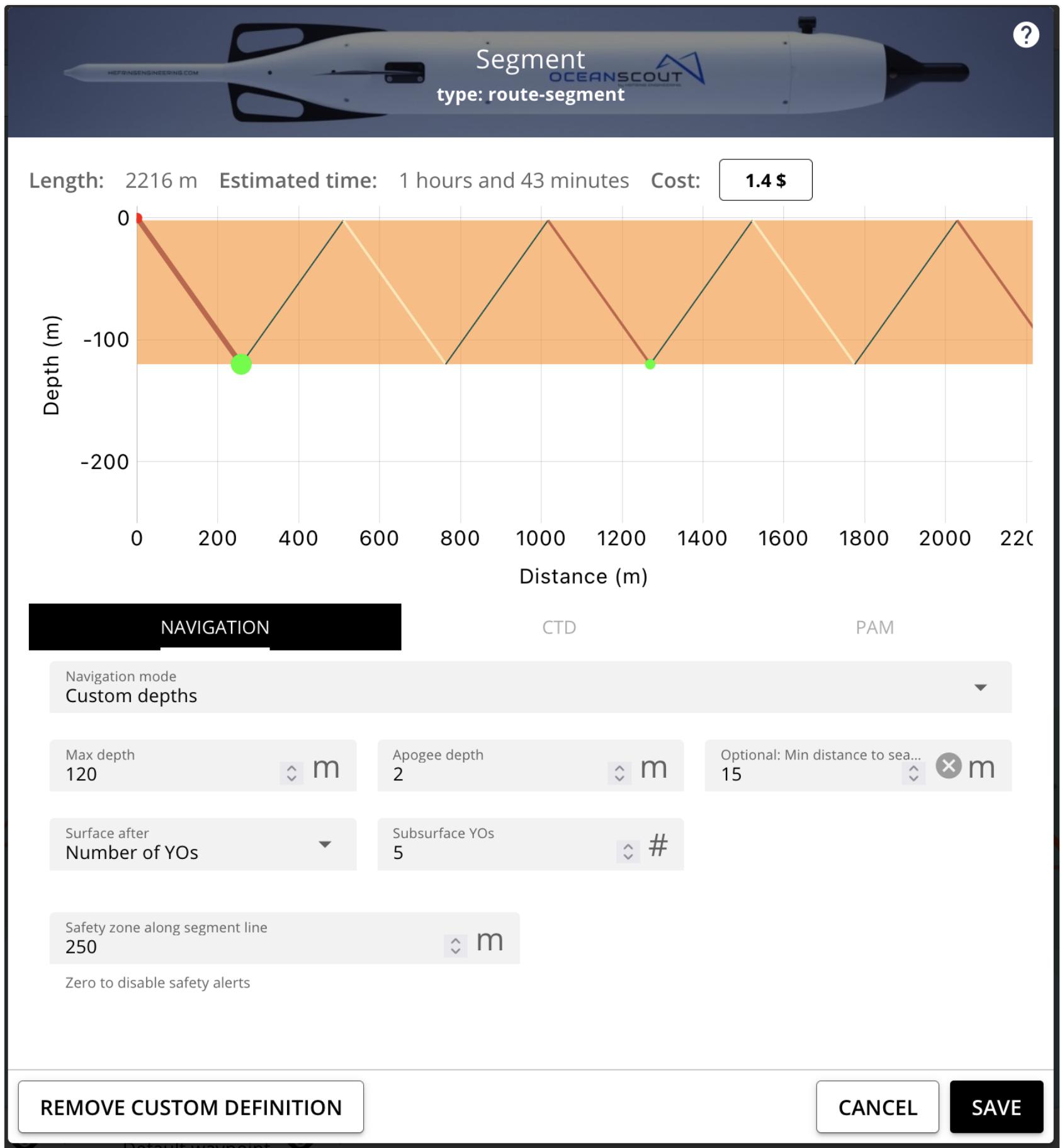


 Remember to set definitions for the travel segment and loop segment (if enabled). Default settings may not be appropriate for all missions. It is easy to forget to confirm definitions for these when they are automatically generated after you have defined your other segments.

Segment Settings

Each segment has setting definitions for navigation (dive parameters eg. depth, yo count) and for the scientific sensors.

You will need to edit the "Segment Definition" to control the details of the dives and sensing on each segment. You can either choose a preset definition (which can be created, saved, and edited under templates 'Definitions' in the menu), or create a new one by selecting the "NEW" button to the right of the definitions. When creating a new definition select "Custom Depths" under the "Navigation Modes" drop down menu, and "Number of Yos" under the "Surface after" menu.



Navigation (dive) Settings:

Max Depth: Depth the glider will attempt to dive to on this segment for every 'yo'

Apogee Depth: Depth the glider will ascend to before diving again for subsurface yos. Set 1m to come all the way up, or 5-10m if you need to avoid ship traffic or wave action.

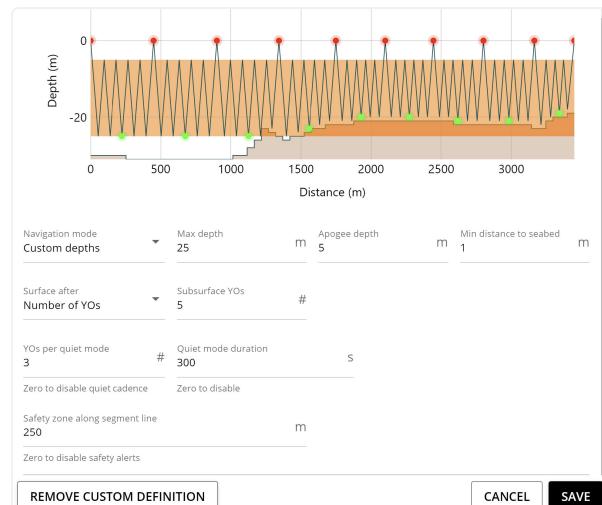
Min Distance to Seabed: Altimeter based turnaround distance, the minimum allowable distance from seafloor before the glider must turn around (i.e. 5 meters will cause the glider to begin ascending once it has reached 4.9 meters off the bottom even if it has not reached the maximum depth). Larger turnarounds are safer.

Subsurface Yos: Yos performed between surfacings

Yos per Quiet Mode: number of yos performed per quiet mode (i.e. 3 yos means on the third yo a quiet mode will be performed before ascending). A zero disables quiet time.

Quiet Mode Duration: time in seconds the glider will turn off all motors and other sensors to record passive acoustic data (setting 0 disables this feature).

Safety Zone: A user-defined safe area around the glider's course, if the glider exits this perimeter it will generate an alert.



Conductivity and Temperature Sensor (CTD) settings

Use the CTD tab to set CTD logging and data transmit settings.

NAVIGATION

CTD

PAM

From depth (m) To depth (m) Sampling interval (m) [trash]

Start at 'yo' index Interval 'yo' index Transmit YO Sample CTD on 'yo'
Index 1 is the first 'yo'
descent/ascent 1 for continuous
sampling, 0 for single
sampling Only data from one 'yo'
will be sent at surface

ADD RANGE

Estimated CTD samples to transmit is: 40

REMOVE CUSTOM DEFINITION**CANCEL****SAVE**

Edit CTD Sampling options:

- Vehicle - Defaults / let firmware determine when to sample CTD
- Sampling Protocol - Custom CTD sample settings
- Power Off - Turn CTD power off to save power and storage

Sampling Protocol

You can define up to four sampling ranges, each with the following parameters:

- From Depth - Set the minimum depth for sampling.
- To Depth - Set the maximum depth for sampling.
- Sampling Interval - Set the interval in meters between each sensor recording.

Click "Add Range" to include a new range in your list.

- Start at yo Index - Specify if you don't want to start sampling at the first yo.
- Interval yo Index - Specify if you want to sample only every, e.g. second yo.
- Transmit yo - Due to data packet size limits, only data from one yo will be sent during any given dive. Data from all yo's will be saved to the internal SD card for later review (higher resolution).
- Sample CTD on yo - Specify if you want to sample while ascending or descending.

Blue lines in the chart indicates CTD sampling, green lines indicate PAM sampling, red indicates both CTD and PAM sampling

Default range settings transmit data for every 0.5m between the surface and 10m depth, then every 5m between 10m and 200m.

You can add ranges by clicking the ADD RANGE button, or remove them by clicking the trash can.

Estimated CTD samples to transmit

- This shows how many CTD samples are sent over Iridium. More samples = more data use.

Passive Acoustic Monitor (PAM) settings

The PAM tab allows you to set PAM logging and data transmit settings.

When setting PAM settings, you may see a "PAM not equipped" warning if you have not selected a glider before adjusting settings, or if you have selected a glider without a PAM nose tip.

• PAM mode

Vehicle: Use standard settings defined in the vehicle firmware.

Sampling Protocol: Sample while moving.

Power Off: Turn off PAM unit to conserve power and storage.

- Sample PAM on yo (Defines the section of the yo to record PAM data. Select ascent, descent, or both.)

Ascending: Sample during ascent.

Descending: Sample during descent.

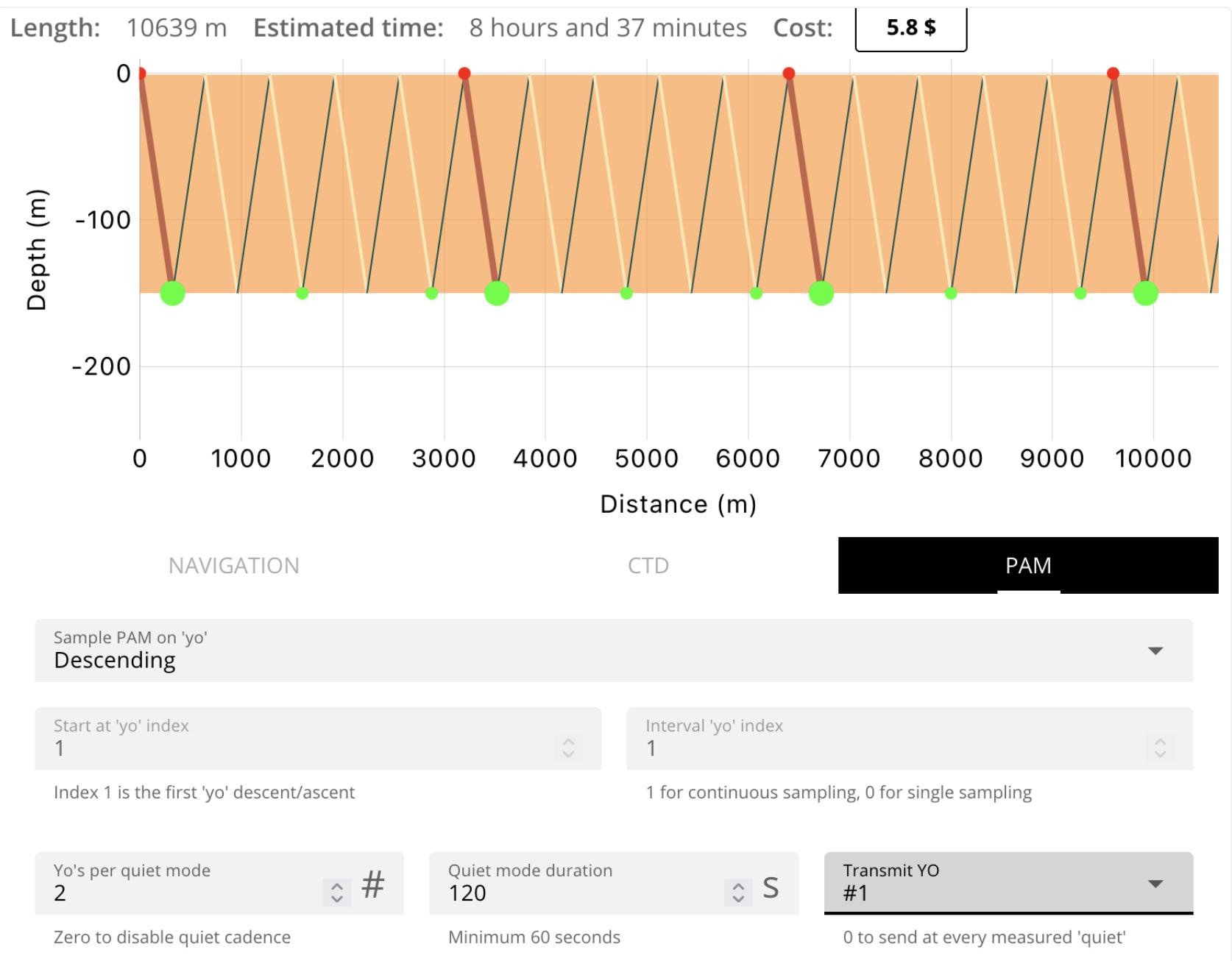
Both: Sample during both ascent and descent.

- Start at yo Index - Specify if you don't want to start sampling at the first yo.
- Interval yo Index - Specify if you want to sample only every, e.g. second yo.
- **Transmit yo** - Defines the yo for which to generate and transmit a power spectrum preview viewable on cloud. Due to data packet size limits, only data from one yo will be sent during any given dive. Data from all yo's will be saved to the internal SD card for later review (higher resolution).
- **Yo's per quiet mode** - First yo will always be quiet, number indicates interval.
 - Setting "0" disables quiet times.
- **Quiet mode duration** - Defines the length of quiet times in seconds. Longer quiet times have more potential for the glider to drift. Generally quiet times are on the order of several minutes. Minimum is 60 seconds.

• Quiet Mode (AKA "quiet times")

- Quiet times are defined periods where the glider stops and hovers (neutrally buoyant) with motors off and the PAM on, to acquire clean acoustic data without motor or flow noise. During the bottom phase of a yo, you can instruct the vehicle to enter quiet mode for a specified duration to facilitate Passive Acoustic Monitoring (PAM) readings. While quiet mode is active, a green marker will be shown in the graph at the bottom of the dive.
- As currently implemented, quiet times occur at the bottom of yos. The maximum descent depth setting (or altimeter distance to seafloor) determines where the quiet times will occur.
- Quiet times are displayed as green dots on the segment preview graphic. All green dots are recorded quiet times. Large green dots are quiet times that will generate and transmit power spectrum data

(see transmit yo settings below)



- In quiet mode, the glider can drift. This has several implications:
 - While the glider does achieve neutral buoyancy before stopping the motors, it may still drift up or down several meters during a motors-off quiet period.
 - Do not run quiet times close to the bottom terrain. We recommend keeping the glider at least 15m above the bottom when running quiet times. This can be set using the descent depth and/or minimum distance from seafloor settings under the Navigation tab.
 - Do not run full depth (200m) dives with quiet times, if the glider drifts below 200m it will trigger a "maximum depth exceeded" abort.
 - If you are operating in a strong current, the glider will drift downcurrent while hovering. Long and/or frequent quiet times make it difficult to navigate against heavy currents.
 - Heading may drift while the glider is hovering. This is usually not an issue as the glider turns to correct heading when it starts traveling again. However, on very shallow dives it may not have time to

complete these correcting turns. Therefor long quiet times on very shallow dives may cause erratic travel directions.

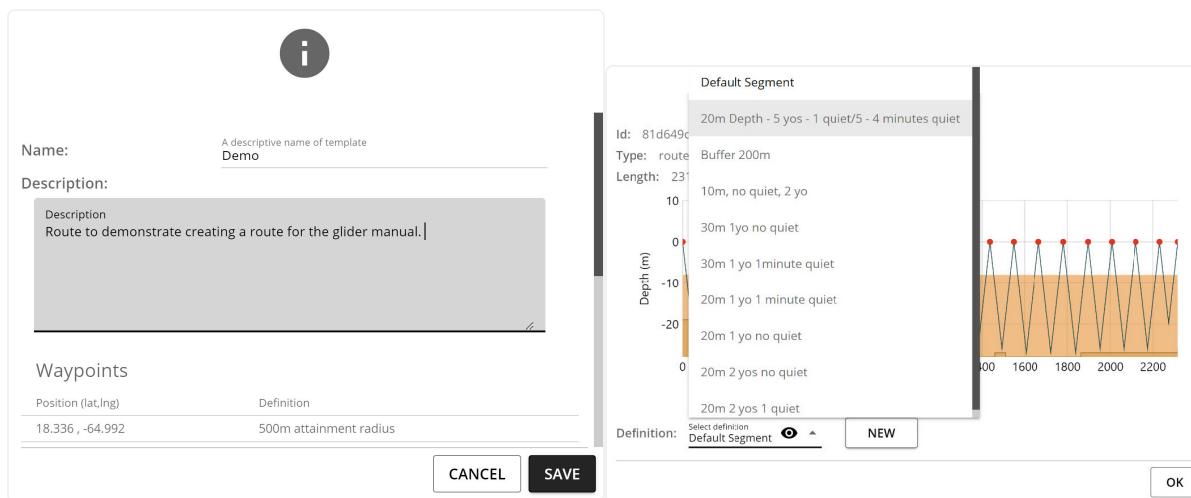


Other Settings

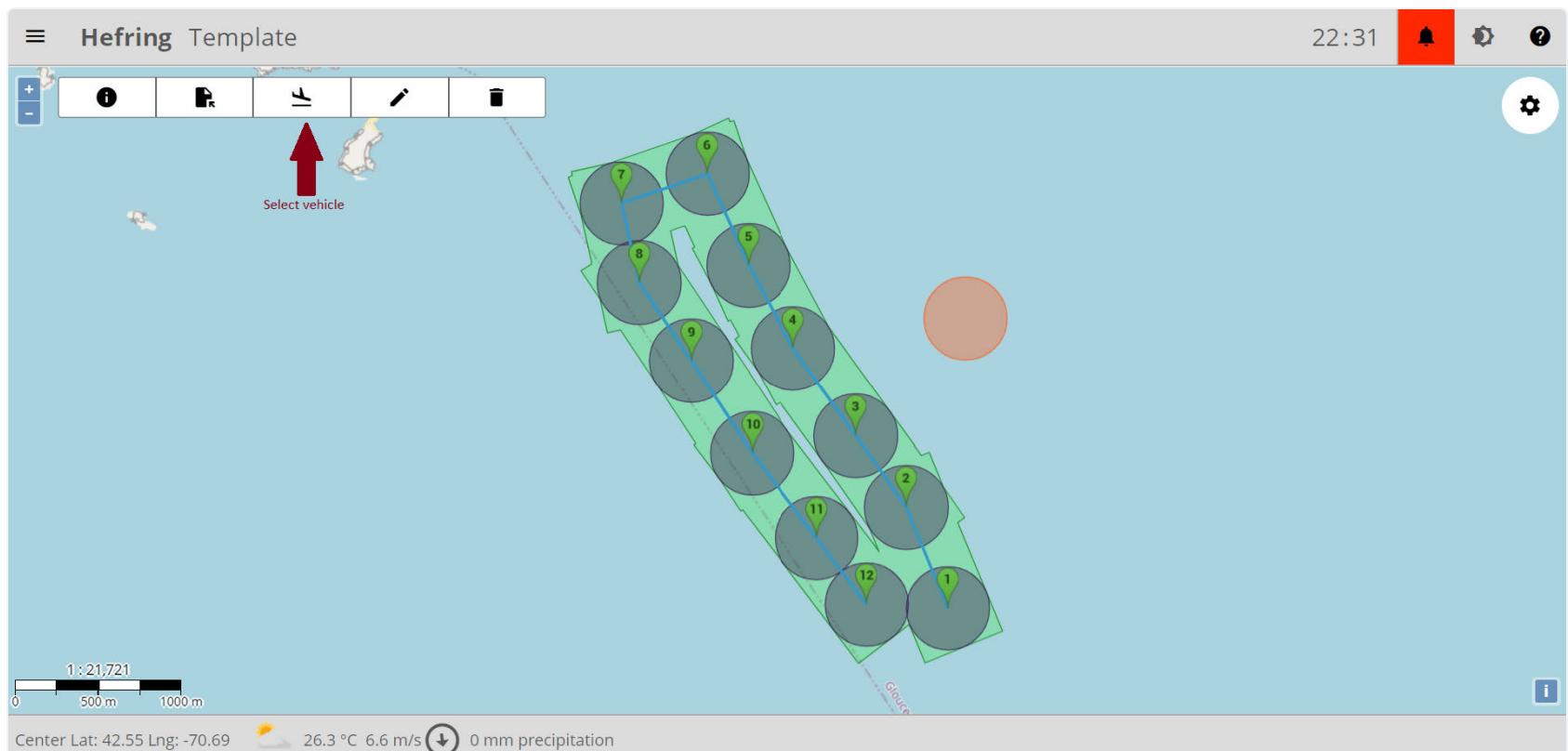
Other sampling settings may be enabled here for different functions or payloads.

Templates and Saved Definitions

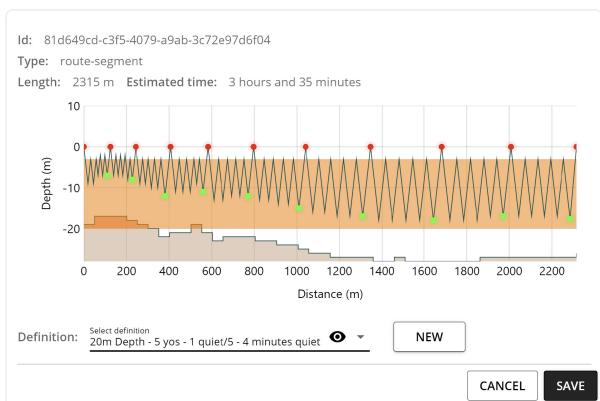
If you don't want to edit each individual waypoint/segment with the same mission details (same depth, same scientific data, etc.) you can program in definitions for waypoints and segments that you wish to use repeatedly. These can be created and saved under "Templates" → "Definitions" and then accessed when creating routes.



You can also set new routes to be created with set definitions so you don't have to change each individual waypoint/segment to the given definition.



 **Saving your work:** Be sure to save waypoints and segments when you edit them as well as saving the final route when you're done working on it. You can always edit it again later, but the route may be lost if not saved.



Setting Same Definitions:

Mission segments and waypoints can be set to the same definitions of other previously custom-defined segments of the same mission, even if they are not saved as presets. Simply set the definition for a segment, then select that segment definition ("Segment #") from the dropdown menu on the segment(s) that you would like to match it. This is very useful when creating a mission with many segments that share the same definition.



Deployments Modes



An Oceanscout floating in **comms position**: full buoyancy with the nose pitched down and antenna pointed skyward. The glider goes into this position during Idle, Abort, Recovery and periodically when it sends telemetry during an active mission.

Oceanscout gliders have several operational modes:

- **Idle (aka Halt or Waiting Setup)**

- The above names mean the same thing.
- The glider is "idling" in this mode. It is the default state when not running a mission. Your Oceanscout will sit and wait for commands in comms position (full buoyancy, nose down antenna up) with regular iridium telemetry. The WiFi network is on. The strobe is not activated. The status LED is blinking green.
- The glider should be in this mode during:
 - Pre-mission setup and calibrations
 - Mid-mission pauses for commands, changes, or new missions. A glider can only receive and start a new mission when it is in Idle.
 - Post-mission for data download.

- **Abort**

- Comms position, strobe on, WiFi off, status LED blinking red.
- Abort is the failsafe mode. When the glider encounters a problem or reaches a timeout it will go into Abort mode.
- WiFi is turned off in abort to conserve battery and extend survival endurance in an emergency. Power cycling the glider will re-enable WiFi connections.
- Check the alerts list for abort reason.
 - *Abort Conditions*
 - No communications timeout
 - Mission timeout
 - Max Depth Exceeded
 - Minimum Battery percent
 - Minimum Battery voltage
 - Minimum disk space percent
 - Minimum disk space MB
 - Internal Pressure (vacuum)
 - Leak detect

- **Recovery**

- Comms position on surface, strobe on, WiFi on.
- This mode is meant for locating and retrieving the glider. Gliders may be manually put into Recovery mode, or automatically switch to recovery on mission completion.

- **Active**

- The glider is in this state while actively running a mission. Strobe, WiFi, and Status LED are off to conserve energy.

- **Maintenance**

- Mode on the Cloud-side used to make system configuration changes, such as reassigning noses between hulls. It is not required for normal setup or calibration. Consult Hefring if you need to use Maintenance mode.

Idle, Abort, and Recovery each have separate **telemetry intervals** which can be set via the webpage or command line interface. It is important to set these telemetry intervals to lengths that make sense for your

mission, and to know what they are. Refer to Telemetry Intervals in the firmware section.

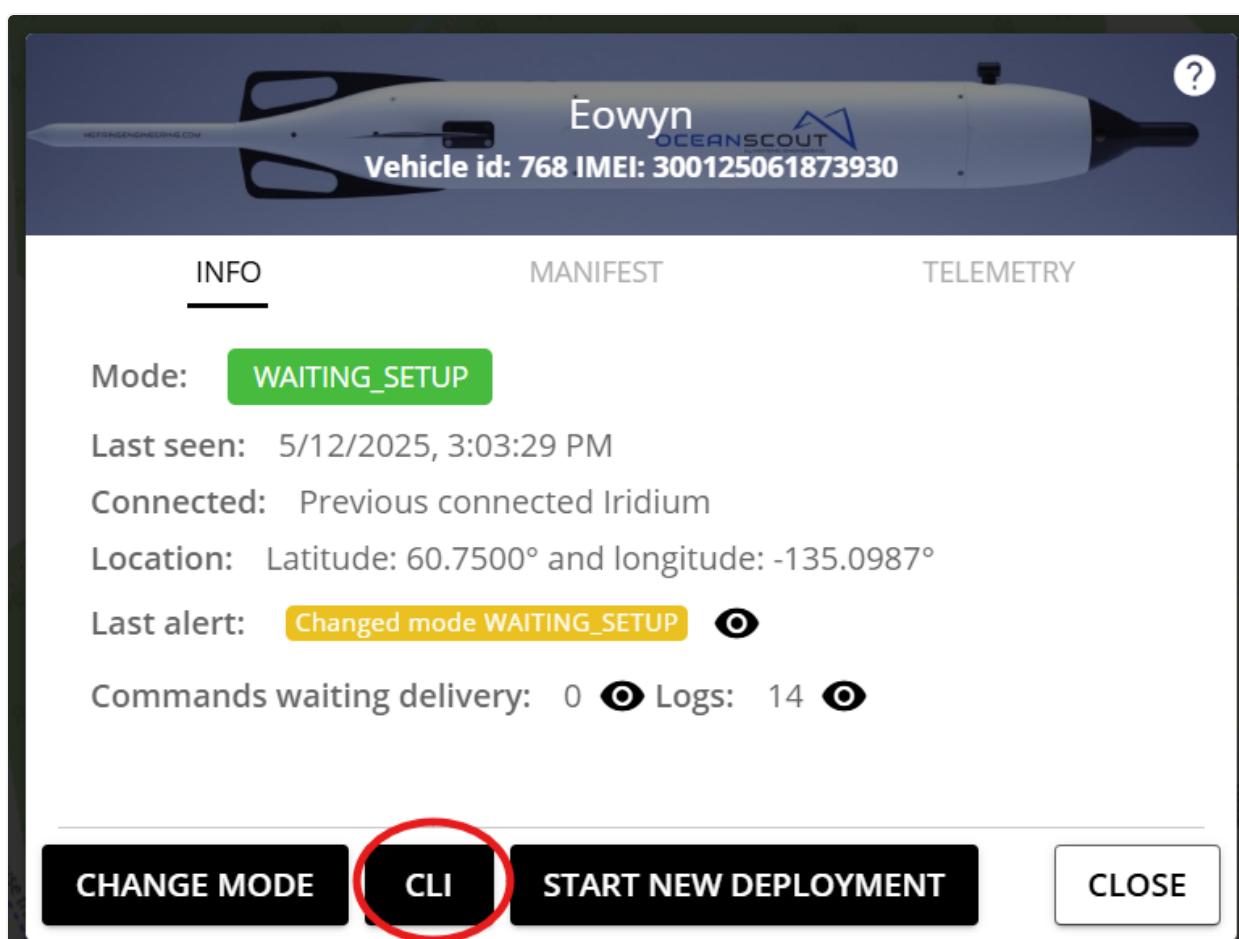
How to: Turn on Wi-Fi during abort/recovery

During Abort and Recovery the Wi-Fi module is OFF by default to conserve battery in the event that the vehicle must drift on the surface for an extended period. If you wish to connect to WiFi in this state you may enable it using the following methods:

- **Manually:** Use the magnet wand tool to power cycle the glider.

- **Via Cloud:**

- Select the vehicle either by clicking on the vehicle shape, selecting the vehicle button at the top of an active mission page, or going to the vehicle tab and selecting it by name.
- Once the vehicle information screen is open select the “CLI” button to open the Command Line Interface to the glider.



- With the CLI interface open send the command “platform.setSurfacePower 1” to turn the surface power processor back on and restore wifi to the vehicle.

- Command Line Interface ?
Or use a predefined... ▾

4/23/2025, 6:46:05 PM mpcu.console pdbgetbattery
Stage: EXECUTED
ACK:
Eowyn, daughter of Éomund Ocean Scout CLI (Level 0) =>
mpcu.console pdbgetbattery MPCU is busy ERROR =>

Eowyn:> platform.setSurfacePower 1

CLOSE SEND

- Confirm that the SBD message makes it through all message queues and is acknowledged as implemented by the glider. (Green message, response says "ok")

Starting a Deployment

For instructions on physical glider launch and recovery procedures please refer to the hardware section.

Using Hefring Cloud, missions may be directly uploaded to a glider over Iridium and started immediately (provided the glider is deployed, communicating, and in Idle mode). This is the standard easy way to start your glider.

There are several ways to start a deployment. You may click New/Deploy under the deployments tab, or click a vehicle icon on the map or name in the menu and select "start new deployment" in the vehicle dialog. The vehicle must be in Idle to start a new deployment.

You may select a premade route, or draw a new one. Remember to save your route template. Once you have selected or created a route you are ready to start a deployment.

Once a route is created or loaded, and a vehicle selected, you will see a dotted line connecting the vehicle location to the first waypoint. This is the **Travel Segment**. Make sure to click the travel segment line and set a

travel segment definition (depth, yo count, etc.) because default settings may not be appropriate for your mission.

You may now click "Deploy Route to Vehicle" This will open a final dialog with the following mission options:

Name: The name assigned to the deployment saved in Hefring Cloud. A default name is automatically generated based on the current timestamp. We recommend appending something custom to this name to help distinguish saved missions, like the location or objective.

Project: Assign the deployment to a project, which will bear any related expenses through its fleet account.

Description: A concise overview of the mission's objectives, location, or settings etc.

Recorder Filename: This designates the filenames for files saved on the vehicle's internal memory, including sensor data and vehicle logs. A default name is automatically generated based on the current timestamp. Because there are many log files with similar names, it is strongly suggested to leave the auto-generated dates and append a descriptive name (objective or location, etc) here. It will help you distinguish the data files later, especially if you run multiple missions.

Route Options: Tailor the deployment by selecting an alternative starting waypoint, direction, and end-of-route behavior.

- **Start at waypoint:** designate a waypoint to start at
- **Direction:** The glider may be set to run the route waypoints forward in ascending (waypoints 1-2-3) or reverse in descending (waypoints 3-2-1) order.
- **Action at end:** What the glider will do when it reaches the final waypoint.
 - **Drift:** Drift in Idle mode (no strobe, WiFi on, ready to receive new mission)
 - **Recovery:** Drift in Recovery mode (strobe)
 - **Backward:** Continue the mission running back through the waypoints in opposite direction. Especially useful for having the glider go back and forth in a straight line between two points.
 - **Loop:** If loop mode was enabled during route creation the glider will continue from the final waypoint back to the first and continue around the route again until stopped.

Mission Timeout (in days): Establish a deadline for the mission, after which the vehicle will enter ABORT mode.

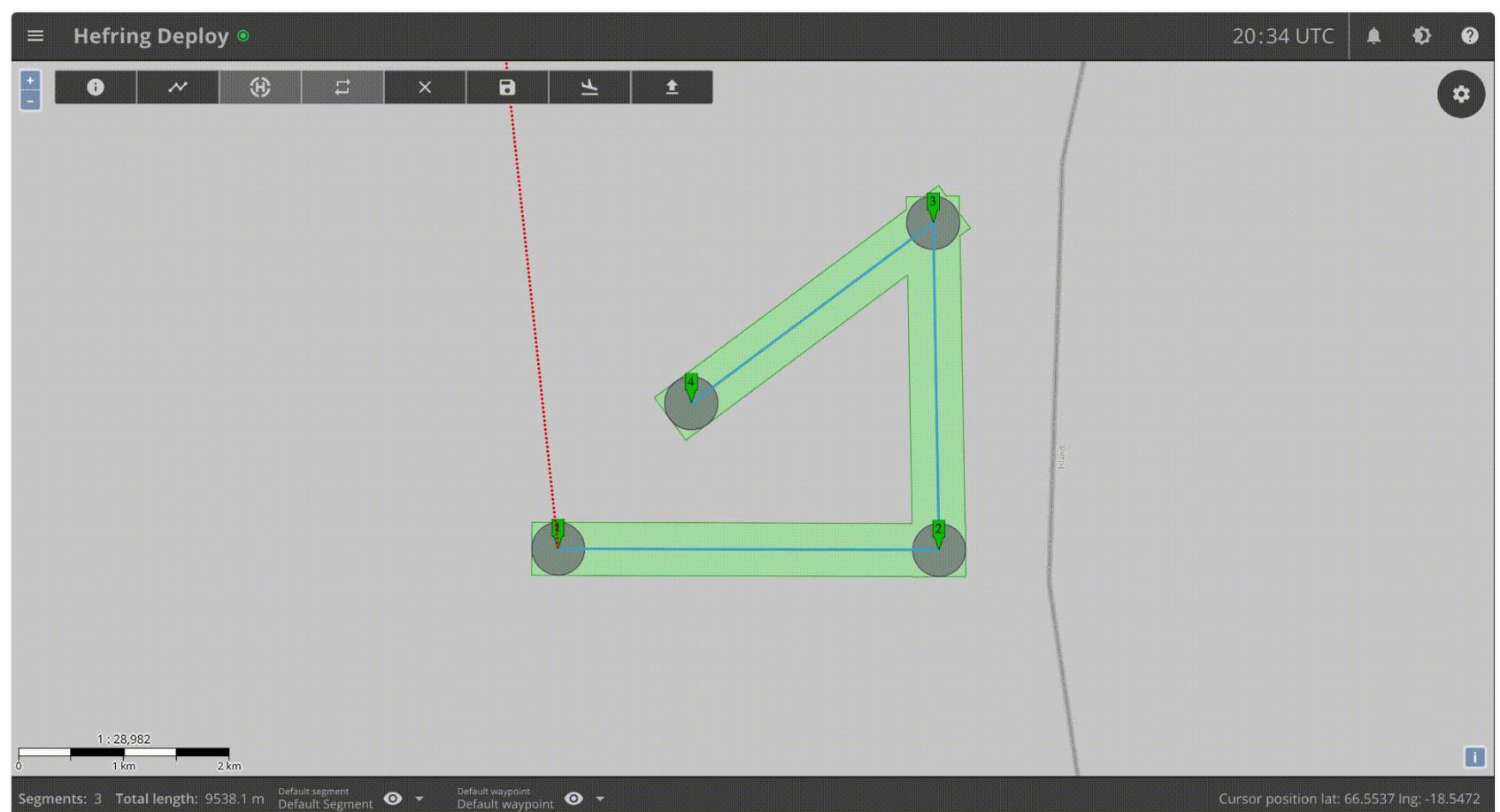
When to start dive?: Decide on the mission's commencement time, whether immediate, scheduled, or manual, to accommodate for vehicle positioning to the start point. If selecting "start manually", a "Start now" button will appear while viewing the deployment (map view). Missions may also be manually started via the glider webpage when connected to local glider WiFi. This is useful if you do not have internet access and cannot use Cloud at your deployment site.

Once these settings are set, the mission may be deployed to the vehicle. The glider must be turned on, in idle, free-floating in water deeper than 10M to start a mission. See Deployments in the Hardware section for information on physically deploying and handling your Oceanscout.

Deploy a vehicle (quick start):

1. Click the  button to deploy a vehicle
2. Select the desired vehicle from the list

3. Click the  button to upload route to vehicle
4. Click "Continue"
5. Name your deployment (optional)
6. Select project
7. Add a description (optional)
8. Define the file naming convention (optional)
9. Select starting waypoint, direction, action at completed route, and mission timeout
10. Select how to start (now, manual or at a given time)
11. Watch your glider go!



To start a deployment from a saved route, open the route, then click Select Vehicle in the top bar.

SEGMENTS**WAYPOINTS**

Filter by name

**ADD DEFINITION**

Name	Source	Updated
Default Segment	GLOBAL	9/13/2021
20m Depth - 5 yos - 1 quiet/5 - 4 minutes quiet	COOPERATE	2/22/2023
Buffer 200m	COOPERATE	2/24/2022
10m, no quiet, 2 yo	COOPERATE	2/14/2023
30m 1yo no quiet	COOPERATE	4/4/2023
30m 1 yo 1minute quiet	COOPERATE	4/4/2023
20m 1 yo 1 minute quiet	COOPERATE	4/12/2023
20m 1 yo no quiet	COOPERATE	4/12/2023
20m 2 yos no quiet	COOPERATE	4/26/2023
20m 2 yos 1 quiet	COOPERATE	4/26/2023

How to: Manual Start a Mission

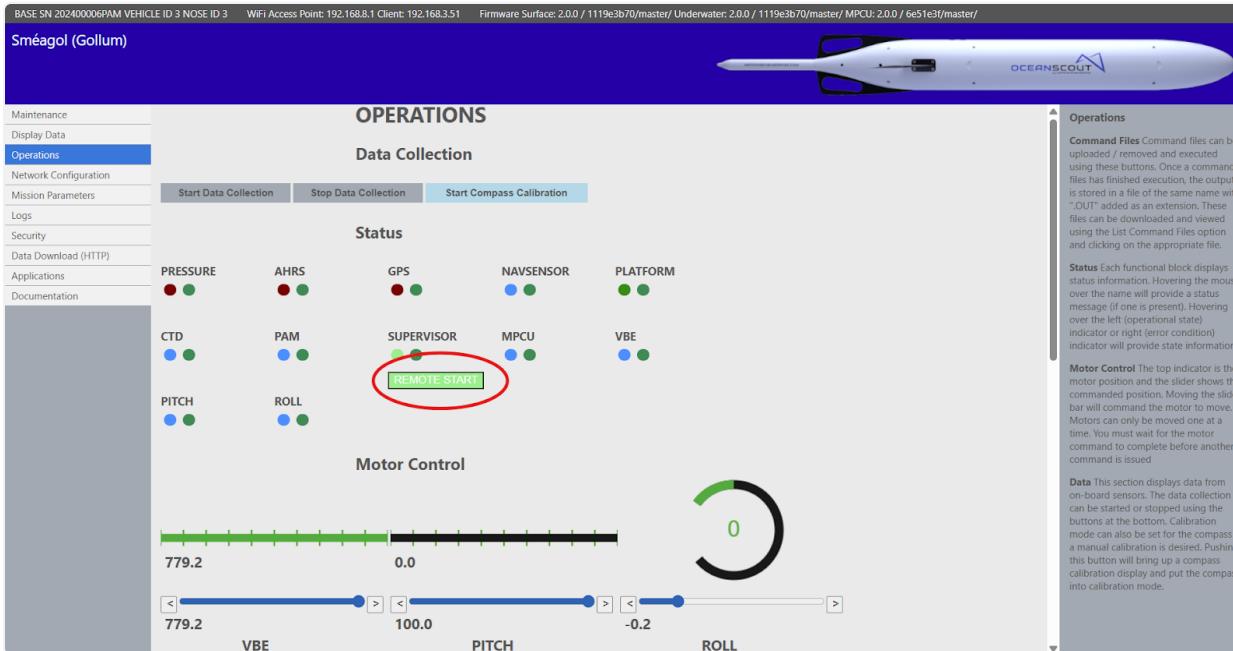
The manual start procedure is not necessary but some situations may require it. Missions may be pre-loaded onto the glider over Iridium using cloud, or over the internet by putting the glider into internet mode. Refer to Internet Mode section in Firmware for instructions. Pre-loaded missions may then be manually started using either Cloud or the local WiFi webpage.

- To manually start a glider mission, program a glider mission normally until you reach the final deployment configuration at which point you select "Start Manually" from the dropdown menu.

The screenshot shows the 'Upload route & dive' section of the Oceanscout interface. It includes fields for 'Vehicle' (Sméagol), 'Fleet' (Mordor Fun Run), 'Project' (Hefring Test), 'Description' (Test Mission for demonstration Purposes), 'Recorder filename' (Sméagol_2025_05_21T20_27_13), and mission parameters like 'Start at waypoint 1 In direction Forward Action at end Recovery'. A circled section highlights the 'When to start dive?' dropdown set to 'Start manually'. At the bottom, there's a cost indicator ('COST 12.5 \$'), a checkbox for 'Direct to Iridium', and 'CANCEL' and 'DEPLOY' buttons.

- Once the mission is received and accepted by the glider there becomes an available option to start the mission on the Cloud interface, the mobile app, and on the glider webpage as pictured below. This option remains even after power cycling the glider. The start button on the glider webpage can be found under the operations tab under the status section. Simply click on the button when the glider is out in open water near the mission site and ready to dive.





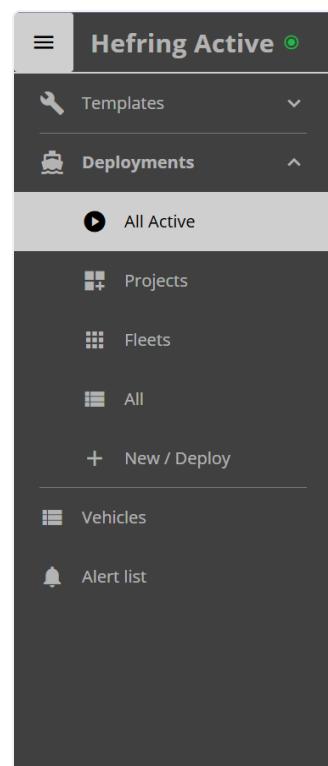
Running a Deployment

Viewing deployments

In the main side menu, you have different options for viewing deployments:

- All Active:** Displays deployments that are currently active.
- Projects:** Shows deployments grouped by project. You can also choose to view completed deployments.
- Fleets:** Shows deployments grouped by fleet. You can also choose to view completed deployments.
- All:** Displays a table with all deployments.

i We recommend using multiple projects to easily distinguish between deployments.



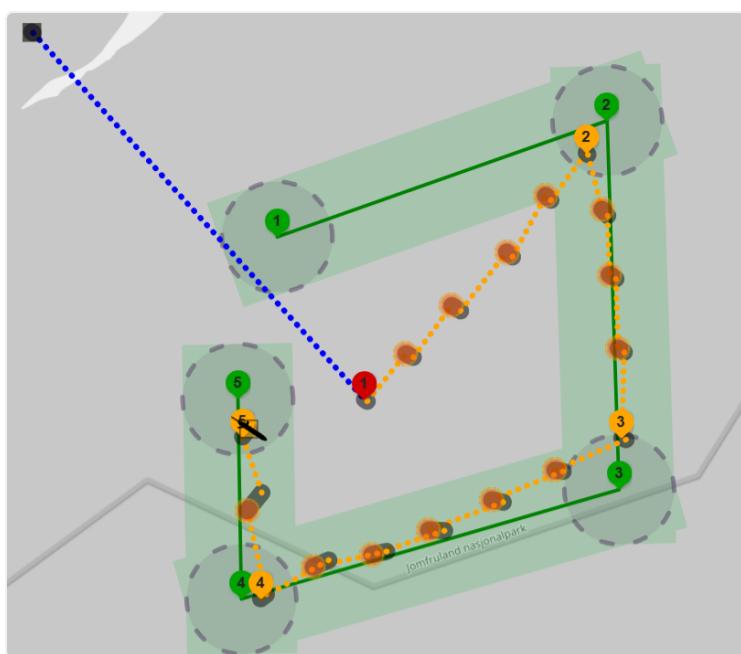
Deployment data

Select fleet	
VEHICLE	DEPLOYMENT
<input type="checkbox"/> TestFixture	Completed 50%, cost 0 USD Online now
<input type="checkbox"/> Geronimo	Completed 100%, cost 0 USD Online now
<input checked="" type="checkbox"/> Gyda	Completed 425%, cost 0 USD Online now
<input checked="" type="checkbox"/> Pocahontas	Completed 100%, cost 0 USD Online now
<input type="checkbox"/> Gimli	Seen: 10 hours ago Completed 0%, cost 4 USD
<input type="checkbox"/> Hafgufa	Seen: 12 hours ago Completed 17%, cost 0 USD
<input type="checkbox"/> Elrond	Seen: 39 days ago Completed 60%, cost 9 USD
<input type="checkbox"/> Círdan	Seen: 39 days ago Completed 80%, cost 10 USD
<input type="checkbox"/> Thorin	Seen: 50 days ago Completed 33%, cost 60 USD
<input type="checkbox"/> CloudSim	Seen: 124 days ago Completed 300%, cost 0 USD

You can view multiple deployments on the same map by using the checkboxes to select the ones you want to see. One of the selected deployments is designated as the main deployment, to which the data and command dialogs are connected. The deployment you select as the main one will have a highlighted background, and its vehicle name and mission name will appear below the command buttons on the map.

- i You can right-click on the deployment-name to zoom the map and display the full extent of the mission.

Track and route data



The green line represents the route that the vehicle should follow. The orange line shows the actual track the vehicle is navigating. The blue line indicates the path traveled toward the first start point.

You can click on waypoints, surface points, and segments to view detailed collected data.

Deployment Data and Override Command Dialogs

+/-
SUMMARY
ANALYSIS
VEHICLE
OVERRIDE

Select lap
<
<
1
2
3
4
>
>>

Gyda - 12/10/2024_12:06:28 PM

At the top of the map, you will find buttons to view deployment data. If the deployment and vehicle are still active, you can manually override the vehicle to navigate differently. If the deployment is set to perform laps, you can also select which lap to display.

- i Please note that these buttons apply only to the main deployment selected in the side menu. The selected main deployment name and vehicle name are displayed below the controls.

Summary:

- Displays data for the entire deployment.

Analysis:

- Allows you to select specific parts of the deployment and to plot data on charts. The **Versus** chart can be customized to compare two variables.

Vehicle:

- Shows information for the active vehicle. See **Active Vehicle Dialog** below for more detail.

Override:

- Provides commands to manually navigate the vehicle. This is only visible if the deployment is still active.
 - **Override Options:**
 - **Skip to Waypoint:** Jump directly to a specific waypoint instead of following the next in sequence. After skipping, it will continue (e.g. waypoint 1, 2, skip, 6, 7, 8).
 - **Move Waypoint:** Drag a waypoint to a new location. The waypoint will turn red, and a confirmation dialog will appear. Click OK to send the new command.
 - **Override Heading:** Manually set a heading (0-360 degrees), duration, and start time. Use with caution.

Cloud Data Export, Live Data Sharing, and Public Display Link

Click **EXPORT** at the bottom of the summary dialog to download route information, export live data transmitted to the cloud, or generate a public view link.



Deployment status
Deployment name: test5/30/2025_12:08:34 PM

SUMMARY

TRACK

TEMPERATURE

CONDUCTIVITY

SALINITY

DENSITY

SPEED

PAM

LOGS

Started: 5/30/2025, 12:08:51 PM Duration: 3d 6h Still Active

Vehicle Narwhal 1

Mode: ACTIVE

Firmware: TBD Battery: 100 % Last Alert: Changed mode WAITING_ACK

Seen at: 6/2/2025, 6:41:52 PM Lat: 42° 33' 42" N Lon: 70° 41' 9" W

Running costs

Iridium bytes: 0 B Iridium cost: 0.0 USD Api cost: N/A USD

Total cost: 0.0 USD

Power consumption

Power consumption: N/A Wh On: N/A Wh End consumption: N/A Wh Time elapsed: 3d 6h

Battery reduced: 0.0 Wh Initial: 2167.2 Wh End power: 2167.2 Wh Average consumption: N/A Wh

Voltage change: 0.00 V Start: 36.00 V End voltage: 36.00 V

Deployment setup

Start at waypoint index: 1 End action: LOOP Deployment timeout in days: 5

Recorder filename: testN_16_08_34

IOOS

Data (CSV)

Coordinates (CSV)

Export Route

Public availability

CHANGE MODE

EDIT ROUTE

EXPORT ▾

CLOSE

• IOOS

- Settings for Live data export to IOOS GDAC (Integrated Ocean Observing System Glider Data Assembly Center, <https://gliders.ioos.us/>)
- Please [contact Hefring](#) if you wish to register your company as a provider/institute.



Export  **OCEANSCOUT**
Export compatible file for IOOS National Glider DAC

The WMO id of the glider
A unique identifier
Narwhal 1-20250602T1806
Each WMO ID is unique to an individual glider deployed in a specific location and must be requested from the NGDAC administrator
A human readable unique identifier for data set, e.g. glidername-YYYYMMDDTHHMM

A title for the dataset
Narwhal 1-20250602T1806
We recommend using the trajectory variable string name, which must have the same format as id

Name of the sea
The source of the data
Observational data from a profiling glider
The project name the data was collected under
Boston project

Acknowledgement
None
Properly acknowledge use of the data

Summary of the dataset
test

Provide a useful summary or abstract for the data in the file. This summary is used as the primary piece of information describing the data set for discovery and archiving purposes. As such, careful thought should be put into constructing the summary.

Optional comment of the dataset
Created on behalf of Develop (<https://hefring.com>)
Deployment created: 2025-06-02T22:54:46.903Z

Free-form field used to provide additional information on the data set

Convention
CF-1.6
Version of the [Climate and Forecast metadata conventions](#)

Meta Convention
CF-1.6, Unidata Dataset Discovery v1.0
Unidata NetCDF group's [Attribute Conventions for Dataset Discovery](#)

Version of CF standard names used for variables
Standard Name Table (v82, 06 July 2023)

NetCDF file format version
IOOS_Glider_NetCDF_v2.0.nc
NetCDF file format version
Oceanscout

CANCEL **EXPORT**

• Data (CSV)

- Downloads all mission data transmitted to cloud by the glider as a .CSV file.
- Note that this is for truncated data as transmitted to cloud, complete data (including the high frequency CTD measurements and PAM data) is stored on the glider for download after recovery. Please refer to the Firmware section for instructions on data download.

• Coordinates (CSV)

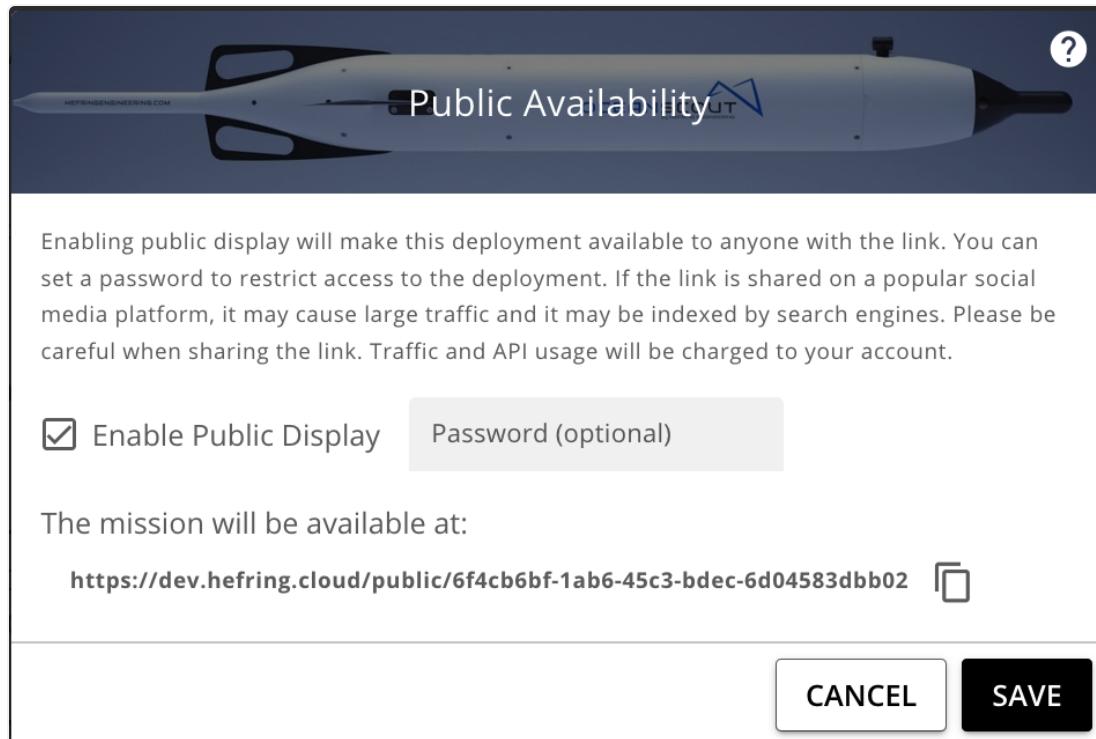
- Download positions as a CSV file.

• Export Route

- Exports mission route as a Hefring route file.

Public Availability (Share Link)

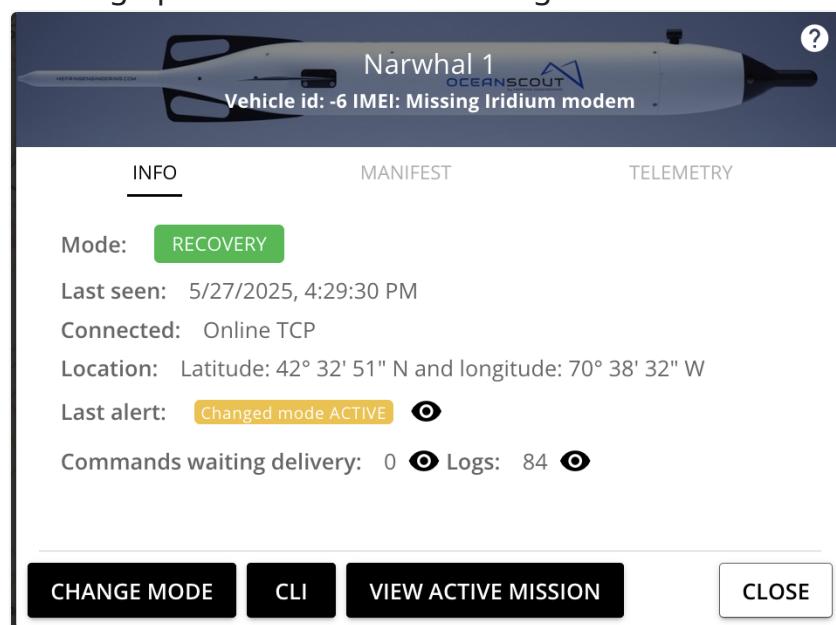
- This option generates a sharable link where others may view a live mission, without having control over the glider. For example, you might share the link with a class of students, a social media following, or a funding agency so they can observe a mission and look at data in real time, without the need to grant them any mission control access.



- Check the box to enable this option, set an optional password if desired, and copy/paste the link to share the mission.

Active Vehicle Dialog

Click on a vehicle's name in the menu, the "Vehicle" button at the top of the map, or a vehicle icon on the map to bring up the Active Vehicle Dialog.



This dialog displays the assigned vehicle name and IMEI (if Iridium modem is installed), and contains the following tabs:

Information

- Mode - The current mode of the vehicle.

Online - Indicates whether the vehicle is connected via TCP (WiFi) or Iridium.

- Last seen - The timestamp of the latest received telemetry.
- Location - Displays the vehicle's latest received coordinates.
- Last alert - The latest received alert message. You may click the eye icon to open a list of all received alerts.
- Commands awaiting delivery - Click the eye icon to see any commands awaiting reception and implementation by the vehicle. Click the eye icon next to "Logs" to see all commands received by the vehicle.

Manifest

Displays a printout of the vehicle's firmware and hardware. Sent on vehicle reboot.

Last telemetry

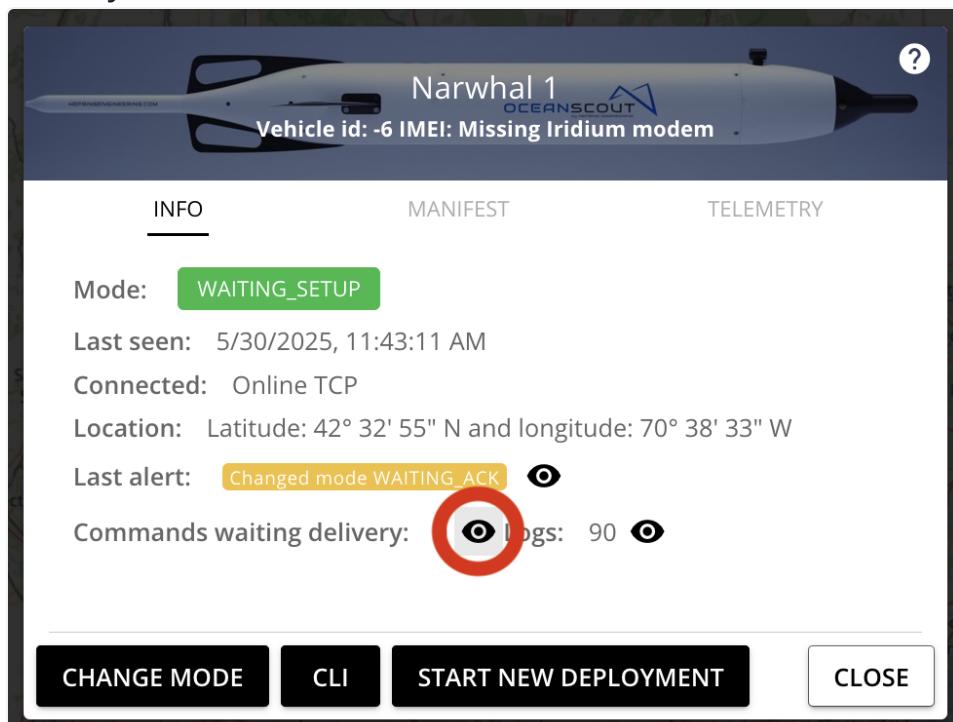
View the data from the latest received telemetry (received by Wifi or Iridium). If a deployment is completed or canceled, only the final telemetry is saved.

Buttons

- **Change mode** - Send a command and change the vehicle mode.
- **CLI**
 - Access the Command Line Interface to send custom commands (Advanced). See Command Line Interface section in this document. For a list of commands, see firmware section.
- **Start new deployment** - Initiate a new deployment for your vehicle.

Iridium Message Queue

To view the Iridium Message Queue (Commands for Vehicle), click the eyeball next to "Commands waiting delivery"



This displays mission commands sent to the glider through the Cloud interface.

The screenshot shows a dashboard for managing vehicle commands. At the top, there's a header with the text "Commands for vehicle OCEANSCOUT Narwhal 1" and a question mark icon. Below the header, a message says "Number messages waiting delivery: 1". To the right is a red button labeled "REMOVE ALL WAITING". The main area is a table with three columns: "Waiting", "Delivered", and "Executed".

Waiting	Delivered	Executed
Deployment: None Index: 117 Date: 5/30/2025 Time: 11:40:31 AM Commands: 1 (Meta) Bytes: 67 Received by Shore: true In AWS connect: false In Iridium queue: false		Deployment: SimVehicle_5/21... Index: 116 Date: 5/29/2025 Time: 10:09:20 AM ACK Commands: 1 (Maintenance) Bytes: 39
		Deployment: SimVehicle_5/21... Index: 115 Date: 5/28/2025 Time: 4:46:09 PM ACK Commands: 1 (Halt) Bytes: 39

At the bottom left, it says "Vehicle last seen: 5/30/2025, 11:40:13 AM" and at the bottom right is a "CLOSE" button.

The states for vehicle commands are as follows: **Waiting**, **Delivered**, and **Executed**.

- **Waiting:** Commands dispatched to the cloud are initially held in a database on Hefring's server, referred to here as "waiting". When a vehicle connects to the cloud (eg. surfaces and sends telemetry) commands are sent sequentially. Commands in "waiting" may be revoked if they are made in error. Iridium commands leave Waiting and enter the Delivered (Iridium) queue and are processed when the vehicle checks in with the Iridium network.

For TCP connections, commands are sent directly to the vehicle bypassing any queuing system.

- **Delivered:** Indicates that commands have reached the Iridium server, but not necessarily the glider yet. Delivery to the glider is uncertain until the vehicle acknowledges execution with an ACK (acknowledgment) or NACK (negative acknowledgment) telemetry message. Radio reception issues might lead to executed commands without confirmation. **Messages that have reached the Iridium server or vehicle (Delivered) cannot be revoked.**
- **Executed:** Indicates that commands have been received and executed by the vehicle, confirmed by an execution report. Successful executions (Acknowledged, "ACK") are marked green, while failures (Not

Acknowledged, "NACK") are marked pink. Click on a command to view details of any unsuccessful execution.

Click on any command to view its details. If a command fails, consider **Halting** and issuing new instructions, as failed commands may leave the vehicle in an indeterminate state.

"Last seen" indicates when the vehicle last connected to the Iridium network. To receive commands, the vehicle must be surfaced, upright, and unobstructed. Conditions such as waves, wind, or heavy cloud cover can prevent connection. If connection fails, the vehicle will store unsent data and retry on the next surface.

Bypassing the waiting queue: Commands may be sent **Direct to Iridium** to bypass the "Waiting" queue by checking the checkbox when available in control dialogs. Messages in waiting may also be manually pushed to the Iridium queue using the yellow "Move Messages to Iridium" button. Use these options with care. Commands made in error can be revoked if they are sitting in "waiting" (Hefring server) but CANNOT be revoked once they are in the Iridium server "Delivered".

Deleting Messages: The trash can icon will remove and actually revoke messages in the Waiting queue. It can NOT revoke messages in the "delivered" (Iridium) queue. Messages erased from the "Delivered" queue are not actually deleted when the trash can icon clears them from view. However, if a message appears "stuck" in the iridium column (eg. it was dropped by Iridium so it will never reach the glider but remains listed in the queue) the trash can button will clear it from view for convenience.

Executed Yo Dialog

[SUMMARY](#) [START](#) [END](#) [YO](#) [TEMPERATURE](#) [CONDUCTIVITY](#) [SALINITY](#) [DENSITY](#) [SPEED](#) [PAM](#)

Start Location (Dive)

Timestamp: 6/2/2025, 7:27:29 PM **Latitude:** 42° 33' 60" N **Longitude:** 70° 40' 1" W

End Location (Surface)

Timestamp: 6/2/2025, 8:00:40 PM **Latitude:** 42° 34' 9" N **Longitude:** 70° 39' 27" W

Track execution

Distance: 808 m **Time:** 33m 32s **Horizontal speed:** 0.00 m/s **Track:** 70 deg # **yo:** 4

Power consumption

Power consumption: N/A Wh **Start consumption:** N/A Wh **End consumption:** N/A Wh **Time elapsed:** 33m 60s
Battery reduced: 0.0 Wh **Start battery capacity:** 2167.2 Wh **End power:** 2167.2 Wh **Average consumption:** N/A W
Voltage change: 0.00 V **Start voltage:** 36.00 V **End voltage:** 36.00 V

[CLOSE](#)

After your glider completes a dive you will see the track displayed as a dotted line on the map. Clicking a section of this line will open the Executed Yo view. Here you can review a variety of information and preview data from that specific dive.

• Summary

- This tab contains the dive summary including times, positions, and power data.

• Start

- "Start" is the final telemetry sent before diving. Telemetry involves transmitting a data package from the vehicle upon surfacing. This package contains details regarding the vehicle's current status and its planned next destination.

• End

- This is a dive summary containing data from the dive as well as from yo's between start and end. This section provides detailed information about the vehicle's status at the time it surfaced.
- An "**intermittent point**" refers to a specific surface location along a segment, positioned between two waypoints.
- The **Expected Dead Reckoned Location** indicates the vehicle's estimated position upon surfacing, while the **Surface Location**, derived from GPS data, reflects the vehicle's actual position. Discrepancies between these locations often result from variations in the depth current during the dive. The vehicle uses the calculated average current to navigate accurately to the next waypoint.

- For precise surface current measurement, the vehicle performs a second GPS reading immediately after surfacing.

- **Yo**

- This table shows all the yo's done between this surface event and the previous one. Press the + to see more detail about each "yo".

- **Temperature**

- This table and plot display temperature versus distance for the selected segment(s).

- **Conductivity**

- This table and plot display conductivity versus distance for the selected segment(s).

- **Salinity**

- This table and plot display salinity versus distance for the selected segment(s). The salinity is calculated from conductivity, temperature, and pressure.

- **Density**

- This table and plot display the density versus distance for the selected segment(s). The density is calculated from conductivity, temperature, and pressure.

- **Speed**

- This table and plot display the speed of sound versus distance for the selected segment(s). The speed is calculated from conductivity, temperature, and pressure.
- The **Table** displays various parameters in relation to depth, with the currently selected parameter highlighted in **bold**.
- The **Chart** graphically represents the selected parameter against depth.

- **PAM**

- The **Passive Acoustic Monitoring (PAM)** device is designed to listen to the sounds of the ocean. It generates a chart that maps sound intensity against frequency, providing insights into the acoustic environment underwater. Note that the power spectrum plots displayed here are only a summary. Complete data is stored to the internal SD-card for post processing.
- Utilize the navigation arrows to browse through different sound samples.

Command Line Interface (CLI) in Cloud

Cloud has a built-in console to send commands to gliders over Iridium. This is an advanced feature for experienced users and field troubleshooting, please use extreme caution when sending commands to deployed gliders. Command line is powerful and lacks the "guardrails" in place throughout the rest of the Cloud user interface. **Improper commands could result in vehicle loss.** Some common commands are not appropriate to send to gliders at sea. **Consult Hefring for guidance on using the command line, we are happy to help.**

```
OK
=>
5/21/2025, 10:59:53 AM mission.getabort
Stage: EXECUTED ACK: Narwhal 1 Ocean Scout CLI (Level 0)
=> mission.getabort

recvfrom failed: Resource temporarily unavailable
ERROR

=>
5/27/2025, 4:41:09 PM super.status
Stage: EXECUTED ACK: Narwhal 1 Ocean Scout CLI (Level 0)
=> super.status

Supervisor state: RUNNING
Run Type: MISSION
Error: NONE
Sequence Status: Executing behaviour RECOVERY

OK
=>

Narwhal 1:>
```

CLOSE SEND

To access cloud command line interface, Click the "CLI" button in the Active Vehicle window. Use the drop-down menu to select from a range of common predefined commands, or write your own. Consult the manual for a list of valid commands. Please allow some time for the glider to respond. If it is currently underwater, it will not receive messages until it surfaces. If it is on the surface (Idle, Abort, or Recovery modes) CLI response time is still limited by the current telemetry interval setting.

Note that command response length is limited. Commands that print long responses (eg. requesting battery stick information) will be cut short.

For a list of commands, refer to the firmware section.

Account Settings

Select the three bars in the upper left of the main Cloud view and expand the Account tab to access settings

Profile

This section is dedicated to viewing and managing your user account. Deployments created or overseen by your account are listed here. For detailed viewing and management, simply click on the respective deployment. Default avatars are randomly generated. To update your avatar, click "edit" beneath the profile image.

Notification

Email notifications are sent directly to your email address, while push notifications are delivered to your browser.

You can choose from the following options:

- None
- Critical Only - e.g., *system failure*
- Major and Critical - e.g., *waypoint reached*

- Warning, Major, and Critical - e.g., *low battery*
- All Notifications, including Information

Note: Mobile notifications are not yet supported, but will be available soon.

Units

This section allows you to customize your units of measurement for display throughout the Hefring site. Options include US imperial, metric, or nautical units. You are free to choose any preferred combination of these units.

Changes are saved automatically, so feel free to navigate away when done.

Show Terms

Shows terms for usage

Sign Out

Sign out your account

Management settings

Meta

This is where you can view general information about your organization. If you need to change any of it, please contact [Hefring support](#). You may upload a logo by clicking "Change" under the placeholder logo image.

Fleets

This is where you view and manage your fleets.

You may filter by name, or simply find what you are looking for in the list. If the list is empty, you may create a new fleet by clicking "New fleet". From the list you may assign users and vehicles to your fleet, and assign your fleet to a project by clicking the corresponding buttons.

- Click the group of people icon to view and edit users
- Click the glider icon to view and edit vehicles
- Click the boxes icon to view and edit projects

If you have many fleets, you may choose how many you see on each page by clicking "records per page" and selecting the desired number. When creating a new fleet, you may assign a name, a description and an image.

Vehicles

This is where you view and manage your vehicles. You can view the vehicle name, its "Vehicle ID" (Vid), the fleet it's assigned to and the attached nose cone.

To be able to edit its properties, the vehicle needs to be in "MAINTENANCE MODE". Contact Hefring for assistance. To edit, click the vehicle in the list. You may change the vehicle name, and reassign it to another fleet by clicking the "Member of fleet" dropdown. You may also reassign its nose cone. We recommend that you name your vehicle in a way that corresponds to the nose cone that is mounted to it.

Nose cones

This is where you view and manage your nose cones. You can see the nose cone name, its "IMEI" and which vehicle it is attached to.

To be able to reassign a nose cone, it needs to be in "MAINTENANCE MODE". Contact Hefring for assistance. To edit, click the nose cone in the list. You may change the nose cone name, and reassign it to another vehicle by

clicking the "Connected to vehicle" dropdown. We recommend that you name your nose cone in a way that corresponds to the vehicle it's mounted to.

If the field "IMEI" is set to "N/A", the nose cone is virtual, and used for testing only. A real nose cone will display an "IMEI" number.

Users

This is where you view and manage your organization's user accounts. It is only available to organization admins.

From the list, you may edit existing users. To do this, click the desired user. From here, edit the user's name, email and phone number. You may also grant admin access by clicking the "Organization administrator" checkbox. To remove access for a user, click "Archive". To send a new password, click "new pass". To assign a user to a fleet, click the "fleets" button, and check any fleet(s) you want the user to have access to.

You can change your avatar by clicking "edit" under the profile image.

Projects

This is where you view and manage your user projects.

Any projects created or managed by your user will be listed here. You may view and edit these by clicking the desired item from the list. From here, you may edit the project name and description. If you wish to remove the project, click "Archive".

If you want to assign fleet(s) to a project, click the "Fleet" button. From here, you may select the desired fleet(s) by checking them in the list.

Billing

This is the billing view, where you can view accrued costs filtered by month, deployments, fleets and projects.

Clicking "Preliminary invoice" under "monthly" gives you a .pdf with an estimate of costs so far this month.

If you have questions regarding your invoice, please contact [Hefring support](#).