seacape GCS: User Guide

Version of user guide: 2024-11-22

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About the SeaScape GCS

The SeaScape GCS app is an Android only application developed by TechAdVision as a companion app our boats and motors under the brand “Seascape”. This application is not designed for use with any other type of autonomous equipment. The application is delivered as part of the equipment purchased.

The application is restricted to landscape device orientation and is not designed to allow split screen with other apps. If you need to multitask with another app, please open the other app in “pop-up” view mode.

First time use

Installing the application

The application is normally installed on an Android device by TechAdVision as part of the equipment delivery process. If needed, the app can be updated or re-installed using the Google Play store. Search for Seascape GCS or use the QR code below:

Configuration to consider before using the application

Seascape GCS is normally set up to fit the equipment you purchased. There should be no need to perform additional steps. But you may tailor the application to fit your preferences. Here is a list of options you should consider:

- **Telemetry connection**:
  Standard connection for our equipment is Bluetooth. Please do not change this.
- **User interface**:
  - Manual driving direction:
    When selected, a red line visualization of travel direction is displayed in manual driving mode.
  - Show user position on screen:
    User position utilizes the Android device GPS and also illustrates direction of movement. If you have the device inside the boat being controlled then you should disable this choice.

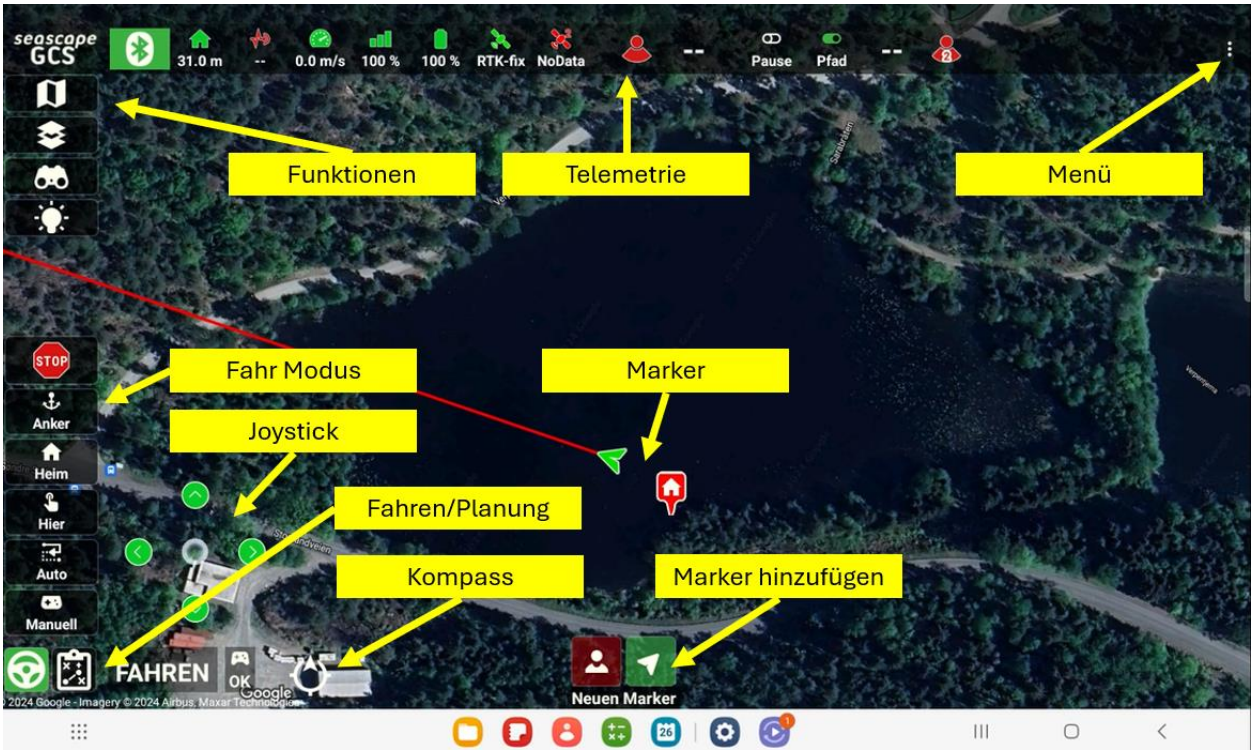
- Display marker path while driving:
  When driving missions, the white arrowed path of travel may be useful to see. You may disable this if so desired.
- Unit system:
  Metric measures is the default when the app is installed.
  Select imperial if desired.
- Speed unit:
  Select m/s or km/h as you prefer (or ft/s vs. mi/h for imperial units)
- Low battery alert:
  Although the remaining voltage is visible as telemetry, an additional high visibility screen alert will notify you even more if the voltage drops beyond the lower threshold. You may disable this if so desired.
- Audible alerts:
  Enabled by default, the app speaks loud when mode is changed, what waypoints are passed, when main events between boat and GCS occurs. You may disable this if desired

- **Boat**:
  - The battery type and size
    Is set by TechAdVision to suit the equipment of use. Smaller boats use 3s LiIon packs, while larger systems may have a different setting. If you select the wrong preferences then it will affect telemetry measures and the visual low voltage alert only.
  - Force manual mode using throttle:
    If you use a game controller then, instead of using the app “stop” button you may force stop automated driving and enter manual mode by raising the throttle to max for 1+ seconds. This option is not enabled by default.
- **Echo sounder**:
  - Installed echo sounder:
    Set as part of the equipment delivery. If you change this then the app will no longer receive data from the echo sounder.
  - Echo sounder integration:
    Set as part of the equipment delivery. If you change this then the app will no longer receive data from the echo sounder.
  - Use second echo sounder:
    Set as part of the equipment delivery. Only relevant if your equipment came with a second echo sounder installed.
  - Draw map with second echo sounder:
    Allows you to select which echo sounder that will draw data on the map

using the second echo sounder. Logs from both echo sounders are still captured. Only relevant if your equipment came with a second echo sounder installed.

- **Joystick and Game Controller**
  - Use game controller:
    If your equipment came with a Bluetooth Game Controller or you purchased this later then this setting should be enabled. Supported controllers are many, but we recommend using a PS4 controller that is paired to the Android device using Bluetooth (although a cabled connection will also work).
  - Left or right stick for throttle:
    The app does not let you use both sticks on a game controller for throttle and steering. Please select the stick you prefer.
  - Use on-screen joystick:
    Enabled by default, you may drive and steer using the on-screen joystick. If you rather use a game controller then this setting can be disabled.

The user interface



The telemetry top bar

Connection status

When not connected the Bluetooth icon will be red. When connected, the color is either yellow or green:

- Yellow: Boat is connected, but autopilot position quality is bad and automated driving is not possible
- Green: Boat is connected, minimum position quality is achieved and automated driving modes are possible

Distance from home position

When not connected and when connected but without a report from the autopilot about its home position the icon is red. The autopilot reports its home position when position quality is achieved and the icon turns green.

- Telemetry value show the distance between the boat and the home position

Distance to object

Boat may be equipped with a lidar to measure distance to a potential blocking object. If no lidar is detected the icon will remain red:

- Telemetry value is the measured distance to a potential blocking object

Speed

Speed is reported by the autopilot. If no speed is reported the icon stays red, green when speed is retrieved:

- Telemetry value is the speed measured by the autopilot

Signal

The signal is a quality measure for the received vs dropped packages in the telemetry connection. The icon colors will illustrate the rough value thresholds.

- The telemetry value is a signal quality measure of the telemetry link

Battery

If no voltage level is reported the icon will be red with a question mark. The other colors illustrate the rough voltage level thresholds.

- The telemetry value is a percentage calculation of remaining battery capacity based on the current voltage level

GPS signal

If no GPS is available the icon will be red. The GPS icon will remain red until a fix is achieved. The icon will then turn yellow when a 2D fix only is achieved. And eventually turn green when the 3D fix is achieved. GPS has multiple telemetry values available as a drop down when clicked. Telemetry values that are available:

- Type of fix: No fix, 2D, 3D, 3D DGPS, RTK float and RTK fix
- Number of satellites used (not visible, use for navigation)
- The current HDOP
- The current position in degrees decimal latitude and longitude

Boats may be equipped with multiple GPS modules. If a second is installed then the telemetry line will show the telemetry status for the second separately.

Temperature

If no temperature data from the connected echo sounder is available then the icon will be of red color. It will turn green as son as the app starts to receive temperature data.

- Measured temperature in degrees Celsius to be displayed below the icon

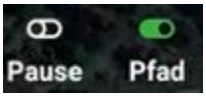
Echo sounder

If no echo sounder data is available then the icon will be red in color. It will turn green as soon as the app starts to receive measured depth values from the echo sounder.

- In larger sized letters to the side, the value of the measured depth is displayed

If the boat is equipped with dual echo sounder, a second telemetry is available for this.

Bathymetry



Not telemetry per se, but rather two important switches for bathymetric data capture is available in the telemetry bar:

- Pause vs Rec:
  By flipping the switch to “Rec” the user can start recording data to the built in bathymetry log database. Data capture is stopped by flipping the switch back to “Pause”
- Additional mapping options:
  Before start of capture the user will have to enter a name for the data set. In the dialog box to enter name, additional options may also be selected (like color scheme)
- Path vs Map:
  By flipping the second switch to Map: The app will draw a 2D depth map based on the measured depth data captured. Color map and level of contour details as selected.

By flipping the switch to Path: The app will illustrate captured depth values as small dots with color matching the color map selected.

The application menu

By clicking the three vertical dots top right, the user may enable the application menu:

Marker menu

The marker menu contains a set of optional actions to manage the markers currently visible on the map. Choosing from the menu, action names should be self-explanatory and action will be instant. Some of the most destructive actions will be accompanied with a dialog to confirm you did not select the wrong action by mistake.

Send to boat: What is currently visible in the app is sent to the boat

Get from boat: What is currently stored in the boat is downloaded. Whatever was presently visible in the app gets replaced.

Save to file: You may store what is currently visible in the app as a file to be retrieved later or shared with someone.

Import from file: You may import a set of waypoints and have these loaded info the app. Whatever was presently visible in the app gets replaced.

Show waypoints here: If waypoints were previously added to the database in this area (the visible map area currently on screen) they will be loaded info the app. Type of waypoints: Waypoint.

Show mapping here: If waypoints were previously added to the database in this area (the visible map area currently on screen) they will be loaded info the app. Type of waypoints: Mapping.

Delete mapping: Waypoints presently on the map of type Mapping get deleted. You will need to confirm this. The mapping markers will not be removed from the database.

Delete all: Waypoints presently on the map, no matter which type, get deleted. You will need to confirm this. The markers will not be removed from the database.

Tools menu

Three tools are available in the app:

- The file manager
- The admin tool for markers database
- The bathymetry editor

Info menu and Settings menu

The info menu opens up a pop-up window displaying which version that is currently installed and the major features added or bugs corrected. You may scroll through the entire history.

The settings menu opens the preferences screen and lets you change your settings.

The general function buttons

Most of the buttons top left will expand a set of sub actions when clicked. The activated button will turn into orange color.

Map choice

This application use Google Maps. Four different map types are supported, selecting one will instantly change the on-screen map.

Note: This app does not store maps offline. You need internet connection to retrieve maps from Google.

Depth map choice

Show a depth map allows you to retrieve KMZ files currently available in the KMZ folder and have it displayed on the map. The app will then zoom in on the area where the KMZ is placed. You are limited to show one KMZ file, if another KMZ file was previously displayed it will be removed.

Remove a depth map removes the currently displayed depth map (if any) from the map.

Find choice

The four quick find and zoom into choices are:

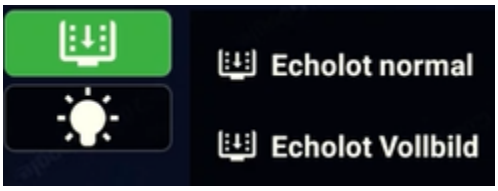
- Find boat: Zooms in on the area where the boat is currently positioned
- Find mission: Zooms in on the area that covers the current set of boat, home and waypoints presently available in the app.
- Find me: Zooms in on the area where the Android device running the app is currently positioned.
- Map search: Brings up a dialog where you can enter a search string and select from search result. The map will zoom in on the selected search result.

Note: Map search requires an active internet connection and will not work otherwise.

Light switch

When the boat is connected you may turn the lights on or off using this button. When it has a green color the lights are turned on.

Echo sounder viewer (BETA)



The button to show echo sounder will be visible if you, in settings, select the option to show echo sounder inside the app. Please note that this function is currently a beta feature and will remain “beta” until the desired image quality is achieved.

The normal echo sounder choice opens a window down/right where the echo sounder screen can be viewed. The driving map remains the same.

The full screen choice removes the driving map and moves this to the down/right corner. The echo sounder will fill the entire screen. But still underneath all app buttons, telemetry and so on. The app can be used for navigation as normal, the only difference is that the map is reduced in size.

When the echo sounder screen is active, the button stays green. To close the echo sounder screen (full screen or windowed mode), tap the button once more.

Side lap painter (BETA)

The side lap painter is currently a beta feature. It will paint the driven path between waypoints in an automated drive. The center line of the paint is the driven path, the extent to each side is determined by the side lap value selected for the mission. This only makes sense to equipment delivered by TechAdVision where “coverage” set by side lap has a real function.

When activated the button stays green. If you tap it again, the painting will be removed. In the beta test the painting cannot be recovered once removed.

This beta feature will be used as a visual proof of concept for a special use case. If concluded to be of interest, the solution will be implemented in a far more robust manner as a tool for documentation.

Buttons to change between driving and planning modes

Bottom left on the screen you will find two buttons that impact the app behavior, and the current mode of operation is confirmed by text to the right hand side of these buttons:

The Wheel button sets app into “driving mode”. By doing so, any planning tools are removed and the driving modes plus the optional on-screen joystick is also made available when driving mode is manual.

The planning button will remove the driving mode buttons and the joystick (if it was presently available) and add buttons to aid your planning.

It is possible, but not recommended, to enter planning mode while actively driving. An alert will be displayed if you enter into any non-driving part of the application when an automated mission is being executed. Even though not recommended, the app will allow you provided you confirm the question. It is understood that you thereby accept that the tools to control driving (like the “stop” button”) is not available when the driving screen is not available while the boat is actively driving.

Driving mode explained

The active mode will always be colored green. The mode selected is triggered by you pressing a mode button, but is actually only activated (and colored green) when the autopilot accepts the mode change command.

Manual mode

The manual driving mode is always available and **can always be selected**, even when the GPS conditions are bad and a proper position accuracy is not (yet) achieved.

The boat may be driven with a joystick (on-screen, game controller or a physical joystick built into some of TechAdVision's products.

Auto mode

The "auto" mode is **only possible to select when the autopilot is satisfied with position acccuracy** (minimum threshold value).

Before entering "auto" the app will check if it has determined that the waypoints currently present in the app has been sent to the boat. If that is not the case, a warning will appear and ask you to take action. Once the waypoints are confirmed received by the boat the panel to control automated driving will appear. Mode "auto" will only start when you hit the "on" button in this panel.

The application will also perform a "zoom to mission" before opening the control panel. In case you forgot to remove some unwanted markers from the last time of use, this will now be clearly visible. To remove unwanted markers, enter planning mode and clean up before you continue.

The supporting tools available during "auto":

Cancel or start

The question mark indicates the mode is not yet activated. Use the cross button to abort, or the “on” button to start.

Once started, the question mark is removed. The cross button to abort is always visible. Using it will abort the “auto” mode and shift the active driving mode to manual driving.

Current target and the number of waypoints in the mission

As the mission progresses the app will speak up the waypoint passed and then shift the “next target” to the upcoming waypoint. The current waypoint is a dropdown, you may click and select another waypoint from the list and the mission next target will instantly apply.

Changing the driving speed

At any time you may change the mission driving speed by using + and – buttons. Should you change the speed, you need to confirm the new settings in the top of the panel (the check marker icon to the right):

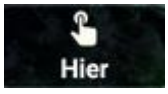
Reducing speed before targets

All waypoints in the missions are “targets”. Depending of your use, reduction of speed before reaching a waypoint may be beneficial. To activate this, use the chekbox. Settings for speed are changed using the + and – buttons, and you need to confirm the change in the identical manner as for the driving speed.

Remaining time and distance

The remaining distance and the time needed given your current speed is continuosly calculated and made available in the bottom of the panel.

Goto mode



The “goto” mode is **only possible to select when the autopilot is satisfied with position acccuracy** (minimum threshold value).

The goto mode is activated when you click a marker. The boat will change into goto mode and instantly drive to the clicked marker and stay there.

Note: If the boat is running “auto”, the boat will NOT enter goto mode but instead set the clicked marker as the next target.

Go home mode

The “home” mode is **only possible to select when the autopilot is satisfied with position acccuracy** (minimum threshold value).

When entering “home” driving mode the boat will instantly drive to the red home marker on the map, and then hold position at that marker. Before entering home mode, please make sure the home mode is placed in the water and not on the shore. The home marker can at any time be moved into the water by long click + drag. Once dragged to a new position, the boat “home target” is updated and will continue driving to the updated position.

Anchor mode

The “anchor” mode is **only possible to select when the autopilot is satisfied with position acccuracy** (minimum threshold value).

The “ancor mode” will enter “hold position” mode. The boat will try to keep position and will use the boats motors infrequently to achieve this.

Stop (emergency) button

The “stop” button is made available to be an easy to spot button in case of emergency. The red color makes it stand out in the user interface. The effect of pushing it is an instant change into manual mode so you may use your joystick or game controller to come out of a potential difficult situation.

Planning mode explained

You are recommended not to enter planning mode while an automated driving mode is activated.

When planning mode is activated, the driving mode buttons are all removed from the user interface and replaced with buttons to aid your mission planning. The driving map is still present though, including the boat icon, as this app in comparison to most similar apps only swaps the functions and not the map itself.

The planning tools are made available partly on the left hand side (replacing driving modes) for objects use:

Add a marker

To add a marker, tap the marker button and then tap the map (once for each marker) where you want markers added.

Note: If a depth map (KMZ file) is currently covering an area where you want to add a new marker you must long tap the map. Long tap will always add a marker, even when no KMZ is overlaid the map.

Select a marker

In planning, if you click on regular marker, the selected marker turns into gray color and an info panel will appear:

The format of position can be freely selected using the dropdown in the panel above the marker position. Available formats are WGS84 (degrees decimal), DMS (degrees, minutes, seconds) and UTM. The selected format is remembered.

Available types are, in this version, “waypoint” and “mapping”. You may change by tapping the type and select another type.

Below the type you can press “delete” to remove this marker. If any other marker is present in the mission, the panel will auto-select the next (higher), or previous if you just deleted the one with the highest number. When the last marker in the mission gets deleted the panel will close. The close button simply closes the panel and deselects the marker.

In the black area there you can use the << (select previous) and >> (select next) buttons to select other markers in the current mission. In-between the selection buttons you see the type of marker and its number, and the distance to this marker from the current home position.

Add a boundary for grid planning

To add a boundary, and have the app create a grid within this boundary, hit the boundary button and draw a semi closed polygon using your finger or a pen:

When you lift the finger, the app will close the polygon and add boundary icons along the polygon perimeter. The last used grid type, angle and side lap will then instantly be applied to the bordered area:

Please note  The **yellow icon is the entry point** for the grid

What happens when you tap these icons?

Short tap  Brings up the **info panel** for the grid

Adds **one additional marker on each side** if you need it

Long tap  “Lifts” the icon up so you can move it to a better position and release it to better fit the area you want to cover

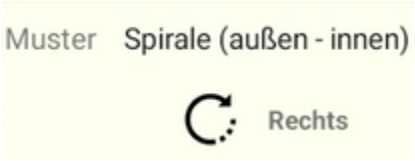
When satisfied with the boundary, tap the yellow or the white circle markers to bring up the info panel for the grid where you may modify multiple settings:

This compact info panel offers you powerful abilities to tailor the grid to suit your purpose. Any changes as described in the following are instantly applied to the grid. If you selected the wrong choice then do not worry, you can change it back and alter to your desire until the grid is converted into waypoints. More about that later.

Type of grid

The pattens are assumed to be intuitive. Any changes using the dropdown selection are instantly. Some sub settings will not be available based on the choice of pattern.

Clockwise or counterclockwise spiral

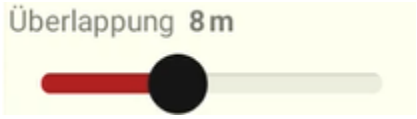


The clockwise choice is relevant for spiral patterns only. Two options – right turning or left turning spiral.

Driving angle

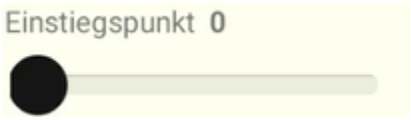
Relevant for parallel and cross pass grids. You may need to set this if you make a grid encapsulating a shoreline as some angles will produce driving paths over ground (must be avoided). Some angles also result in an overall longer length of driving.

Side lap



The side lap is the distance in meters between the driving lines. A narrower side lap increases accuracy of the captured area but also extends the driving distance.

Point of entry

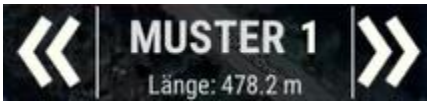


By dragging this slider you can decide the entry point of the grid. All white icons are possible entry points. By moving the slider the yellow marker is moved accordingly.

Delete or close

You may close the info panel, but also delete the entire grid object using these buttons.

Navigate between markers and grid objects



The arrows on the ends let you move through mission objects (other markers/grids), and the panel updates its information accordingly.

Add a driving path

If needed you can have the boat travel a path of waypoints. You draw a polyline using your finger or a pen:

When you lift the finger, the polyline is instantly converted into a set of waypoints for the boat to follow during an automated mission:

Deleting stuff

If you activate the delete button, it will turn red. As long as the button is red, any marker you click will instantly be deleted.

If you long press the delete button, additional tools to delete more broadly will appear:

When using these choices, the app will ask you to confirm before deleting:

Delete selected: Deletes all waypoints that are currently selected (selected markers are black in color)

Delete mission: Deletes all waypoints and grids.

Delete mapping: Deletes all markers of type mapping and grids.

More planning tools at your disposal

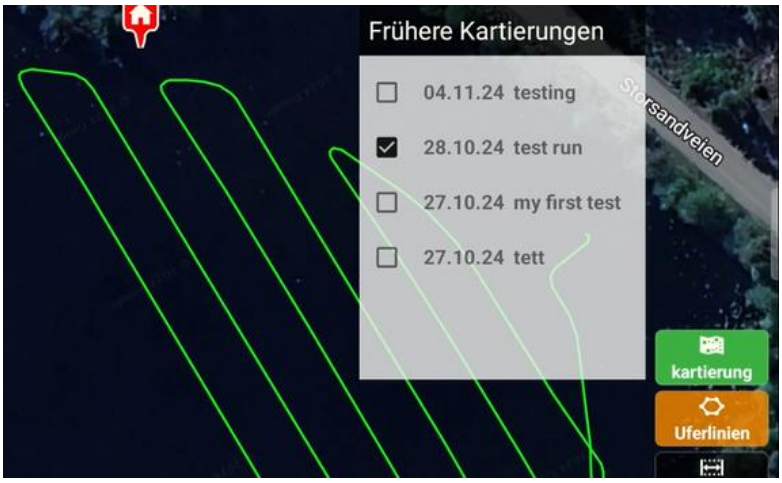
Planning tools are also partly visible the right hand side (additional tools):

Previously executed mapping tracks and available shorelines

Mapping data available

The tracks button is transparent black if you are in an area with no prior mapping activity stored in the database.

If you have used this app to capture data in an area, the app has the ability to recognize this and make the tracks button orange. The ability is useful if you capture data for a given water body over several sessions. If the button is orange it means there are captured tracks within the visible area of the map. By clicking the button a window appears with a listing of all tracks in the area (date and name is shown). By selecting one or more track from this listing the captured paths are displayed on the screen as green lines to aid your planning to complete the area. The green lines will be present until you deselect the chosen mapping track or close the window by clicking the tracks button once more.



Use your shorelines to plan, and how to import one

The shorelines button is transparent black if you are in an area with no prior shoreline data stored in the database.

If you have used this app to draw a shoreline or to import a shoreline from a CSV, the app has the ability to recognize if shorelines are available in the area and then turn the shorelines button orange to alert you.

Use a shoreline to plan a mission

Clicking in the shoreline button brings up a window displaying available shorelines in the area. By selecting one, the shoreline will be visualized as a red boundary, and a white offset boundary planning polygon will appear within. Offset distance in meters between the shoreline and plan polygons you set with the sliding drawer,

When satisfied, press the draw button. The shoreline popup and the red and white polygons disappear, and a boundary object is created ready to be uploaded to the boat.

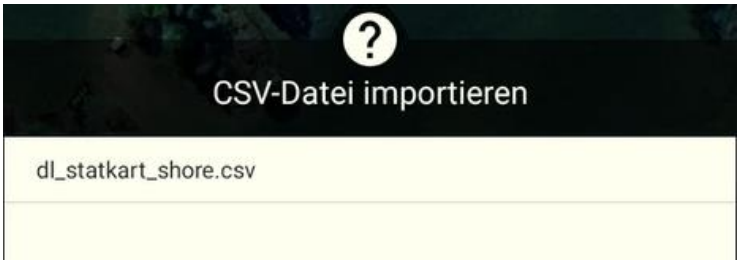
Import a shoreline from a CSV

In this version of Seascape, importing a shoreline to the database and then use it to plan a mission is supported based on the following requirements (abilities will likely be extended in a future version):

- File type (extension): csv
- The file may have many columns of data, but the app expects the following to appear as the two first columns:
    - Column 1: latitude
    - Column 2: longitude
    - Latitude and longitude MUST be formatted as decimal degrees (WGS84)
- If the input file does not comply, the import will gracefully fail
- In addition, files are only looked up in app-internal folder “CSV-import”.
    - When you have a CSV file available, say in a file manager app, then use the Android concept to share file to another app. Make sure you share the actual file and not only a link (important when sharing from OneDrive), then:
        - select Seascape as destination,
        - Seascape app opens with its built in file manager active
        - select folder “CSV-import”
        - hit the white + button top right and you are done!

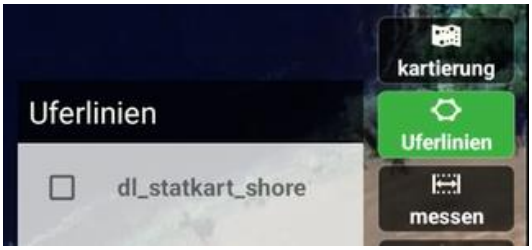
When you have shorelines made available in the CSV-import folder you can import them to the database (one at a time): Press shoreline button, then press import down left:

This will bring up a dialog listing all CSV files available:



Select the desired file. The import dialog appears. Here you may select a name for the shoreline. The file name will be pre-filled in the edit field for your convenience:

Click OK to execute the import. The import will store the shoreline in the database, and it will automatically appear among the selectable shorelines if your map view is showing the same area as the imported shoreline belongs to:



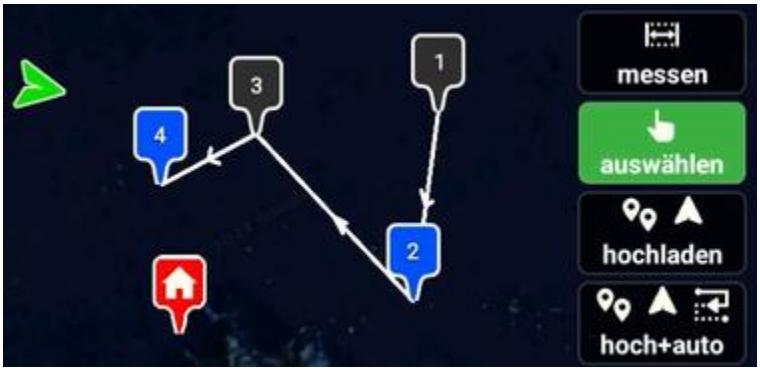
Now you can use the newly imported shoreline to plan a mission as described above.

Measure distances

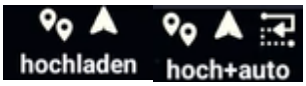
With the measure tool activated you can measure distances on the map (any point) or between markers of the map. Click first for starting point, click then for end point. Click third to remove. And start over again if needed. The distance is visualized in yellow between two measure pins.

Multi select

With the selection button activated you may select one or many markers on the map. Selected markers appear in black color. These can now be deleted using the delete seleted option.



Upload plan to the boat / Upload and enter auto mode



These functions are for convenience.

Upload simply sends the mission to the boat with no need to use the menu.

While upload + auto will swap from planning to driving, then upload the new mission item and finally trigger mode “auto”. The auto control panel will appear when done, press start to execute the mission.

Other icon functions in the user interface

With the majority of functions for driving and planning explained, let’s dive into the other graphical objects and functions in the app.

Game controller indicator

Android game controllers only work provided the app has focus. When something else steals the focus, even some functions within the app (like an expanded dropdown to view additional GPS telemetry data) then game controller signals cannot properly reach the app.

If the icon is white and “OK” then everything is working. But if the icon turns red you will not be able to use the game controller properly.

Map compass

When rotating the app it can be difficult to understand where north is. The map compass at the bottom will however reveal this.

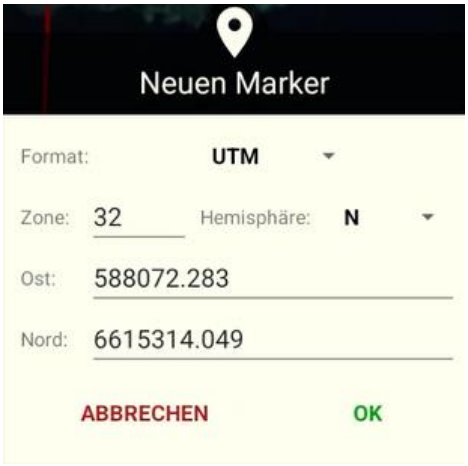
Adding a new marker where you are, the boat is or use manual input

In mapping and driving there are three icons available center bottom. Clicking on these will:

- instantly add a new marker at YOUR position (the Android device position)
- instantly add a new marker at the BOAT position
- bring up a dialog to add a marker with desired position using the keyboard for input

As the marker you want to add is likely close by, the app will try to find the current boat position or (if boat not connected) the current Android device position and use this to pre-populate the form. If no such data is available the form will be empty.

Select the format you desire (WGS84, DMS or UTM), the app will remember the format selected last. Then enter the position, and click “OK” to add the new marker.



The “home” icon

The home icon will be placed automatically. When the autopilot is satisfied with position accuracy after being started it will report the current position of the boat as the home position. As for any marker but the boat icon, this marker can be long tapped and drag/dropped to any position you desire.

The actual position is at the pointy edge of the icon.

The “marker” icons

There are two types of markers: Markers for mapping and general blue waypoints. Using the info panel for planning object you can change the current type using a dropdown menu.

The actual position is at the pointy edge of the icon.

In addition, when using “goto” function, the selected target for the boat to drive to gets temporarily replaced by a yellow marker symbol.

The actual position is at the pointy edge of the icon.

The “boat” icon

The boat icon also appers in various colors.

Gray: The boat position was known, but app lost contact with it (loss of telemetry, like if you power off the boat or telemetry is lost for whatever reason): This is the last known position.

Yellow: Telemetry is active. But position accuracy is below the threshold to drive in any automated mode. Manual driving possible, but remember the position is inaccurate.

Green: Normal condition, the position accuracy is above the threshold and automated driving is possible.

The actual position is at the center of the icon (the inner white pointer).

Boat icon driving direction indicator

If you activated the user interface option to show driving direction in manual driving mode, this can make hitting a target driving manually easier:

Incl the manual driving indicator line

The “my position” icon

My position is a semi-transparent icon with an arrow inside. My position is in reality the position of the Android device as reported by its built-in GPS. And for premium Android devices the position is surprisingly accurate. The arrow inside has a purpose. If you walk around with the device, or have the device inside of a boat, the direction of movement will be visualized as well.

The “my position” can be activated or deactivated in settings. For use cases where the user sits inside the boat it is recommended to deactivate this icon.

Bathymetry capture

The information already described for the following app functions are relevant when you want to perform mapping with this app:

- How to show previously executed mapping tracks in the area
- How to use planning to create and then modify a grid, with side lap and type of grid particularly important
- How to run an automated mission
- Using the switches in the telemetry line to start/stop capture, and how to switch between illustrating the captured data by showing a depth map compared with mapped paths

Although automated missions are very convenient, please remember that objects like fallen trees and other obstacles may cause problems. It is often advisable to map main bodies using missions but to consider manual driving for areas near shore or close to obstacles.

The following is considered the bare minimum before any data capture can take place:

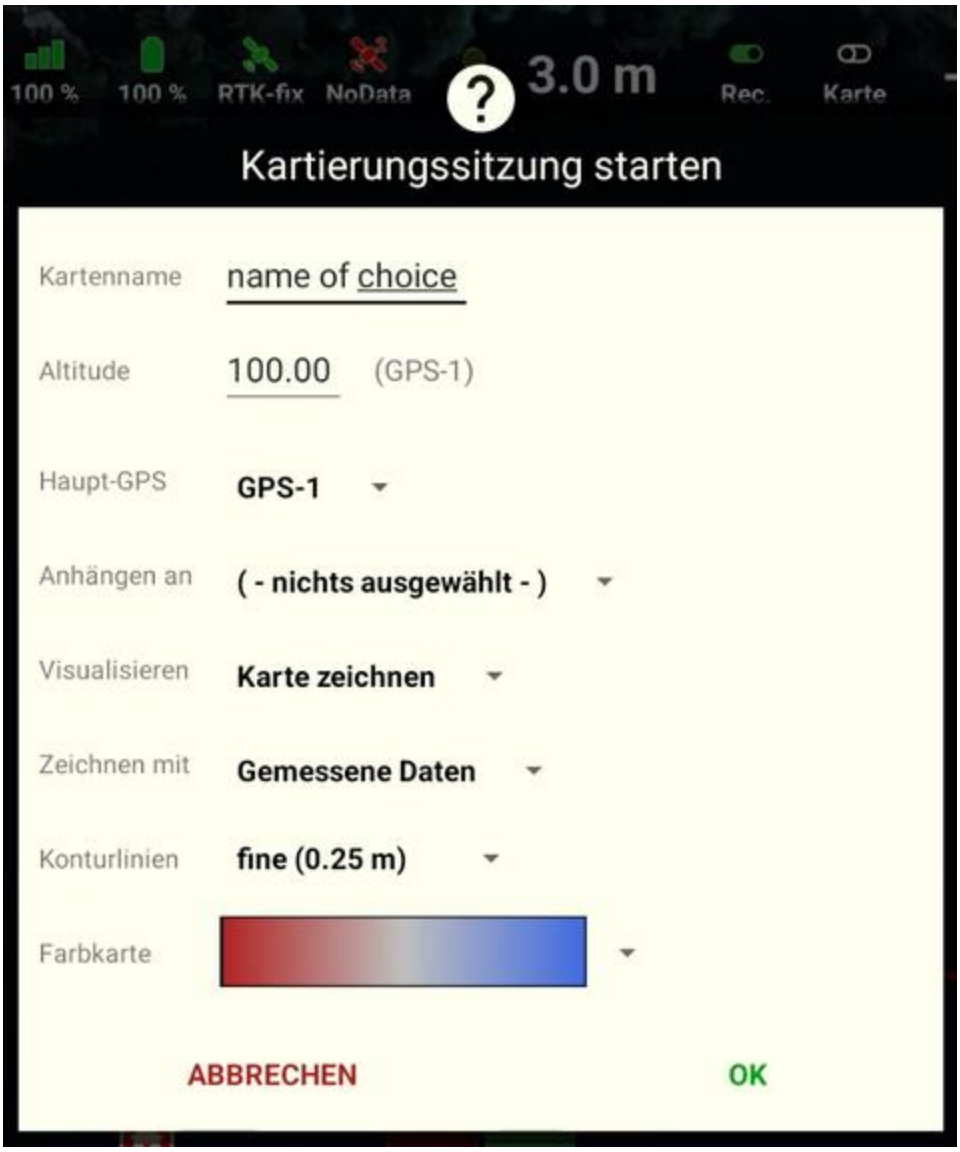
- The boat icon must be green
- The GPS icon must be green
- The boat should already be placed in the water
- The echo sounder telemetry must show depth data

The boat need not move to initiate the live mapping. The app will review position when receiving depth data. And if the boat stays put in one position it will only capture one data point (no risk of getting hundreds of readings on the same spot).

It is good practice to create the plan and upload the waypoints to the boat first, and only then initiate data capture. Mapping using manual driving is the exception.

Start capturing new data

Initiate the live data capture by flipping the “Pause” switch into “Rec.”. This will bring up a dialog to check settings and to add a name. We will go through the settings below the illustration:



Name: This is entirely up to you, but it must be entered. A suggested name based on date and time will be suggested, but you can change it to fit your preference.

Altitude: Only use this setting if your equipment is without a proper RTK GPS. You may then use a separate RTK GPS to measure the altitude at water level and enter its value in this field.

Main GPS: If your boat has multiple GPS modules, here is where you select which is to be used during the capture.

Append to: If you want you may append the newly captured data to an existing data capture. This is not strictly needed as you can combine multiple sessions into a single using the bathymetry editor later. To do this, click the dropdown and select the desired

mapping data set. The name of this new capture will then forcibly be changed to the name of the previous data set.

Visualize: Here you can select to visualize the data capture live by creating a depth map or by illustrating the path driven. You may also, at any time during data capture, change this using the second switch in the telemetry bar.

Illustrate how: You can select to use actual readings from GPS and echo sounder or to use the real time corrections of the same data (utilizing boat sensors). The choice does not impact data capture as all data is stored in the database.

Contour lines: If you illustrate using depth map creation then the level of intermediate contour lines is determined by this choice.

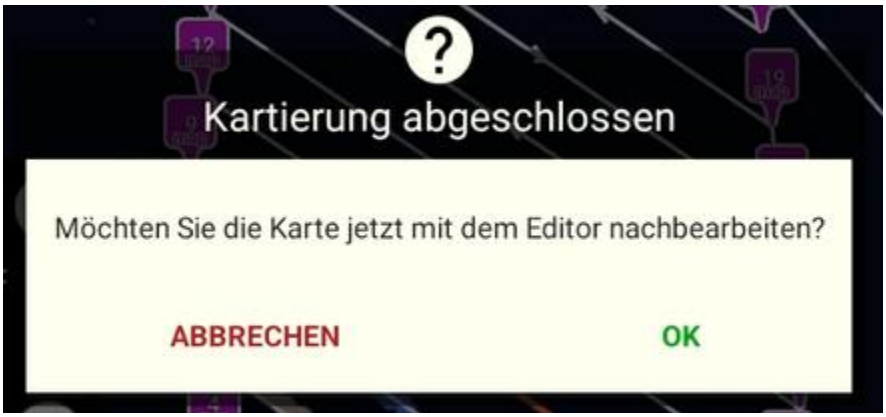
Color map: Five optional color maps for illustration is offered. This impacts the illustration of both depth maps and paths.

As soon as you click OK, the data capture will start.

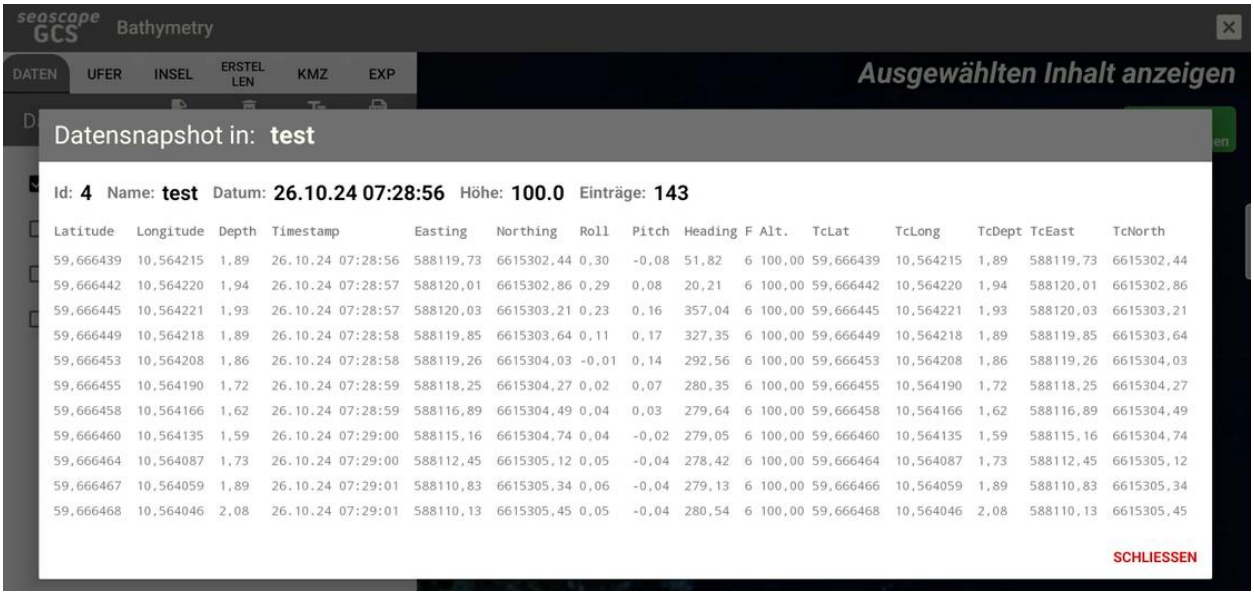
Do NOT exit the driving screen or minimize the app during data capture. If you do, data will NOT be captured.

Stop capturing data

The data capture will run continuously until you flip the “Rec.” switch back to pause. When flipped back, the app will ask you if you want to enter the editor to post process the captured data:



What data is captured?



Latitude	Longitude	Depth	Timestamp	Easting	Northing	Roll	Pitch	Heading	F	Alt.	TcLat	TcLong	TcDept	TcEast	TcNorth
59,666439	10,564215	1,89	26.10.24 07:28:56	588119,73	6615302,44	0,30	-0,08	51,82	6	100,00	59,666439	10,564215	1,89	588119,73	6615302,44
59,666442	10,564220	1,94	26.10.24 07:28:57	588120,01	6615302,86	0,29	0,08	20,21	6	100,00	59,666442	10,564220	1,94	588120,01	6615302,86
59,666445	10,564221	1,93	26.10.24 07:28:57	588120,03	6615303,21	0,23	0,16	357,04	6	100,00	59,666445	10,564221	1,93	588120,03	6615303,21
59,666449	10,564218	1,89	26.10.24 07:28:58	588119,85	6615303,64	0,11	0,17	327,35	6	100,00	59,666449	10,564218	1,89	588119,85	6615303,64
59,666453	10,564208	1,86	26.10.24 07:28:58	588119,26	6615304,03	-0,01	0,14	292,56	6	100,00	59,666453	10,564208	1,86	588119,26	6615304,03
59,666455	10,564190	1,72	26.10.24 07:28:59	588118,25	6615304,27	0,02	0,07	280,35	6	100,00	59,666455	10,564190	1,72	588118,25	6615304,27
59,666458	10,564166	1,62	26.10.24 07:28:59	588116,89	6615304,49	0,04	0,03	279,64	6	100,00	59,666458	10,564166	1,62	588116,89	6615304,49
59,666460	10,564135	1,59	26.10.24 07:29:00	588115,16	6615304,74	0,04	-0,02	279,05	6	100,00	59,666460	10,564135	1,59	588115,16	6615304,74
59,666464	10,564087	1,73	26.10.24 07:29:00	588112,45	6615305,12	0,05	-0,04	278,42	6	100,00	59,666464	10,564087	1,73	588112,45	6615305,12
59,666467	10,564059	1,89	26.10.24 07:29:01	588110,83	6615305,34	0,06	-0,04	279,13	6	100,00	59,666466	10,564059	1,89	588110,83	6615305,34
59,666468	10,564046	2,08	26.10.24 07:29:01	588110,13	6615305,45	0,05	-0,04	280,54	6	100,00	59,666468	10,564046	2,08	588110,13	6615305,45

As the sensors of the boat operate on WGS84, the app always stores position in degrees decimal along with the measured depth and time stamp of capture.

The application then converts the WGS84 position to UTM and stores that as well.

At time of capture the application retrieves high precision readings of 3D orientation (roll, pitch and heading), GPS fix type and the altitude and stores this as part of the depth record.

Then for each reading this information is utilized to calculate the ACTUAL values of position and depth (the TCxxx values illustrated). Provided your boat is equipped with an RTK GPS and that the GPS also has an RTK fix these data will be the correct measurements. Should the boat not use an RTK GPS then these calculated values will however be inaccurate.

To evaluate the quality of the Tilt Corrected (TC) values, please consider this scale:

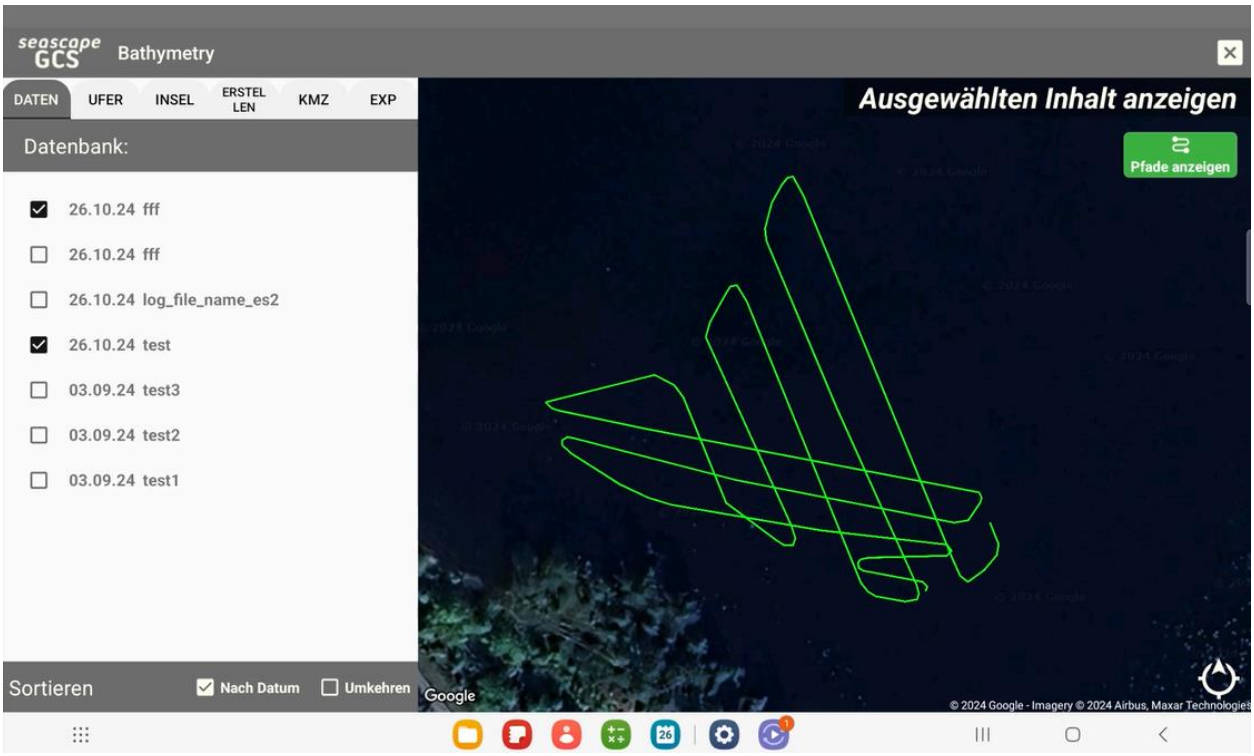
4 = 3D DGPS 5 = RTK float 6 = RTK fix

The readings and calculations are all performed per record.

All of the described values are at your disposal when you want to export the data as input for further analysis or map creation.

Bathymetry edit

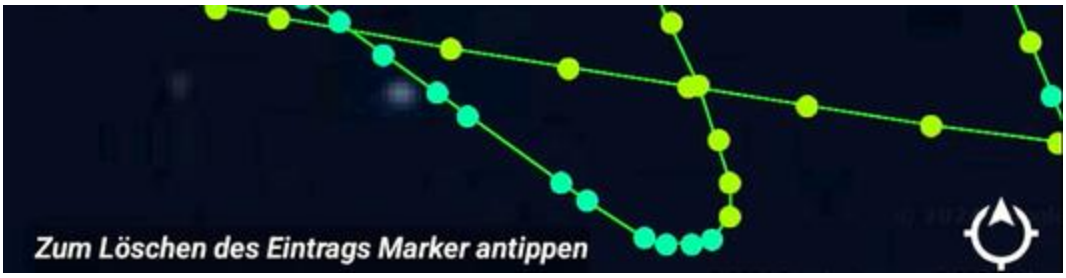
Start the bathymetry editor by selecting menu, tools, bathymetry. This will open a new part of the app with tabbed interfaces for functions to the left and a map viewer to the right:



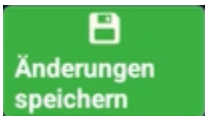
Working with logs

As illustrated above, the opening tab is always the “Logs” (or data). Listed by date and name, with options below to sort by date (otherwise by name) and to reverse the sorting order. When selecting one or more data sets, the viewer on the right hand side will zoom in on the relevant map area and illustrate the captured tracks with green lines. You may remove the green lines by deactivating the “show paths” button” if so desired.

If you zoom in closely, each data point will also be illustrated with small dots following the red-yellow-blue (shallow to deep) color map:



As described in the window, tapping any of these small round markers will delete the record. To avoid accidental deletion you need to confirm the changes by pressing a save button before the database gets updated.



Database tools

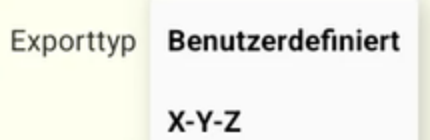
Note: In the current version of the app, these tools are all limited to be used on a single data set. Functions to delete and to export to CSV file will be updated later to take a list of selected data sets.

Four abilities are directly available when one data set is selected:

- Show: Brings up the viewer shown in chapter “What data is captured?”
- Delete: Deletes the data set from the database. This action can not be undone
- Rename: Renames the data set in the database. You can change the name as often as you like
- Export: Brings up a comprehensive set of export options. Purpose of export is to retrieve data sets from the database and convert it into csv or xyz files that you can use outside of the app.

Export: When you need to use the logs outside of the app

The export window may seem complex at first, but in reality it contains two optional ways to retrieve the data you want using a single dropdown:



- User defined export: All attributes can be individually selected. The app remembers your preferences, so you only need to make these choices the first time. This always export the data as CSV with comma sign as separator
- XYZ export: Just the data you need to use the output in any GIS tool afterwards. You will still be presented a set of options as the database contains data in both WGS84 and UTM formats, and both raw sensor data and corrected data using calculations on sensor values. As for the user defined export, any preferences set here is remembered the next time you want to export data

The user defined option

The user defined option is straight forward. Remove by unchecking what you don't need. The app will remember these choices the next time you use this export option.

The X-Y-Z option

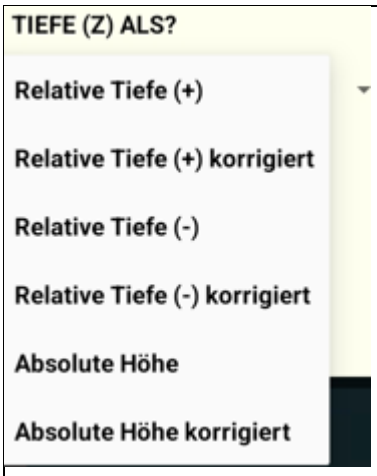
Tailor the export to fit your preferences by using the drop down fields in this screen:

Choice of position

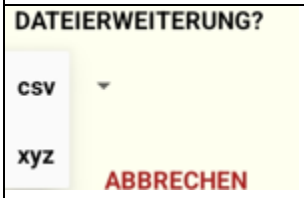
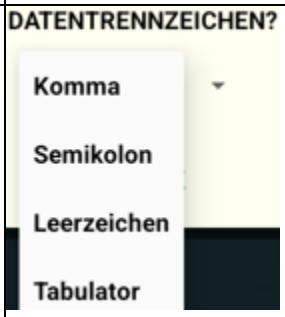
Position drop down	Choices explained
	The decimal choices will export decimal latitude and longitude values for position The UTM will export easting and northing as position. The corrected options exports the tilt and elevation corrected positions, while regular options export raw GPS positions.

Choice of depth

Depth as drop down	Choices explained

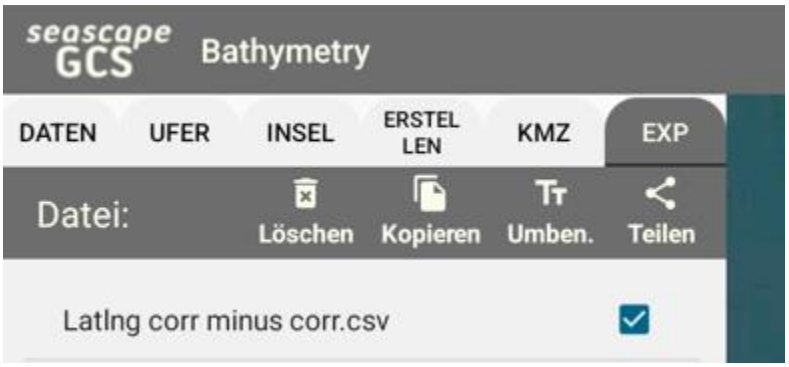
	Relative depth is the echo sounder measurement. The data may be exported as positive or a negative measured value. The absolute depth will result in depth exported as the altitude above sea level. The corrected options exports the tilt and elevation corrected depths, while regular options export data based on raw echo sounder values.

File extension option and data separator option

Extension as drop down	Separator as drop down	Choices explained
		These choices are most likely self-explanatory.

Retrieve a log to be used outside of the app

This application uses the Android “share to” concept to support sending the file to the desired destination. To share an exported file, please tap the “EXP” tab on top of the lists. Then select the desired file to share. And the “share” icon will appear on top along with other basic file management abilities:



In the following we will assume that the user wants to share the file to an email recipient. As soon as the “share” button is tapped, Android starts its sharing workflow. You will be offered a popup window containing all installed applications that is able to handle the file type. The list will include any installed email app as they can all handle attachments.

Please note: If the user ALWAYS wants to share files by email and always use the same email program to do so, the user taps the desired email program in the window and then taps “Always”.

Should the user desire to select this option (always share file in the exact same manner) then the next time sharing will instantly open the selected email application. In order to revert this, please refer to general Android user guides as it is not straight forward.

As an option the user may tap “Just once” instead of “always”. This makes it possible to select another program for sharing the next time.

Once the program is selected it will start. Fill in recipient, email title and any other desired email content. And hit button to send the email. The selected file will be an attachment to the email message.

Creating depth maps inside the app

Although users of SeaScape app are usually mapping professionals and will most likely use other tools for map creation, the SeaScape GCS indeed has a built-in ability to produce proper looking depth maps. The maps are stored as KMZ files and can be shared to others from the KMZ folder. These KMZ files contain a KML with all contour data and also an overlay PNG file should you opt to create a shaded relief. These KMZ files are fully compliant to be rendered correctly with other tools like Google Earth.

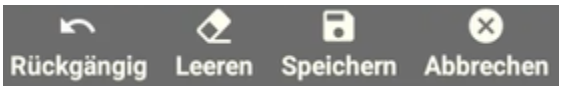
Drawing shorelines

The app has a built-in editor to create shorelines for waters and for islands respectively. When tab for shoreline or island is selected, and you have no prior shoreline available, creating a new is straightforward:

Click new, and the right side of the editor will open a map with ability to create shorelines. Move over to the map area and start building a shoreline by tapping one marker at a time. The shoreline must be created in a continuous clockwise or counterclockwise direction. For each new marker added, the app will add a new filled bullet marker with an open + marker in-between:

As you move around the edges, a polygon with red infill will start to form. Continue until the shoreline is completed. Then zoom in and start to work your way around the details. You may long tap, then drag and drop any marker to follow the shoreline as accurate as possible. And you may tap a + icon to add new markers in-between the markers already resent to better follow curves along the shoreline.

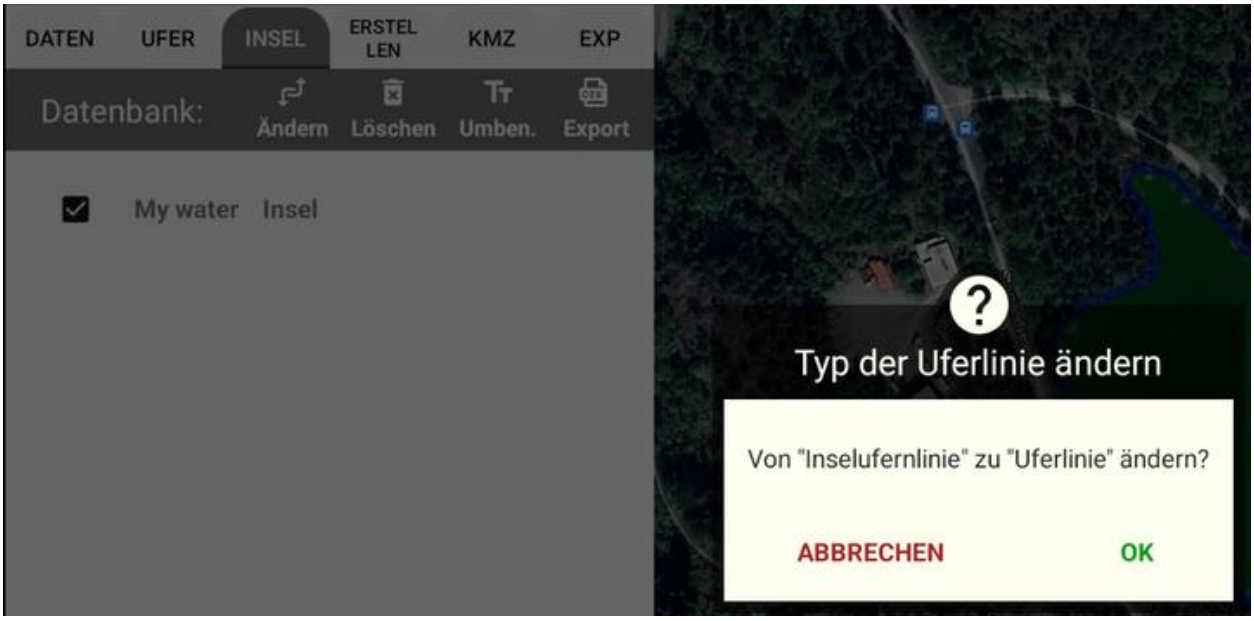
Beneath the map area you have some functional buttons:



- You may undo, in steps, the latest additions
- You may start over by clicking clear
- You may save the final result by clicking save
- And abort everything

Like logs you are able to export the results of a shoreline, be it an island shoreline or a shoreline, to a csv file for use with external tools: Just select the stored shoreline and then select “export”.

The shoreline editor assumes you create a shoreline for an island if you started from the island tab, and a general shoreline should you have started from the shoreline tab. If that was a mistake you can convert it between “island” and “shoreline” shorelines using one additional database tool by clicking change:



Doing so is important for management of data if the depth map is to be created within this application. But beyond tidy householding principles it is more or less irrelevant if all you want to do is to export the shoreline for use in other tools.

As the CSV viewer built into the “EXP” tab illustrates, a shoreline is a set of decimal (WGS84) positions with Z-values of 0.0 depth:

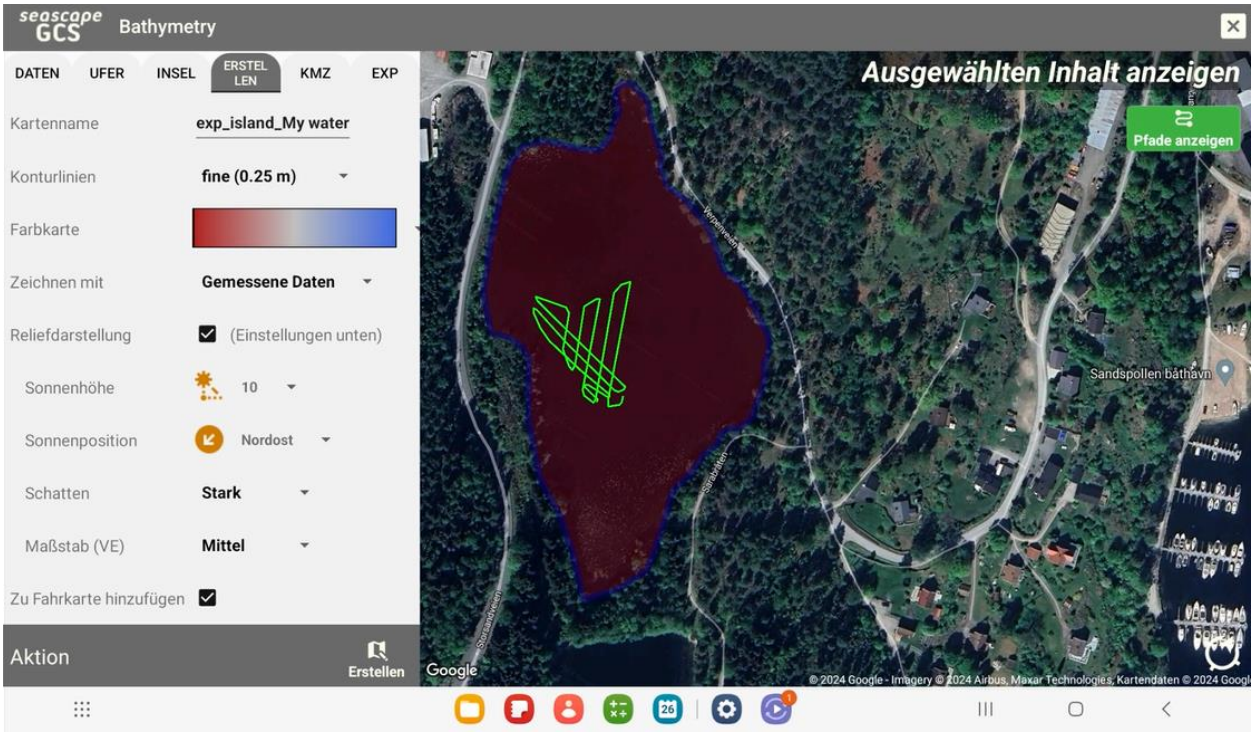
Col.0	Col.1	Col.2
Latitude	Longitude	Depth
59.66753113336105	10.564227551221848	0.0
59.667520223060066	10.564255732577754	0.0
59.66750931275908	10.564283913933663	0.0
59.6674984024581	10.56431209528957	0.0

Building depth maps

While not a crucial ability for mapping professionals that usually has dedicated GIS tools for the job, the SeaScape GCS indeed has basic abilities to create good looking depth maps available. As this is likely not in focus for the majority of the users, this user guide will only explain the ability briefly:

Data selection

Creation of maps is based on a selection of relevant data captures (green lines) and selection of shoreline (and possibly islands) objects. When you have, you may select the create tab to get going. The shoreline will appear as a red filled polygon with the logged depths as green paths. If the paths are outside of the shoreline you selected the wring combination. Redo selection in other tabs before revisiting the create tab.



Settings to consider when creating a depth map

Even though the app is able to create depth maps in real time while capturing data, depth maps ca be modified and adjusted at any time using the logged data at any time later. The depth map itself (the KMZ file) is just a “print out”. The actual value is the captured depth log stored in the database. Also, the use of shorelines are not made available for live data map creation. To use shorelines, post processing using the bathymetry editor is mandatory.

When creating a depth map using this app, the following options are at your disposal:

Name: The name of the first selected data set is suggested. You may change the name to whatever you like. The name is important though: If you want to display a depth map within this app later using the function button for showing depth maps then this is the name you will see.

Contour lines: SeaScape assumes major contours to be 1 m. Your choice will determine the intermediate line details in-between.

Color map: A set of 5 optional color maps are at your disposal using the dropdown selector. The drop down contains illustrated colors rather than descriptions.

Draw using: Select to use captured data or the calculated data. If your equipment has a RTK GPS built-in, and you had RTK fix during data capture, then the calculated data will be of superior quality.

Relief view: Producing a shaded relief is possible when the checkbox is selected. The resulting depth map is often (but not always) easier to interpret when contour drops get artificially added shadows. This highly depends on the shaded relief options selected. You may have to try multiple times to get the desired result.

Relief view options:

- Sun height, sun direction, how much shadow to apply and the scale needs to be adjusted to generate the desired result. Sun direction usually being the most important of the choices.

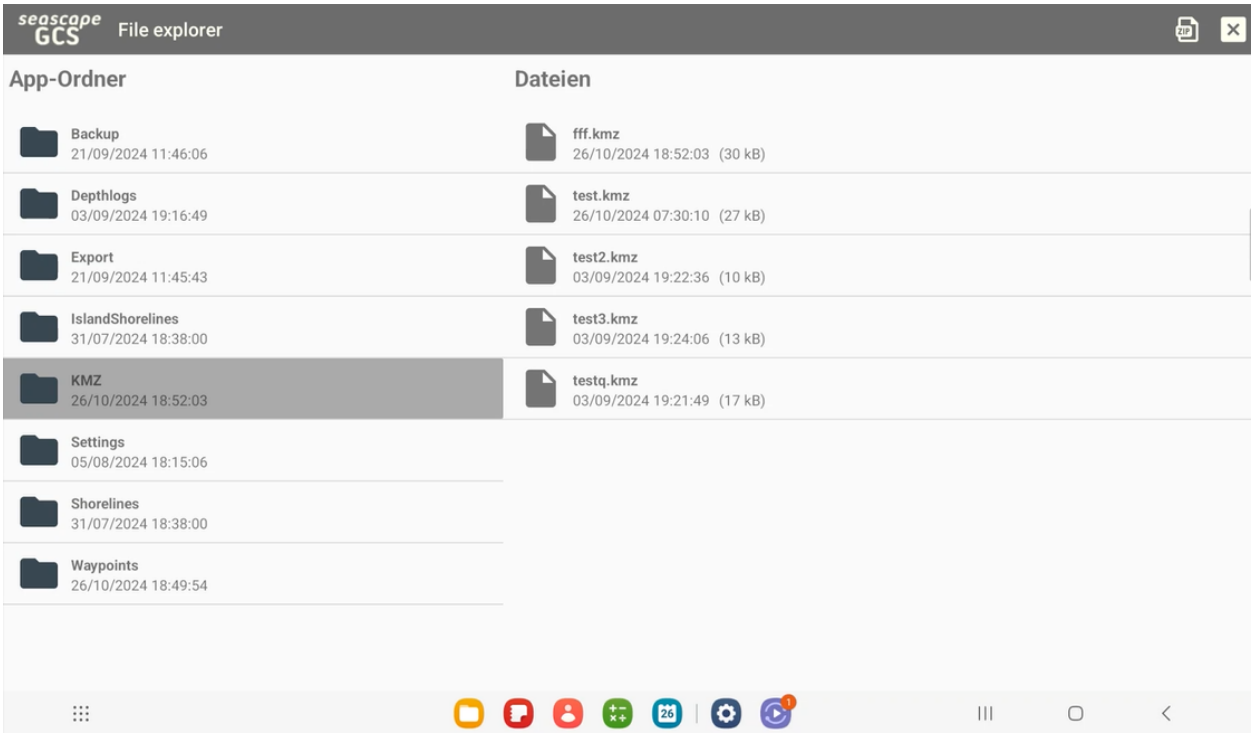
Add to driving map: if you leave this selected then the resulting depth map will be placed on the app's driving map when you exit the bathymetry editor. If not, the resulting map will anyway be selectable using the select depth map function button.

Map creating using huge data sets, with shoreline and additional illustrative effects like shaded relied may take some time to process. The editor has a progress indicator, please be patient.

How to use the built-in File Manager

Start the file manager by selecting menu, tools, file manager

The folders are fixed by the app (you cannot add or remove any folders). When starting up the file manager, the folders are initially visible. Tap a folder name to browse the content.



File management tools available when a file is selected

File management abilities are all available on top of files listed when a folder is selected. With exception of the ZIP button, the file management functions require you to first select a file. These functions only work with one file selected at a time.

The following functions are available:

ZIP button

Always available, also when no file is selected. Tap the icon and then:

- All files in this folder are added to a zipped: <folder name>.zip.
- The zip file is stored in the backup folder.
- The share to dialog is automatically started, allowing you to store the backup on another location instantly.

Delete button

Delete removes the file permanently. You will be asked to confirm that you want to delete the file as a safety measure.

Copy button

Copy instantly creates a copy of the selected file with new name “Copy_”<file name>. You can rename the file afterwards.

Rename button

Rename button opens a dialog with an edit text field, the current name of the file is filled in. Alter the file name and tap “OK” to rename it. You do not have to bother about file extension, the renamed file will have the same extension as the original.

Share button

To share the file to somewhere else, tap the share icon and the standard Android sharing dialog will start. Select which app you want to share it to (like OneDrive to save the file on your OneDrive account or an email app to send the file as an attachment):

Be careful not to select “always” in the Android dialog as that will limit your choice “forever” (you need to enter Android App settings to reverse a default share share-to action). It is safer to:

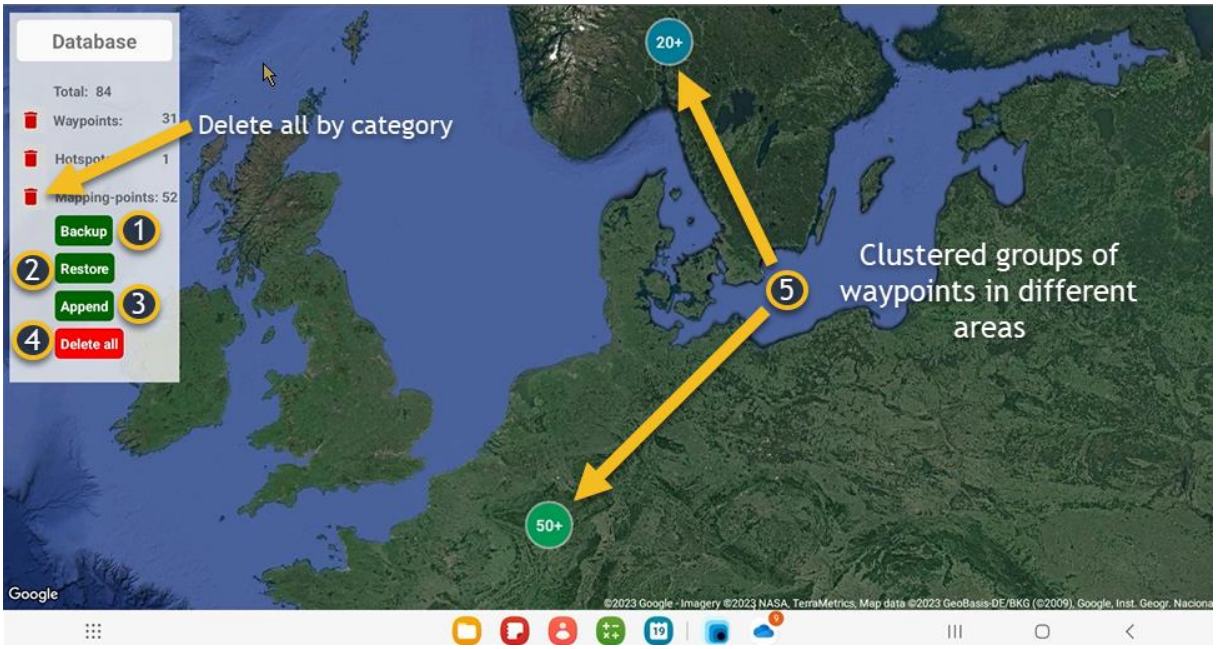
1. Select the desired app once, and then:
2. Choose “just once”.

How to manage the database for markers

Start the database management tool by selecting menu, tools, Marker DB. This will open a new part of the app designed to manage all of your markers.

Note: In this version of the app management of individual markers are cared for. For the mapping professionals, management of missions in the database is not a present feature. As TechAdVision assumes retrieval of planned missions may be of interest when revisiting a water for repeated mapping sessions over time, an upcoming version of the app will include this.

The waypoint database



In the waypoint database, the general information and high-level functions are available to the left under title “Database”, while information about individual waypoints opens on the right side of the screen when a waypoint marker is selected. If a marker is selected it changes color to red.

The red trash bin icons to the left of the waypoint let you delete all waypoints of this category with a single click. Usually done to get rid of old mapping-points efficiently.

Backup

Click once on the backup button. The database is exported to a csv file with extension “db” and saved in the “backup” folder (you may reach this folder using the built in file explorer). The name is automatically set as “waypoint-db-backup-“<YYYYMMDD-HHMMSS>

Restore

Click once on the restore button and a dialog pops up displaying the current backup files for the database currently present in the backup folder. As a restore will wipe the entire database and then import from the selected backup you will be asked to confirm before proceeding after you selected a file.

Append

Click once on the append button and a dialog pops up displaying the current backup files for the database currently present in the backup folder. As a append adds all records from the backup to the existing database you may end up with duplicates. The option to append is mainly added to allow you to enrich your database using the backup from a friend who may have waypoints from other waters than you. You must confirm the alert before the action is completed.

Delete all

Click once to wipe your waypoint database clean. You must confirm this action to proceed as all your waypoints will be permanently deleted. If you never made any backup before doing this, then you have no source to restore waypoints from and you start on scratch.

Clustering and zooming

When opening “My waypoints”, the map area zooms in to cover the entire area where you have waypoints. As you may have waypoints distributed over a wide geographical area, the waypoints are clustered into groups with round blue icons displaying the number of waypoints covered in different areas. You may zoom in and out by standard Android finger pinch. But if you click on a cluster icon the app will also zoom in to display all waypoints beneath this cluster. If you have many waypoints in nearby waters, you may get another set of clusters in this area, and you can tap the desired cluster once

more to zoom further. Beyond a certain zoom level, all waypoints are shown no matter how many waypoints you have.

NMEA sender

The SeaScape CGS publish sentences using UDP with:

- Broadcast address: 255.255.255.255
- Port: 10111

The talker ID for our sentences is:

- “AI” (“Autonomous Instrument”).

The following sentences are currently published.

AIVTG:

- Standard VTG (Velocity Track over Ground) message
- Provides data for the equipment currently controlled by the SeaScape CGS
- Format
  $AIVTG,<heading true>,T,<heading magnetic>,M,<speed knots>,N,<speed km/h>,K<checksum>
- Note: Heading true is not used
- Sample: *$AIVTG,,T,99.2,M,0.05,N,0.10,K*49*

AIEDM:

- Proprietary EDM (Equipment Driving Mode) message
- Provides data for the equipment currently controlled by the SeaScape CGS
- Format
  $AIEDM,<mode><checksum>
- Note: Mode string will contain current driving mode of the equipment
- Possible driving modes (our equipment may not use all possible modes):
  https://ardupilot.org/rover/docs/rover-control-modes.html
- Sample: *$AIEDM,manual*56*

Permissions needed by the SeaScape GCS

When considering permissions, please note:

As a general rule of thumb, the SeaScape app collects no data to be shared to other apps or to the outside world. Even the file system used by the app is located in a private space,

hence the need for an integrated file manager. Android however submit crash logs caused by the app as described in the subsequent chapter.

SeaScape GCS requires a decent set of permissions to work. Some of which are considered harmless. While others are considered potentially harmful, and thus you as the user will have to approve. When installing and using the app for the first time, these are the questions Android will serve you:

- Access to device location:
  SeaScape GCS is an application highly focused on location. In addition to be highly dependent on the position of the boat, the app also uses the device GPS extensively to position the device itself. When app starts it will not be connected to the boat, that only occurs after the app has started. The app will anyway zoom in on the area where the user is currently positioned.
  Failing to approve “allow while using the app” will render the app more or less unusable.
- Ability to find, connect to an determine the relative location of nearby devices:
  This permission is directly related to the app’s use of Bluetooth for Telemetry (Bluetooth scan and connect typically) and must be accepted to enable the SeaScape GCS to speak to the TechAdVision equipment.
- Allow SeaScape GCS to send you notifications:
  The volume of notifications are highly limited and you will not be bothered. Verbal notifications can be muted in settings. Any notification configured has a functional purpose. Please accept this permission when asked (it will usually only occur after you have started to use the app).

What data TechAdVision is able to retrieve from app usage

The SeaScape app does NOT capture any data to be reported to any central repository. The app usage is totally private. Any sharing of data is solely initiated by the user when. The only option is to actively share specific content using the built-in file manager or the bathymetry editor.

The Android device DOES capture events of crashes and events of unresponsive behavior for apps as part of the Google Play capabilities. When a crash or a non-responsive behavior occurs, Android will report what has happened when the Android device is connected to the internet (then or later).

When reporting crash events, the reported content is limited to:

- Exception Type and Error Message: The type of error (e.g., NullPointerException) and a brief description or message related to the crash.
- Stack Trace: The sequence of function calls that led to the error, showing which lines of code triggered the crash.
- App Version Information: The specific version of the app and build number that was running when the crash occurred.
- Device Information:
    - Model and brand of the device (e.g., "Pixel 8").
    - Operating system version (e.g., Android 14).
    - Screen orientation and possibly screen resolution.
- Memory and Storage Details:
    - Amount of free and total memory at the time of the crash.
    - Storage details, which might indicate whether the device was low on storage.
- Network Status: Whether the device was connected to Wi-Fi or cellular data.
- Battery Level and Status: Remaining battery level and whether the device was charging.
- Locale Settings: Language and region settings on the device (e.g., en-US).

TechAdVision needs this information (exception type, error message and stack trace) to improve app quality. We assume our customers do not object to having details about code crashes, without any Personally Identifiable Information, submitted to the crash log registry. If you have any concerns, please contact us.

Troubleshooting tips

To be added in a later version of this user guide.

Frequently asked questions (FAQs)

To be added in a later version of this user guide.