Urban lakes play a crucial role in modern cities, contributing to flood control, groundwater recharge, water quality, and urban aesthetics. As urban development intensifies around these lakes, obtaining accurate underwater topographic data becomes vital for engineering design and ecological management.

One Lake, One Small USV, 250,000 Square Meters of Secrets

This case study showcases how Hi-Target's Android-powered **iBoat BS12 USV** was deployed to perform an **underwater topographic survey** of a large urban lake in Bangkok, Thailand. The project highlights the USV's efficiency, adaptability, and suitability for complex, confined inland waters.

Challenges in Urban Lake Surveying

In dense urban settings like Bangkok, traditional underwater topographic surveying methods using manned boats present several limitations:

- **Restricted access**: Crowded shorelines and narrow water entries make it difficult to launch and maneuver full-sized boats.
- **Safety concerns**: High pedestrian traffic and busy surroundings increase operational risks.
- **Data gaps**: Inaccessible or shallow zones near the shorelines may be missed or poorly captured.

Such limitations posed a clear need for a compact, flexible, and intelligent survey solution capable of accessing tight spaces without compromising on data quality.

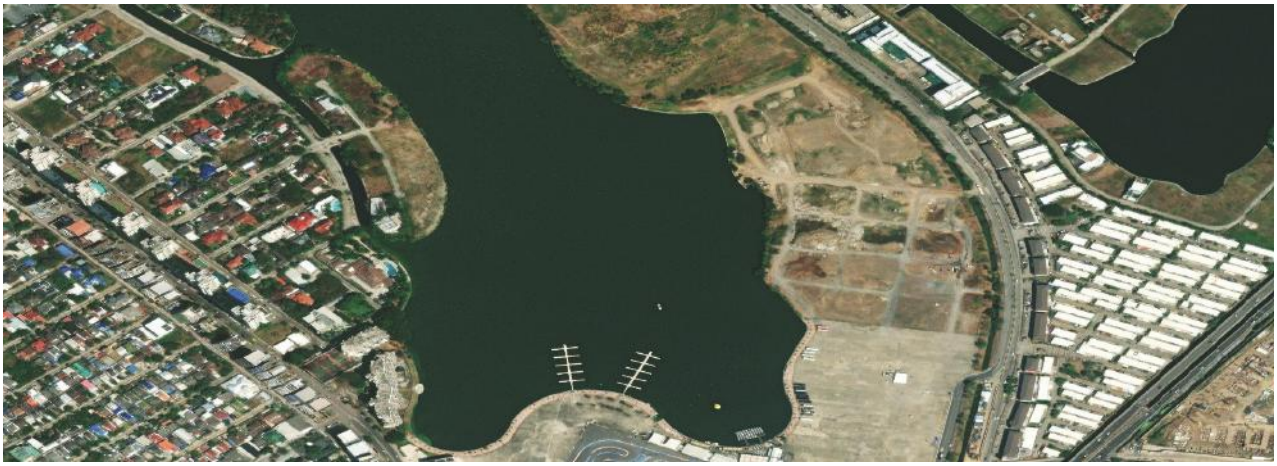


Figure 1. Survey site overview

Solution

The iBoat BS12 is a lightweight, Android-controlled unmanned surface vessel specifically engineered for inland water survey missions. With a sleek hull made of carbon fiber and Kevlar, it combines durability and portability. Its compact size allows it to be transported in a vehicle trunk and launched single-handedly, making it ideal for constrained urban sites.

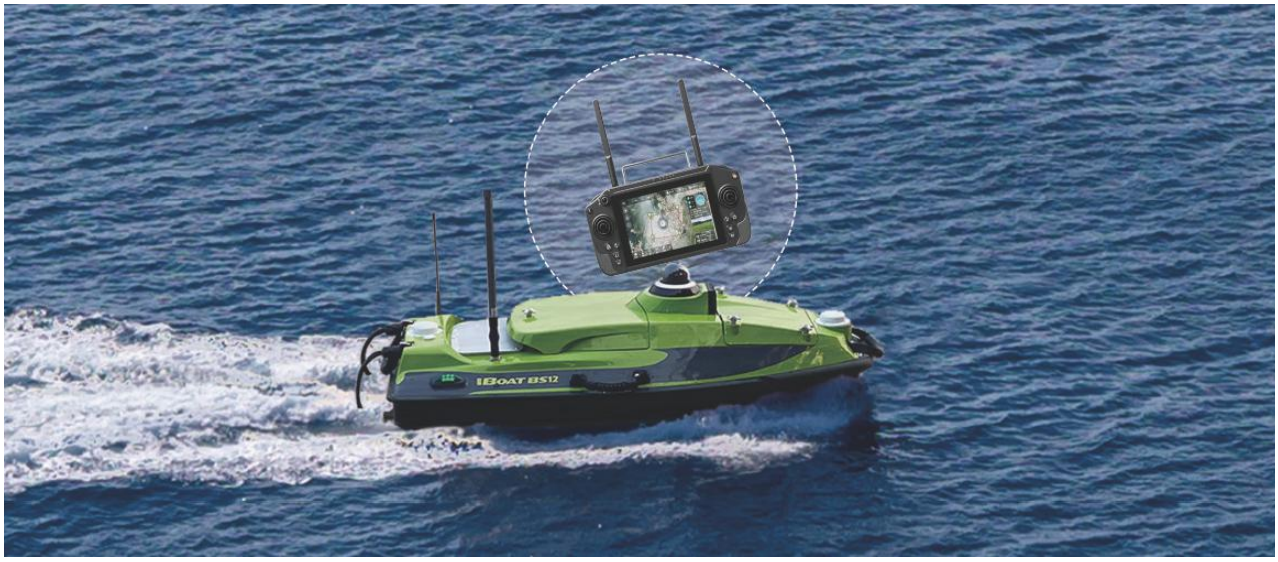


Figure 2. iBoat BS12: Android-powered Multi-function USV

Key Features

- **Propulsion & Design:** CFD-optimized hull; top speed of 6 m/s; stable in rough water.
- **Navigation:** Integrated GNSS + IMU module ensures sub-meter positioning even with intermittent satellite signals.
- **Sensors:** Built-in single-beam echo sounder, 360° camera, and millimeter-wave radar for obstacle detection.
- **Control System:** Operated through the Hi-Survey Boat Android app with manual or fully autonomous modes.
- **Mission Continuity:** Supports breakpoint resume—ideal for large-scale surveys over multiple sessions.

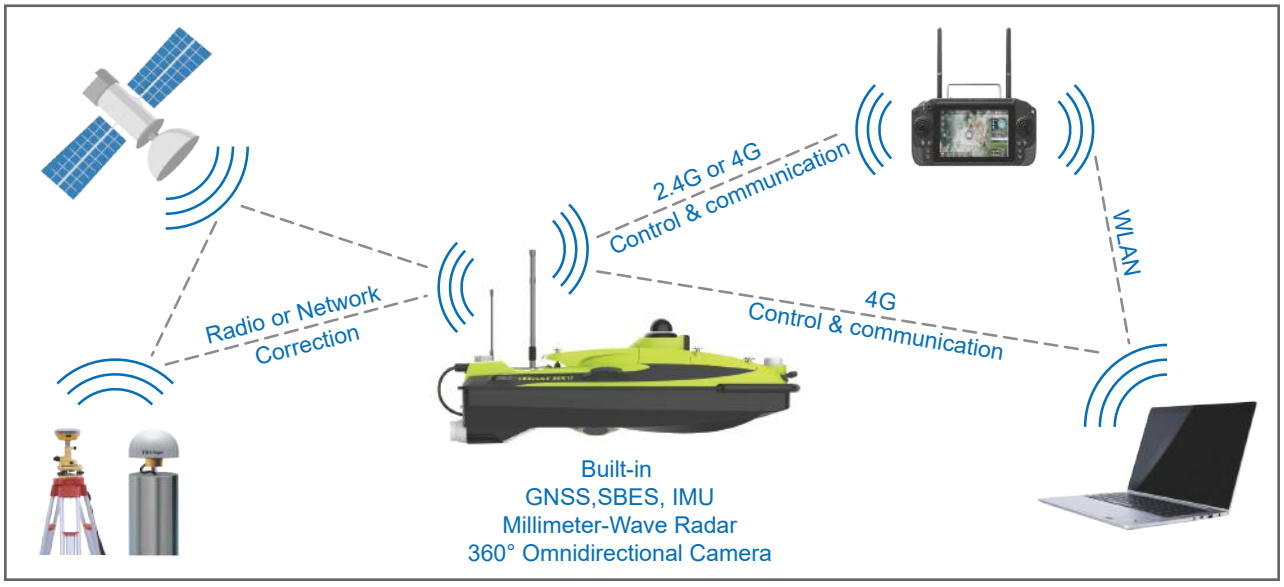


Figure 3. Working principle

Field Operation

The survey was conducted at a 250,000 m² urban lake located in a high-density commercial and tourism zone in northern Bangkok. This lake plays a vital role in the area's stormwater regulation and ecological balance. With construction projects developing along its perimeter, obtaining precise **underwater topographic data** was crucial for both foundation design and environmental impact assessments.

Thanks to its compact design, the **iBoat BS12** was deployed directly from the vehicle. Its portability and quick setup made it ideal for busy urban areas with restricted access.

Figure 4. Deployment of the iBoat BS12

Using the integrated mission planning software with **Google Maps support**, the survey team defined survey lines, spacing intervals, and coverage zones within 5 minutes. The software allows intuitive drawing of lines and areas, with automatic spacing and orientation features to accommodate various survey needs.

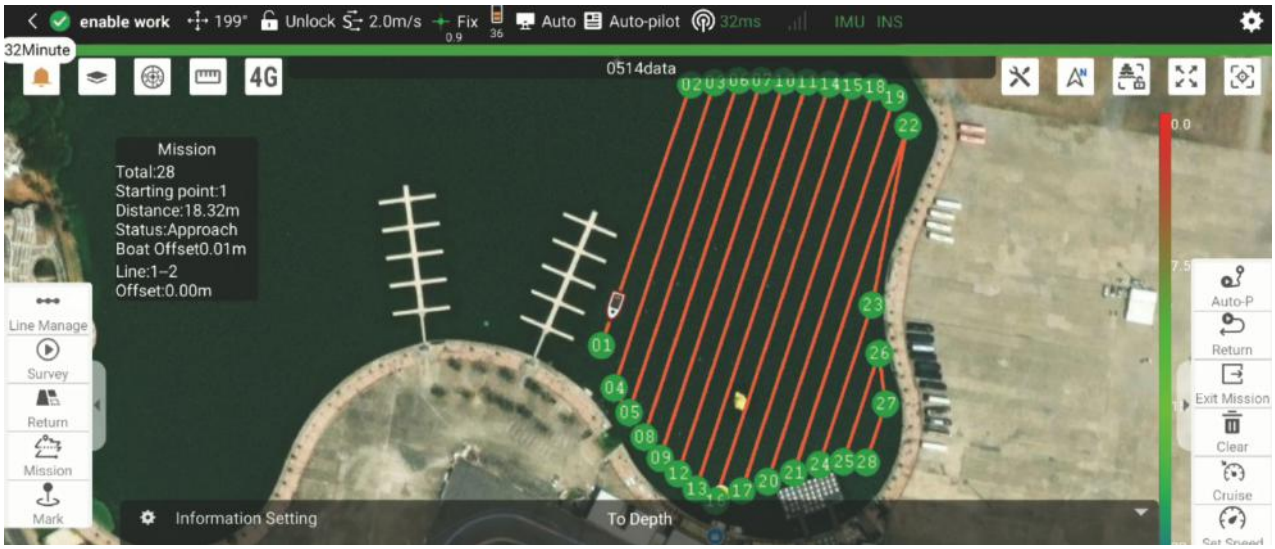


Figure 5. Mission planning with Google Maps interface

Once the mission was plotted, the BS12 began fully autonomous navigation, **collecting real-time underwater topographic data** along its route. No manual intervention was needed—operators simply monitored data collection from the shore.

Figure 6. Autonomous survey in progress

Given the scale of the lake, operations extended beyond a single day. The **breakpoint resume** function allowed the team to pause the survey at any point and continue from the exact same location the next day—without reconfiguring the setup or data.

Data Processing and Visualization

Once data collection was completed, information was downloaded from the remote controller and processed using **HiMAX,** Hi-Target's proprietary hydrographic data software.

The post-processing workflow included automatic detection and removal of anomalous depth points, one-click generation of contour maps to visualize depth variation, and 3D modeling for detailed visualization of the underwater terrain.

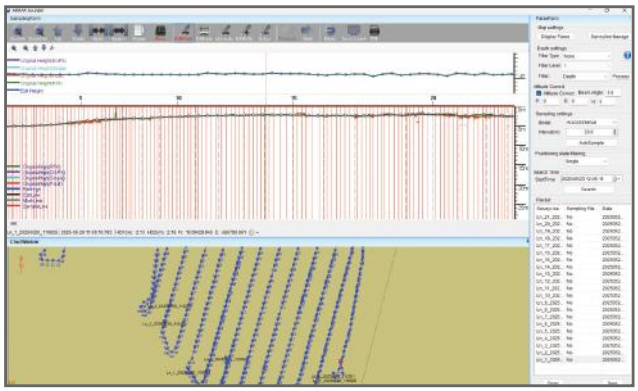


Figure 7. Anomaly removal in HiMAX software

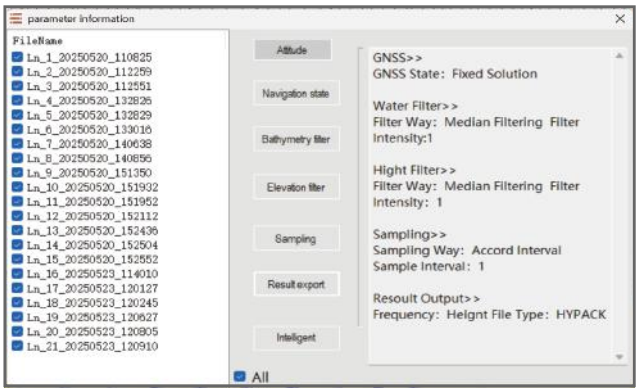
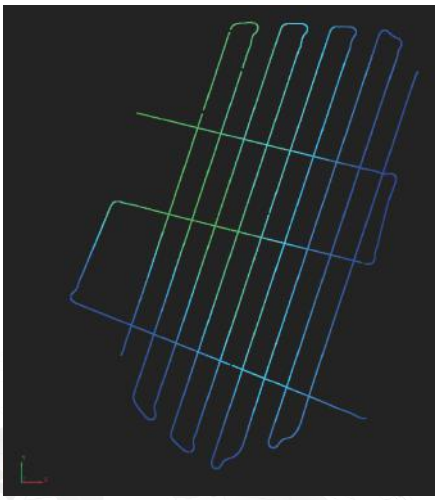


Figure 8. Auto-generated depth contour map

During the survey, we also collected a cross-section to validate the accuracy of the bathymetric data and ensure compliance with required specifications. The validation results proved that **95.12% of all data points fell within the defined confidence interval,** confirming the superior precision and reliability of the iBoat BS12's outputs.



Generation time	2025-07-30 17:48:33.243
Current grid	PointCloud-Ln_7_20250730174643.xyz
Reference grid	Ln_8_20250730174212
Measurement class	Special0rder
Total number of points in the grid	41
Above IHO model error points (red)	2(4.88%)
Below IHO model error points (green)	39(95.12%)
IHO Error Model	Special0rder(a=0.25m, b=0.0075m)

Figure 9. Overlay analysis for accuracy verification

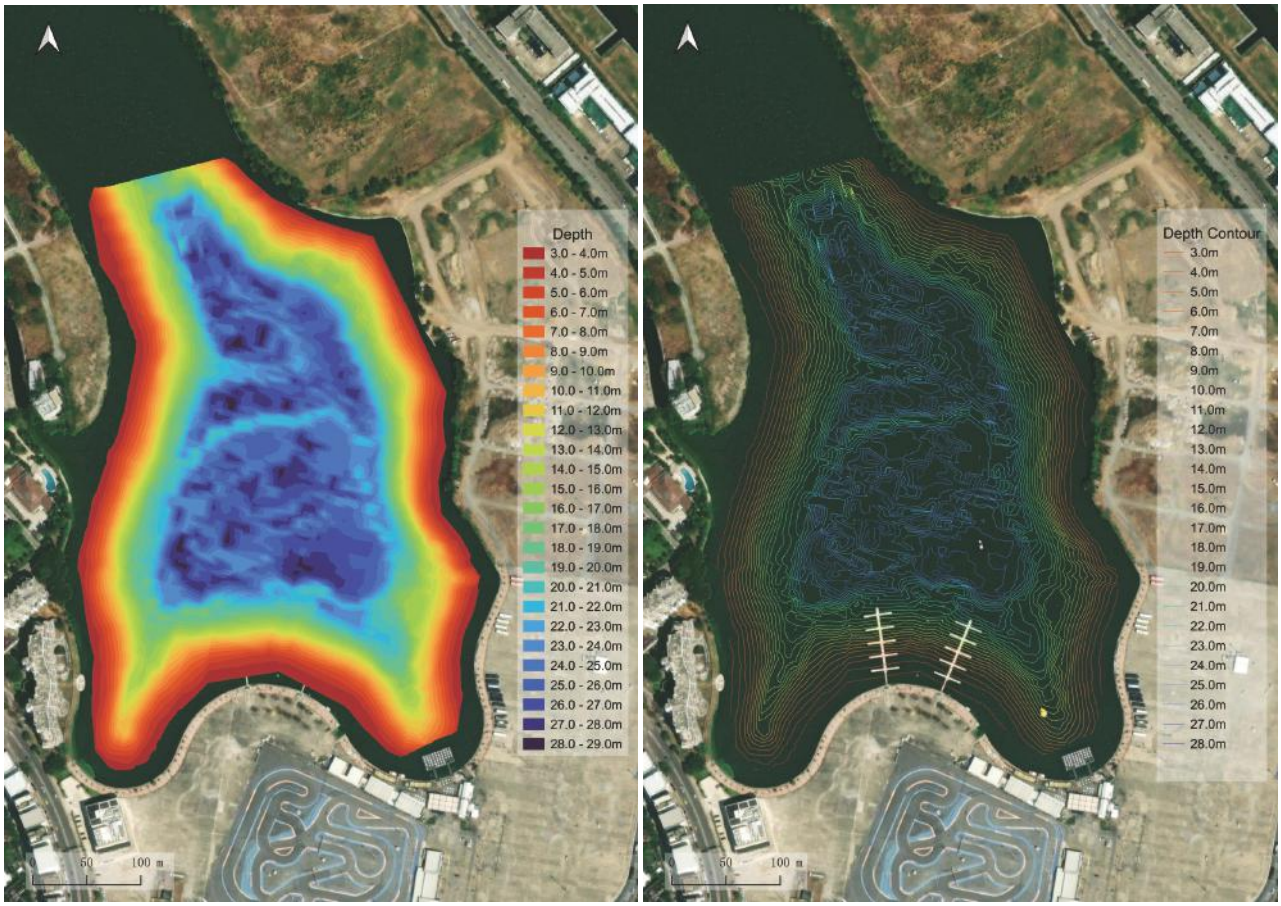


Figure 10. Visualized depth contour

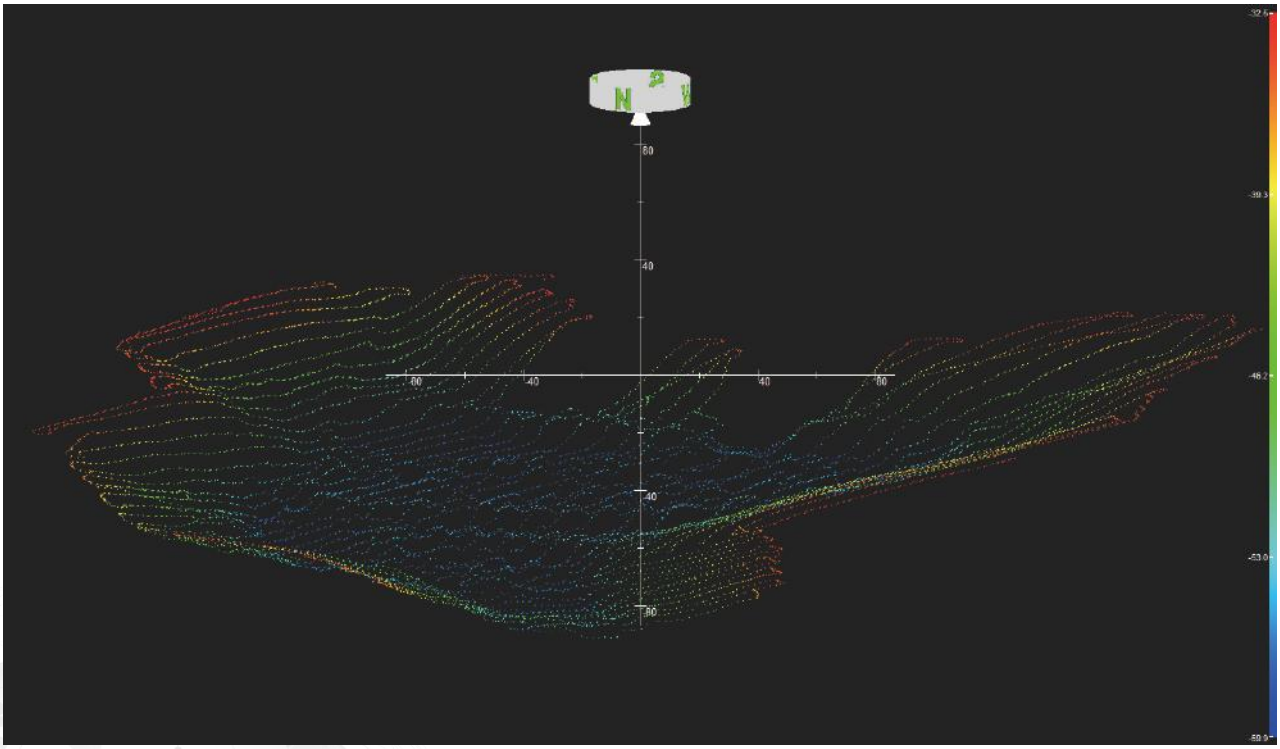


Figure 11. 3D lakebed terrain model

These outputs provided a clear and accurate representation of the lakebed structure, supporting downstream applications such as sediment assessment, construction planning, and ecological studies.

Outcome and Value

The project successfully delivered a high-resolution **underwater topographic map** of a complex, built-up urban lake–something that would have been difficult, time-consuming, or even impractical using traditional manned boats.

Key Benefits:

- **Rapid deployment** and reduced manpower
- **Safe and efficient** operation in narrow or crowded water environments
- **High-accuracy depth data** with seamless integration into post-processing workflows
- **Breakthrough scalability**, especially for large or multi-day survey missions

This case demonstrates how the **iBoat BS12 USV** redefines inland water surveying, offering a smart, compact solution for collecting accurate data in challenging environments. It empowers municipalities, civil engineers, and environmental specialists to make informed decisions, improving waterway management and urban resilience.

At a Glance: iBoat BS12 Urban Lake Survey

Parameter	Survey Area	Deployment Time	Navigation Accuracy	Key Sensors	Post-Processing Tool	Application Scenario
Value	~250,000 m²	<5 minutes	Sub-meter (GNSS + IMU)	Single-beam, 360° camera, radar	HiMAX	Urban lake bathymetry

Water tasks simplified. Precision redefined.

Learn more about the iBoat BS12 and how it empowers hydrographic professionals in real-world scenarios.