TOPOGRAPHIC AND TOPOBATHYMETRIC SURVEY ANALYSIS: CASE STUDY OF SEDIMENT ACCUMULATION IN CĂTĂMĂREȘTI, BOTOȘANI COUNTY

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Abstract. *The technical report outlines the methodology and results of topographic and topobathymetric surveys conducted at the Cătămărești reservoir in Botoșani County, undertaken by SysCAD Solutions S.R.L. in collaboration with the Prut-Bârlad Water Administration. Utilizing GNSS receivers, mobile and static scanners, aerial drones, and bathymetric equipment, the survey aimed to obtain high-resolution data for the reservoir, dam body, and surrounding areas. Data processing was performed using Sierrasoft ProST software, resulting in a comprehensive 3D model, orthophotoplan, cross-sectional profiles, and volume-capacity curve calculations for the reservoir. These outputs serve as critical resources for hydraulic studies, maintenance planning, and area protection strategies. Using the Sensefly eBeeX drone, a flight was made of the entire study area, in order to obtain an orthophoto plane and a digital model of the surrounding terrain in the form of a cloud of points. This model can be used at any time in the hydraulic or systematization studies of the Cătămărăști accumulation protection area. With the help of the static scanner, 15 terrestrial scans of the dam body were performed in order to obtain its 3D model with high accuracy and precision. With the help of the G4 receiver, the coordinates of the specific points of the dam body, the coordinates of the rapiers mounted on it and the piezometers were determined. The measurement method was the RTK method, averaging the measured points for 30 seconds at an interval of 1 second.*

Keywords*: Topobathymetric, 3D Model, Scanning, GNSS, CAD*

INTRODUCTION

Topobathymetric Digital Elevation Models (DEMs) are a merged rendering of both topography (land elevation) and bathymetry (water depth) that provides a seamless elevation product useful for inundation mapping, as well as for other earth science applications, such as the development of sediment-transport, sea-level rise, and storm-surge models.

Numerous techniques have been used over the years to collect bathymetric data. These include hydrographic surveys, ship/boat-based sonar, airborne topobathymetric Lidar, satellite-derived bathymetry (SDB), advanced topographic laser altimeter systems (ATLAS) and, more recently, UAS bathymetric Lidar and UAS bathymetric echosounder/sonar.

Topobathymetric lidar has many important applications. These include:

- Shoreline and coastal intelligence
- Habitat restoration
- Floodplain modeling
- Volumetric analysis
- Infrastructure planning and engineering
- Coastal zone management

This specialized capability allows you to significantly increase your knowledge of the nearshore environment for improved marine resource mapping, benthic habitat mapping, shoreline delineation, nautical charting, and marine debris mapping.

This project involved a comprehensive topographic and topobathymetric survey for the Cătămărăști reservoir in Botoșani County. Executed by SysCAD Solutions SRL in partnership with the Prut-Bârlad Water Basin Administration, the survey aimed to assess and document the dam structure, lake depths, and surrounding areas for future hydraulic and systematization studies. Advanced surveying equipment, including GNSS receivers, mobile and static scanners, and a bathymetric drone, was utilized to obtain high-precision measurements. The gathered data was processed into 3D models, cross-sectional profiles, and various site plans, offering critical insights for effective water management and infrastructure planning.

MATERIAL AND METHODS

The following equipment was used to perform the topobathymetric measurements:

South Surveying SU30 bathymetric drone equipped with GNSS RTK model G1 receiver and sonar

South Surveying G4 GNSS receiver as the basis for transmitting RTK corrections to the bathymetric drone

The software installed on the remote control of the bathymetric drone allows its configuration and the setting of the mission to be carried out.

The results thus obtained are exported directly in DXF or CSV format, which can then be processed in any desired processing software.

The obtained data were processed and integrated into a three-dimensional model covering the entire studied area.

Cross profiles were set within the application and then generated based on the measurements.

The obtained results were then exported in DXF format, compatible with any version of CAD software (Autocad, Progecad, Bricscad, ZWCad, etc.).

Figure 1. Orthophoto plan with the marking of the axis of the accumulation and the transverse profiles

Using the Sensefly eBeeX drone, a flight of the entire study area was made, in order to obtain an orthophoto plane and a digital model of the surrounding land in the form of a cloud of

points. This model can be used at any time in the hydraulic or systematization studies of the Cătămărăști accumulation protection area (fig 1).

With the help of the G4 receiver, the coordinates of the specific points of the dam body, the coordinates of the rapiers mounted on it and the piezometers were determined. The measurement method was the RTK method, averaging the measured points for 30 seconds at an interval of 1 second.

Using the RobotSLAM scanner, the Unloading Tower and the walkway connecting the dam body and the tower itself were measured (fig 3).

With the help of the static scanner, 15 terrestrial scans of the dam body were performed in order to obtain its 3D model with high accuracy and precision (fig 2).

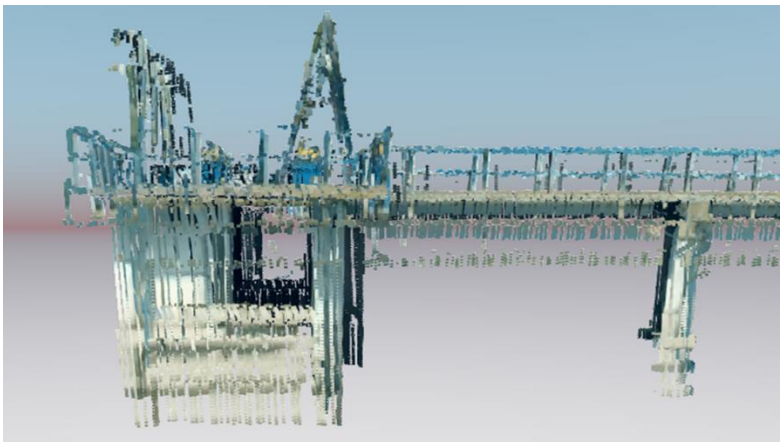

Figure 2. 3D digital model view of the tower obtained from the scan using the static scanner

RESULTS AND DISCUSSIONS

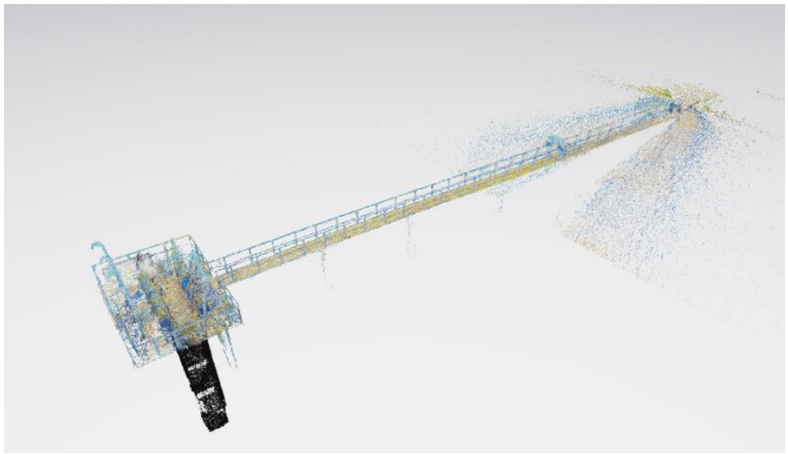

Figure 3. Digital model of the tower obtained with the RobotSLAM mobile scanner

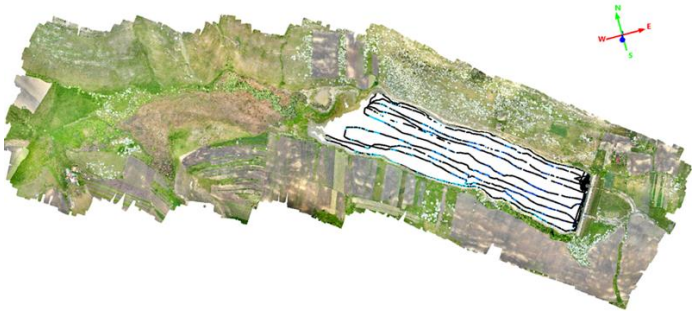

Figure 4. Cătămărăști accumulation point cloud - studied area, bottom of the lake, dam body

CONCLUSIONS

The topographic and topobathymetric survey of the Cătămărăști reservoir successfully achieved the objectives set out in the project scope, providing detailed and accurate spatial data for the dam and lake area. Using state-of-the-art surveying technologies, the project team generated high-resolution models and calculations essential for monitoring water capacity and infrastructure stability. These deliverables will support future planning and maintenance efforts, ensuring sustainable management of the reservoir and surrounding ecosystem in Botoșani County.

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