



Drone in sediment management: Grono power plant case study

Practical application

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Agenda

- Quick overview on Misox Powerplants
- Roggiasca Dam
- Flood of 21 Juni 2024, what happened?
- Sediment measurement methods
- Sediment measurement results
- Damage at Roggiasca Dam
- Questions

Quick overview on Misox powerplants

- 2 Turbines
- 4.2 + 20.9 MW
- 70GWh/year



Spina

- 2 Turbines
- 83 MW
- 245 GWh/year



Soazza

- 1 Turbine
- 0.3 MW
- 1.3 GWh/year

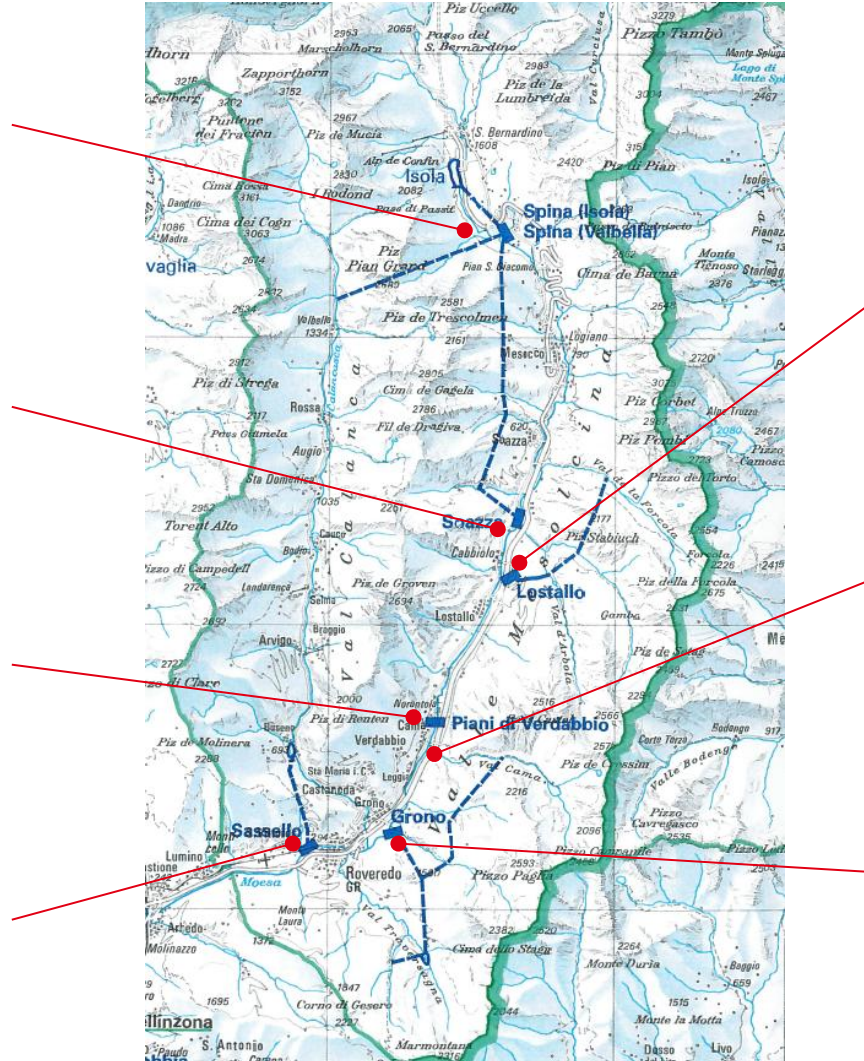


Tecnicama

- 2 Turbines
- 21 MW
- 90 GWh/year



Sassello



Lestallo

- 2 Turbines
- 25 MW
- 72 GWh/year



Ogreda

- 1 Turbine
- 0.06 MW
- 0.3 GWh/year

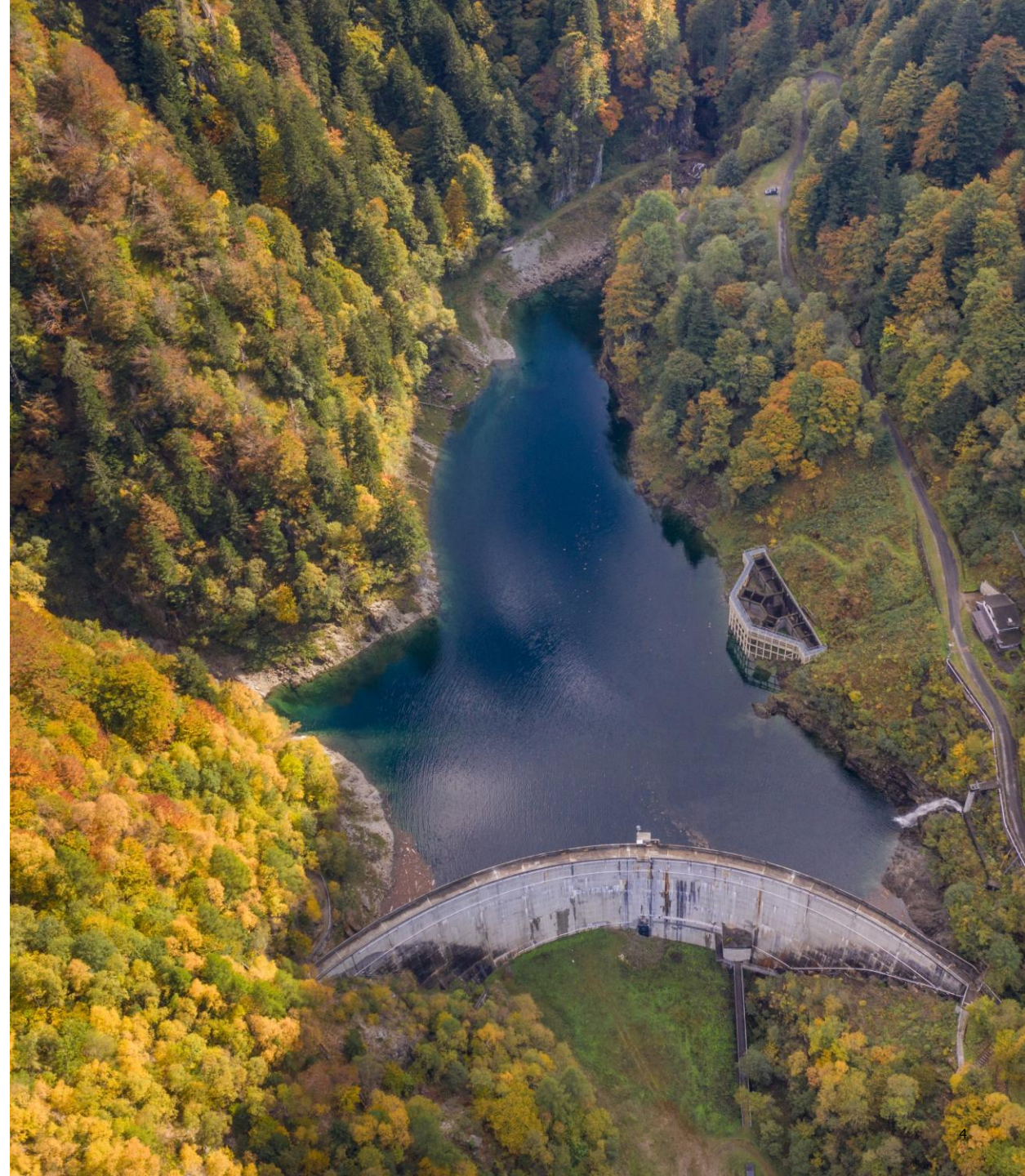


Grono

- 3 Turbines
- 37.5 MW
- 94 GWh/year

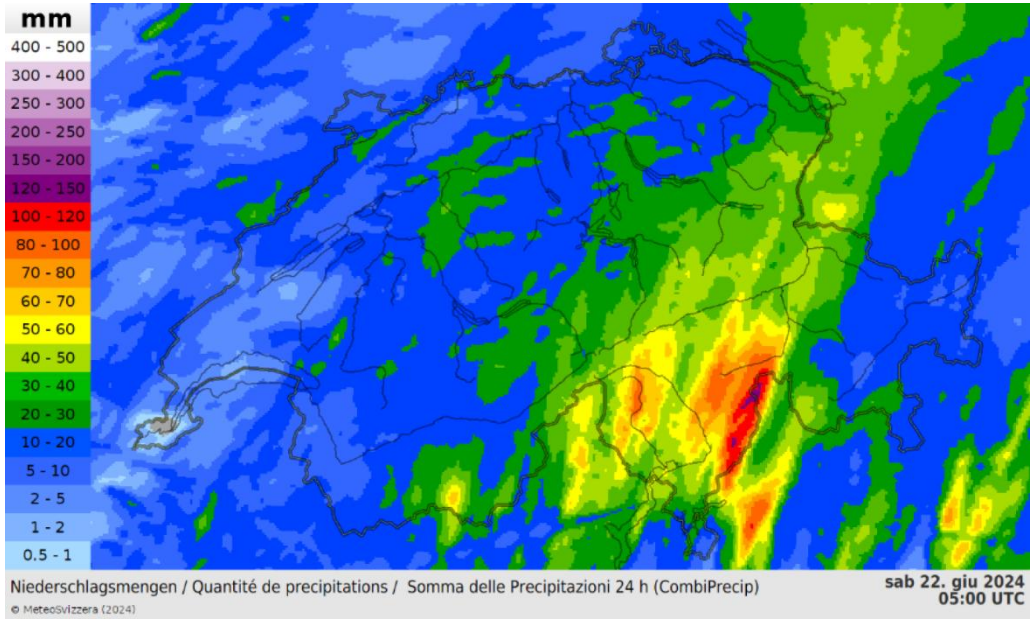
Roggiasca Dam

- Arch Dam
- Height: 68m
- Length: 177m
- 470000 m³

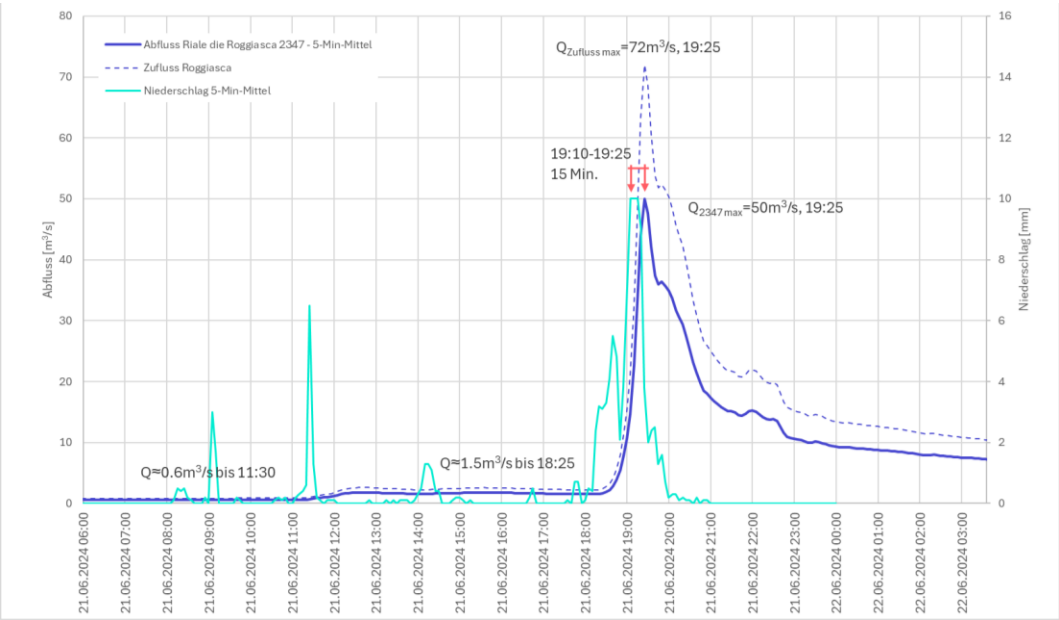


Flood of 21 June 2024(1/2)

Accumulated 24-hour precipitation



Precipitations 1,5 Hours = 90 mm



Flood of 21 June 2024 (2/2)

- Up to 75l/m²
- 320 days of production were lost at the Grono power plant
- 200 Tons of wood removed from Roggiasca Dam
- Other major damage in the whole Misox valley



Credits: Keystone / Michael Buholzer

Sediment measurement methods (1/3)

Echo sounding

Single Beam

The lakebed is surveyed using vertical echo-sounder pulses along a grid pattern, with gaps between survey lines interpolated. DGNSS positions the sensor with an accuracy of a few centimetres per point



DGNSS: Differential global navigation satellite systems

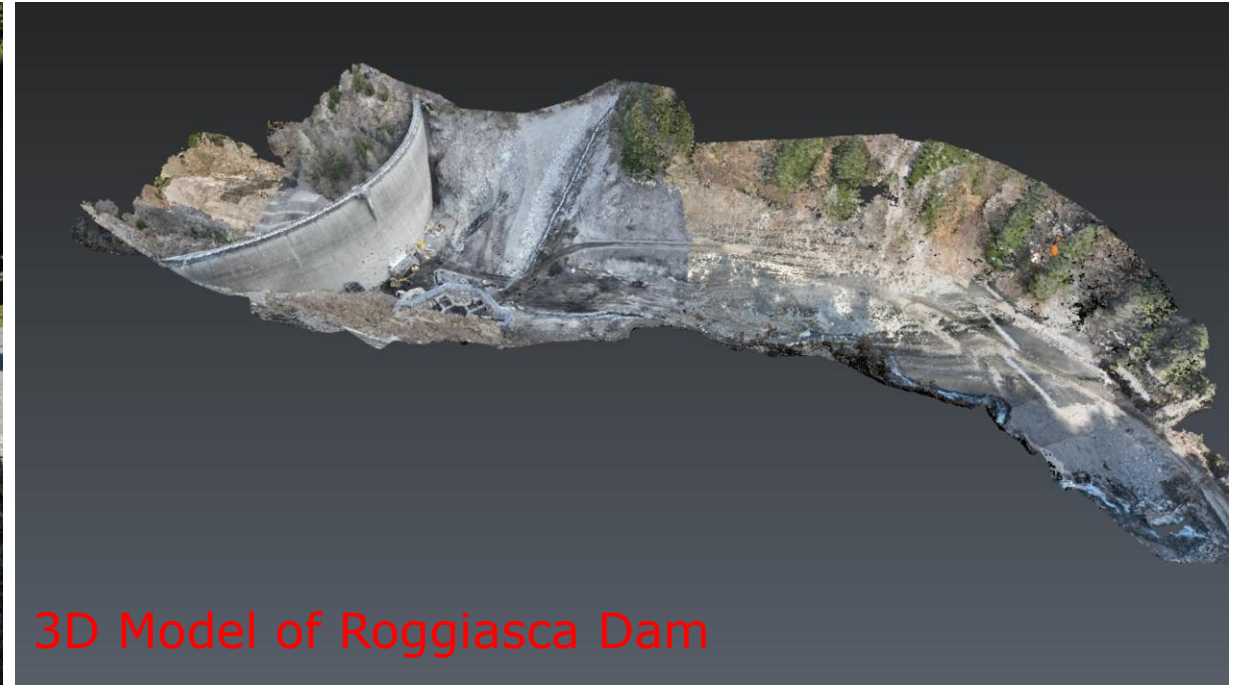
Multibeam

A multibeam echo sounder also maps the lakebed using acoustic pulses, capturing data in overlapping swaths to avoid interpolation. An inertial measurement (IMU) provides the trajectory while the DGNSS provides positioning and stabilises the trajectory. Accuracy is likewise within a few centimetres.



Sediment measurement methods (2/3)

Drones with LiDAR 3D scanning

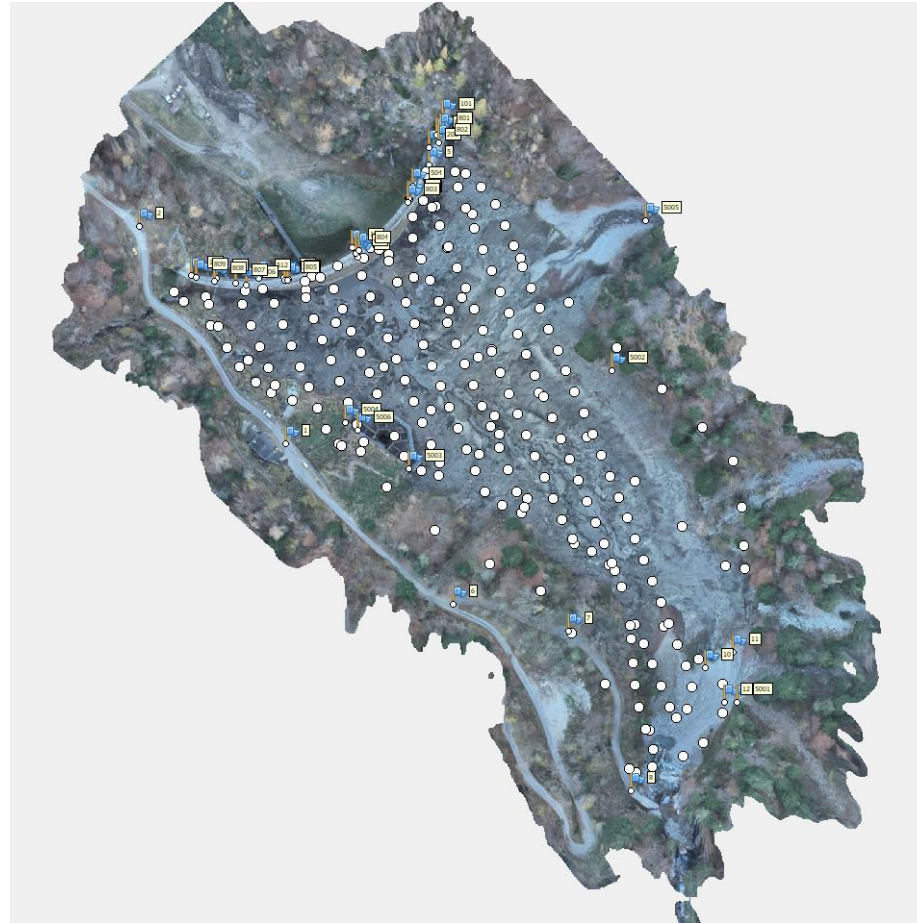


Sediment measurement methods (3/3)

Drones and photogrammetry



Blue flags: reference points; White points: camera positions



Sediment measurement results (1/5)

Approach

Measurement date	Technology	Reason
November 2011	Echo sounding – single beam	Routine
May 2024	Photogrammetry	Routine

Flood 21 Juni 2024

September 2024	Echo sounding – single beam LiDAR 3D scanning	First measurement after event
November 2024	Photogrammetry	Detailed measurement after event
May 2025	LiDAR 3D scanning	End of works

Sediment measurement results (2/5)

Measurement with Photogrammetry after the flooding event

We compared the the mesurement between November 2011 and November 2024 and divided the lakebed in 4 surfaces to simplify the calculations and we obtained:

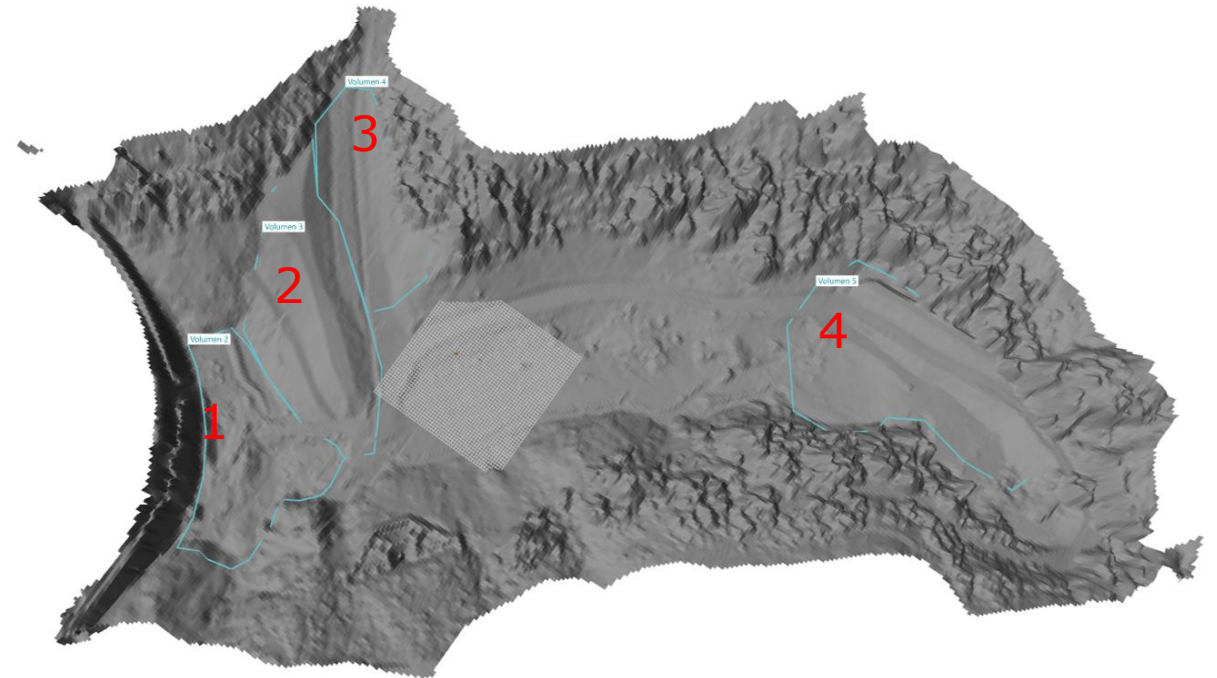
Area 1: 10000m³ sediment deposited

Area 2: 7000m³ sediment deposited

Area 3: 10000m³ sediment deposited

Area 4: 13000m³ sediment deposited

Total: 40000m³ sediment deposited



Sediment measurement results (3/5)

Measurement with LiDAR after sediment removal works

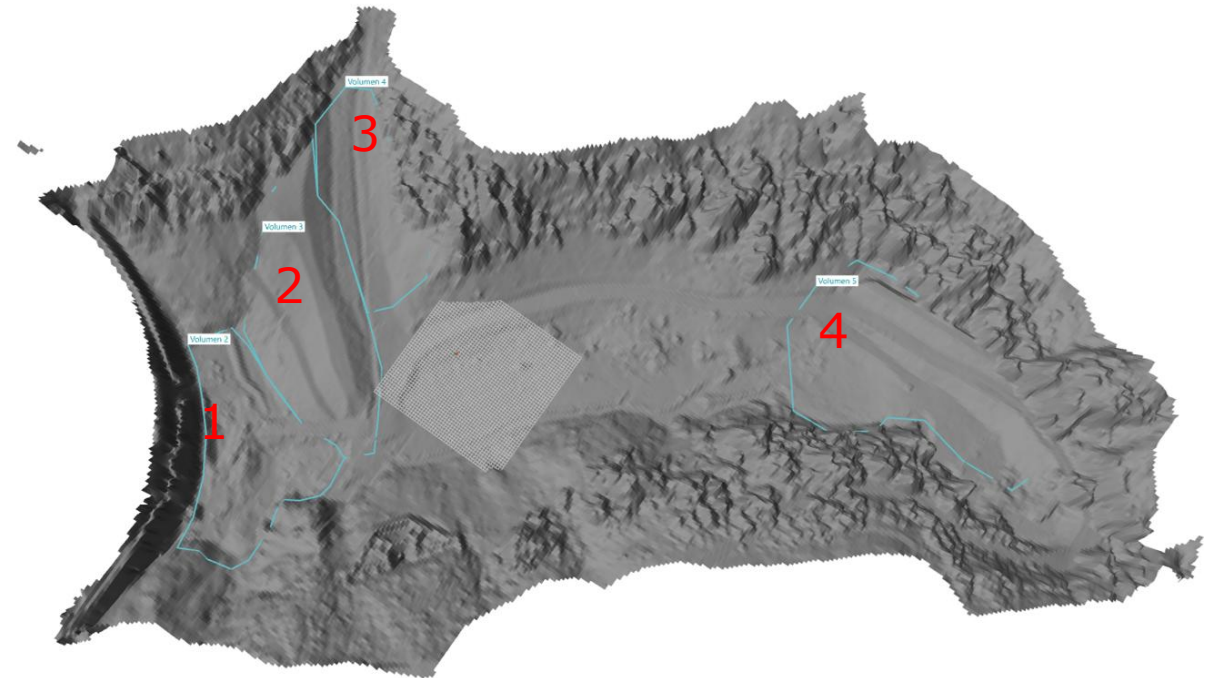
Area 1: 8500m³ sediment removed

Area 2: 2000m³ sediment removed

Area 3: 4500m³ sediment removed

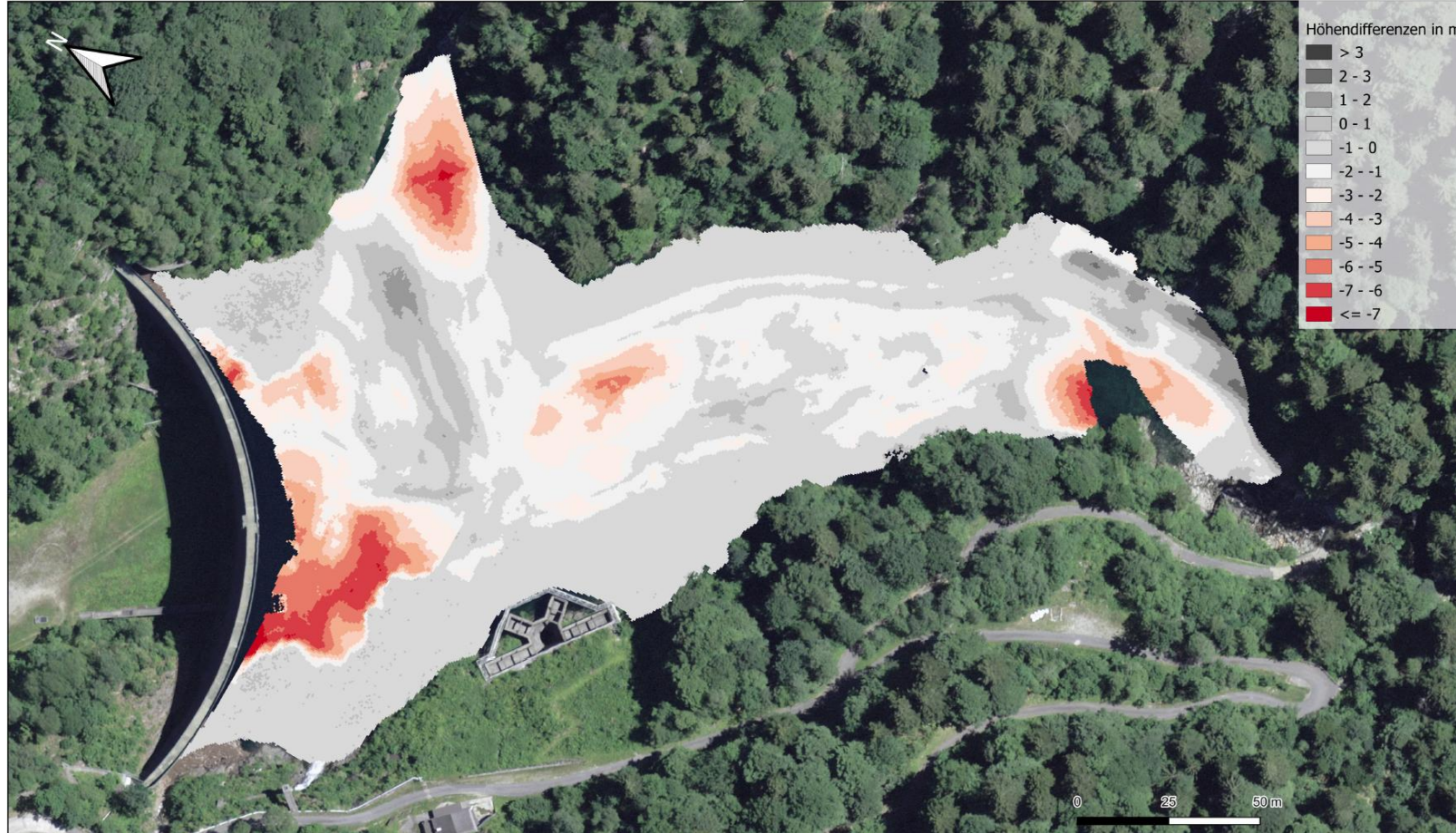
Area 4: 5000m³ sediment removed

Total: 20000m³ sediment removed



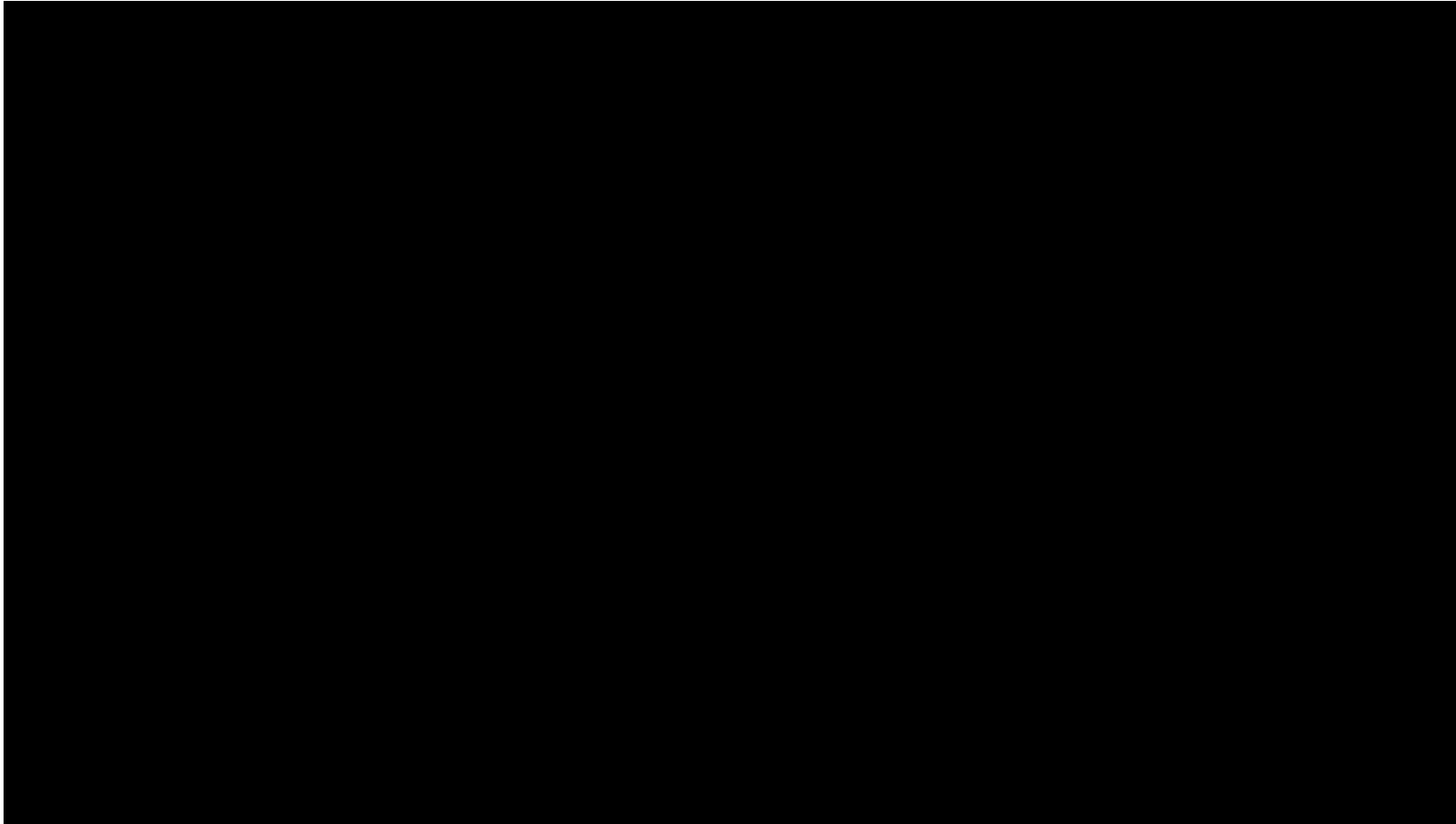
Sediment measurement results (4/4)

Result after sediment removal works



Sediment measurement results (5/5)

Snapshot sediment removal works



Damage at Roggiasca dam (1/3)

Water intake



Damage at Roggiasca dam (2/3)

Mud in the tunnel



Damage at Roggiasca dam (3/3)

Ball valve



Questions

