



Sediment transport along the Talferbach

the effectiveness of check dam openings in sediment continuity

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Contents








- openings of check dams downstream the retention dam
- its effect on sediment transport / continuity
- its effect on grain size distribution
- the importance of defining an adequate monitoring strategy (with measurable indicators) to assess the effectiveness of the 'undertaken action'



The Talfer-Talvera had threatened Bolzano for a long time until a large retention dam was built North of town

This dam trapped sediments and large amounts of wood; in addition it was an obstacle for the fish. Downstream the retention dam 45 check dams and lateral walls confined the river to an artificial morphology to protect Bozen from flooding.

BAUKAT 30 - Consolidation and protection structures

-  Check dams
-  Weir / Ramps / Ford
-  Wooden bridges
-  Foot bridges
-  Concrete bridges
-  Riverbank protection walls
-  Chutes



Lately a change in culture and mentality has enhanced the values of **river ecology** and its related **ecosystem services**.

Starting from 2015 a series of **River Restoration measures** has been implemented by the civil Protection Agency of the Province of Bozen. Some of the 45 check dams have been opened in order to promote fish and sediment continuity.

Talferbach - restored reach



Within the context of an Interreg project - **HyMoCARES** of which the civil Protection Agency was partner - an assessment of the restoration actions on the river morphology and on the aquatic ecology was carried out to establish the objectives for which defining the most appropriate type of monitoring, based on suitable indicators



Watercourse	Talvera Torrent
Catchment area	429 km ²
Restored reach length	5 km
Channel slope	2% average
Active channel width	20 – 50 m
Restoration start	2015
Restoration end	2019

Check dam opening and retention dam removal

2005



2019



**Goal: enhancing longitudinal continuity (for fish and sediment);
finding a balance between hydraulic risk management and river
restoration**



Retention check dam removal



built in 2018



removed in 2019

Goal: enhancing longitudinal continuity (for fish and sediment); finding a balance between hydraulic risk management and river restoration

Monitoring: to assess the effectiveness of the restoration measures a series of indicators has been selected

PHYSICAL indicators

DoD

DEM of Difference

Grain size analysis

MQI, MQIm

IARI

MesoHABSIM

ECOLOGICAL indicators

Diatoms

MZB

Fish

Chemical analysis

MesoHABSIM

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Available Data

- 2013 DEM
 - 2016 DEM
 - 2018 DEM
- } Airborne LiDAR
(Airborne Laser scanning)

Action: check dam opening

Monitoring: sediment mobilization, river morphodynamics and morphological variability

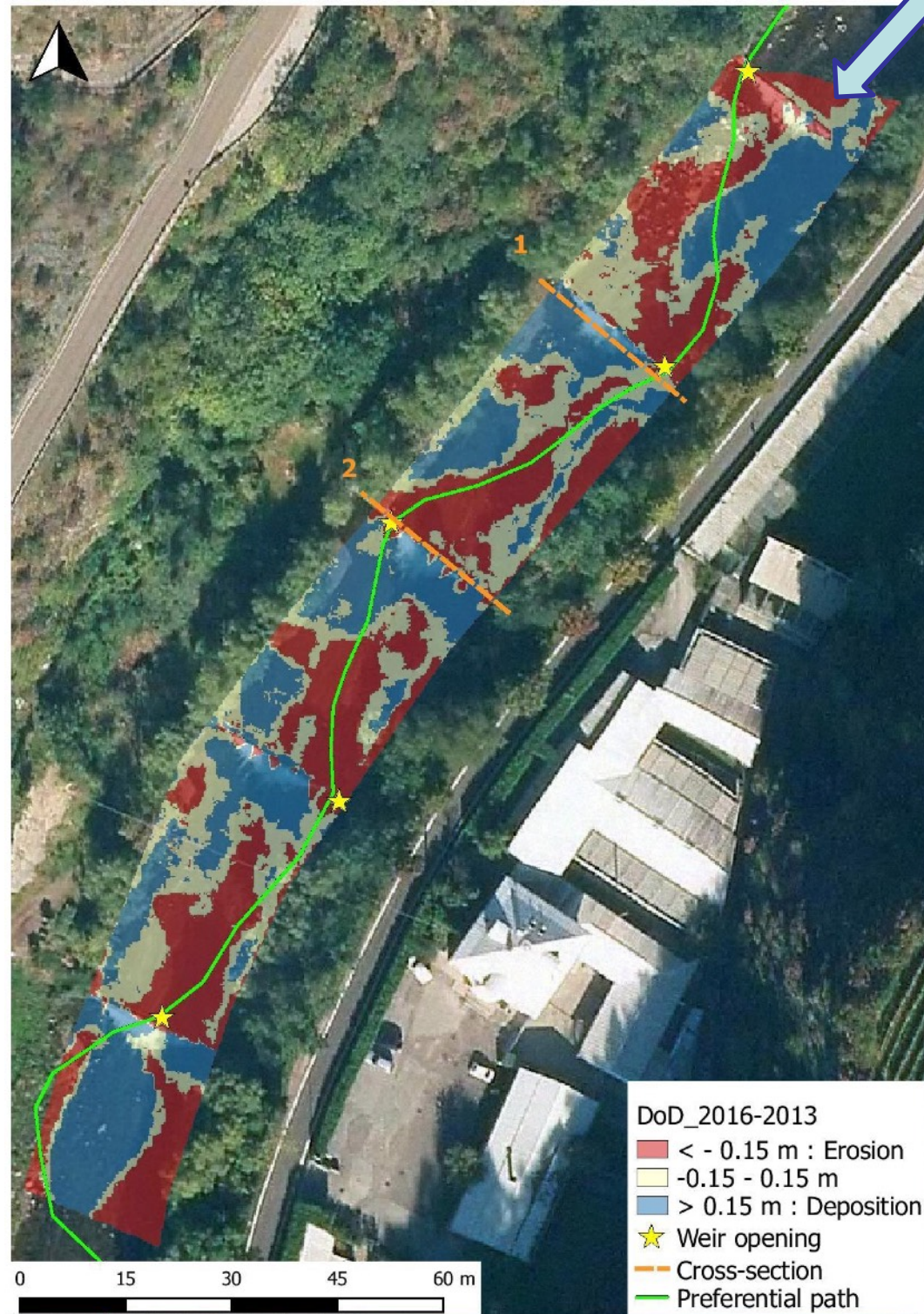
DoD

DoD 2018-2016

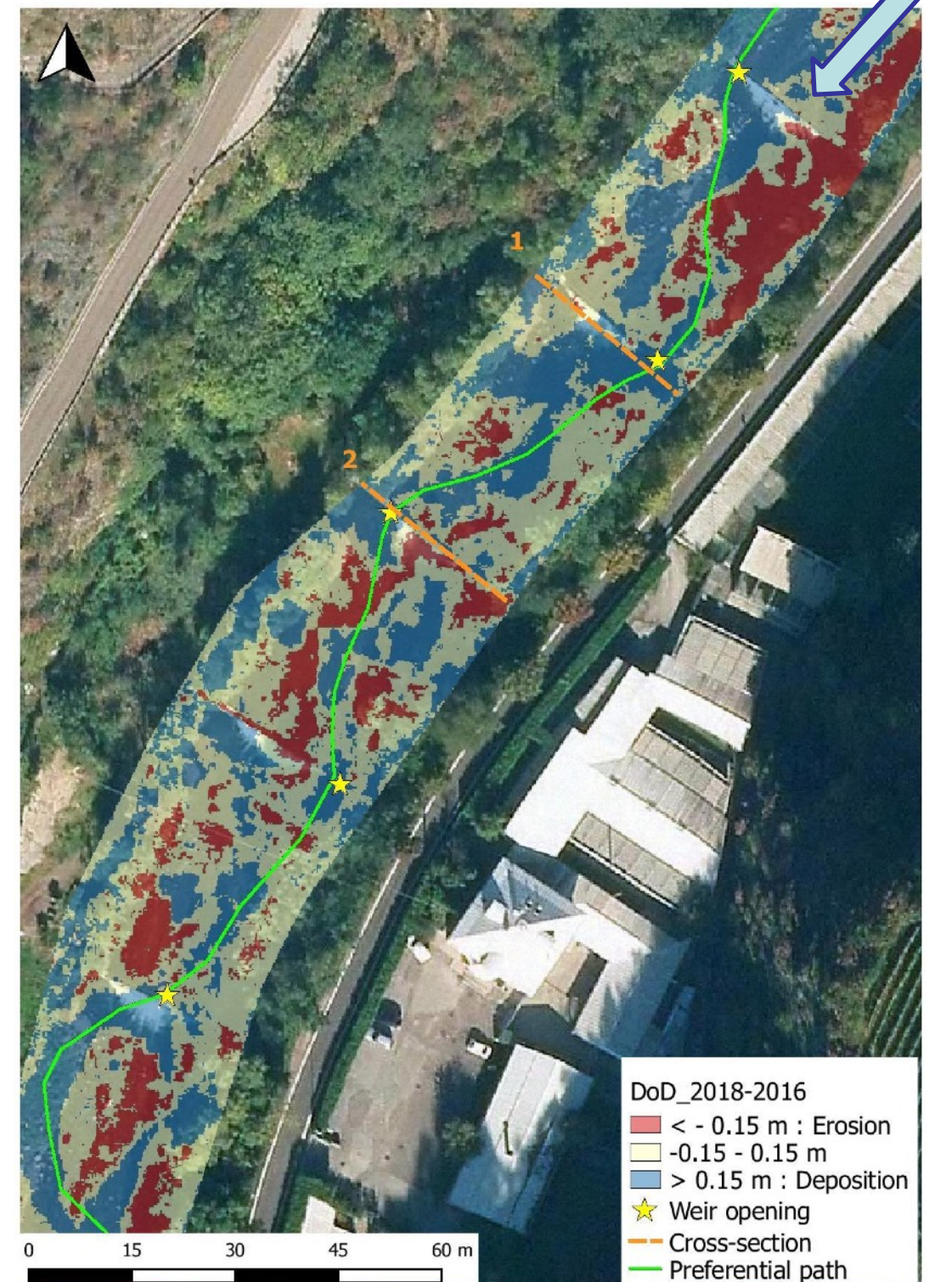
DoD 2016-2013



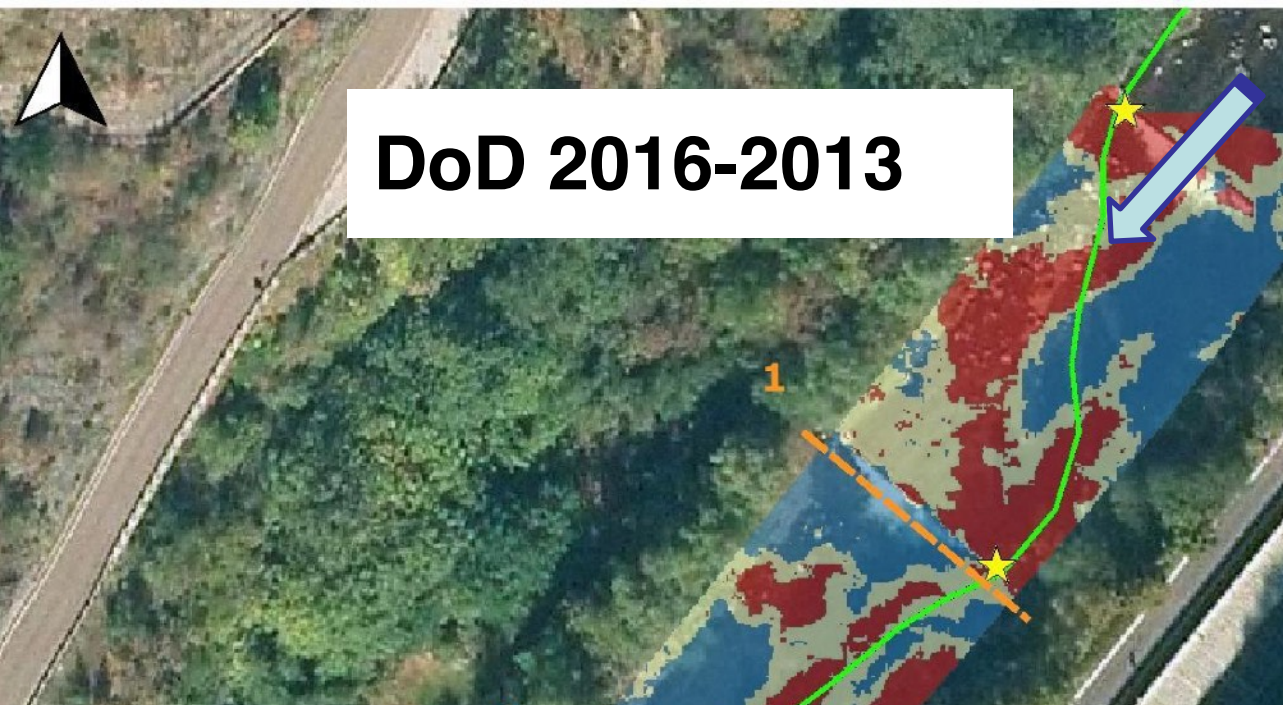
DoD 2016-2013



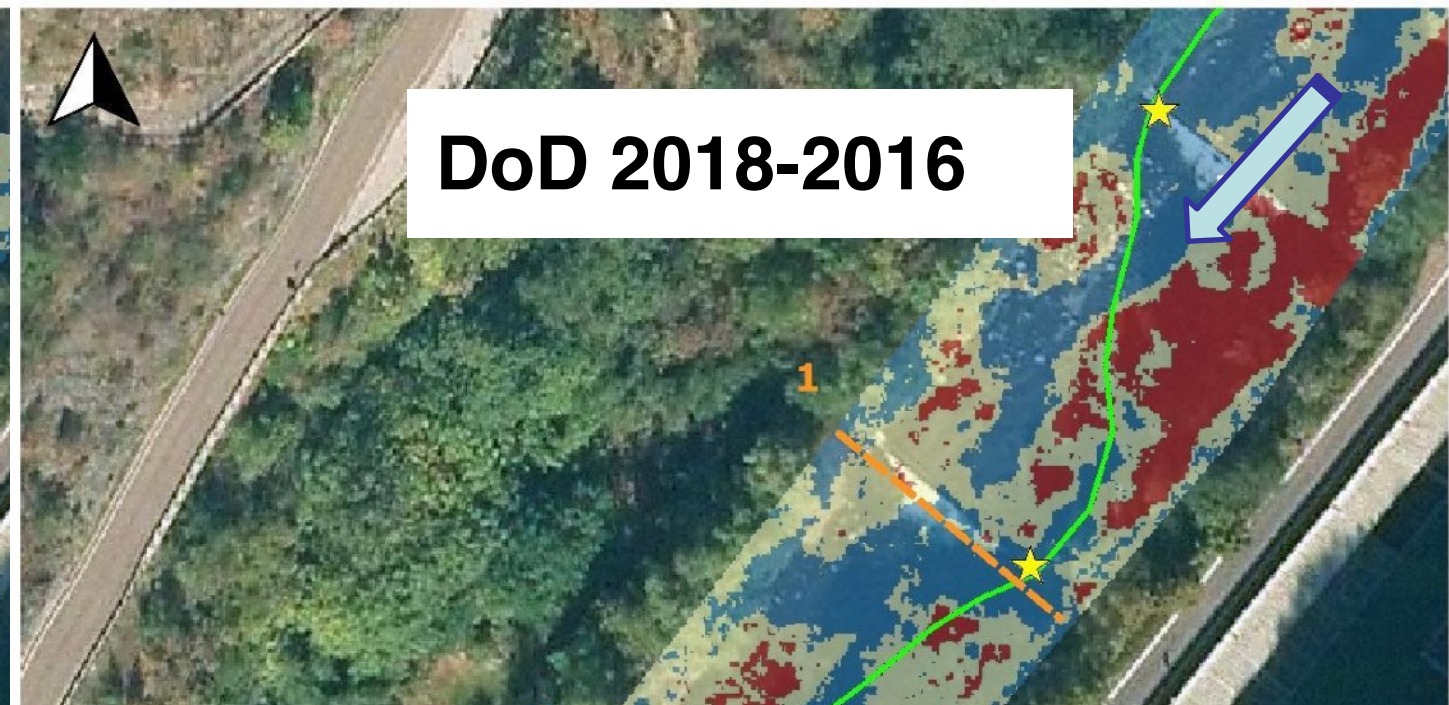
DoD 2018-2016



Results: along the main flow, induced by the check dam openings, erosion can be observed (red patterns), elsewhere deposition occurs (blue patterns)

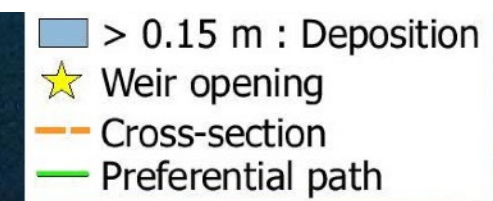
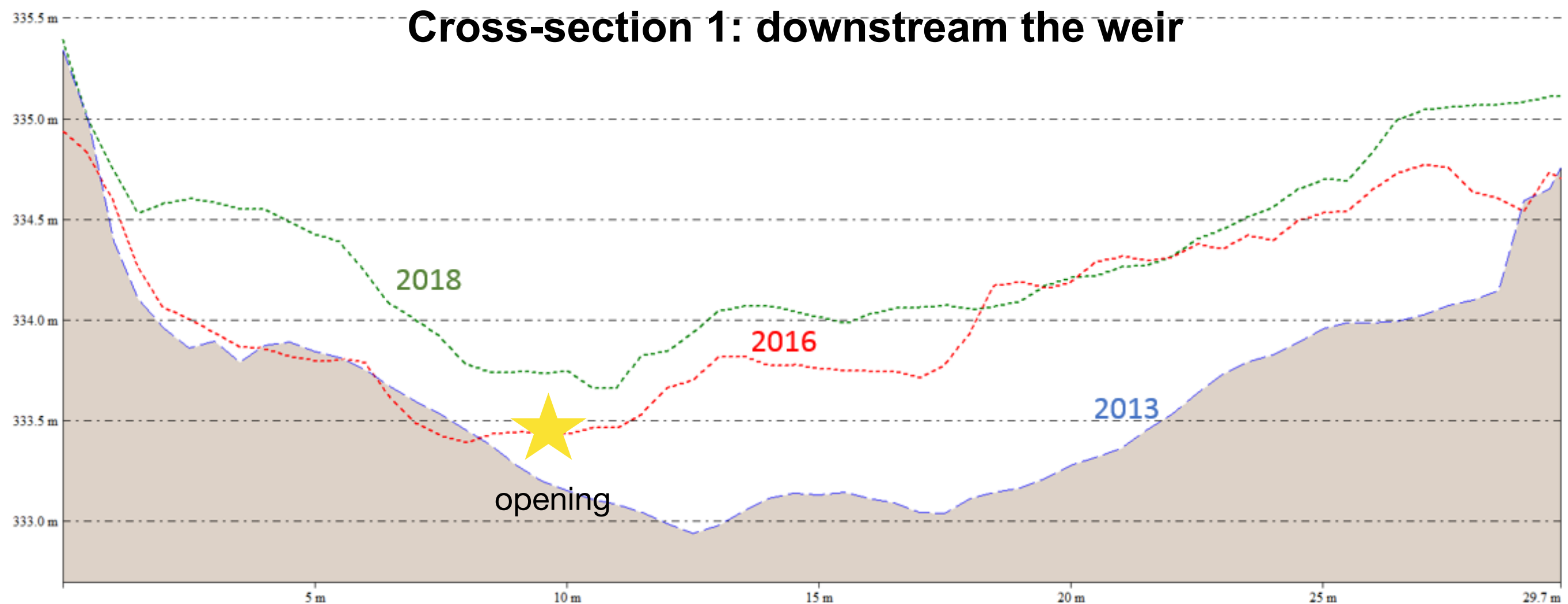


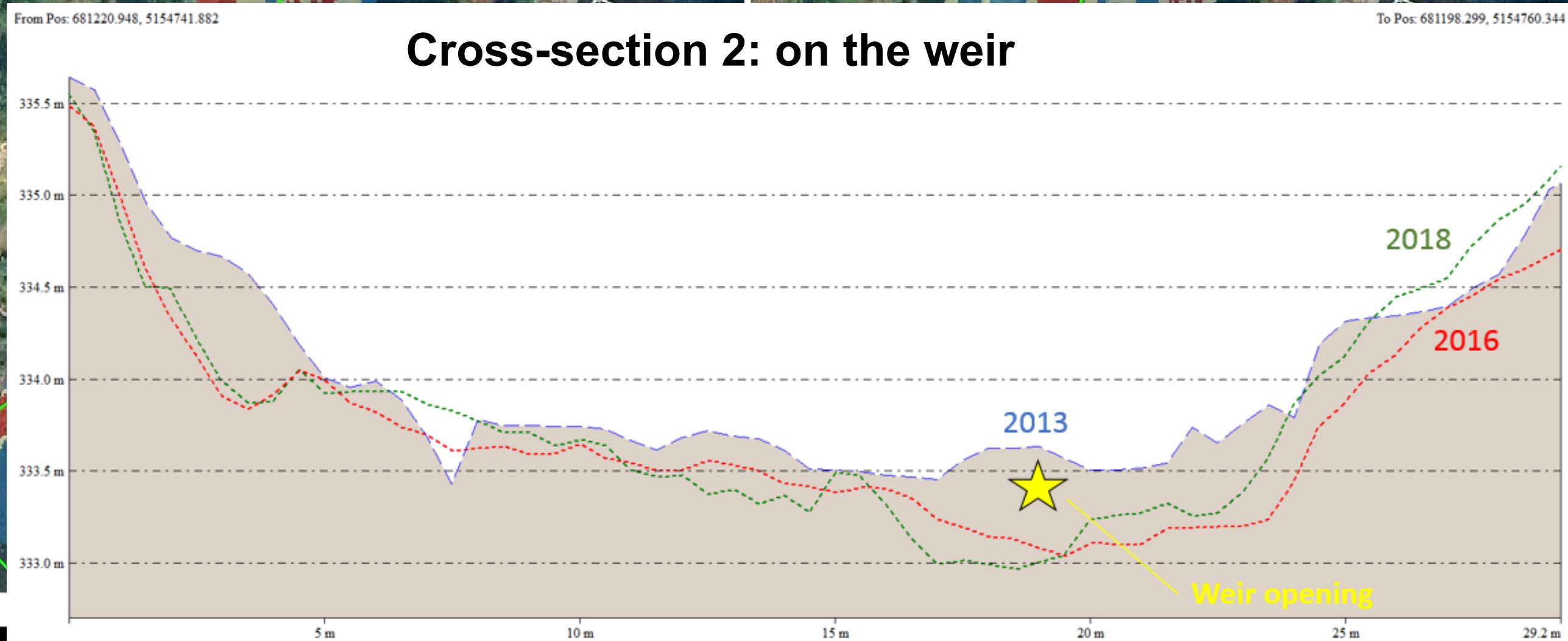
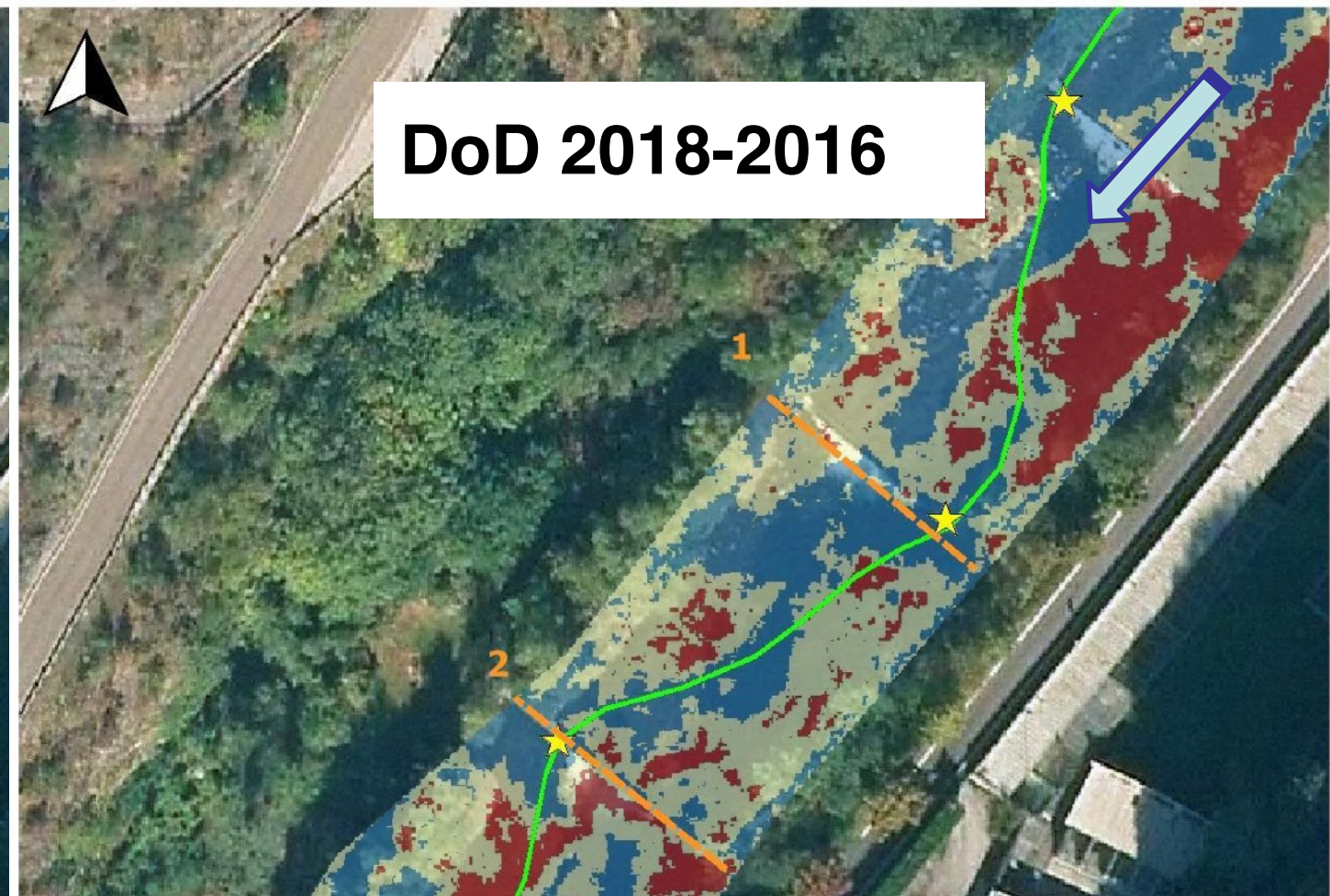
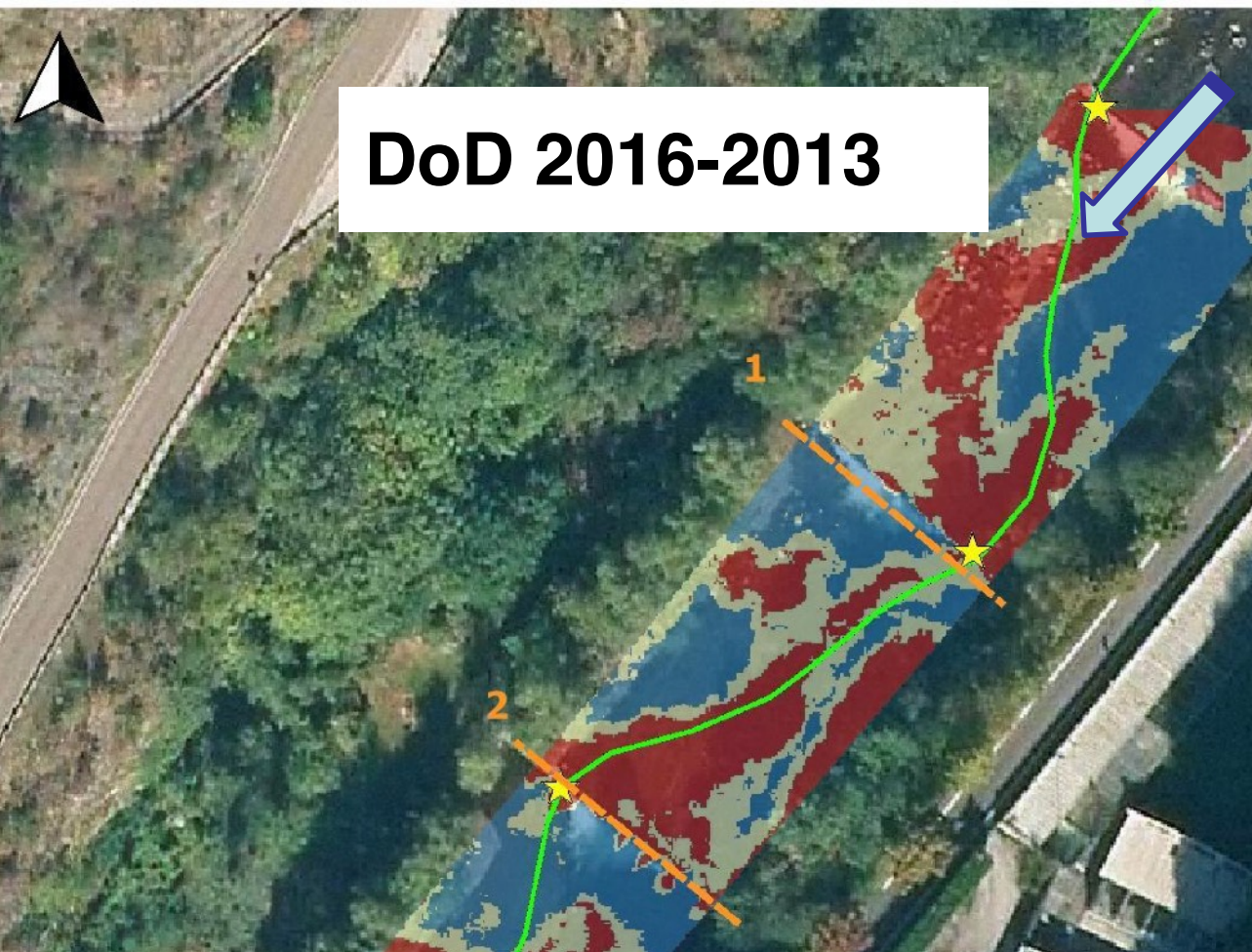
From Pos: 681244.739, 5154771.002



To Pos: 681221.900, 5154790.035

Cross-section 1: downstream the weir



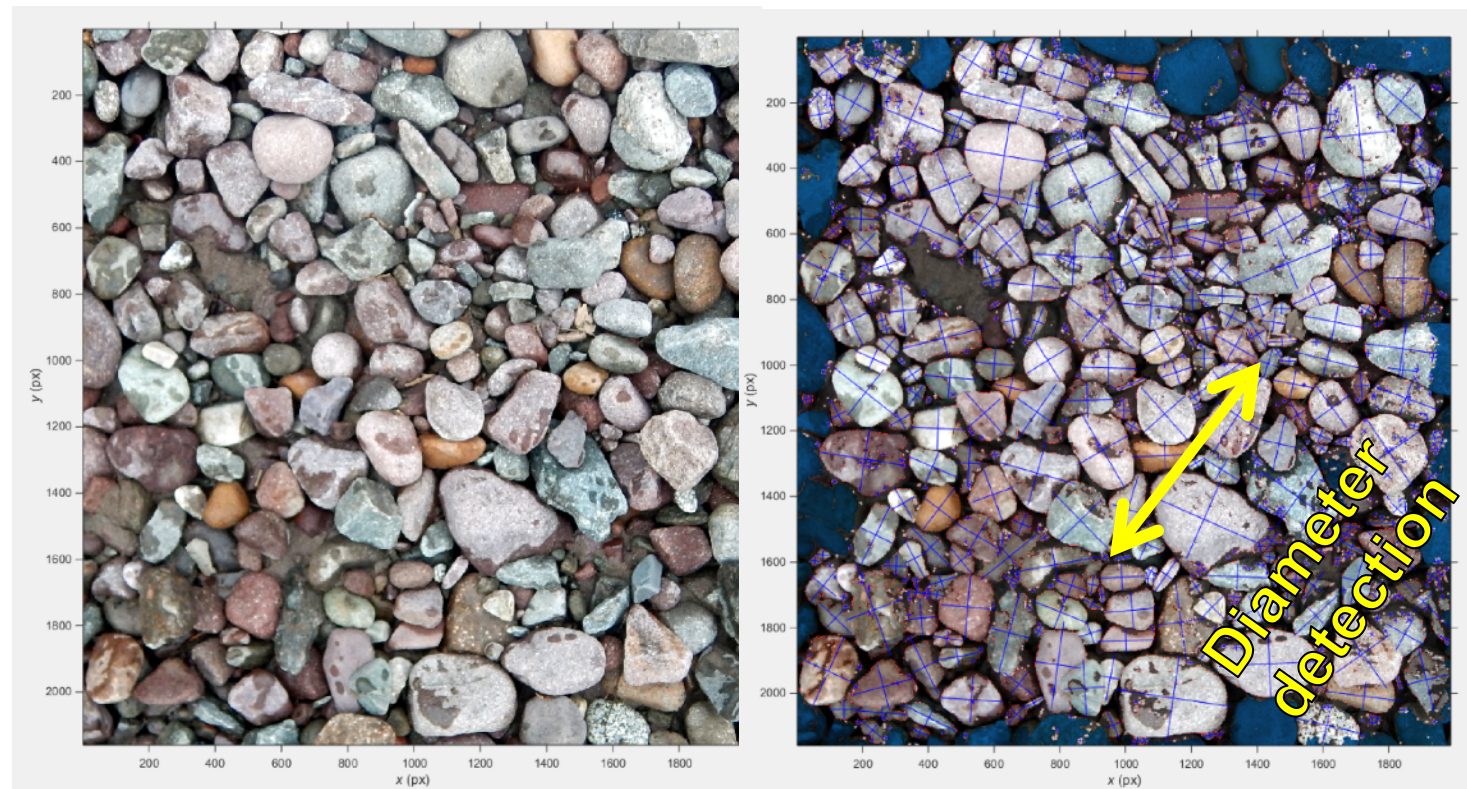
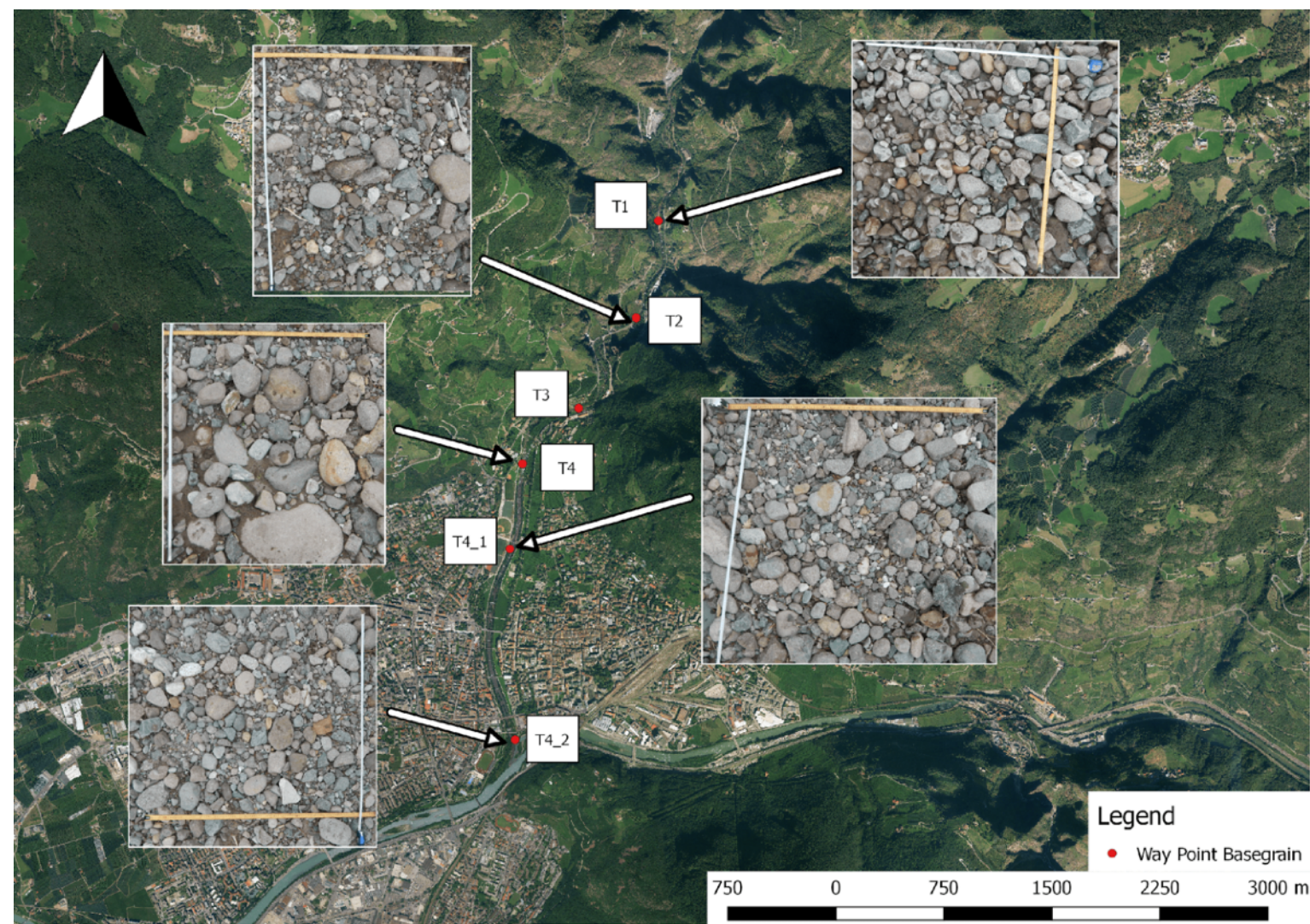


Monitoring objective: assessing the effect of the openings on the grain size distribution along the restored reach, i.e. whether the sediments have moved

Grain size analysis

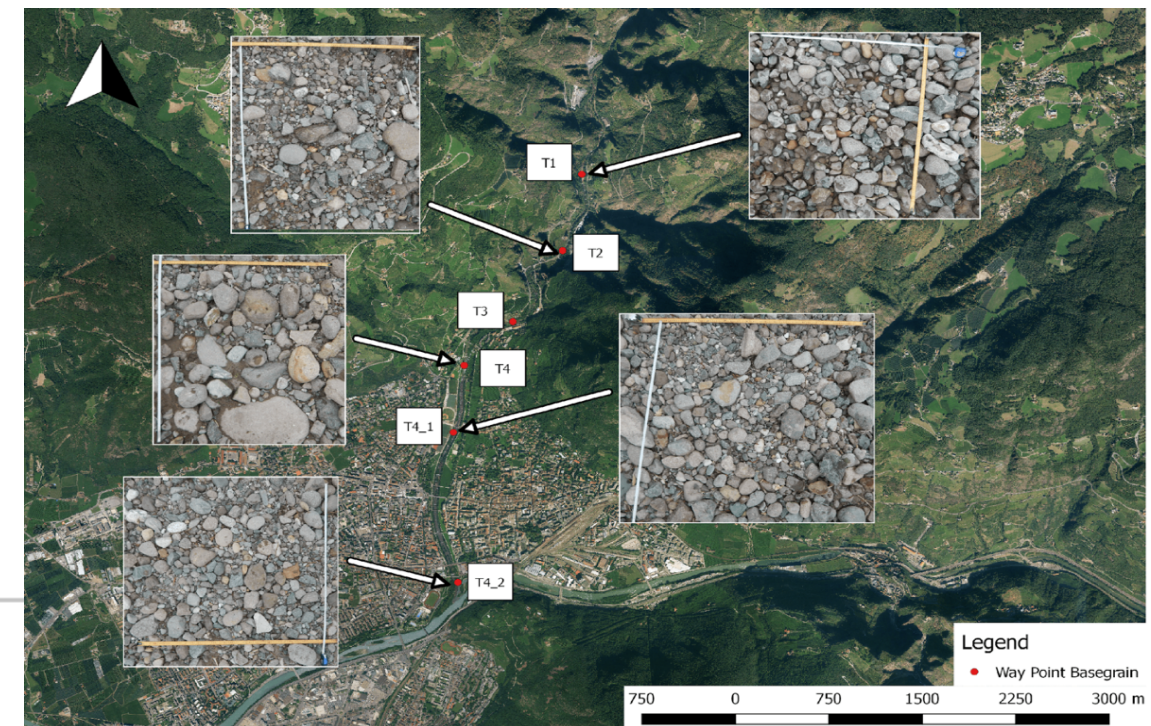
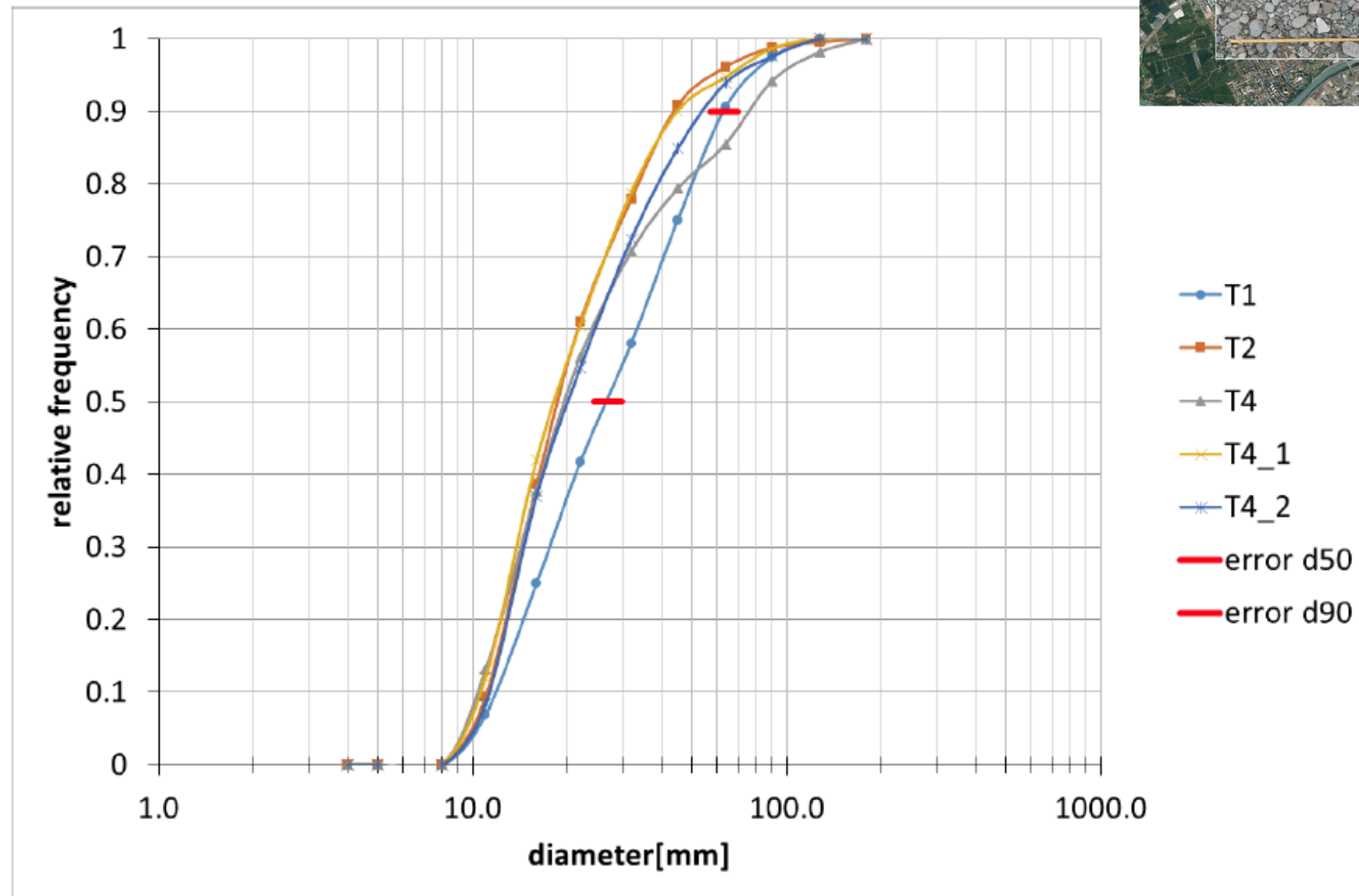
The restored reach has been divided into 6 sub-reaches

The surface sediments were analysed taking samples and using the software Basegrain and compared with previous studies (2013).



Grain size analysis

2019: Grain size distribution comparison among all survey points



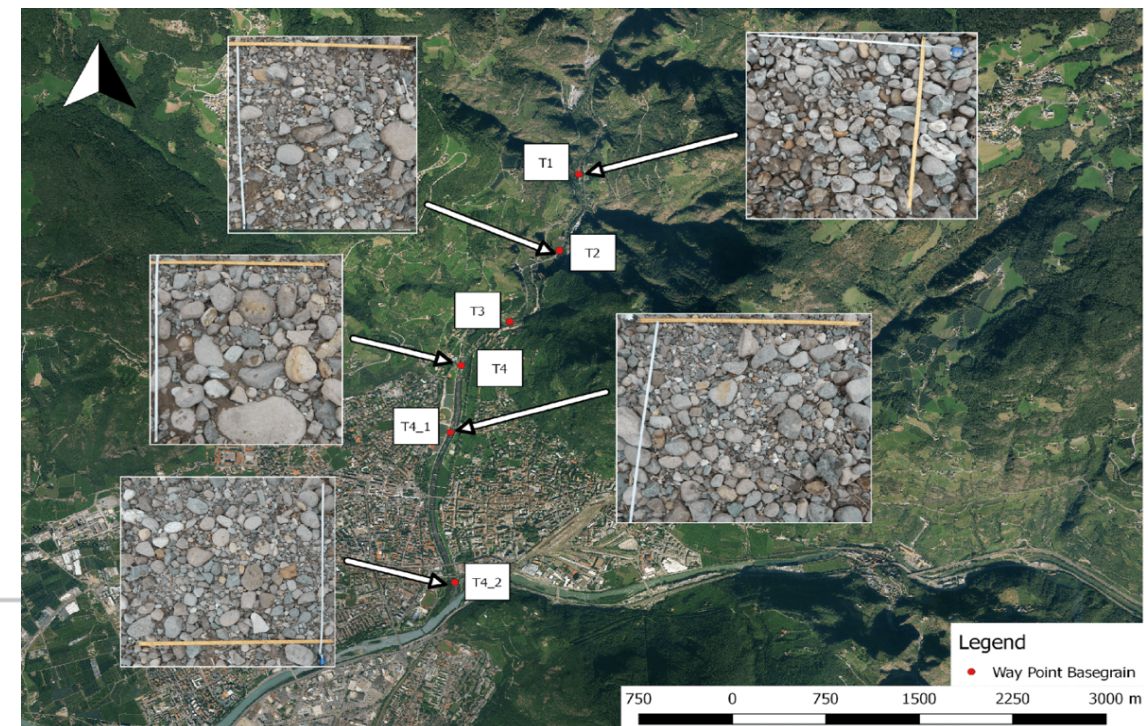
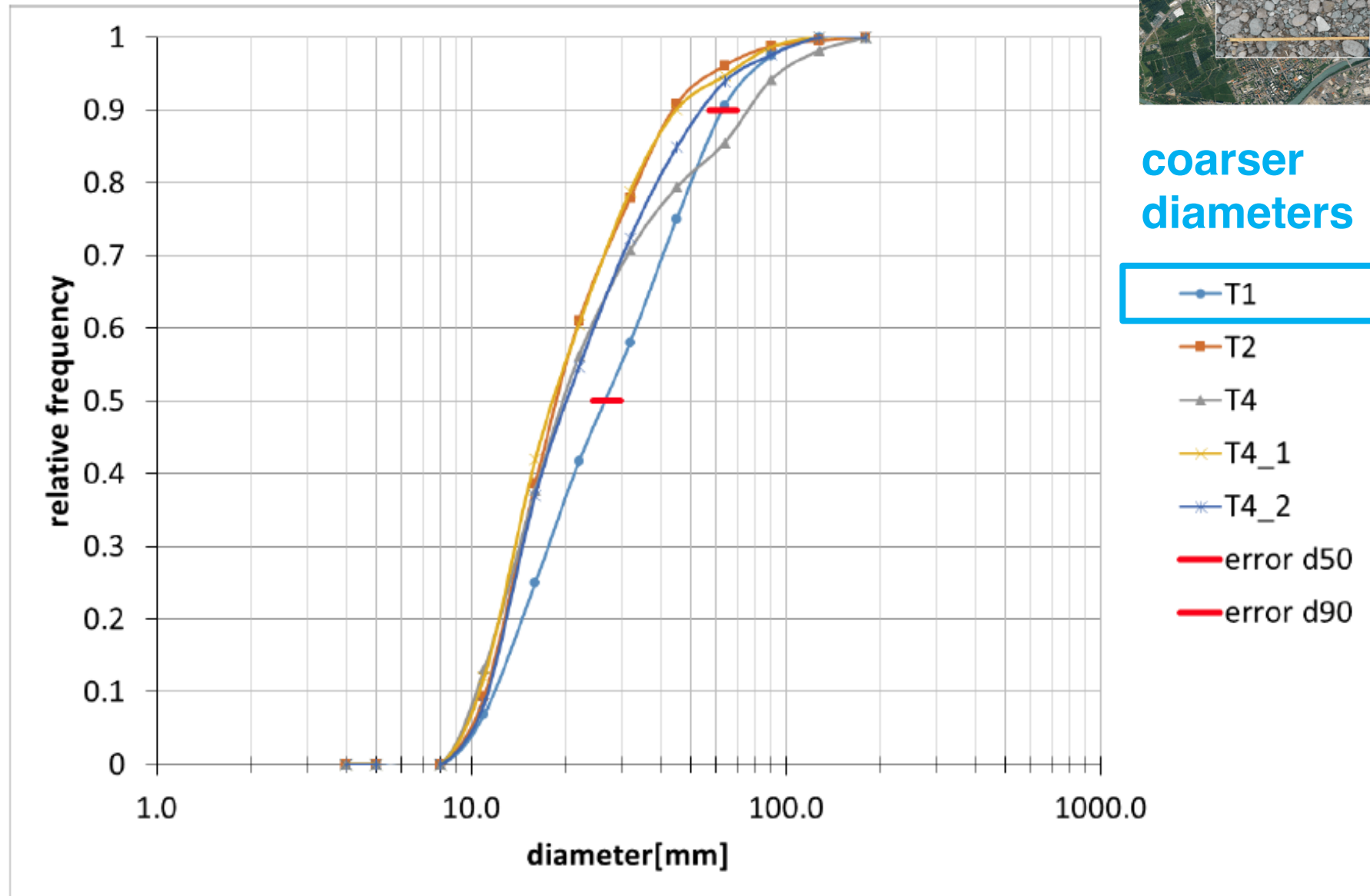
T1: coarser grains compared to the other reaches

T2: same grain size as T4 (finer than T1)

T4: same grain size as T2 (finer than T1).

Grain size analysis

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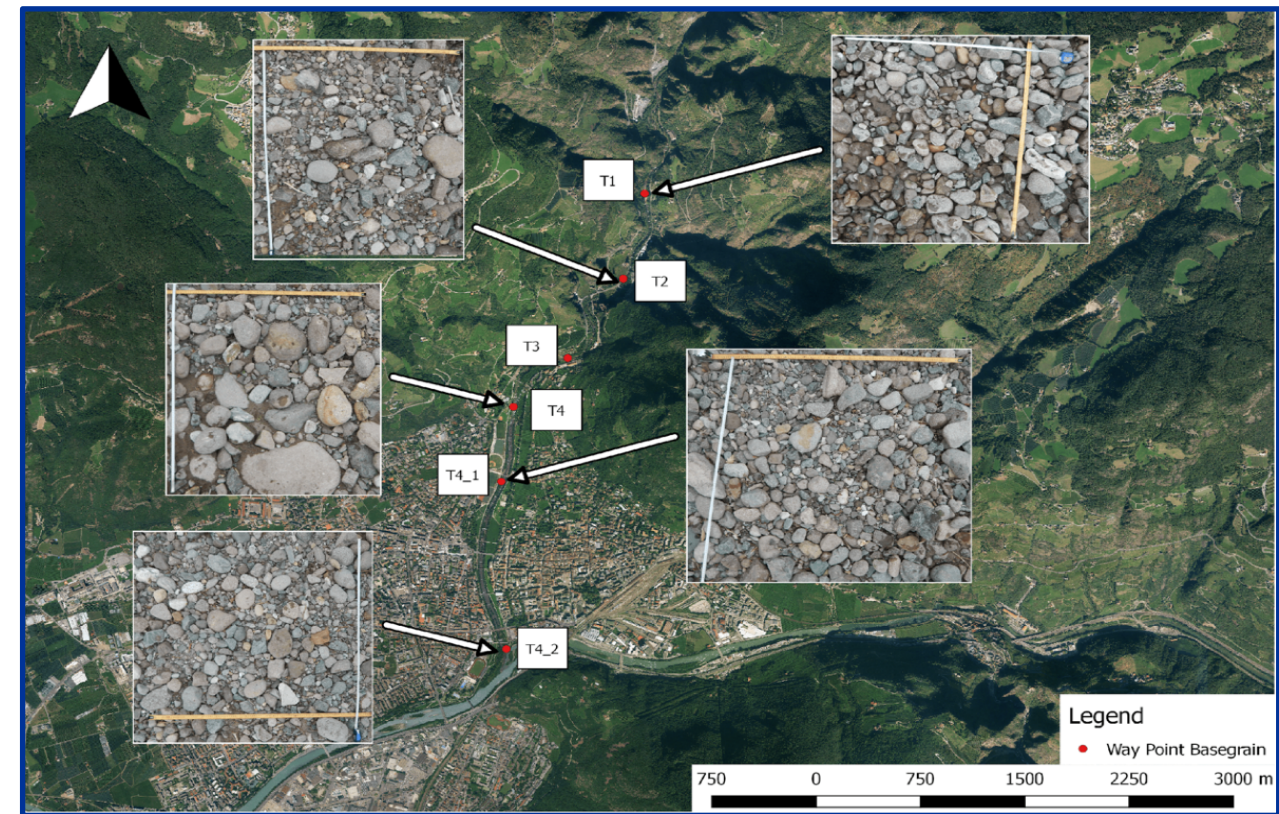
Grain size analysis

2013 - 2019: diameter comparison

T1: No major changes from 2013 to 2019

T2: Coarser grains compared to 2013

T4: no clear trend compared to 2013



Reach	$D50_{PRE}[mm]$	$D50_{POST}[mm]$	$\delta 50$	$D90_{PRE}[mm]$	$D90_{POST}[mm]$	$\delta 90$
T1	26.6	27.1	2%	67.1	63.3	- 6%
T2	12.6	19.1	52%	21.1	44.1	109%
T3	44.4	-	-	109.1	-	-
T4	-	20.0	-	-	77.4	-
T4 ₁	36.4	18.61	- 49%	80.6	44.9	- 44%
T4 ₂	13.6	20.4	50%	36.7	55.8	52%

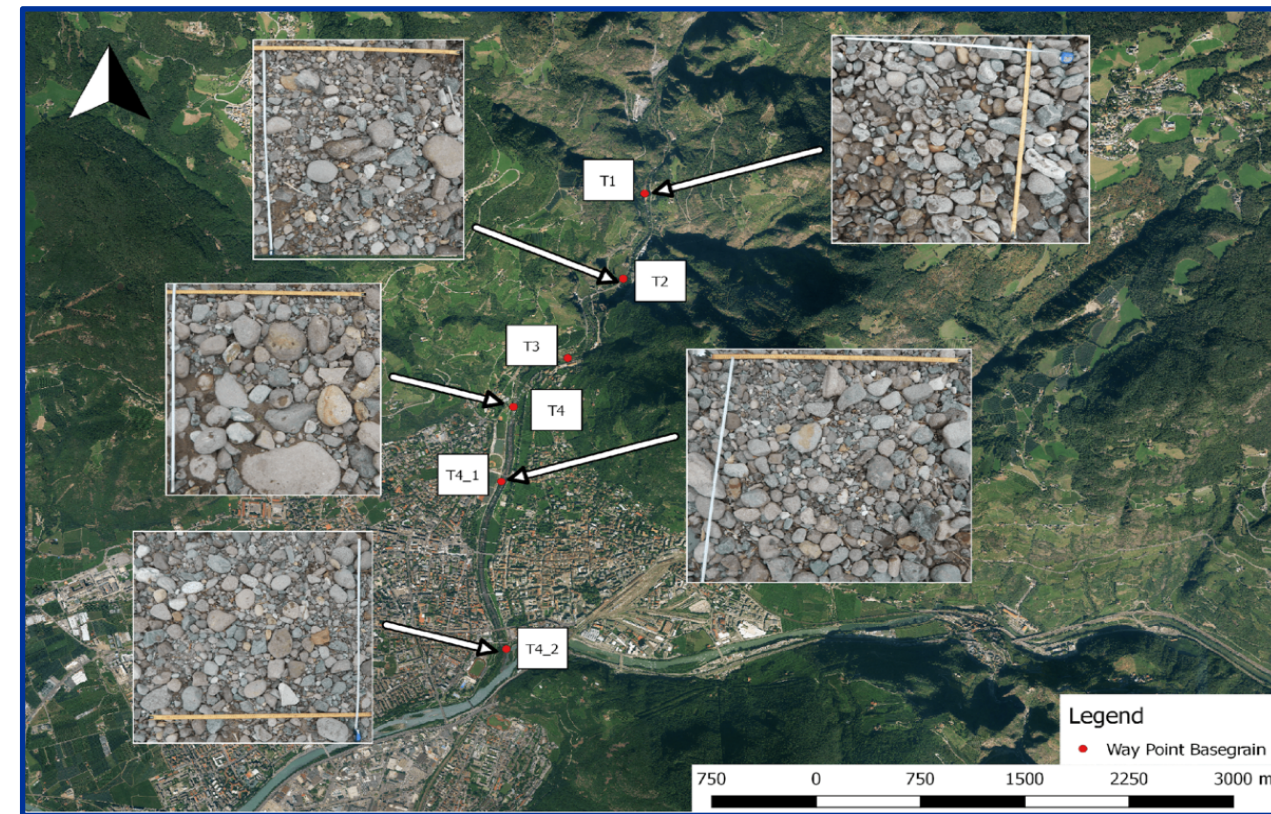
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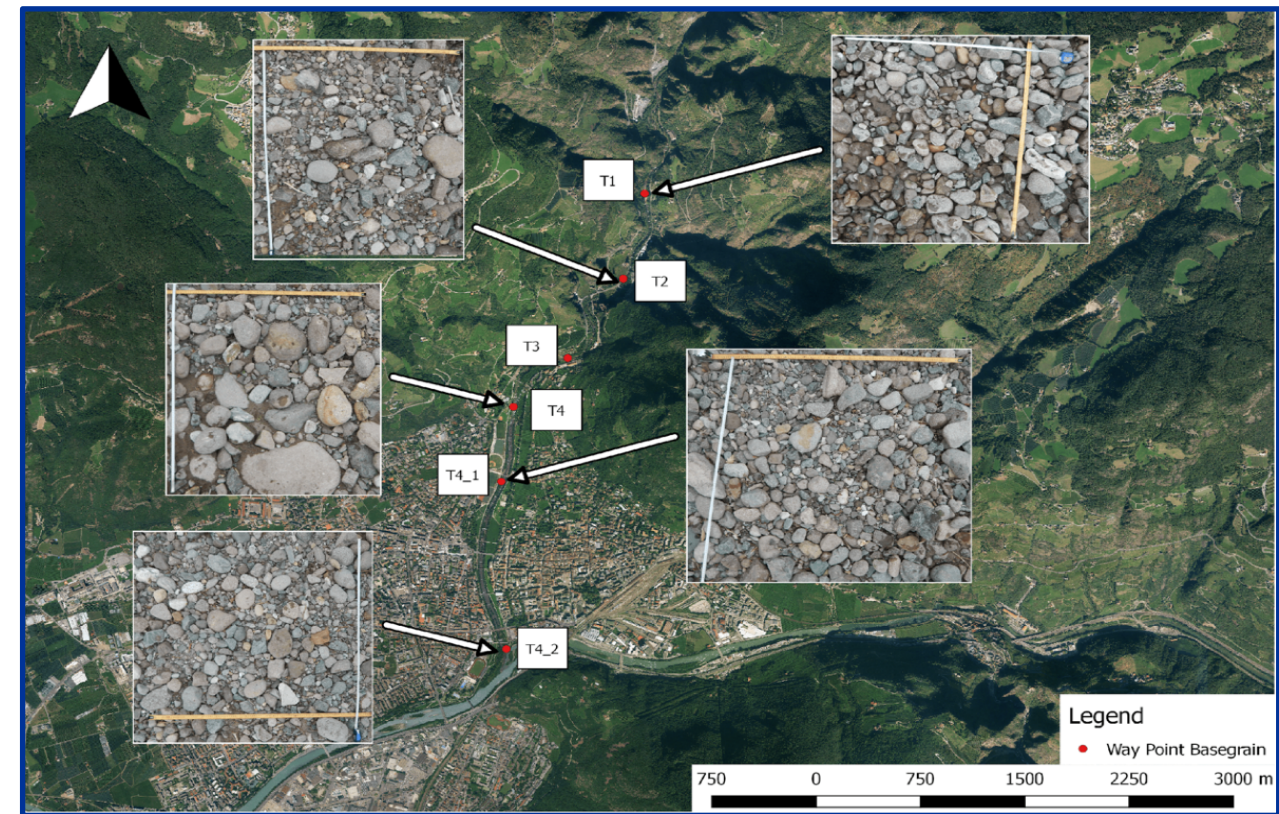
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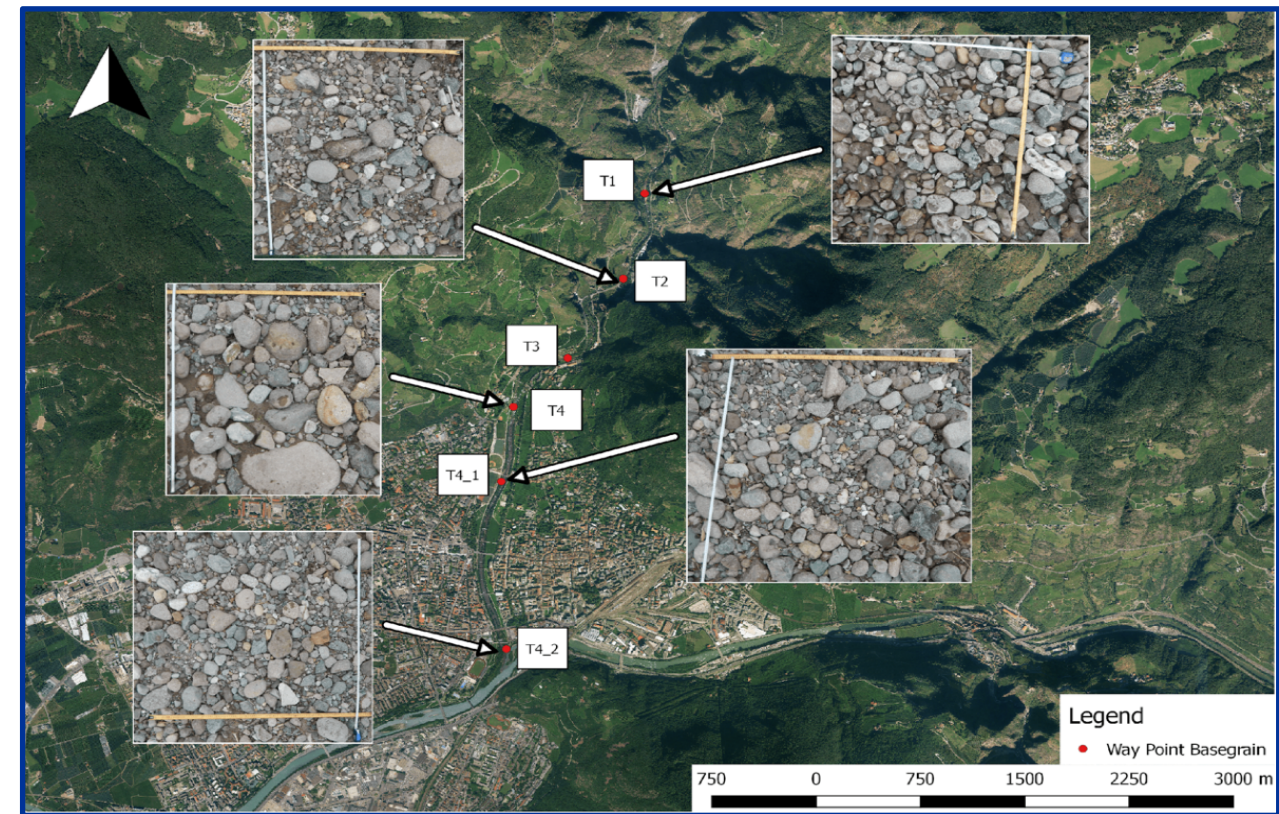
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- A **balance** between **hydraulic risk management** and **river restoration** can enhance the river morphology and its related ecosystem services while maintaining a good control in case of flood
- **Sediment dynamics and continuity has been enhanced** by check dam openings. However, sediments need time to move downstream
- Defining an adequate **monitoring strategy** allows for a **quantitative assessment** of the effectiveness of the ‘undertaken action’

