



THE DESIGN OF NATURAL, SOUND SOLUTIONS FOR RIVERBANK PROTECTION

Date

October 14, 2021

MACCAFERRI



Webinar Agenda?



5' Introduction

Antoine Gagliardi – Head of Double Twist Wire Business at Maccaferri

30' A real case of river analysis with MacRa software

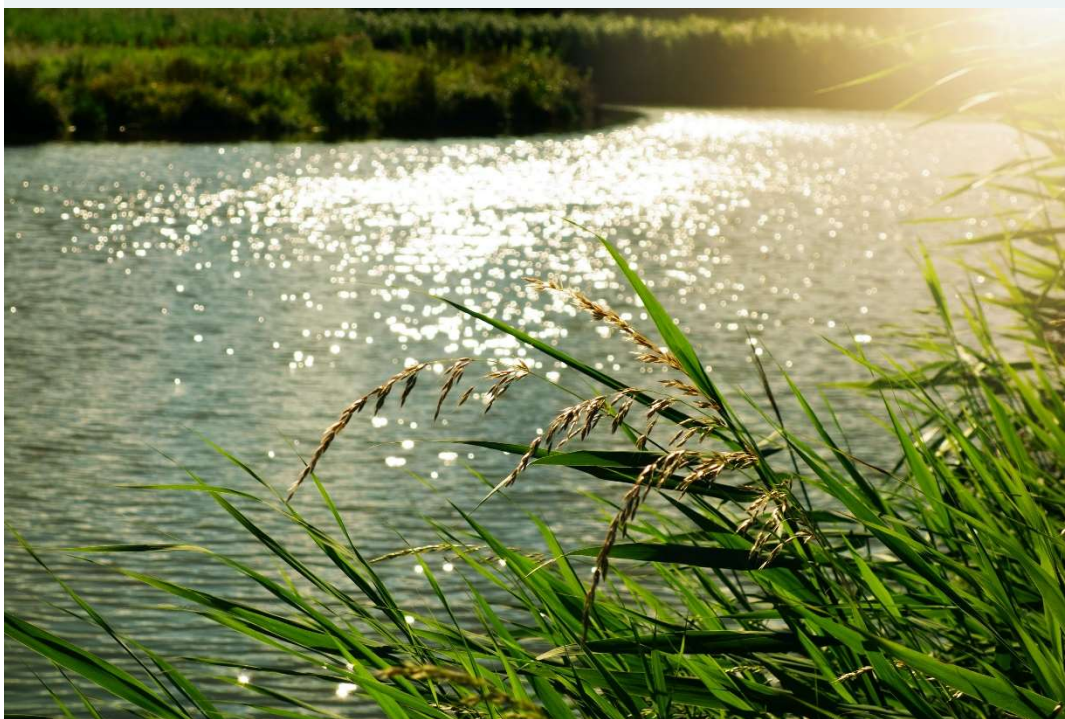
Paolo Di Pietro – Technical Manager at Maccaferri

10' Reno Mattress Plus Benefits

Paolo Di Pietro – Technical Manager at Maccaferri

Live Q&A Session





A green thought has driven our engineering mindset.

For over 140 years, we have developed solutions that enhance river ecosystem resilience including the social ability to recover quickly from catastrophic events (flood, natural disasters)



 **Reno Mattress Plus**
with X-Ties

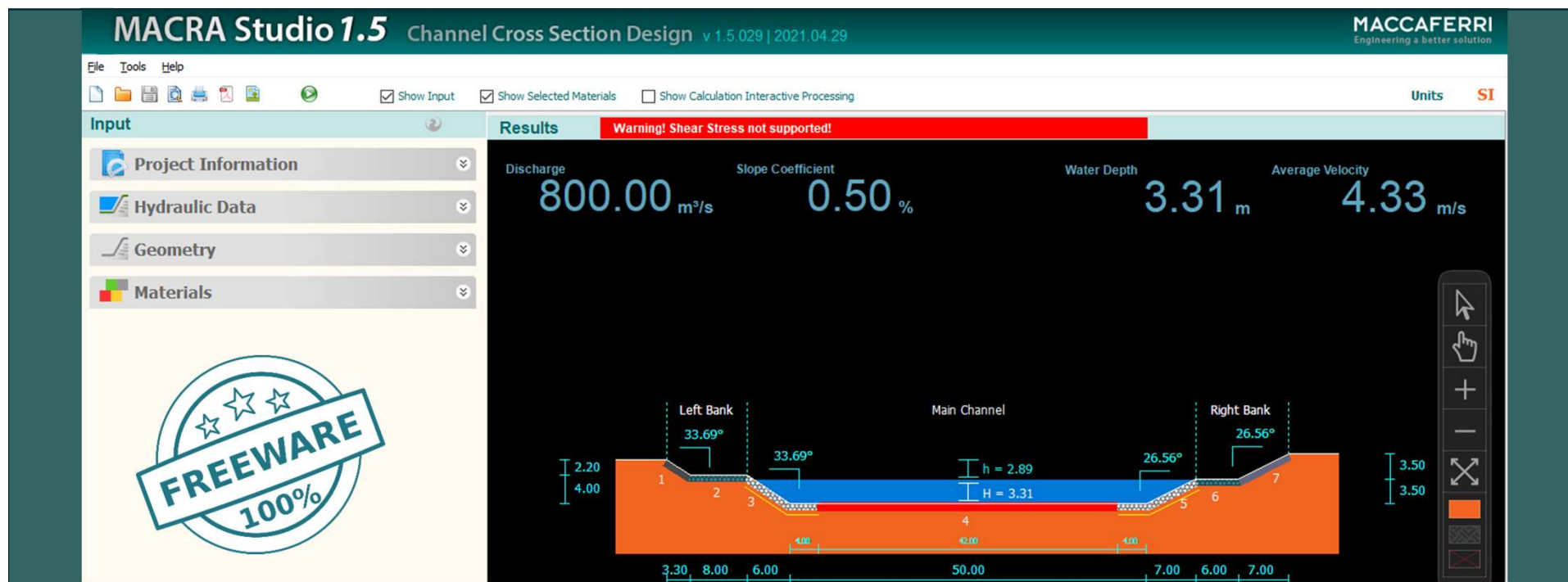
*Integration of hydraulic engineering systems into the natural environment to provide **long-term economical, environmental and social benefits***



M USER FRIENDLY INTERFACE

M ACCURATE RESULTS

M INTEGRATED WITH OUR PRODUCTS





Mappa senza titolo
Seleziona una descrizione per la tua mappa

Legenda



Google Earth
© 2013 Google

2013



2014

Mappa senza titolo

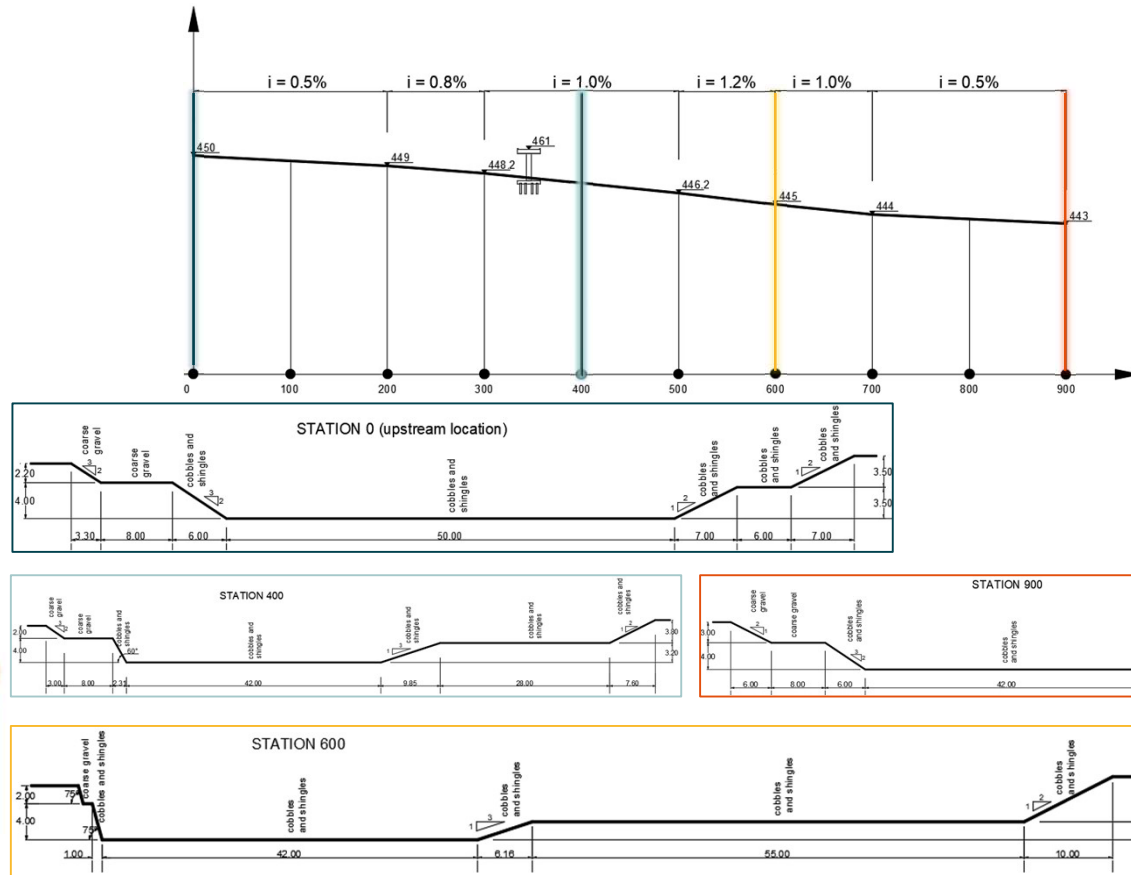
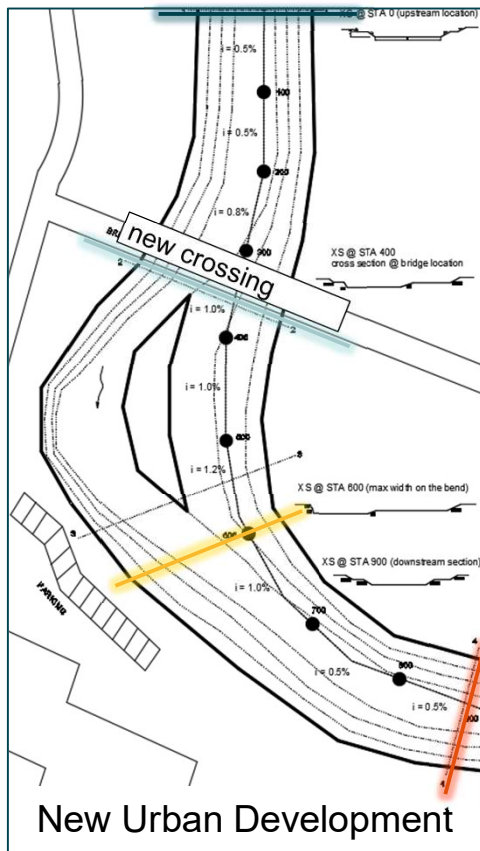
Seleziona una descrizione per la tua mappa

Legenda



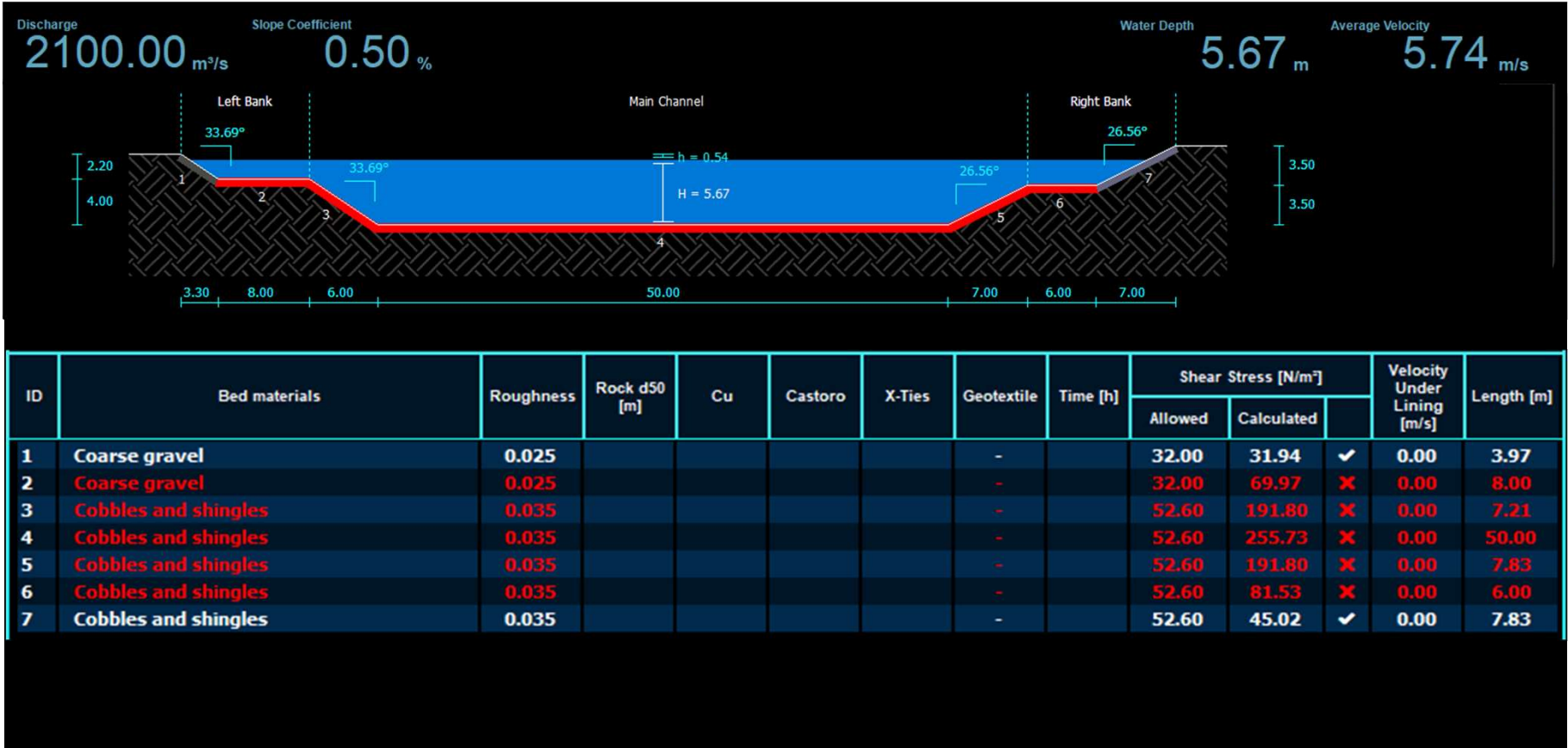
Google Earth
8.3.0.5853.07

2019



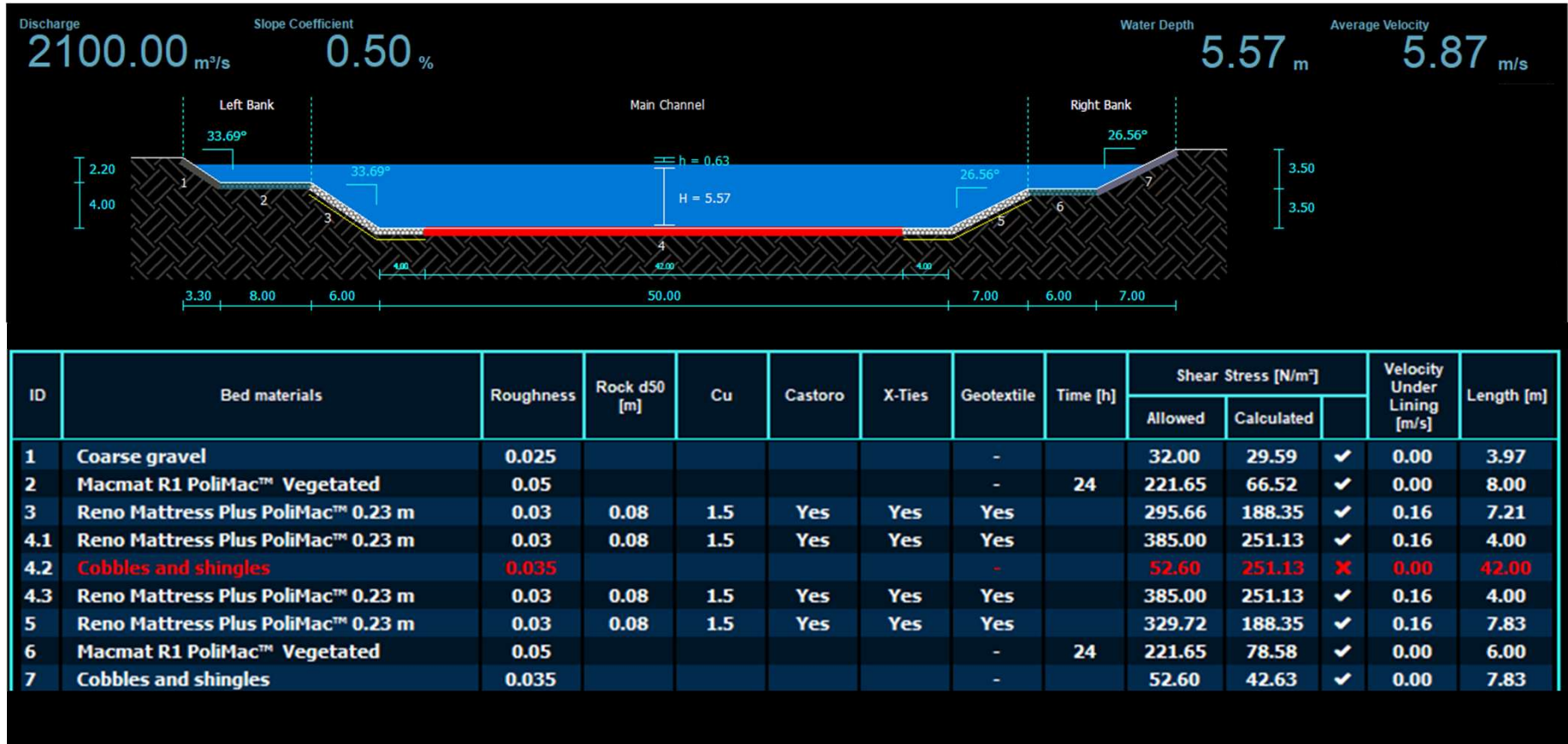
STATION 0: SIMULATION AS IT IS TODAY

MACCAFERRI



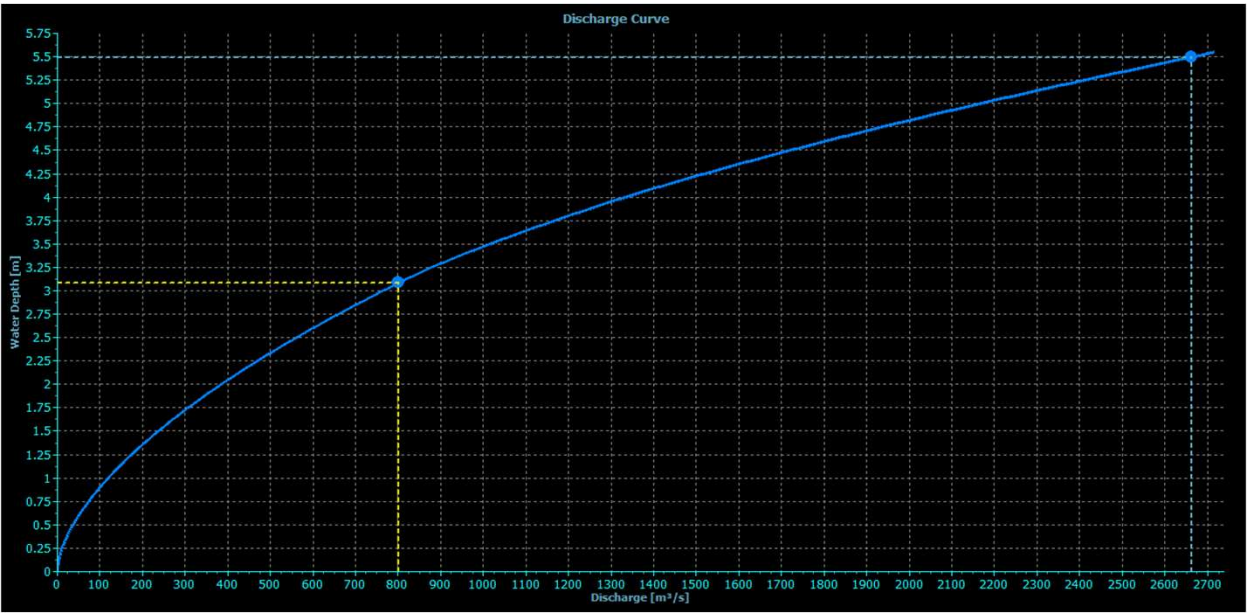
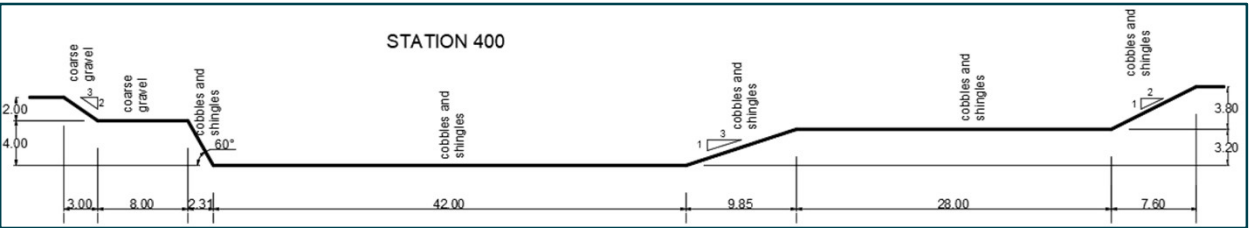
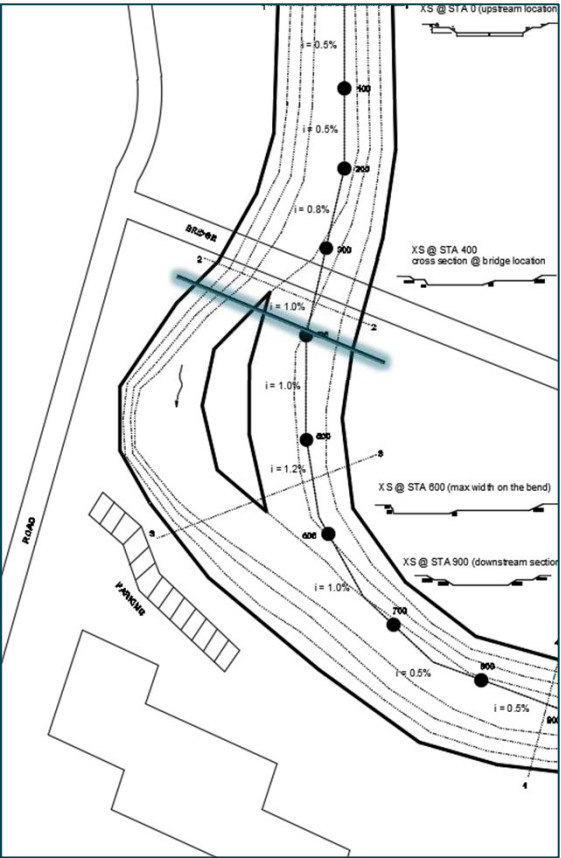
STATION 0: SIMULATION WITH RENO MATTRESS PLUS

MACCAFERRI



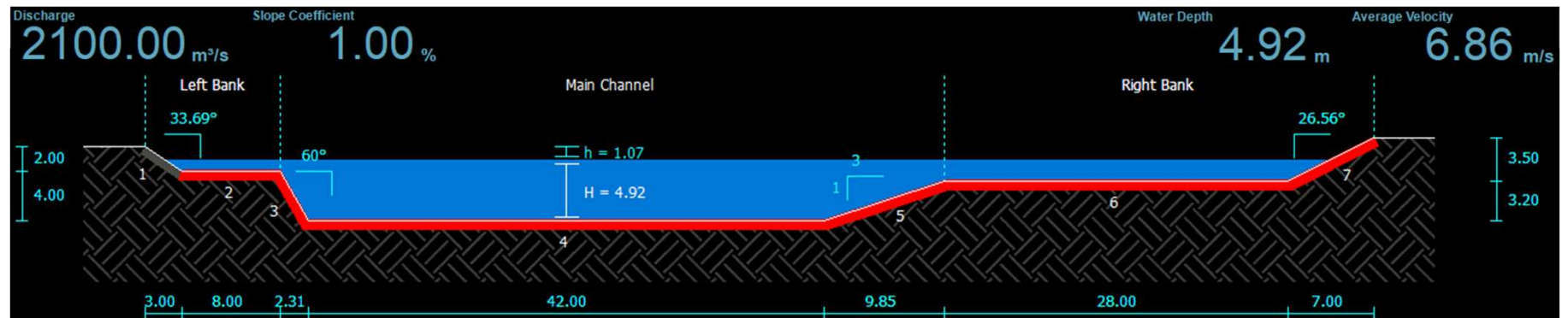
STATION 400

MACCAFERRI



STATION 400: SIMULATION AS IT IS TODAY

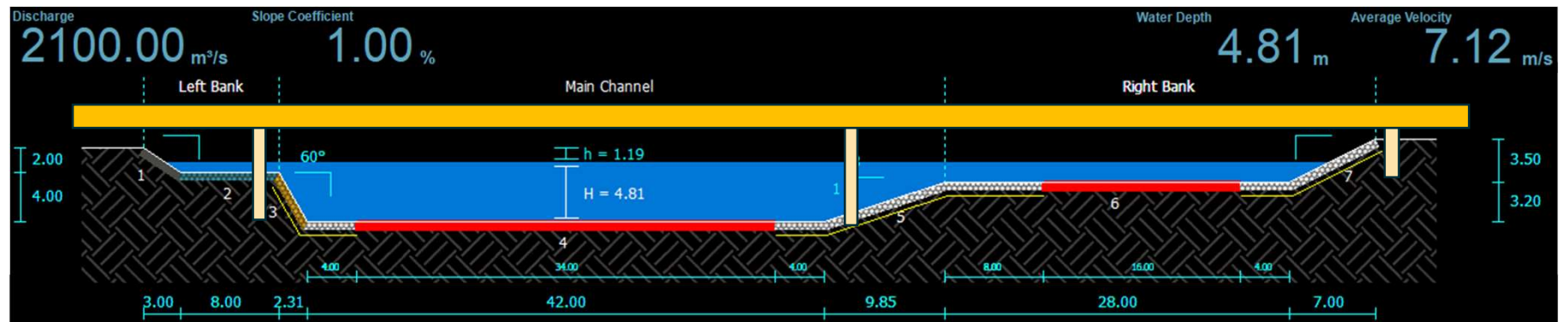
MACCAFERRI



ID	Bed materials	Roughness	Rock d50 [m]	Cu	Castoro	X-Ties	Geotextile	Time [h]	Shear Stress [N/m ²]			Velocity Under Lining [m/s]	Length [m]
									Allowed	Calculated			
1	Coarse gravel	0.025					-		32.00	26.23	✓	0.00	3.61
2	Coarse gravel	0.025					-		32.00	83.15	✗	0.00	8.00
3	Cobbles and shingles	0.035					-		52.60	324.29	✗	0.00	4.62
4	Cobbles and shingles	0.035					-		52.60	432.39	✗	0.00	42.00
5	Cobbles and shingles	0.035					-		52.60	324.29	✗	0.00	10.36
6	Cobbles and shingles	0.035					-		52.60	160.95	✗	0.00	28.00
7	Cobbles and shingles	0.035					-		52.60	82.39	✗	0.00	7.83

STATION 400: SIMULATION WITH RENO MATTRES PLUS

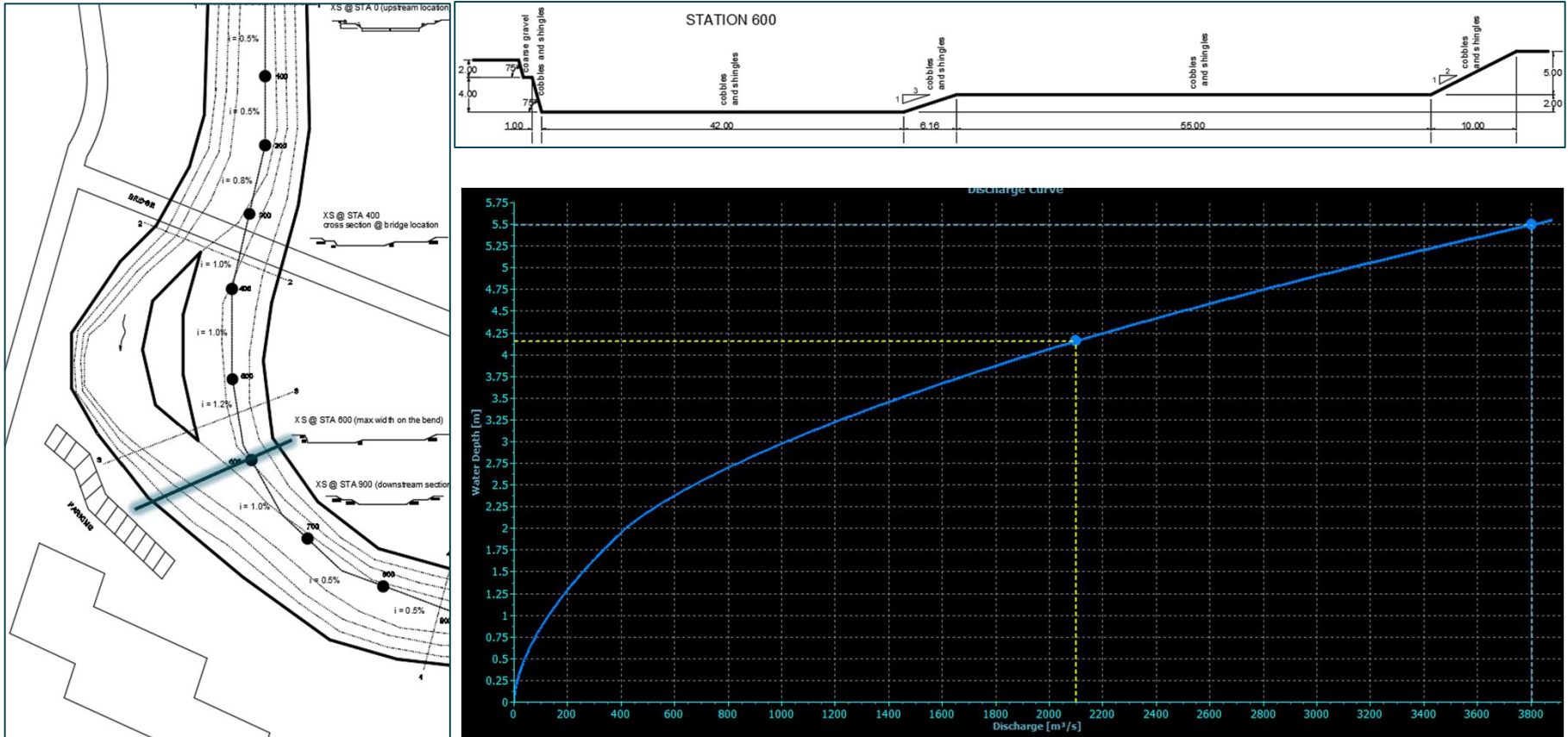
MACCAFERRI



ID	Bed materials	Roughness	Rock d50 [m]	Cu	Castoro	X-Ties	Geotextile	Time [h]	Shear Stress [N/m²]			Velocity Under Lining [m/s]	Length [m]
									Allowed	Calculated			
1	Coarse gravel	0.025					-		32.00	21.15	✓	0.00	3.61
2	Macmat R1 PoliMac™ Vegetated	0.05					-	60	107.88	73.70	✓	0.00	8.00
3	Gabions PoliMac™	0.03	0.13	1.5			Yes		714.00	316.09	✓	0.37	4.62
4.1	Reno Mattres Plus PoliMac™ 0.3 m	0.03	0.08	1.5	Yes	Yes	Yes		459.00	421.46	✓	0.23	4.00
4.2	Cobbles and shingles	0.035					-		52.60	421.46	✗	0.00	34.00
4.3	Reno Mattres Plus PoliMac™ 0.3 m	0.03	0.08	1.5	Yes	Yes	Yes		459.00	421.46	✓	0.23	4.00
5	Reno Mattres Plus PoliMac™ 0.3 m	0.03	0.08	1.5	Yes	Yes	Yes		428.79	316.09	✓	0.23	10.36
6.1	Reno Mattres Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		385.00	150.86	✓	0.23	4.00
6.2	Cobbles and shingles	0.035					-		52.60	150.86	✗	0.00	20.00
6.3	Reno Mattres Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		385.00	150.86	✓	0.23	4.00
7	Reno Mattres Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		329.72	75.62	✓	0.23	7.83

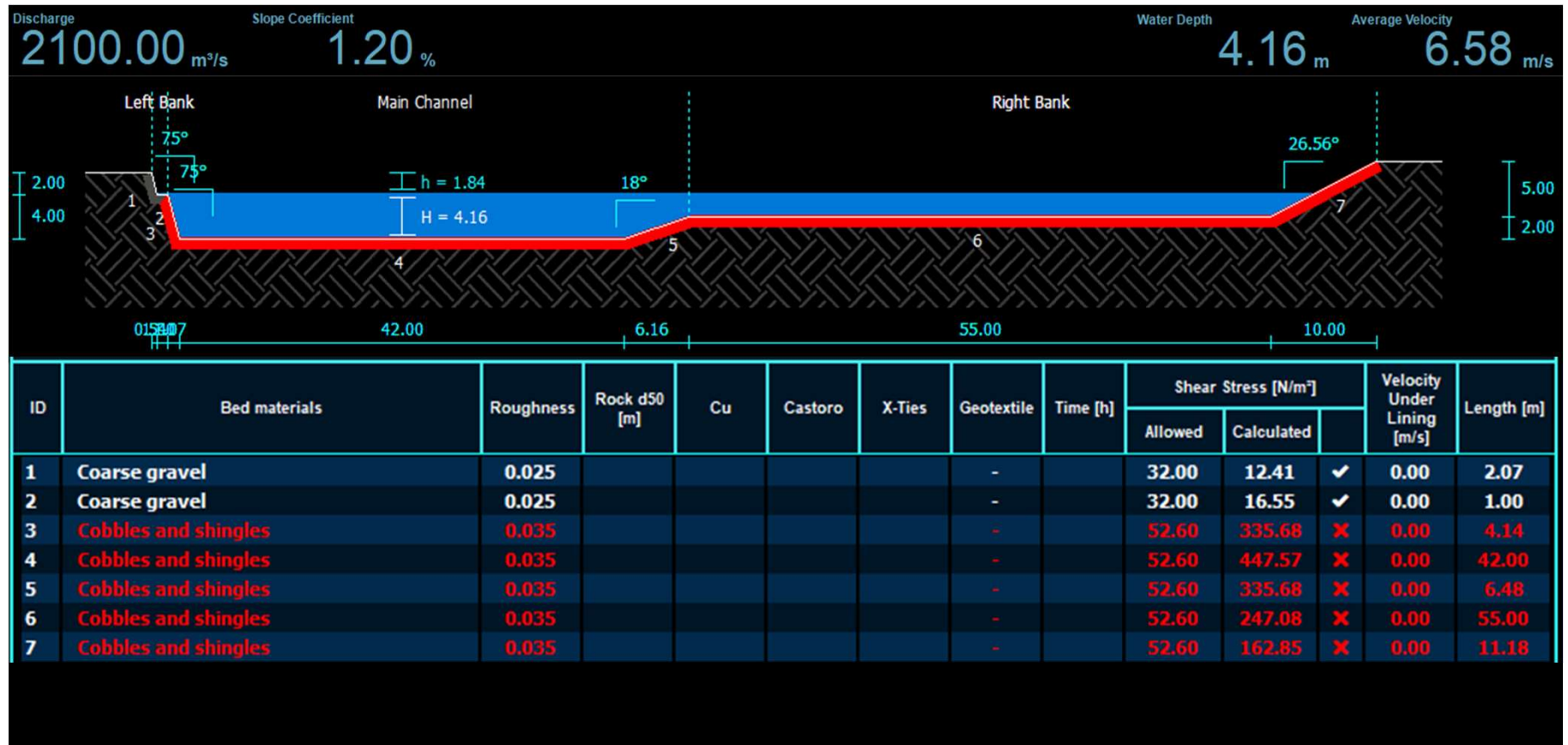
STATION 600

MACCAFERRI



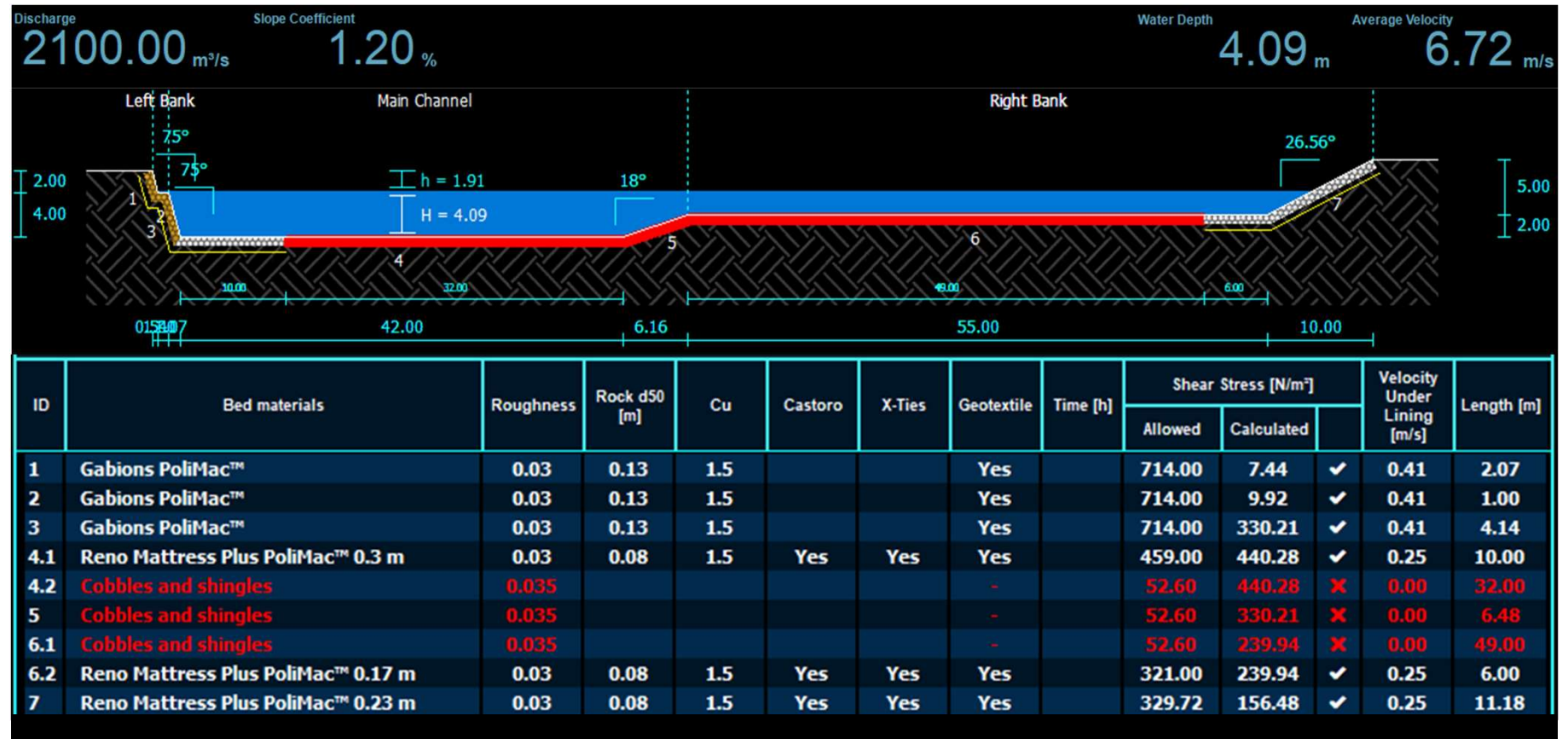
STATION 600: SIMULATION BEFORE INTERVENTION

MACCAFERRI



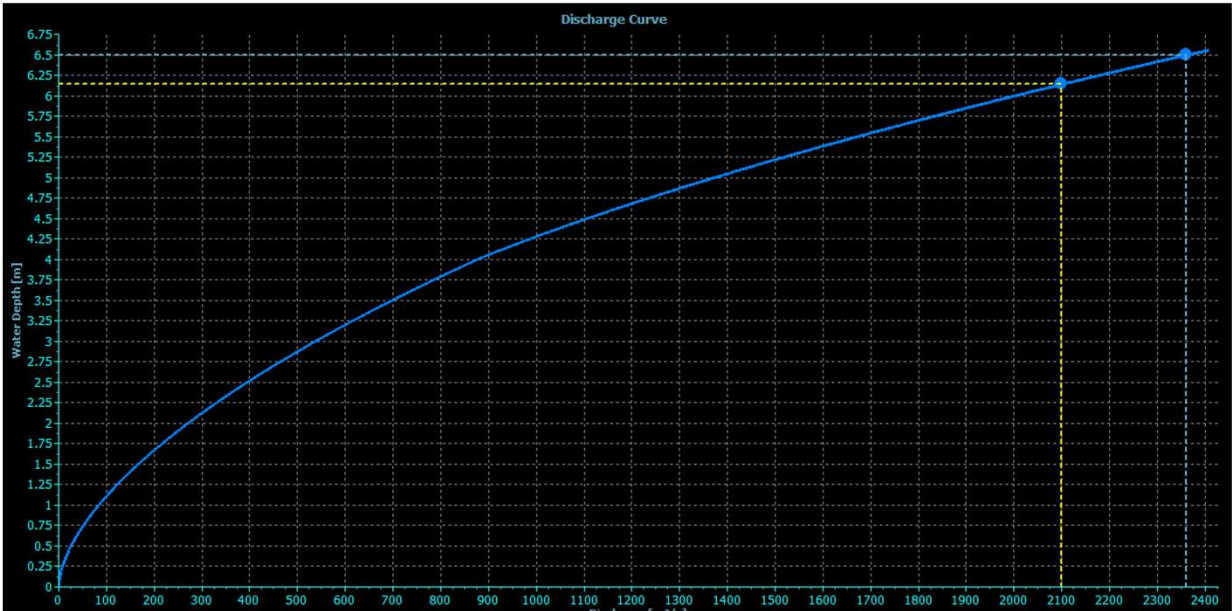
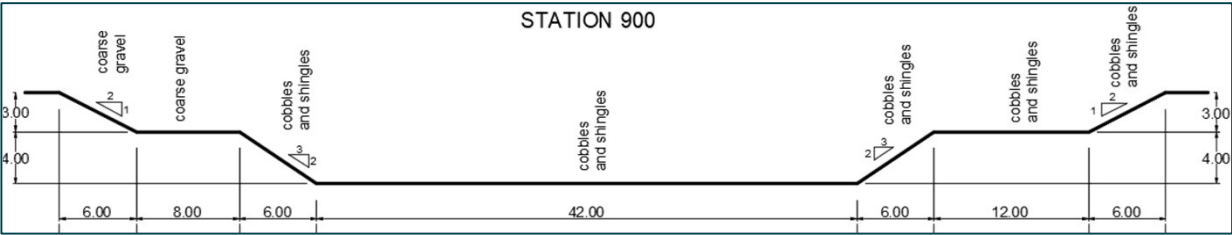
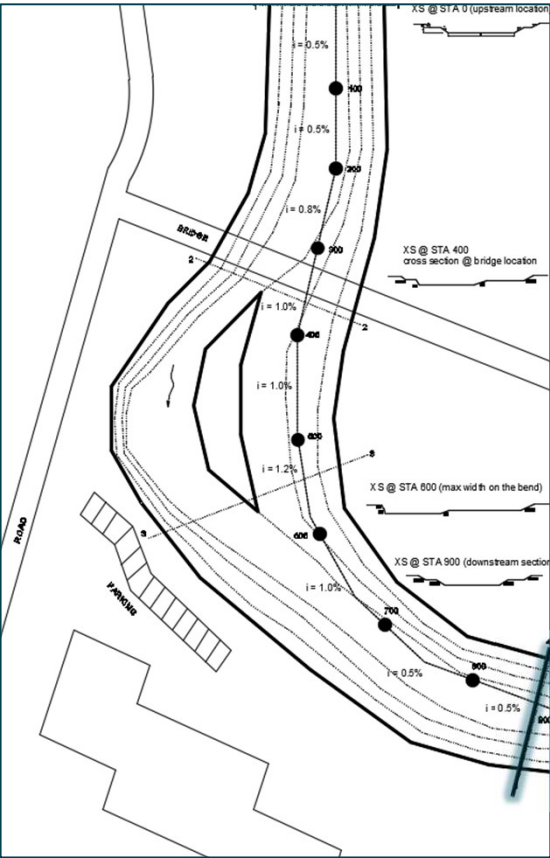
STATION 600: SIMULATION WITH RENO MATTRESS PLUS

MACCAFERRI



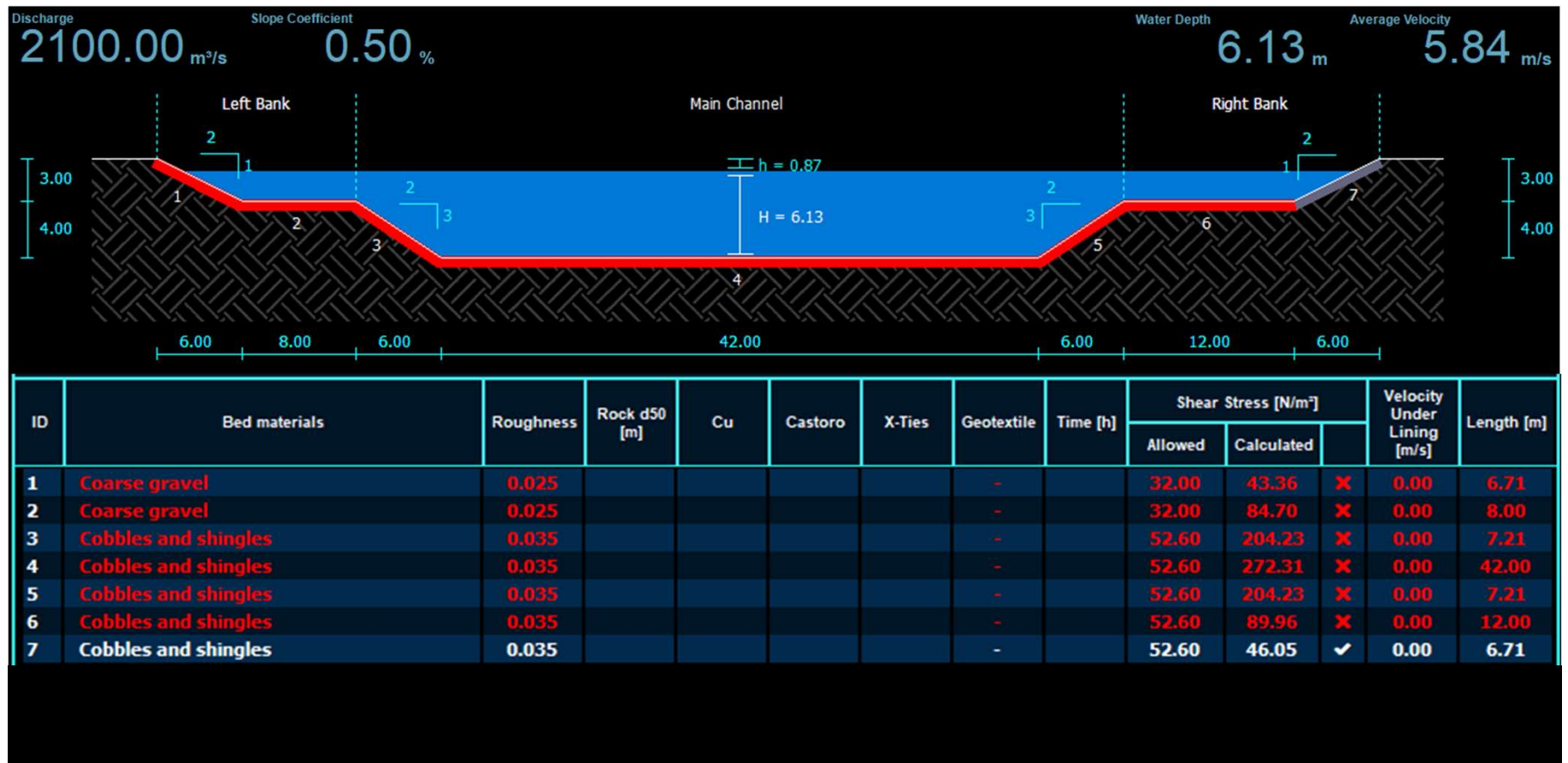
STATION 900

MACCAFERRI



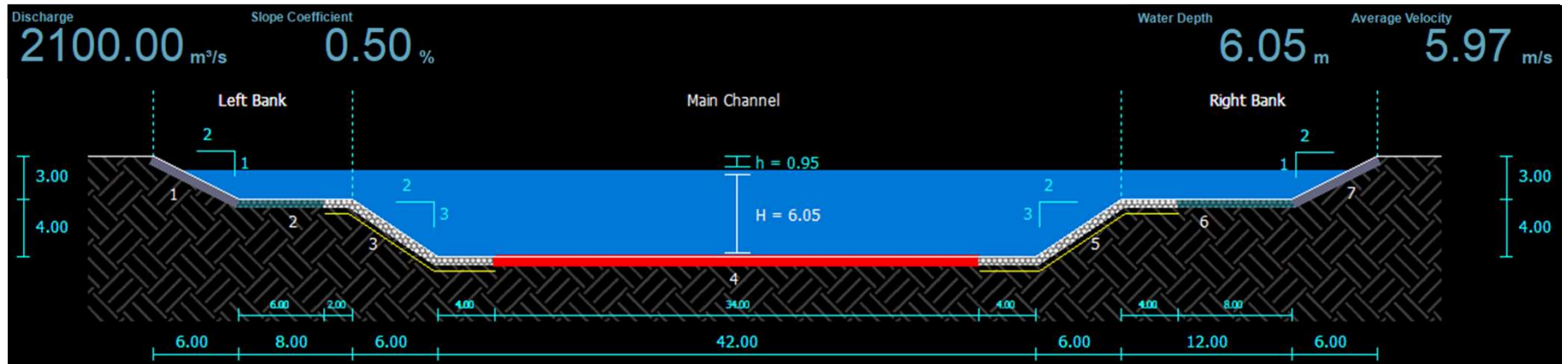
STATION 900: SIMULATION BEFORE INTERVENTION

MACCAFERRI



STATION 900: SIMULATION WITH RENO MATTRESS PLUS

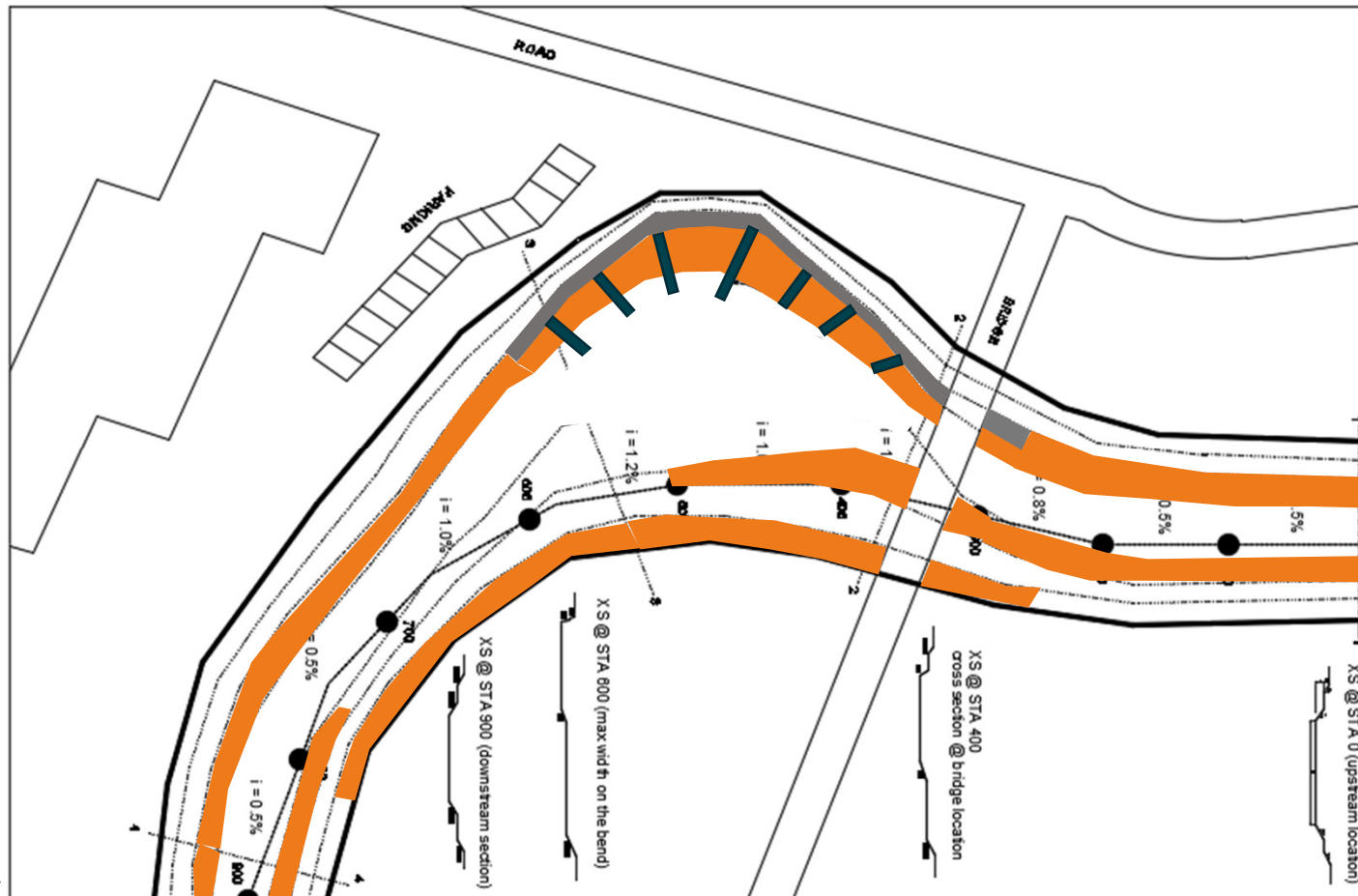
MACCAFERRI



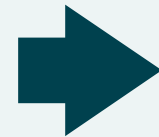
ID	Bed materials	Roughness	Rock d50 [m]	Cu	Castoro	X-Ties	Geotextile	Time [h]	Shear Stress [N/m²]			Velocity Under Lining [m/s]	Length [m]
									Allowed	Calculated			
1	Cobbles and shingles	0.035					-		52.60	40.95	✓	0.00	6.71
2.1	Macmat R1 PoliMac™ Vegetated	0.05					-	55	119.23	81.69	✓	0.00	6.00
2.2	Reno Mattress Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		385.00	81.69	✓	0.16	2.00
3	Reno Mattress Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		295.66	201.00	✓	0.16	7.21
4.1	Reno Mattress Plus PoliMac™ 0.3 m	0.03	0.08	1.5	Yes	Yes	Yes		459.00	268.01	✓	0.16	4.00
4.2	Cobbles and shingles	0.035					-		52.60	268.01	✗	0.00	34.00
4.3	Reno Mattress Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		385.00	268.01	✓	0.16	4.00
5	Reno Mattress Plus PoliMac™ 0.3 m	0.03	0.08	1.5	Yes	Yes	Yes		352.49	201.00	✓	0.16	7.21
6.1	Reno Mattress Plus PoliMac™ 0.23 m	0.03	0.08	1.5	Yes	Yes	Yes		385.00	86.65	✓	0.16	4.00
6.2	Macmat R1 PoliMac™ Vegetated	0.05					-	59	110.07	86.65	✓	0.00	8.00
7	Cobbles and shingles	0.035					-		52.60	43.44	✓	0.00	6.71

WHAT WE HAVE LEARNED..

MACCAFERRI



TYPE
“SOFTWARE”
IN THE
CHATBOX TO
RECEIVE THE
LATEST
VERSION OF
MACRA
STUDIO

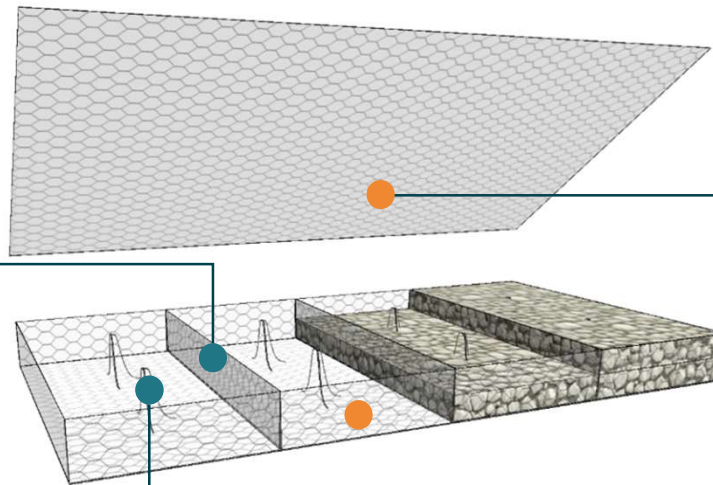
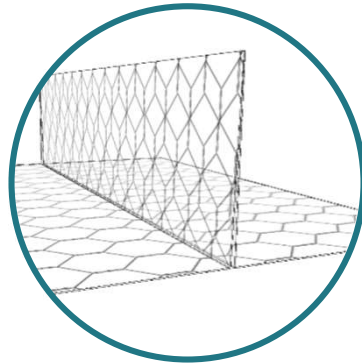


RENO MATTRESS PLUS: MORE PERFORMANCE THAN EVER

MACCAFERRI

Reno Mattress Plus with X-Ties

Vertical standing double diaphragm make filling operation easier.



X-Tie is the experimentally developed and patented tie to maximise the structural resistance of the mattress

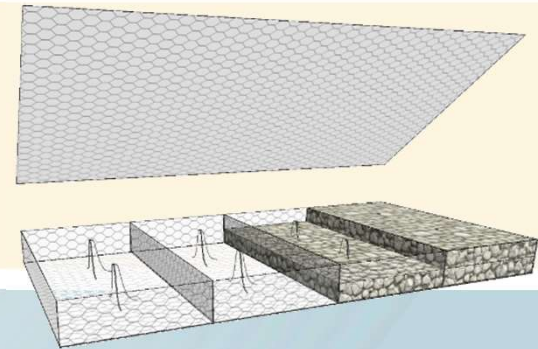


The **PoliMac®** coating gives outstanding protection against mechanical loads and chemical aggressions

WHAT ARE THE BENEFITS WE BRING IN?

MACCAFERRI

A solution that will reduce the **life cycle cost** of a river bank protection



LESS MATERIALS

Less Reno Mattress steel and aggregate mean savings in terms of materials, emissions to the environment and money!



QUICKER INSTALLATION

Optimised solutions and material reduction mean easier and faster installation.



TOTAL COST OF OWNERSHIP

GREENER RESULTS

Less emissions and better integration into the natural environment mean less environmental burden.

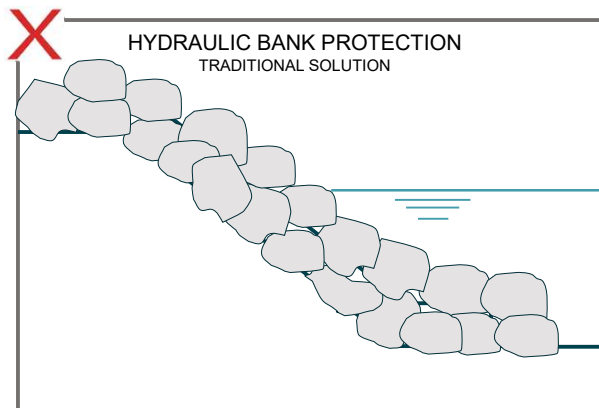


COST-EFFECTIVENESS AT THE CENTRE OF OUR THOUGHTS

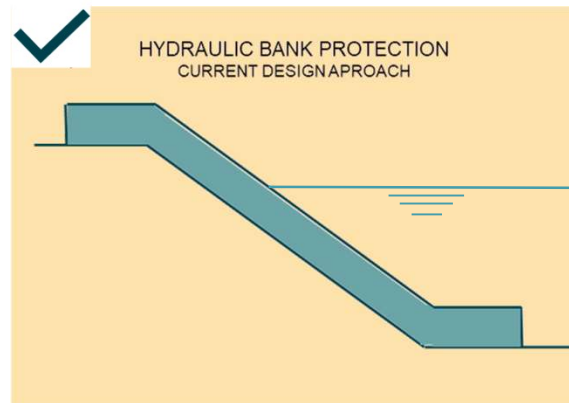
MACCAFERRI



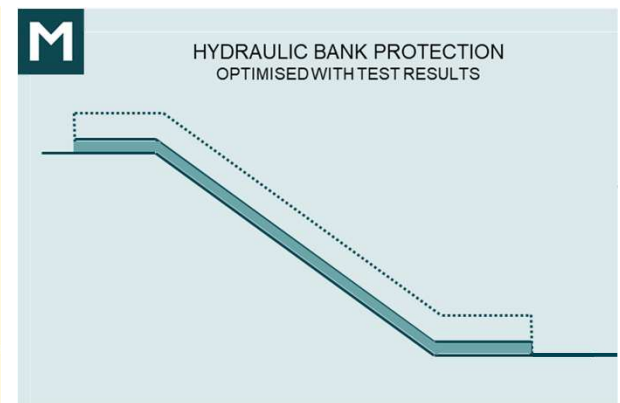
MATERIAL REDUCTION



Traditional river bank protections with **loose stones** (rip-rap) to be effective require thick layers. Being stones **not confined**, stone layers cannot be accurate, resulting in a **need for overfill** and, consequently, in an **environmental burden increase**.



Standard Mattresses for river bank protection bring a first reduction in volume compared to rip rap.

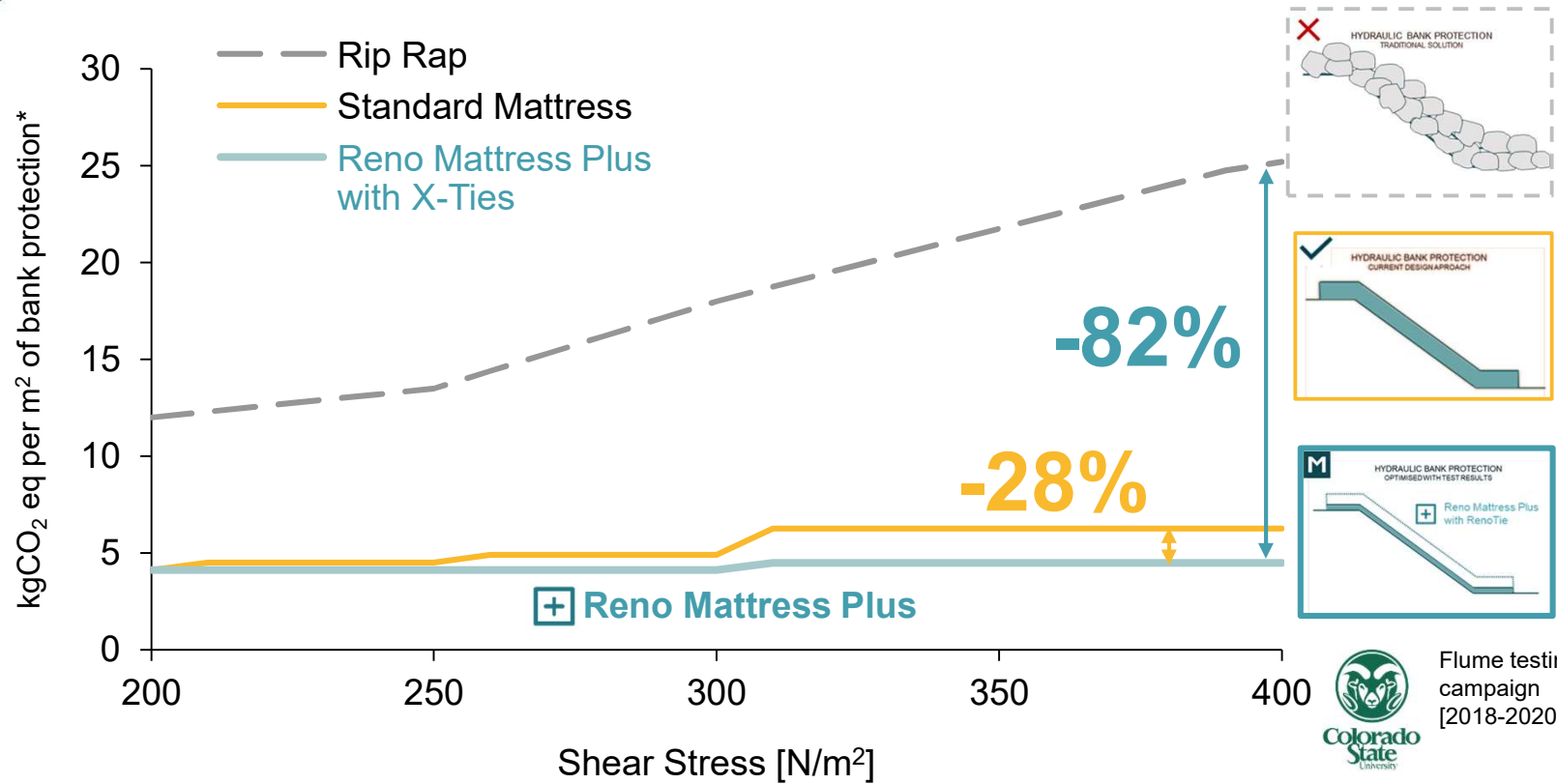


Reno Mattress Plus with X-Ties is the result of an experimental test. The mattress **performance** enables us to increase the **cost-effectiveness** in design.

In application with high
values of shear stress,
Reno Mattress Plus is
over **73%** more
efficient than rip-rap

ENVIRONMENTAL BENEFITS: GREENER RESULTS

MACCAFERRI



Flume testing campaign [2018-2020]

ENHANCING THE BIODIVERSITY

MACCAFERRI



Reno Mattress Plus creates a natural habitat for living species, enhancing biodiversity through the protection of the benthos.

The interstitial spaces of the mattress offer a habitat for species that live in the transition zone between water and land.



As Built



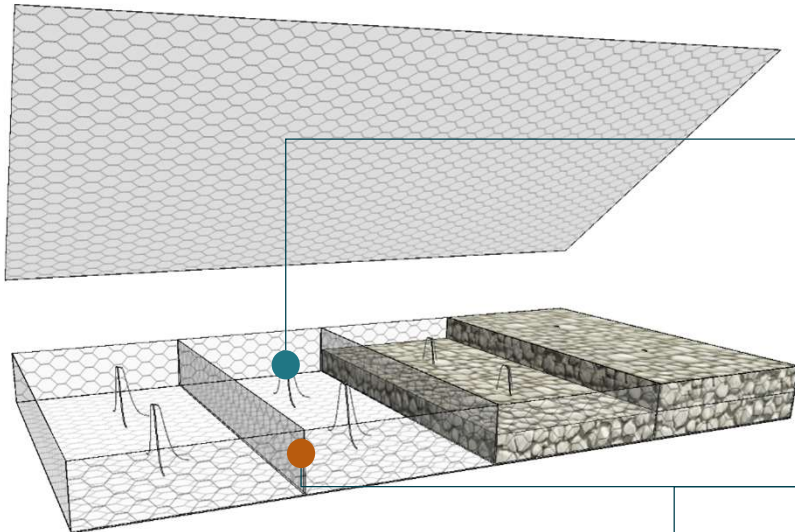
After Years



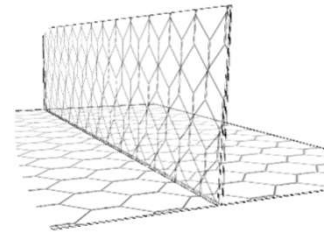
Benthos is the community of organisms that live on, in, or near the seabed, river, lake, or stream bottom, also known as the benthic zone.

INSTALLATION BENEFITS: SPEED UP ON-SITE OPERATIONS

MACCAFERRI



X-Tie, the new self-standing tie developed to make installation easier and improve the structural performance of the mattress



Reno Mattress Plus features robust double diaphragms, which enable to speed up installation in slope conditions, minimising installation inaccuracies

INSTALLATION VIDEO



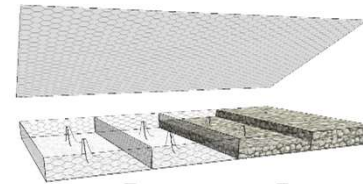
Not only **performance** certification but also to **environmental** and **digital** ones.



THE INTERNATIONAL EPD® SYSTEM

We provide reliable and comparable information on the environmental impacts of the product life cycle **reducing energy** and **material consumption**

visit maccaferri.com/EPD



bimstore

Our products are also available as BIM Model.
BIM system **reduces design time and cost** and facilitates cooperation between project stakeholders

visit maccaferri.com/BIM

CONCLUSIONS

MACCAFERRI

RIVER ENGINEER SHALL TAKE INTO ACCOUNT TWO TYPES OF REQUIREMENTS WHEN DESIGNING A SOLUTION...

HYDRAULIC REQUIREMENTS

- M Geotechnical and hydraulic stability
- M Sound engineering principles
- M Design criteria on risk assessment
- M Erosion impacting on environment

ENVIRONMENTAL REQUIREMENTS

- M River is a dynamic environment
- M Introducing minimal disturbance
- M Sustainable system
- M Balance the eco-system

TEXT «**PROJECT**» IN THE CHAT BOX FOR DEDICATED ASSISTANCE ON YOUR DESIGN PROJECT!



LIVE Q&A