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WASSERBAU INNSBRUCK

- Hydropower and River Ecology –

Current developments in fish protection

Markus Aufleger

Trondheim, 4th of February 2020

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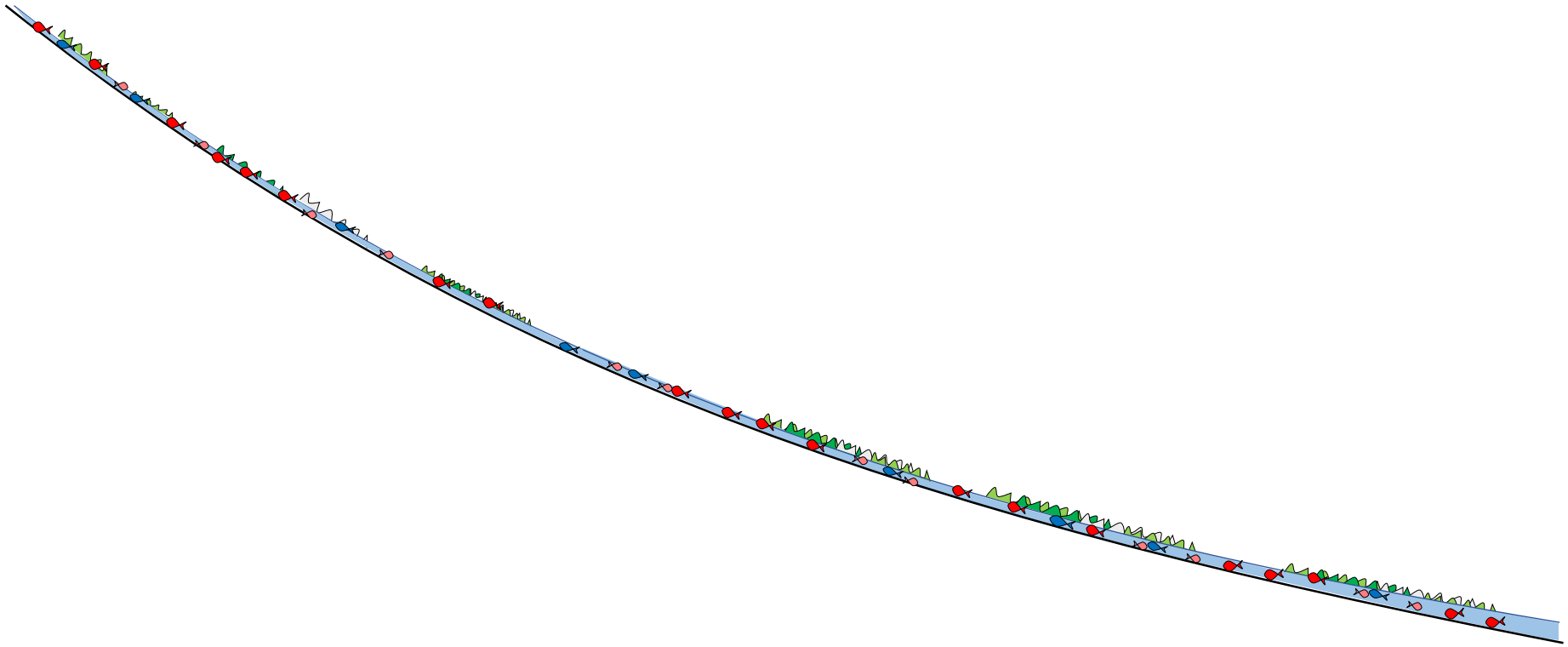
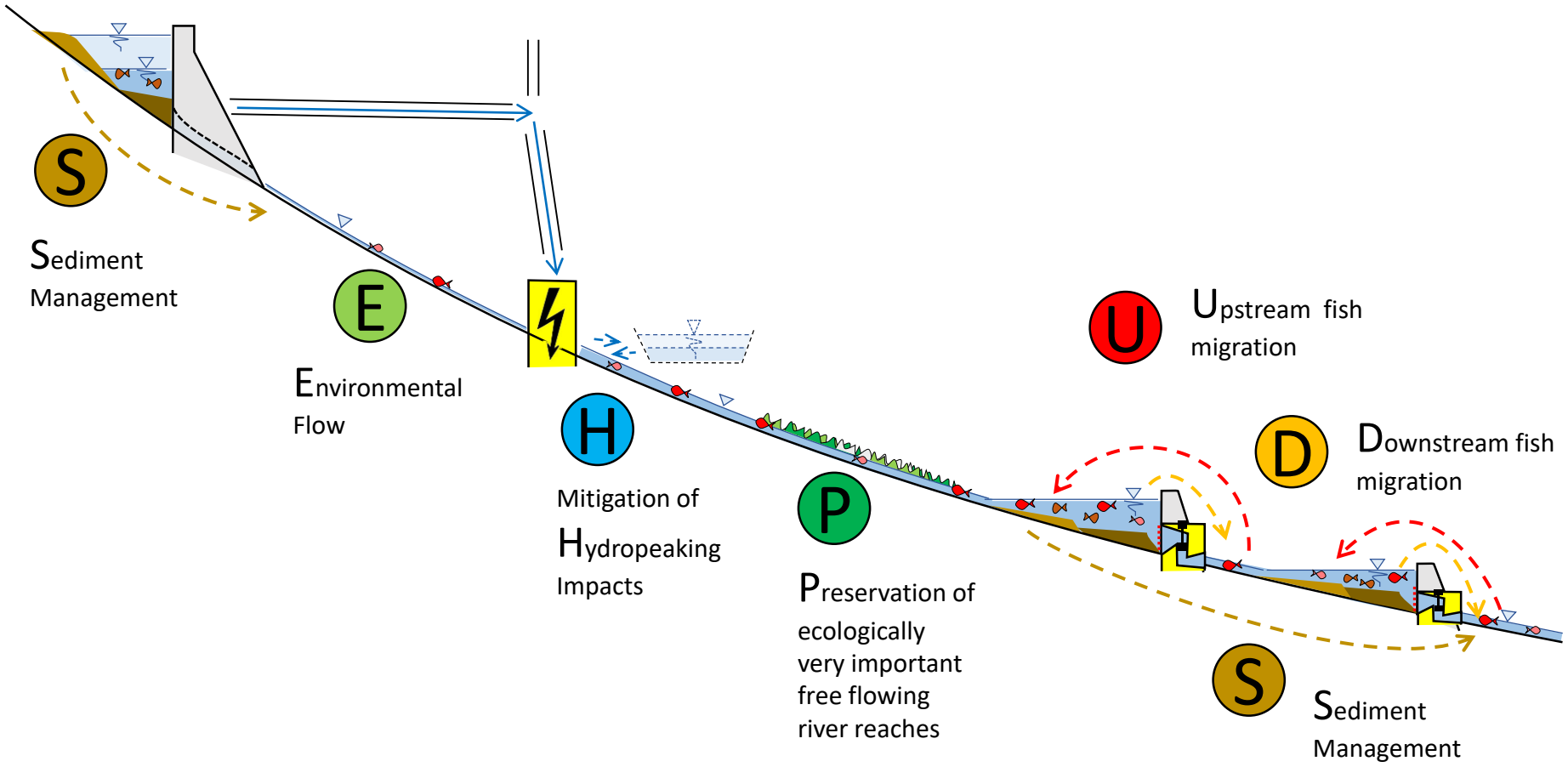
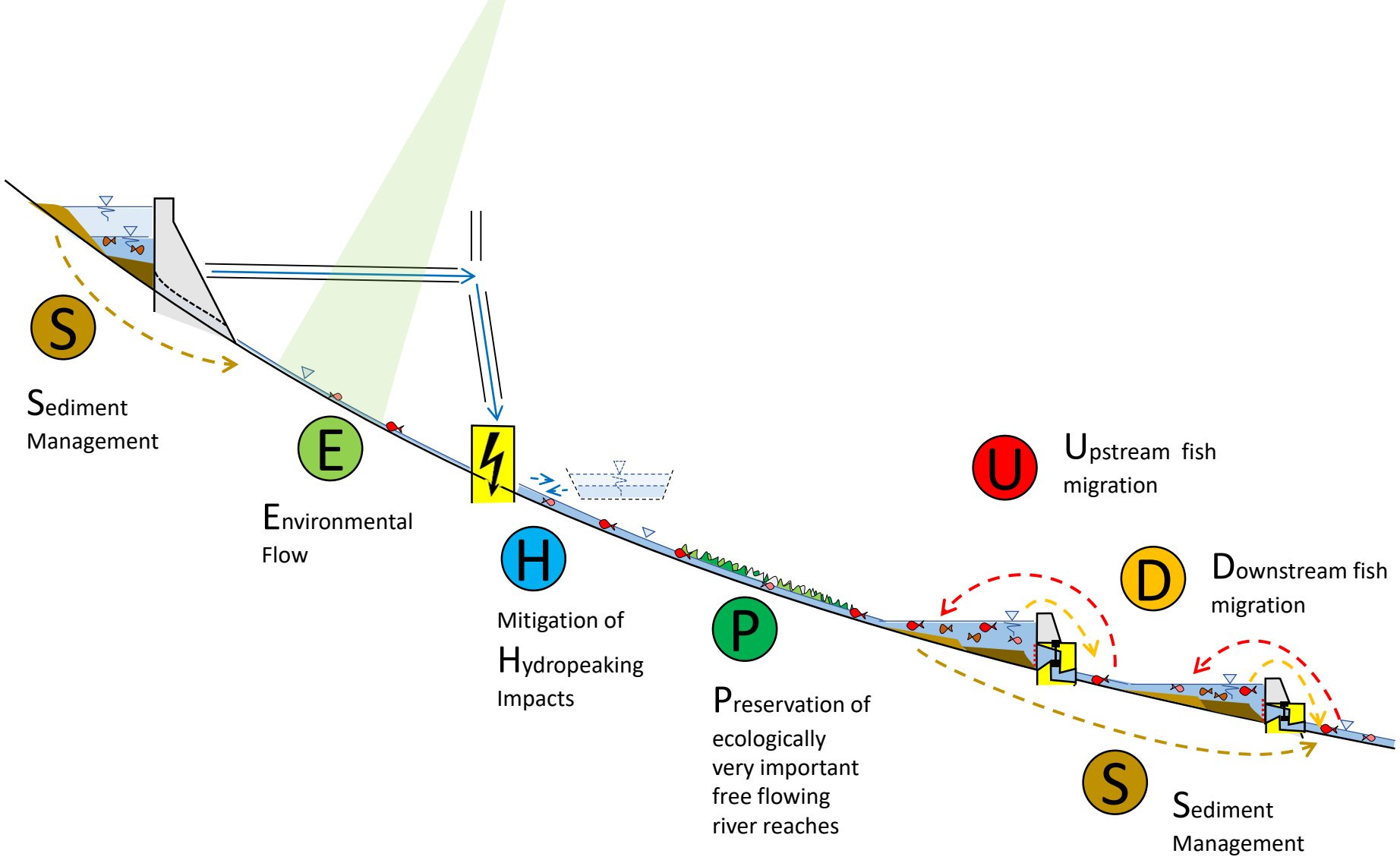
- Hydropower and River Ecology –

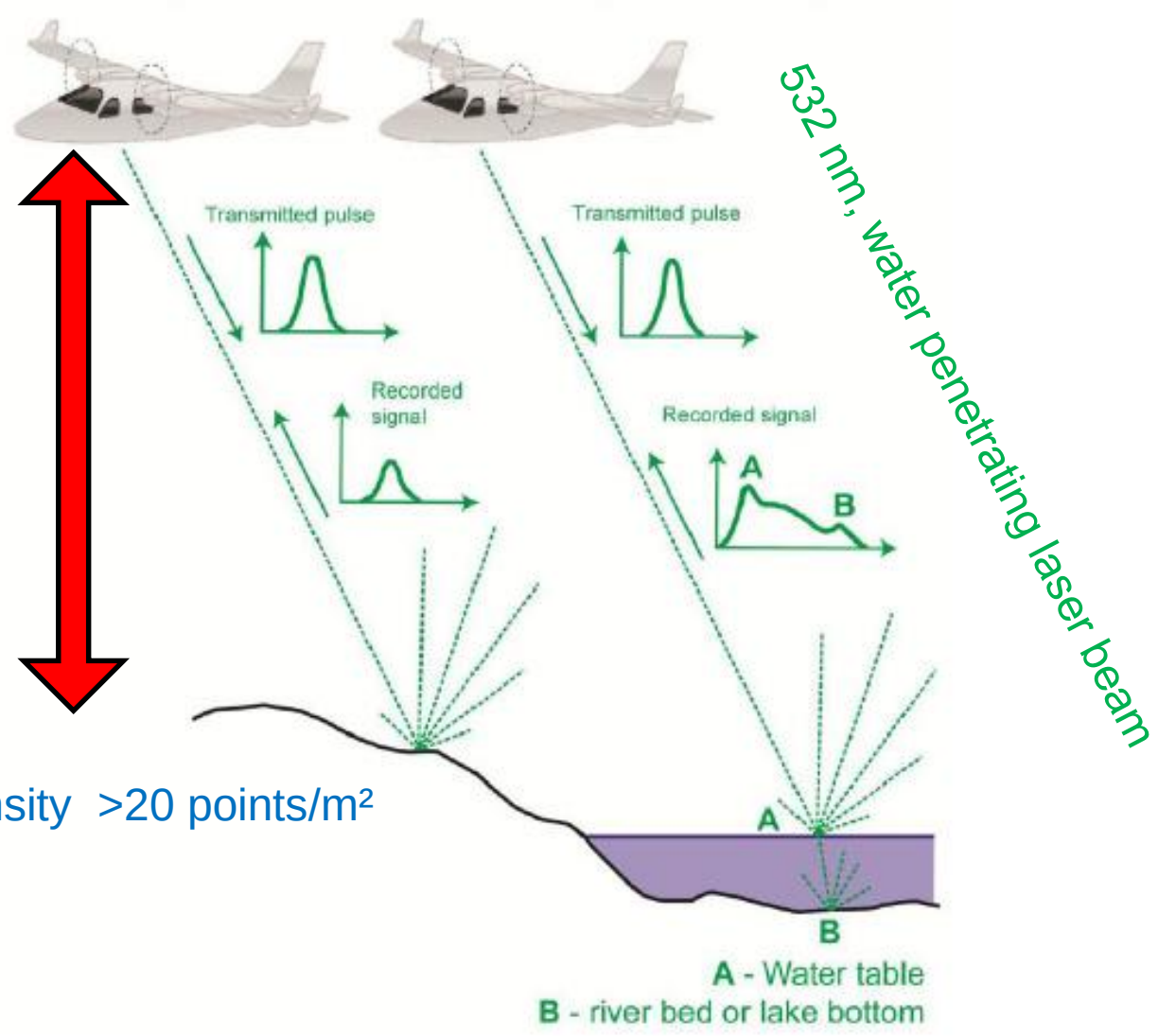



S
Sediment Management
E
Environmental Flow
H
Mitigation of Hydropeaking Impacts
P
Preservation of ecologically very important free flowing river reaches
U
Upstream fish migration
D
Downstream fish migration
S
Sediment Management

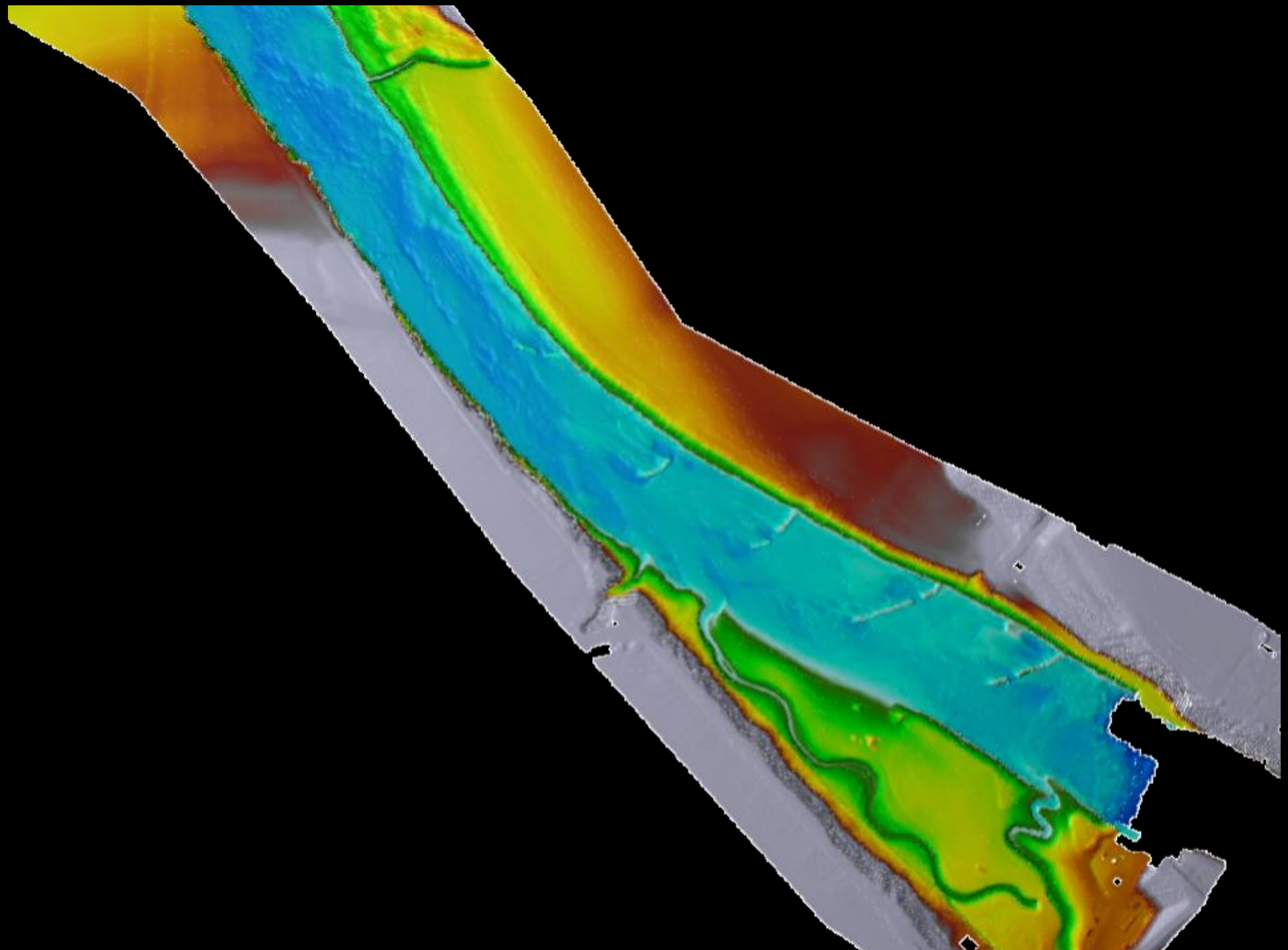


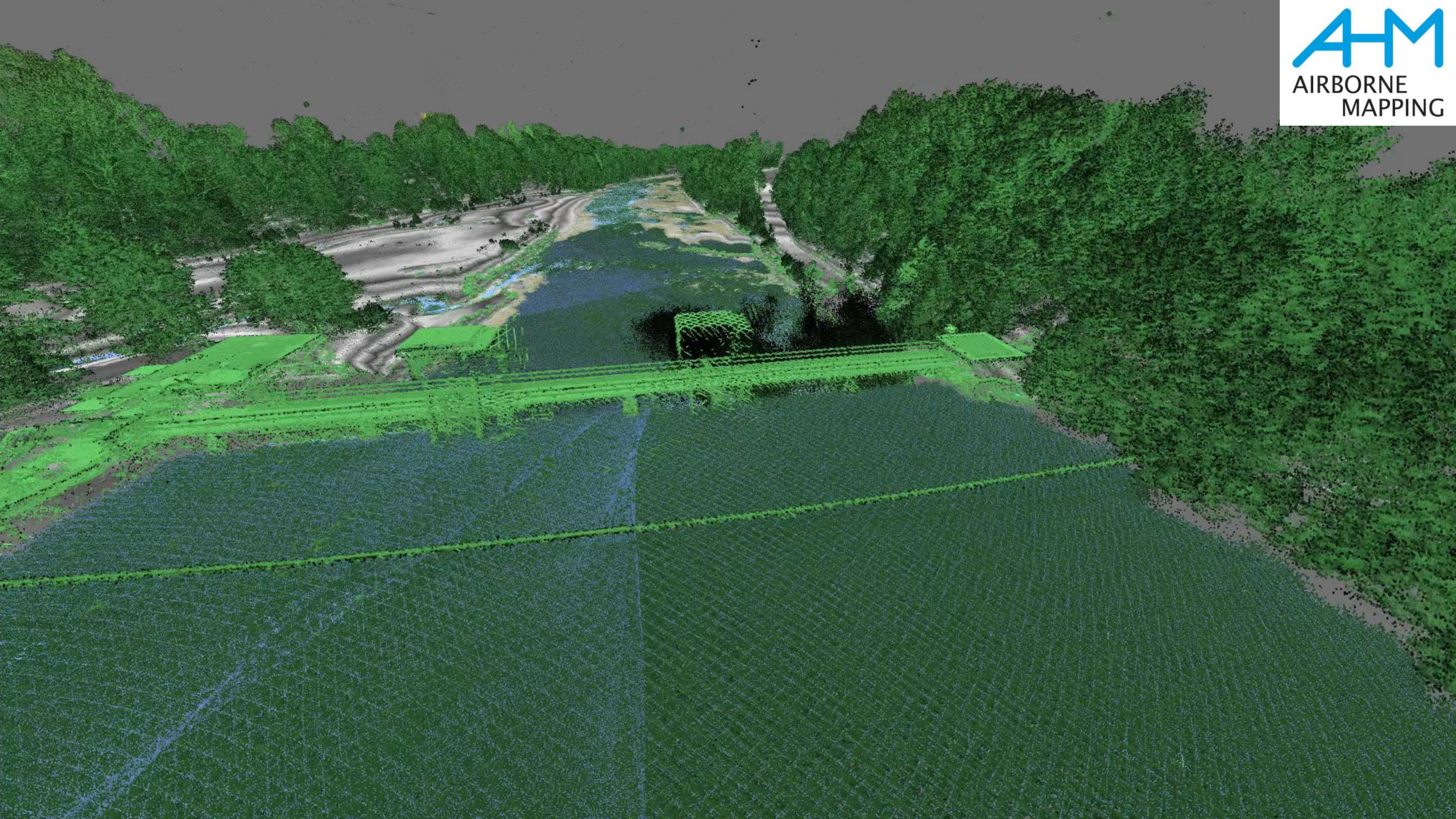
Airborne Laser Bathymetry

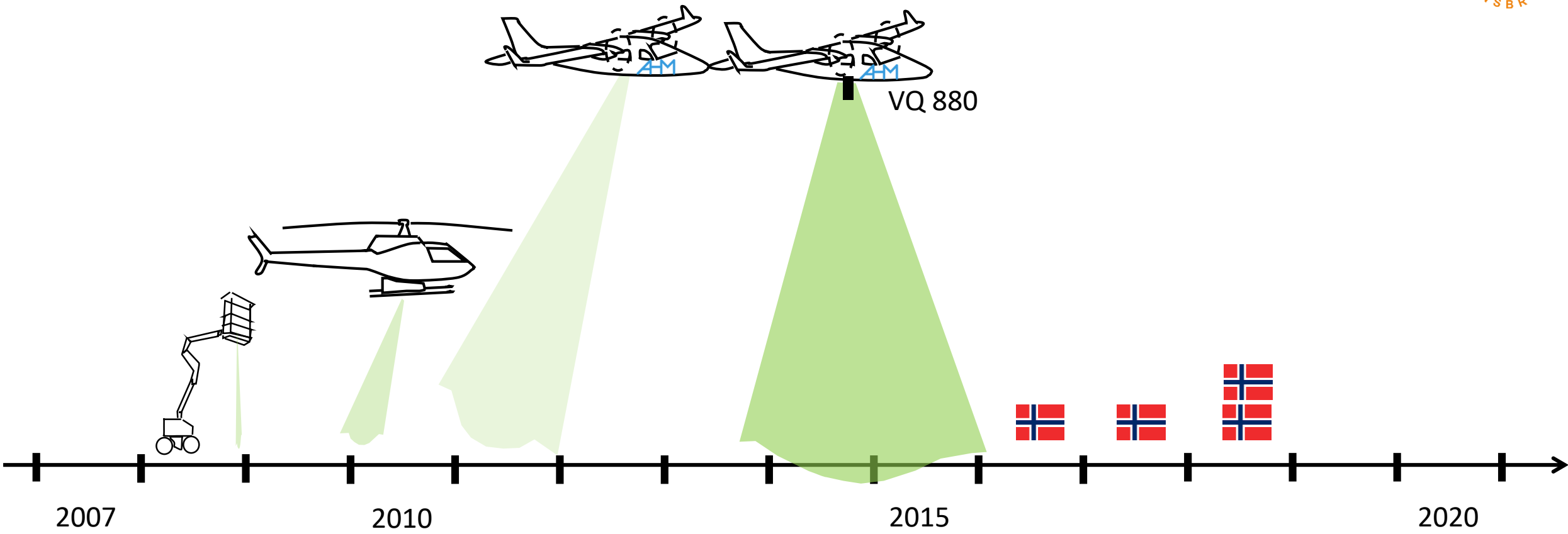
~ 500m AGL



- Point density >20 points/m²




AIRBORNE
MAPPING



RIEGL LASER MEASUREMENT SYSTEMS

FFG

„Airborne Hydromapping“

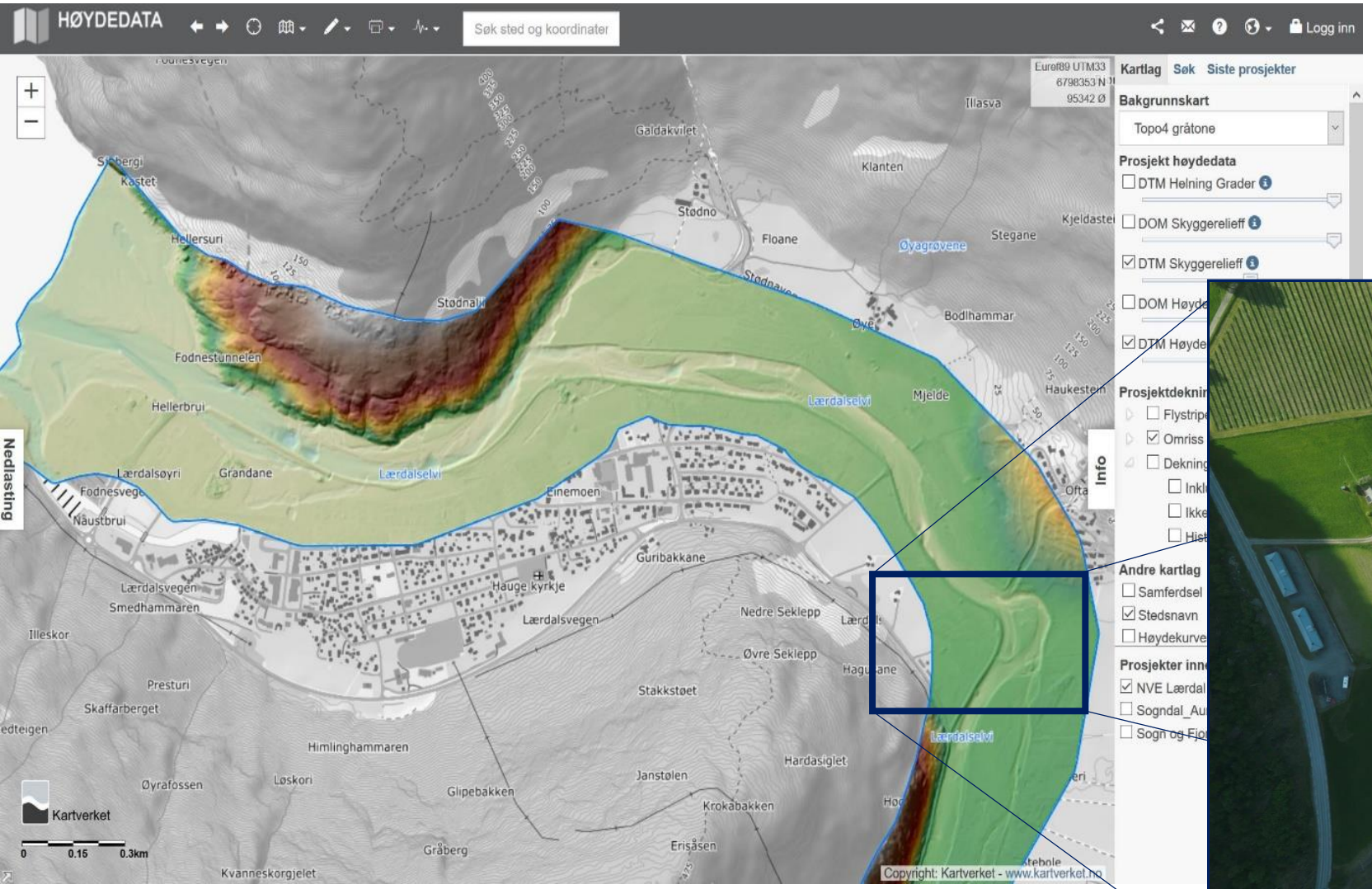
FFG

„Alpine Airborne Hydromapping“

AIRBORNE MAPPING

Laerdal river (Central Norway) [Customer: NVE]

- Topobathymetric airborne survey of 25 km long section of Laerdal river in May 2018
- Dataset published at Hoydedata in June 2019

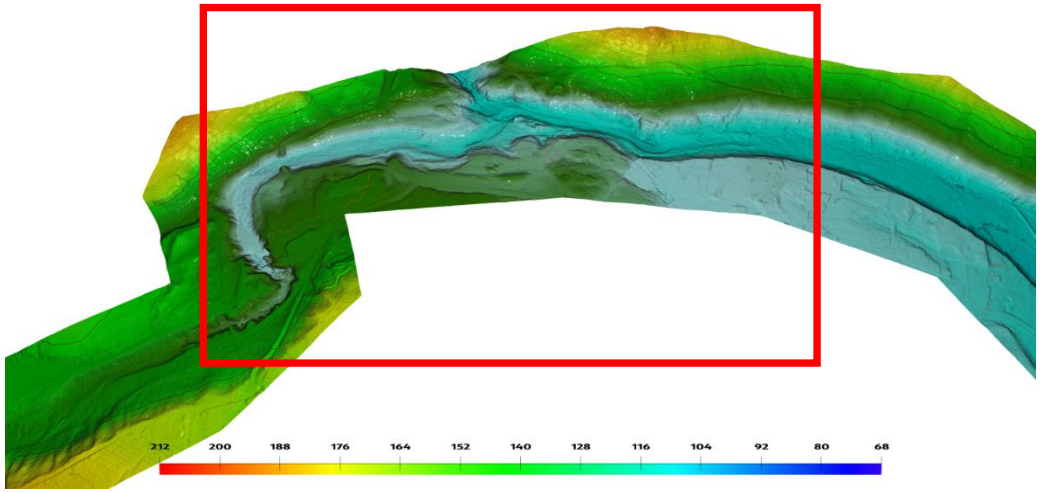


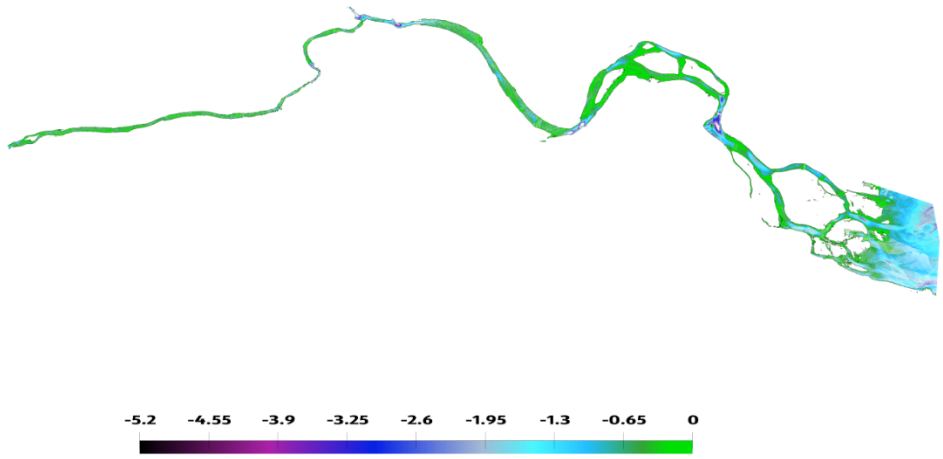
Topobathymetric airborne surveys in Norway

AIRBORNE MAPPING

Kvina river (12 km, Southern Norway) [Customer: NVE] **5/2018**

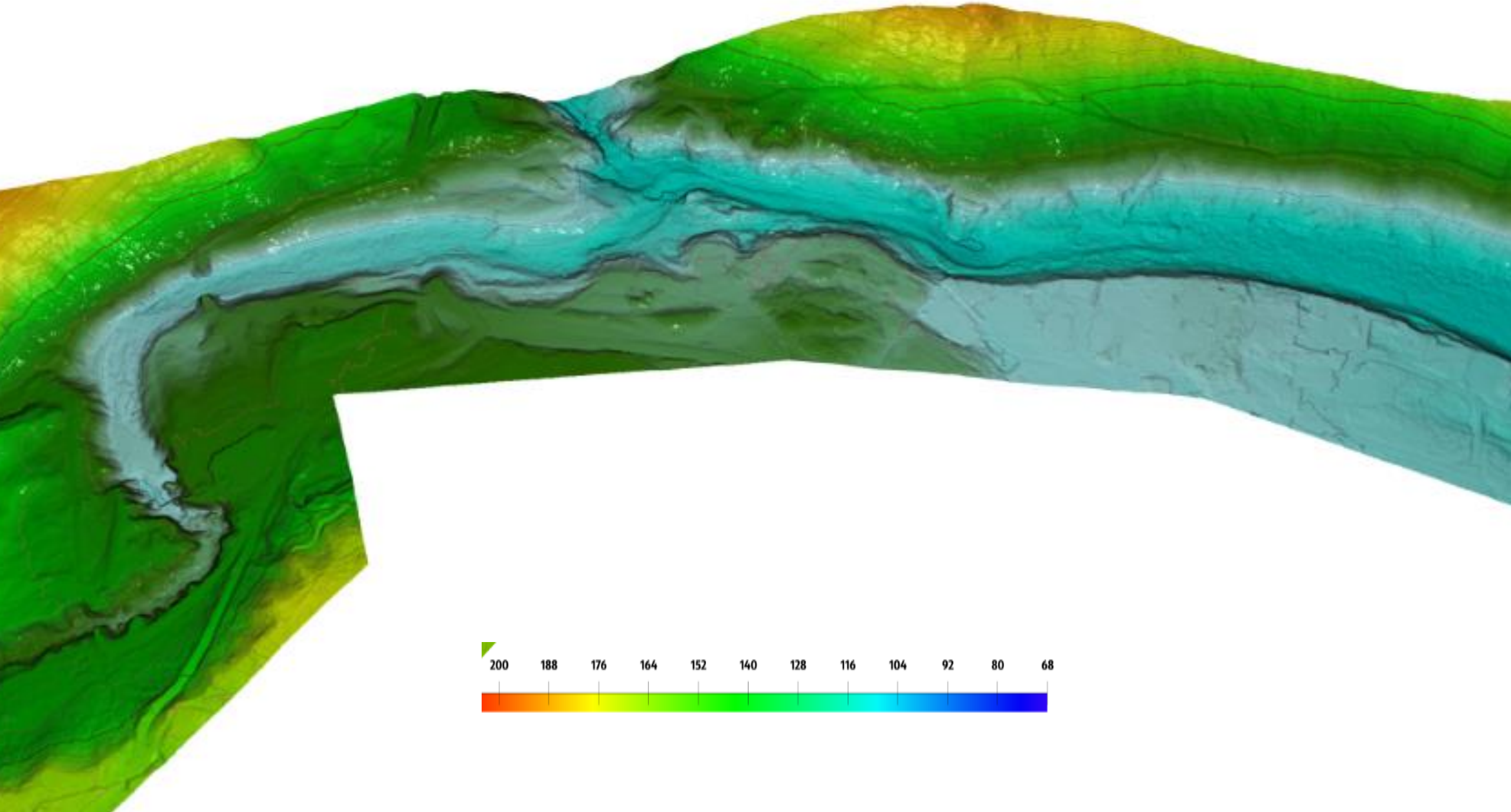
Tokkaei (8 km) and Surna (30 km) rivers (Norway) [Customer: Statkraft AS] **8/2016**

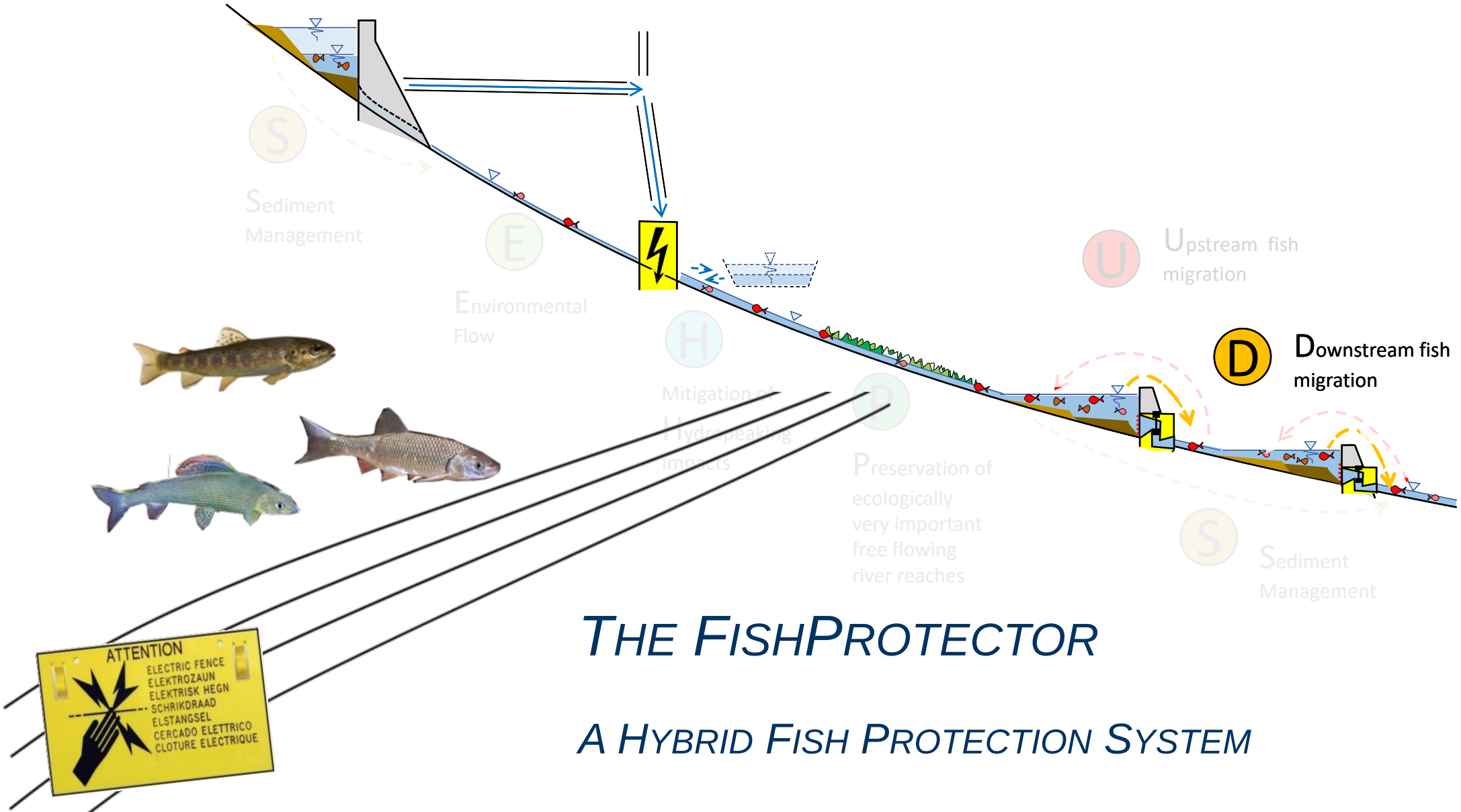




Tokkaei (8 km), Hallingdal (20 km) and Ljungan river (25 km, Sweden) [Customer: Statkraft AS & E-CO Energy]

9/2016


200
188
176
164
152
140
128
116
104
92
80
68



THE FISHPROTECTOR

A HYBRID FISH PROTECTION SYSTEM

- **Technical Features of the FishProtector**
- Hybrid fish protection
- First projects
- Conclusions

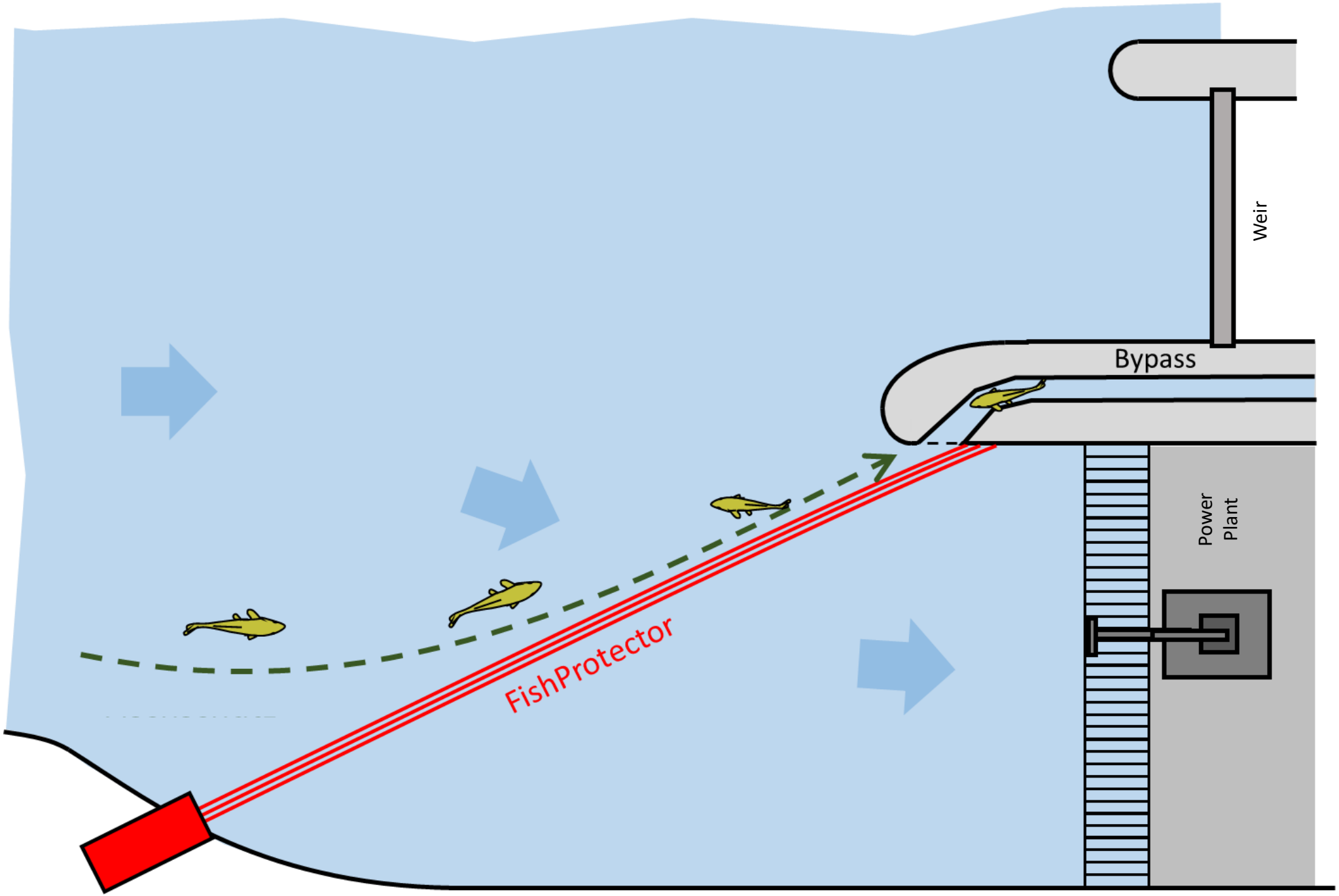
→ www.hyfish.at

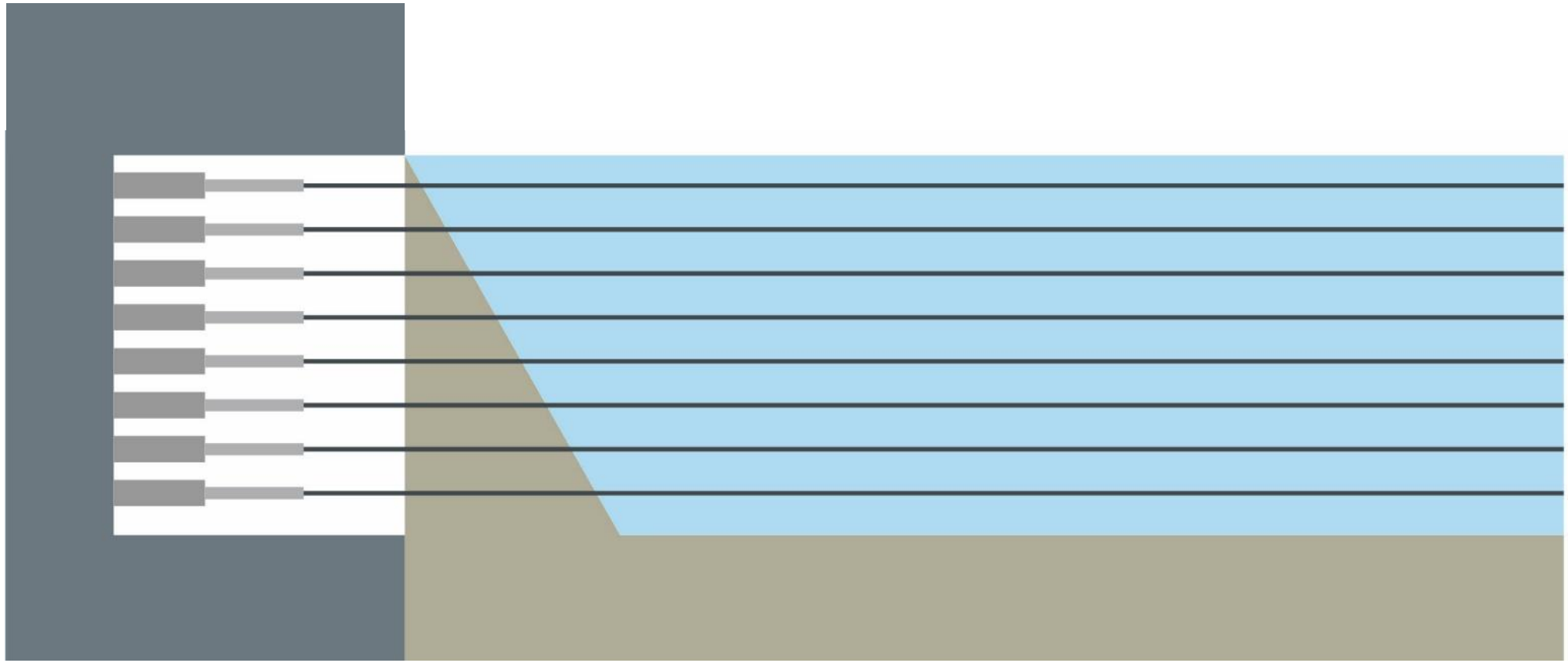
HyFish
//FishProtector

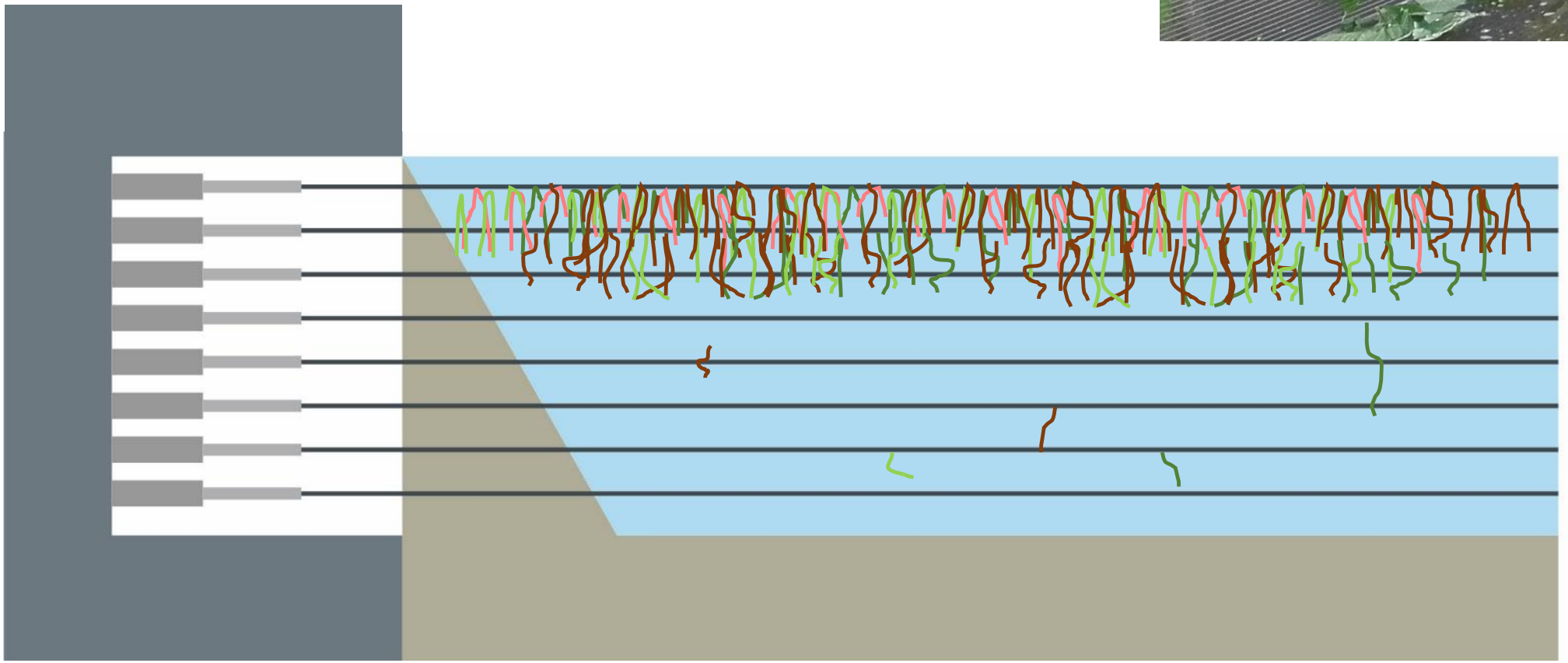
//FishProtector

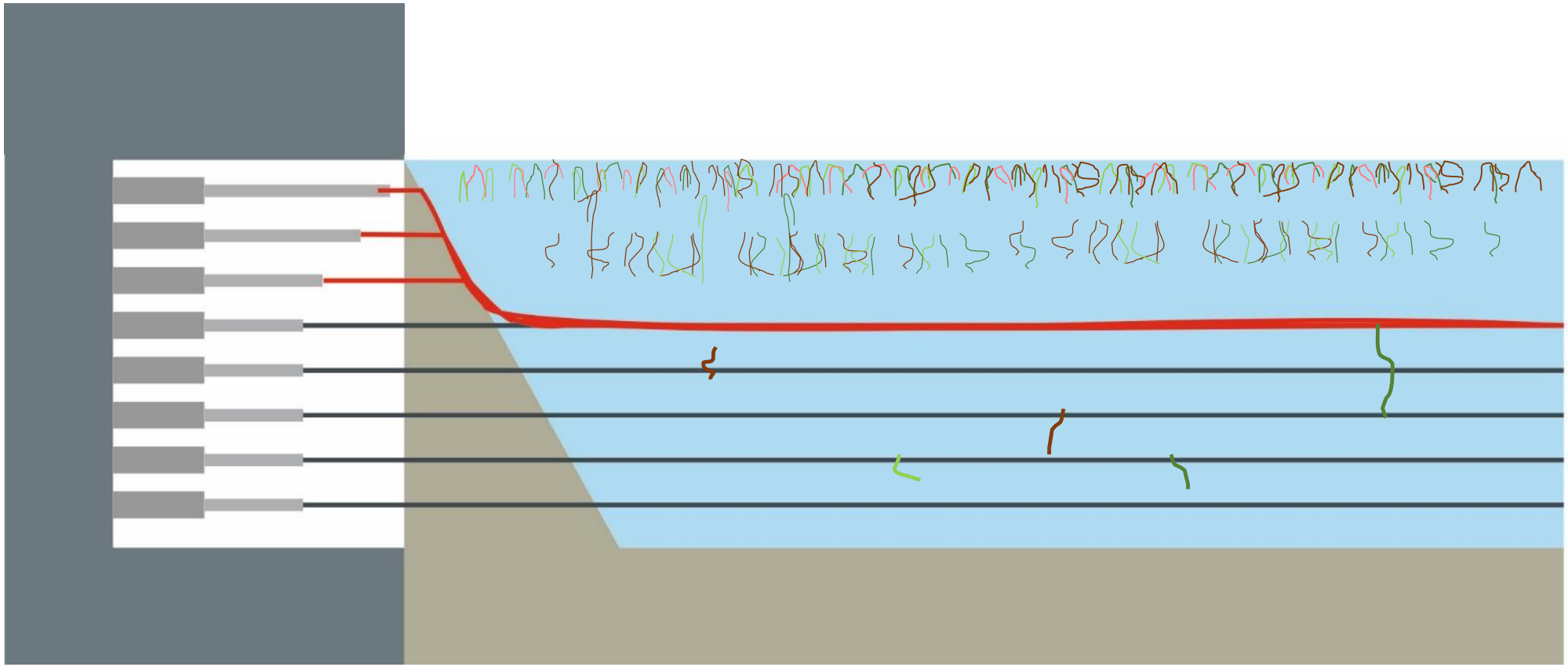
Efficient protection and guiding of fish at low cost

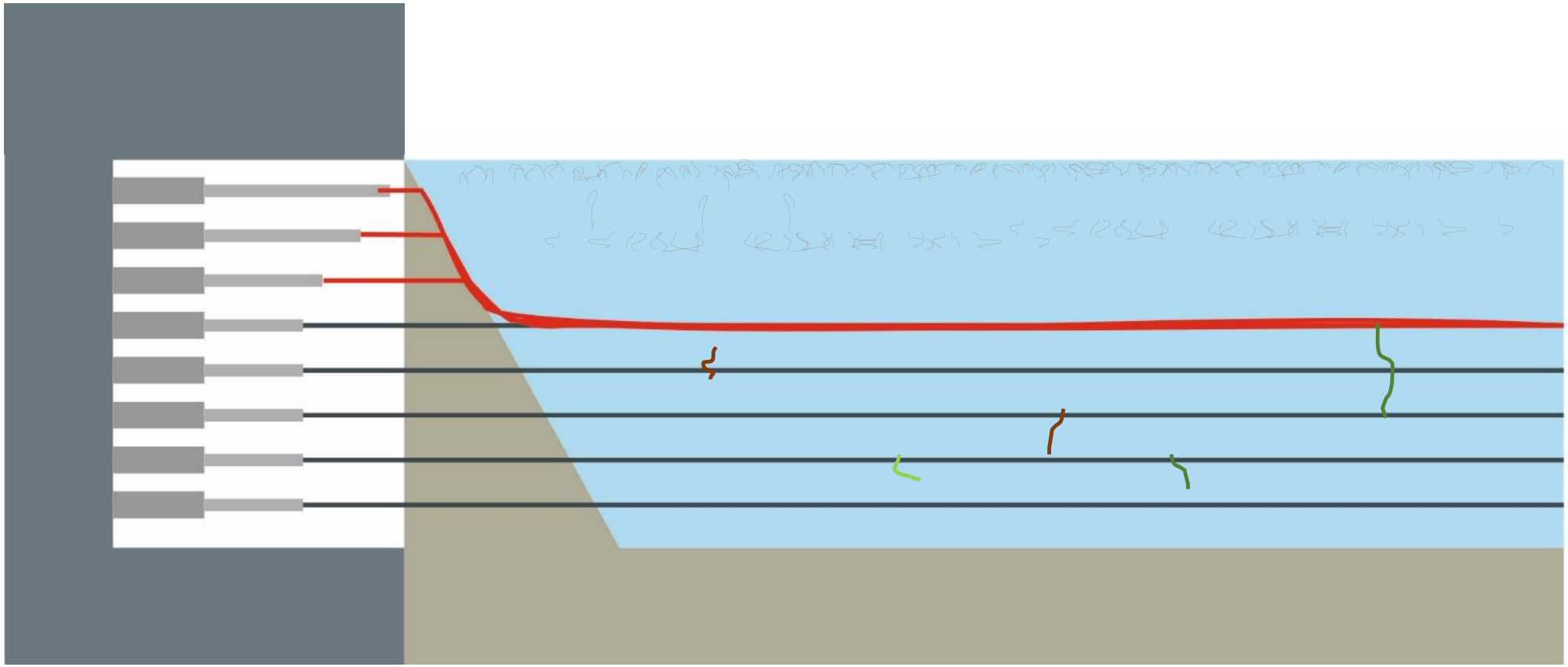
Plan View

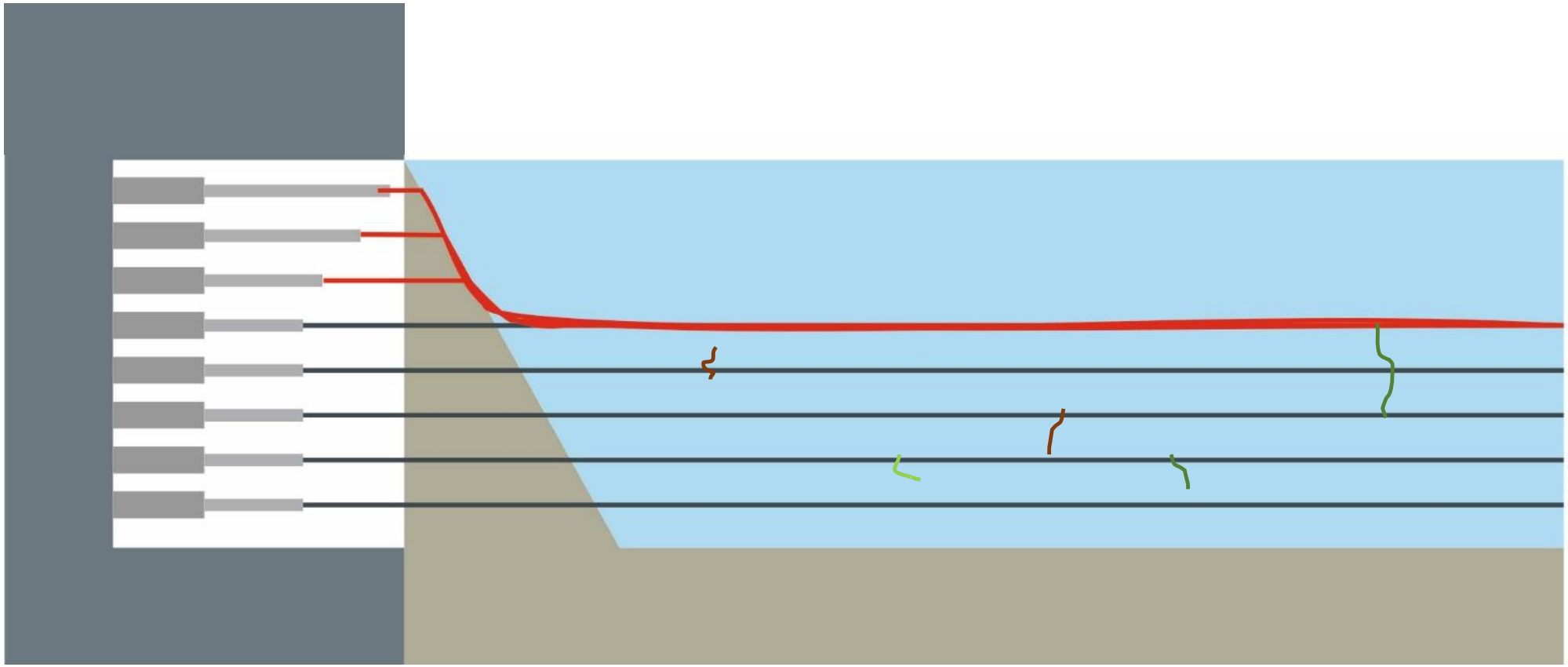


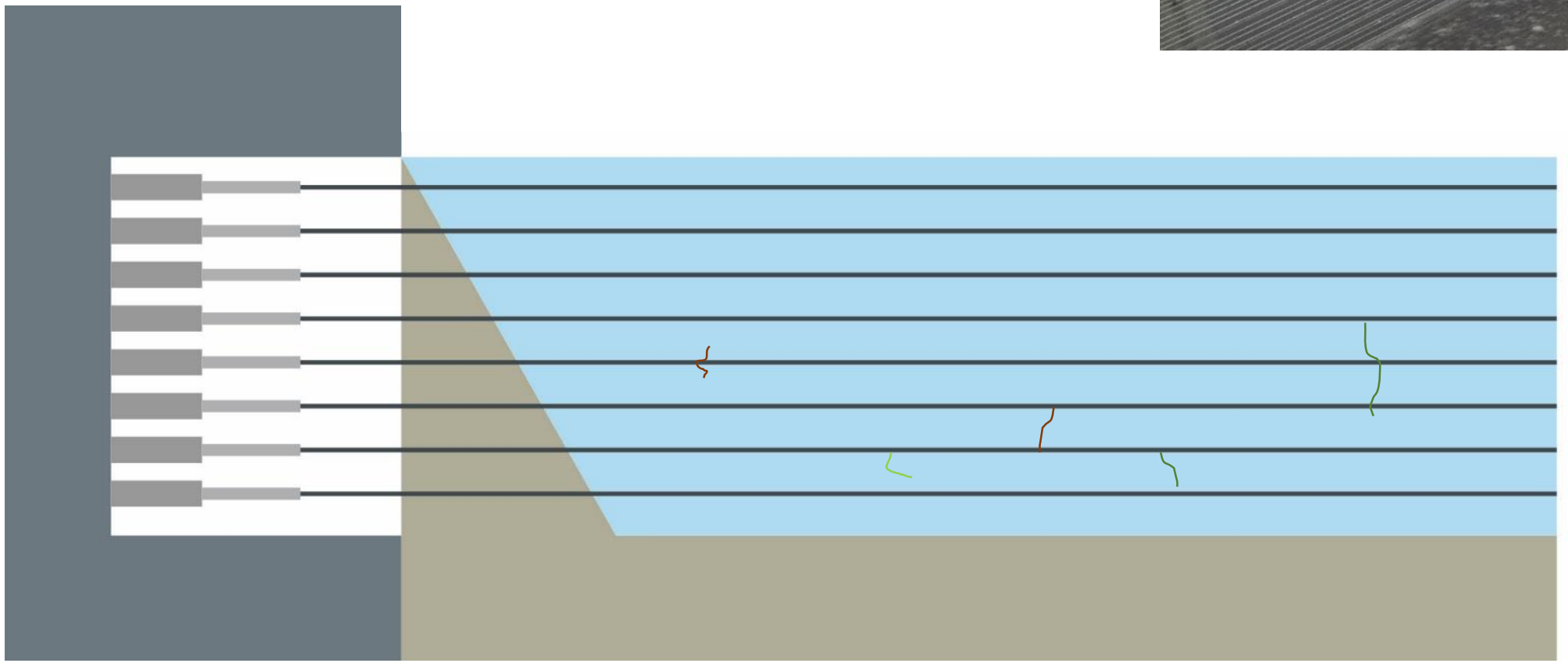




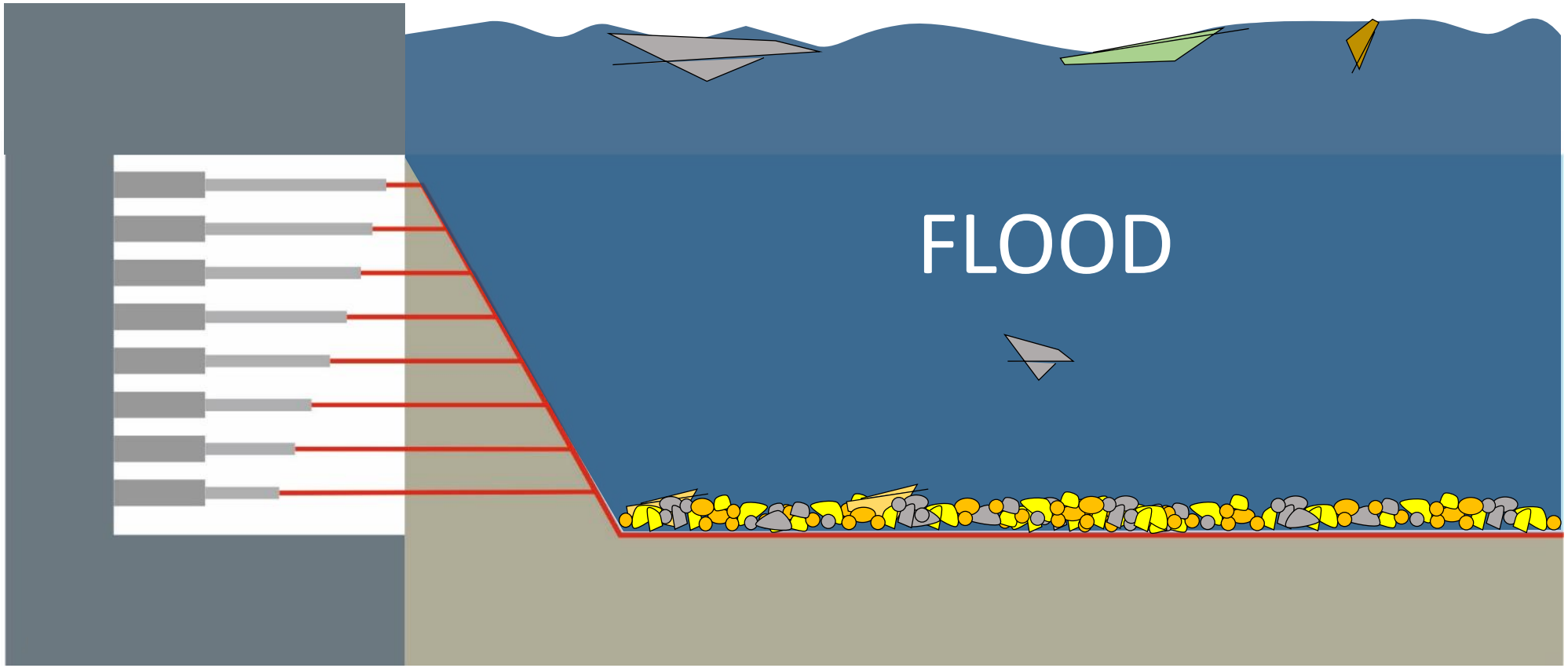


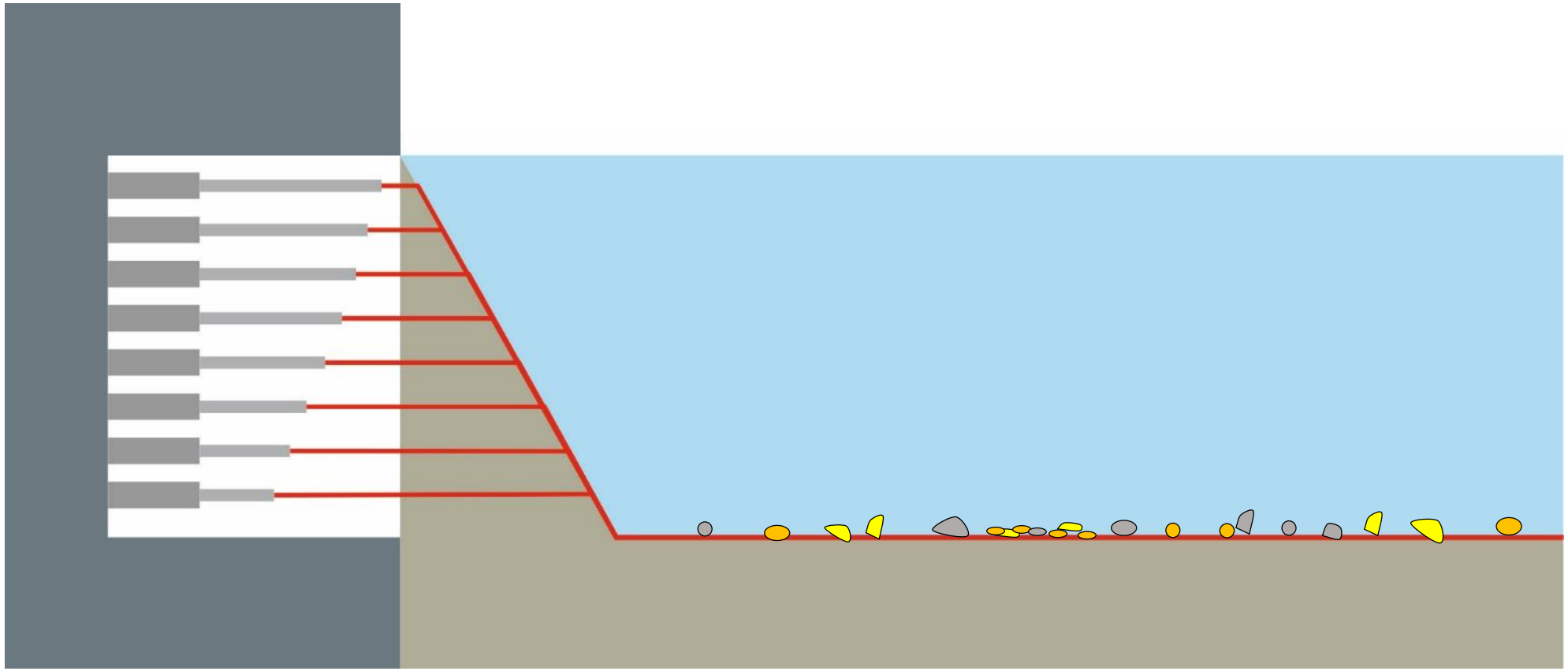


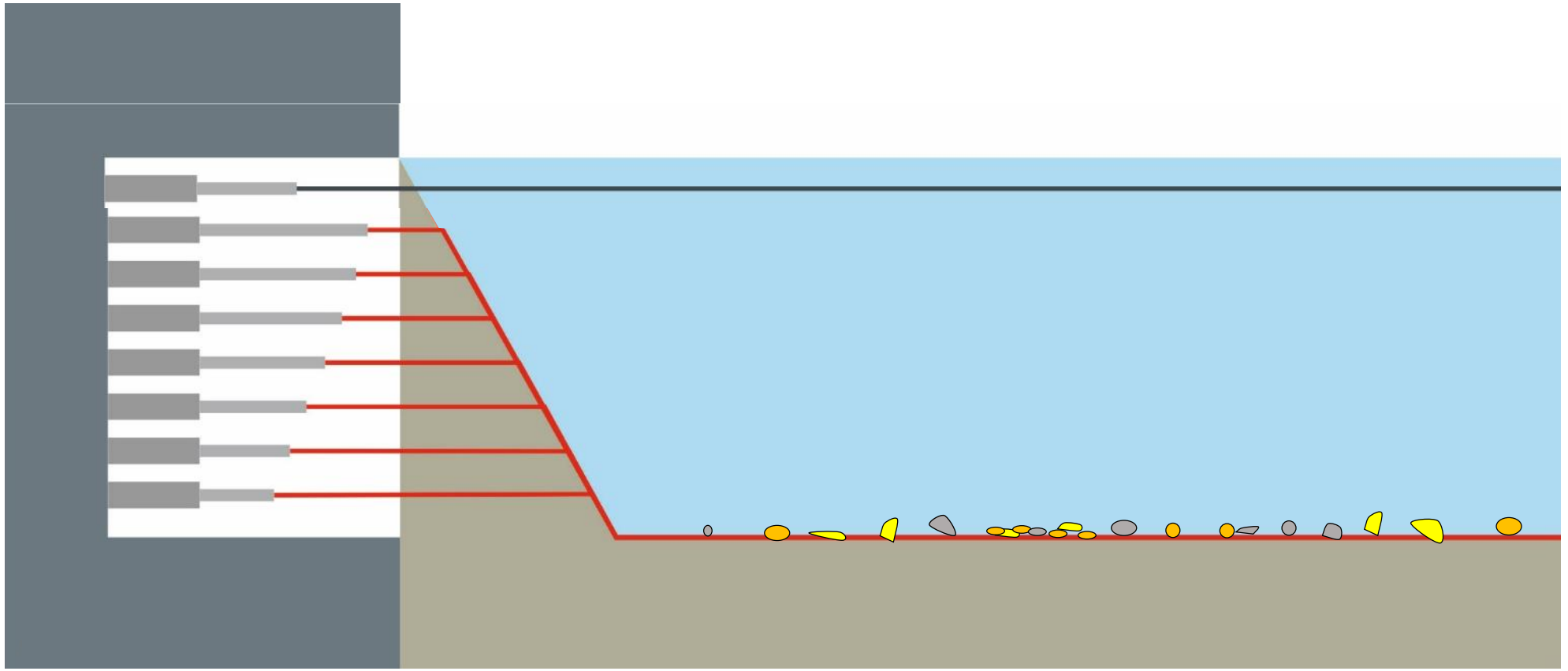


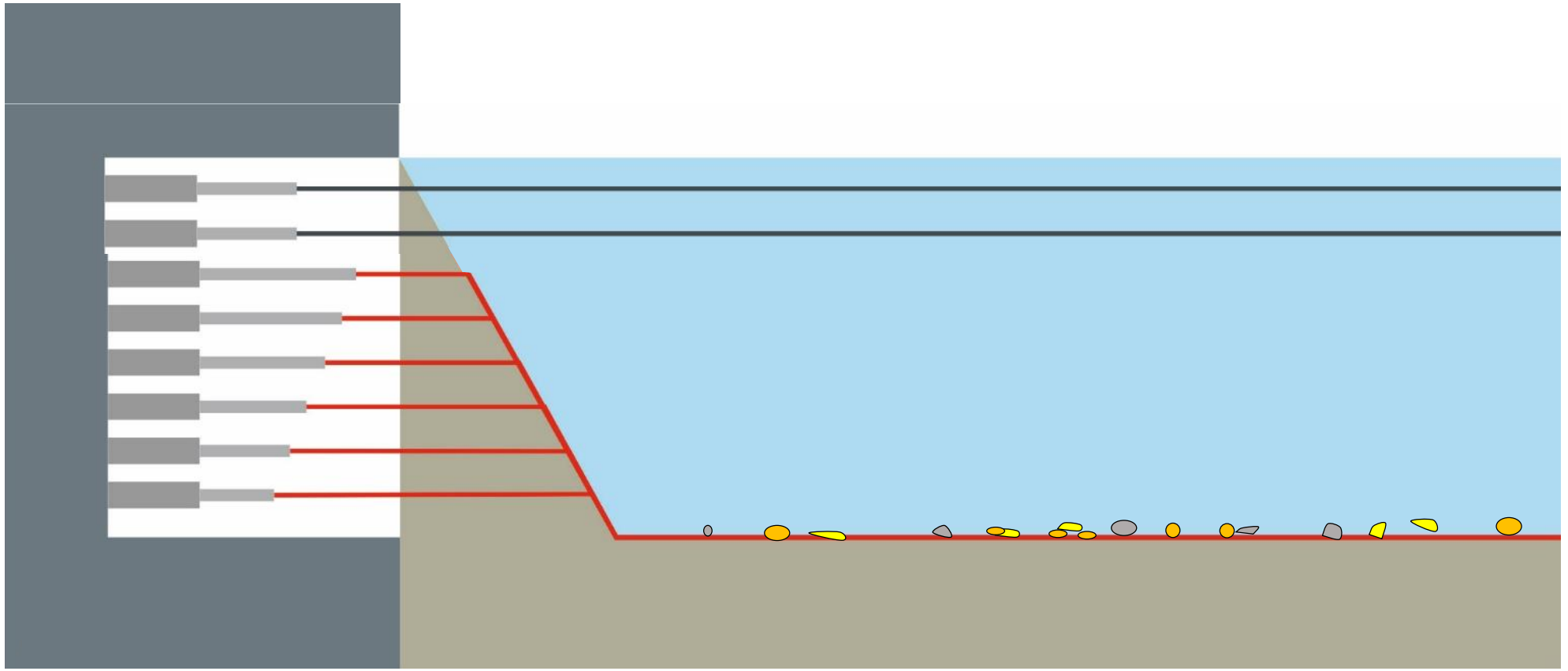


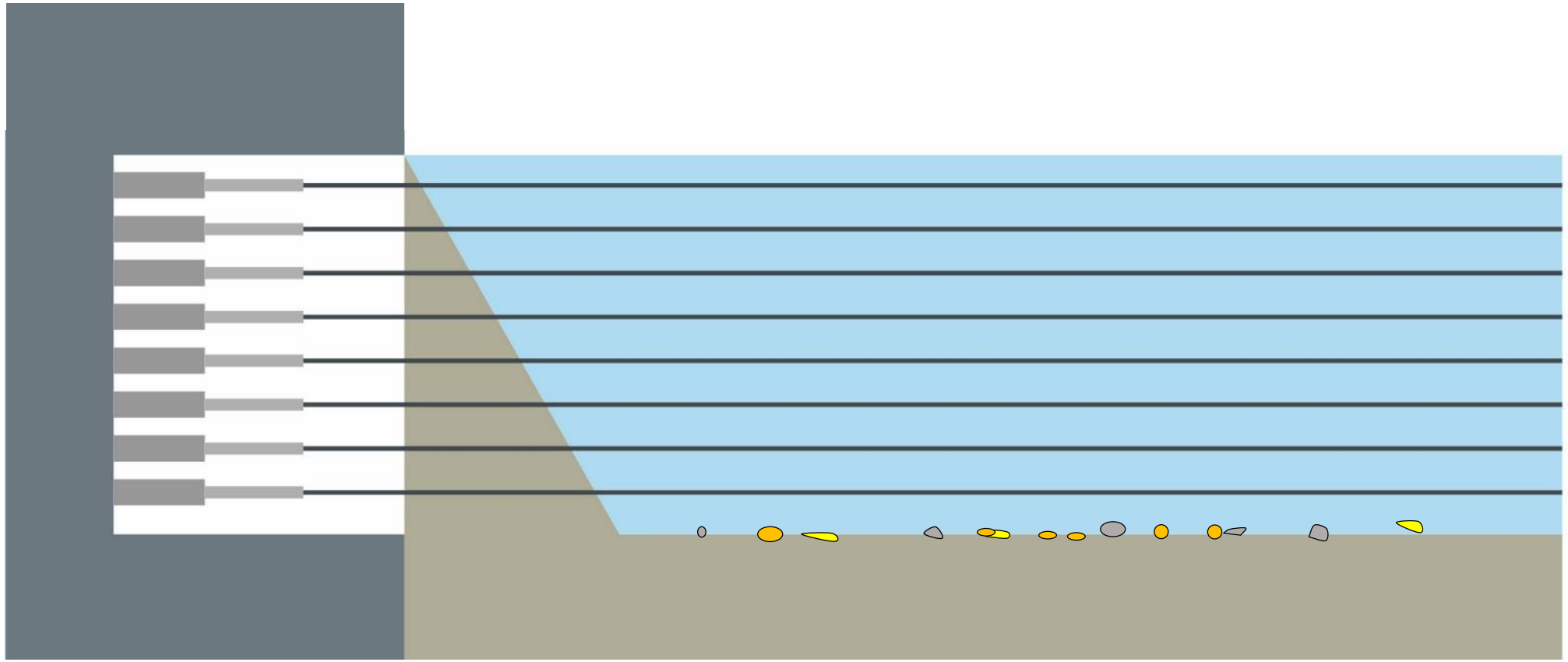
Technical Concept



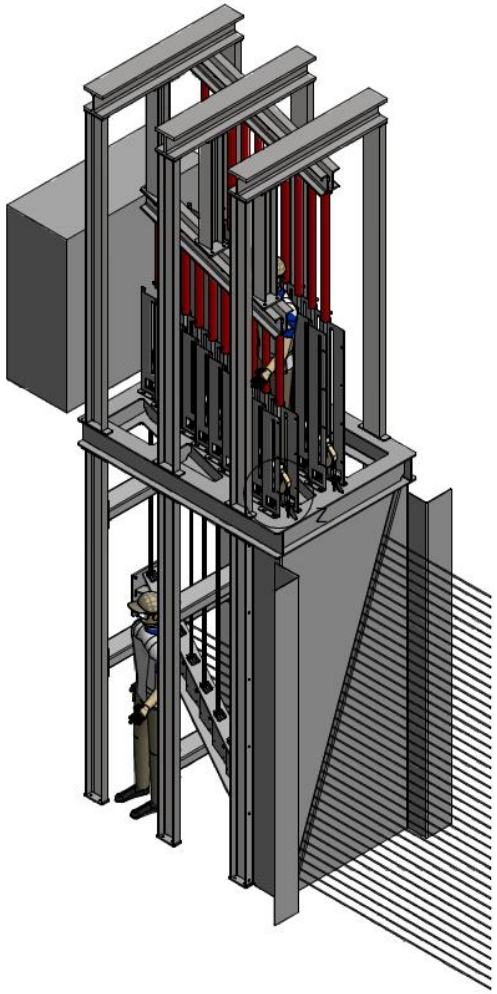


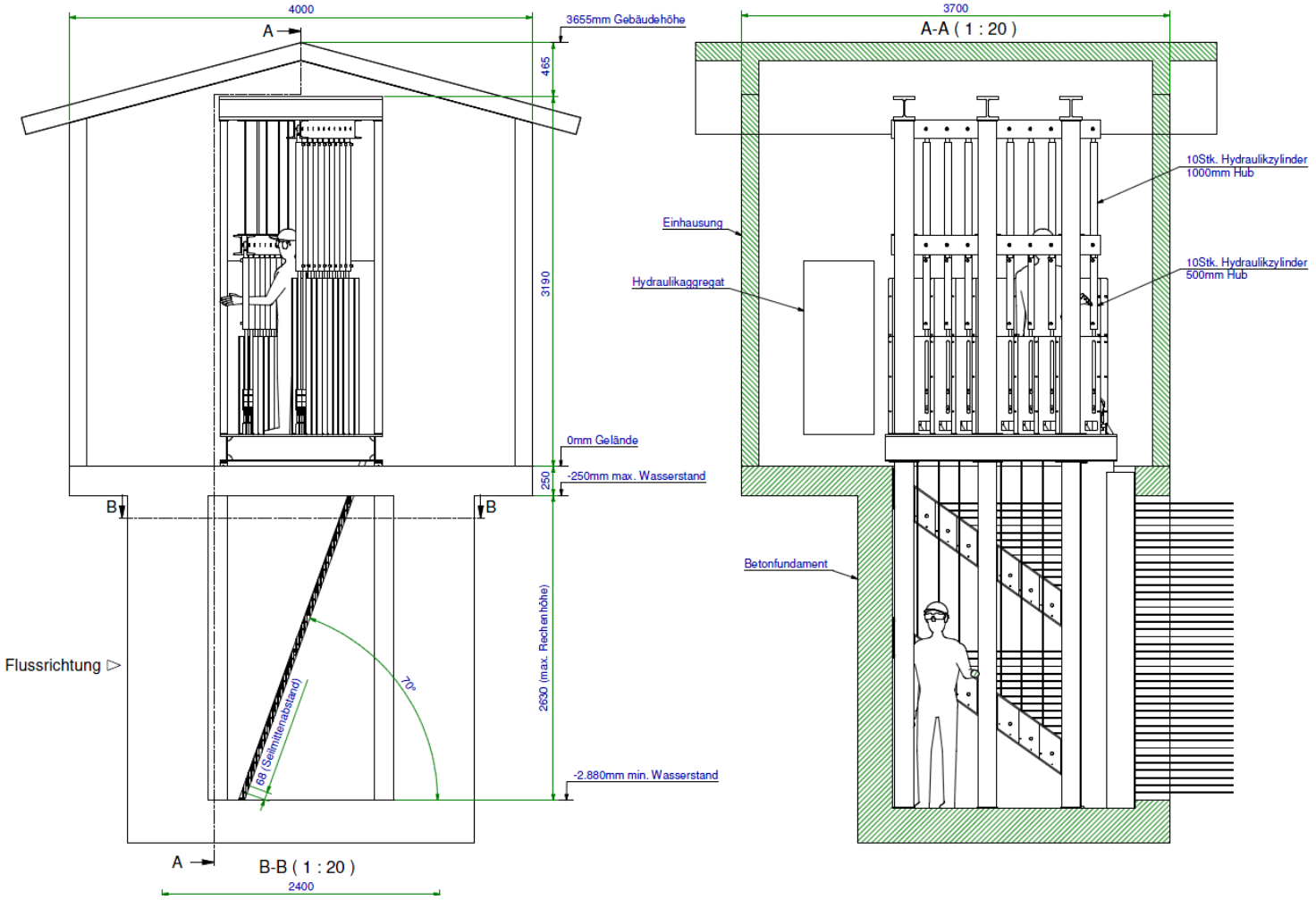






System with Hydraulic Cylinders

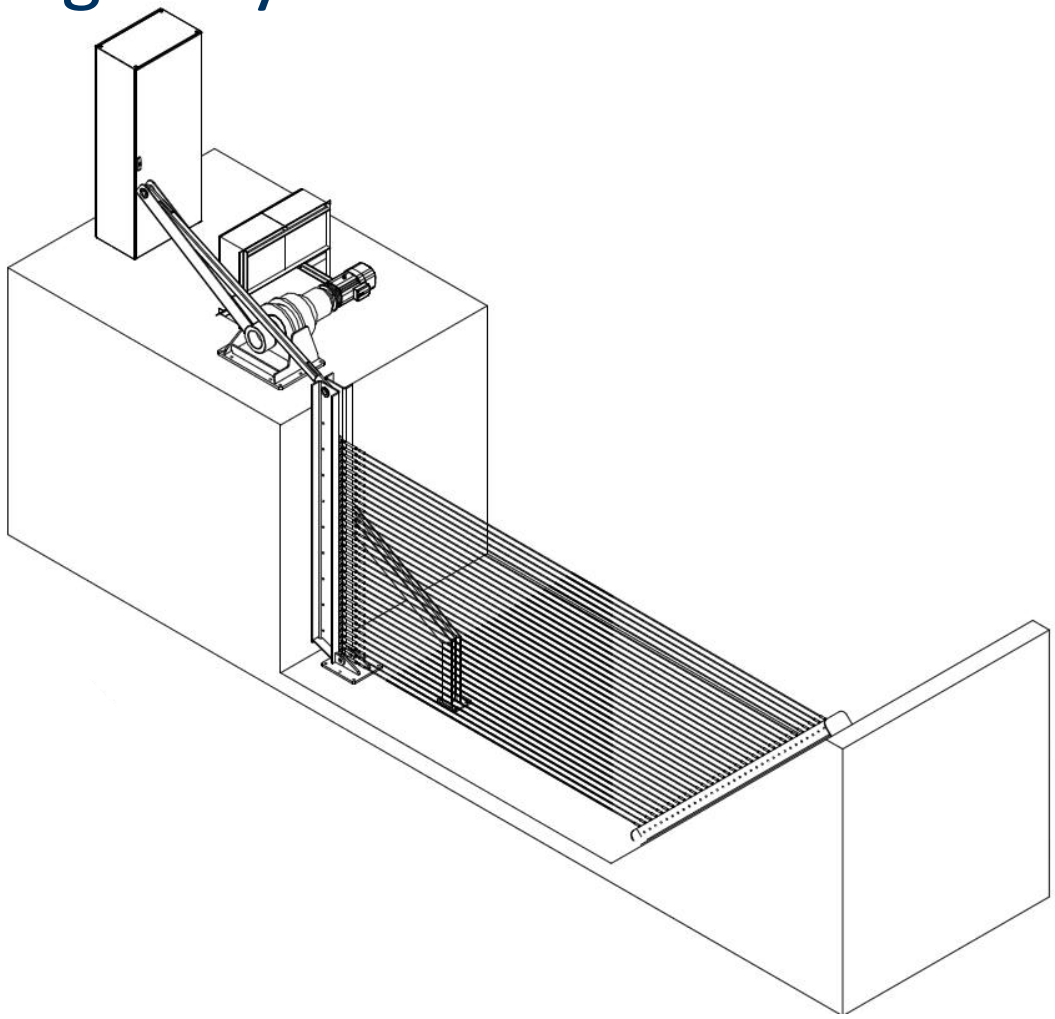


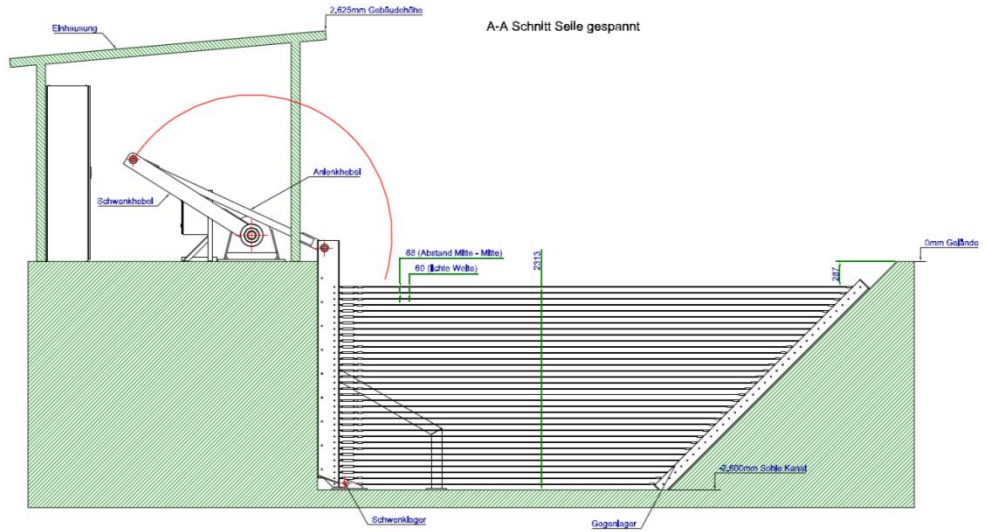


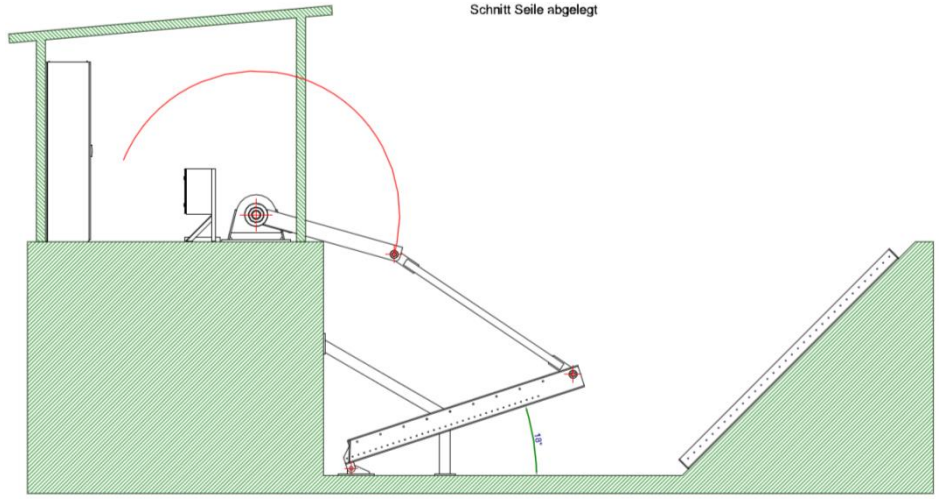
HyFish
//FishProtector

ALBATROS

Hinged System



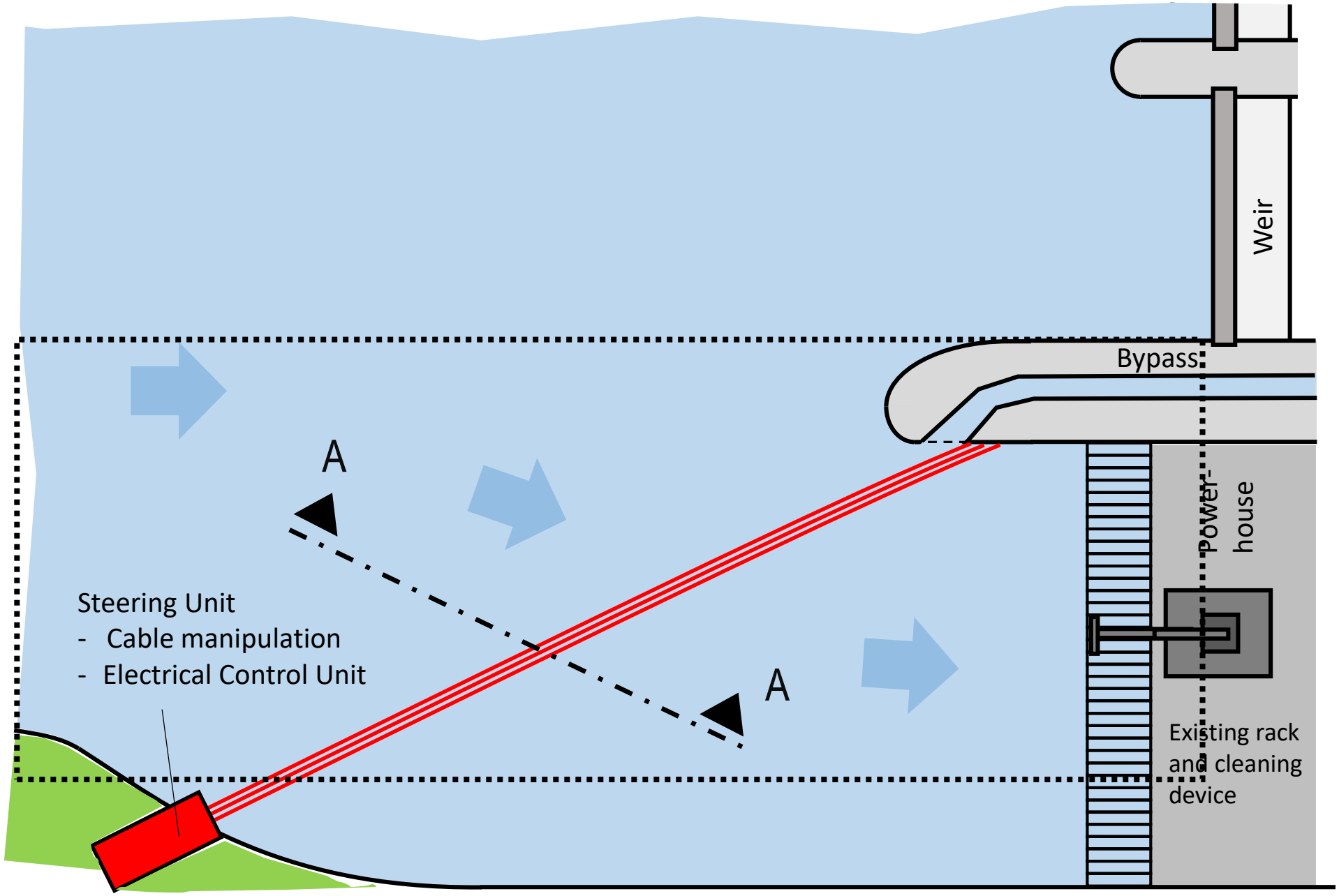




- Technical Features of the FishProtector
- **Hybrid fish protection**
- First projects
- Conclusions

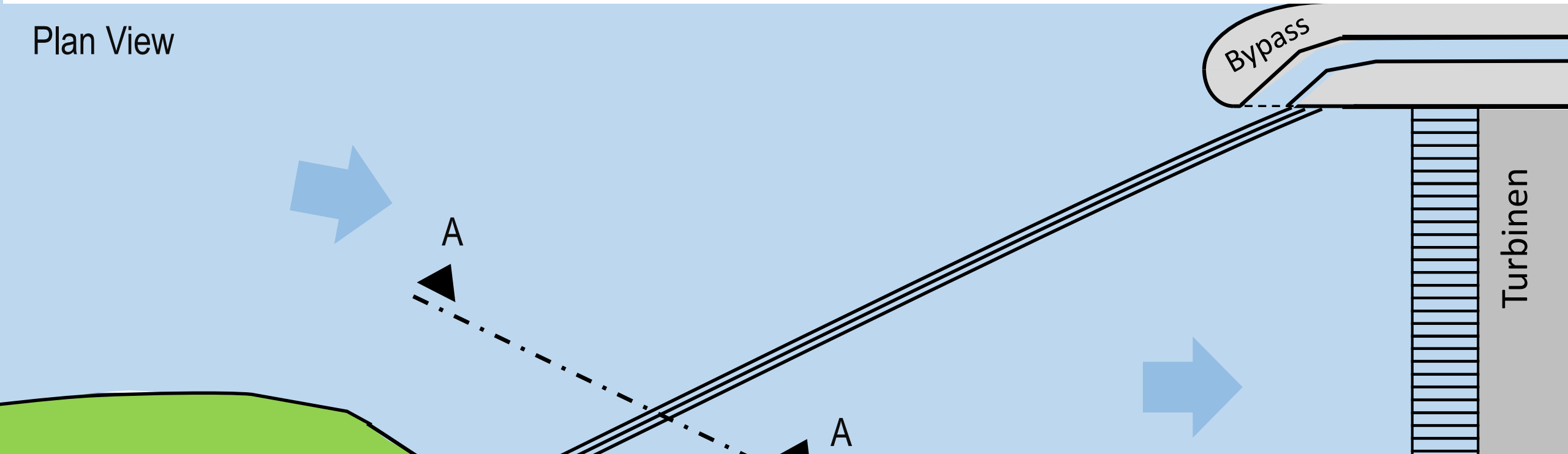
→ www.hyfish.at

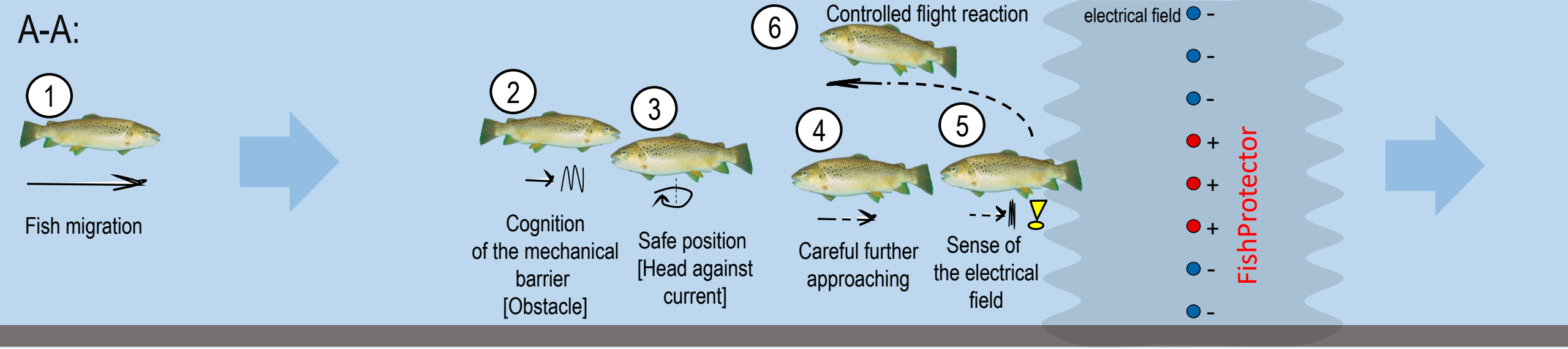
Plan View

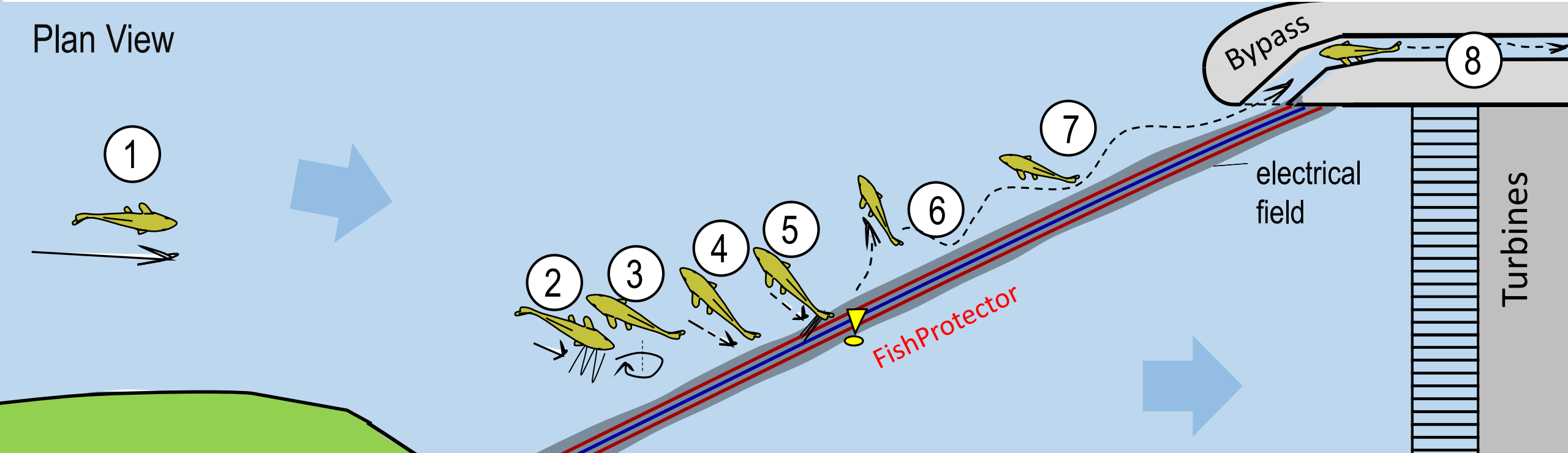

Weir
Bypass
A
A
Steering Unit
- Cable manipulation
- Electrical Control Unit
Power-house
Existing rack and cleaning device

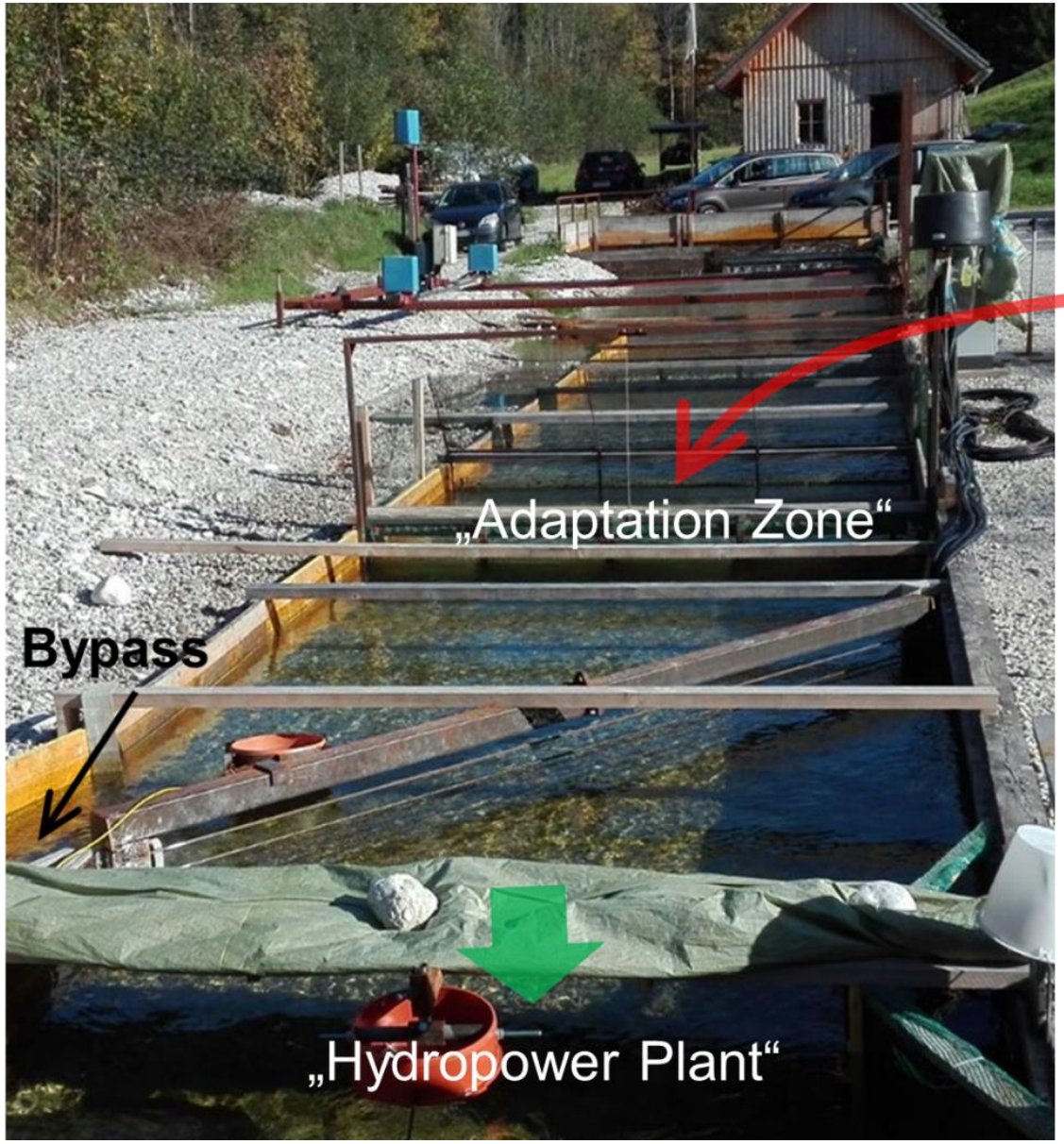
A-A:

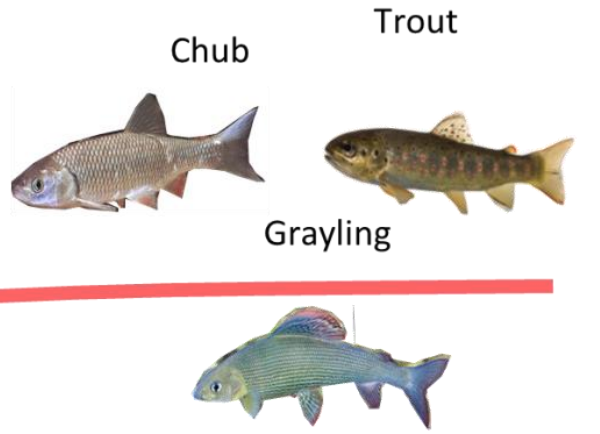
Plan View

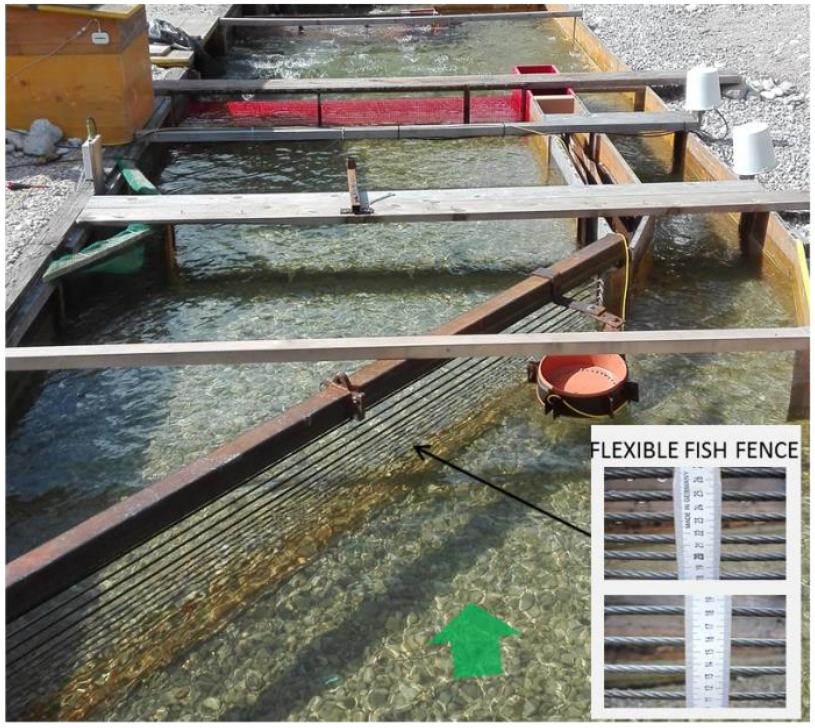



A-A:
1
Fish migration
2
Cognition of the mechanical barrier [Obstacle]
3
Safe position [Head against current]
4
Careful further approaching
5
Sense of the electrical field
6
Controlled flight reaction
electrical field
FishProtector


Plan View
1
2
3
4
5
6
7
8
Bypass
electrical field
FishProtector
Turbines



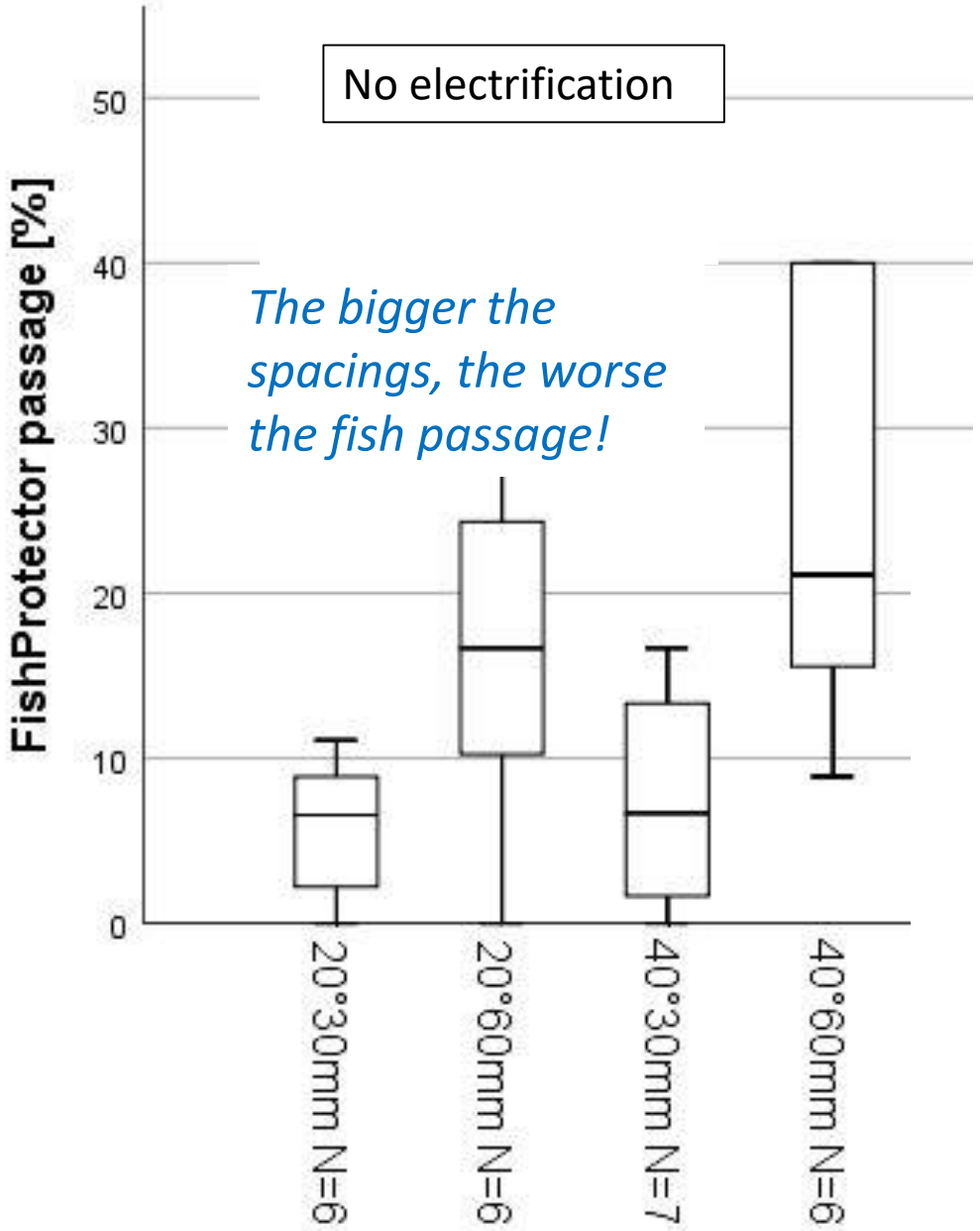


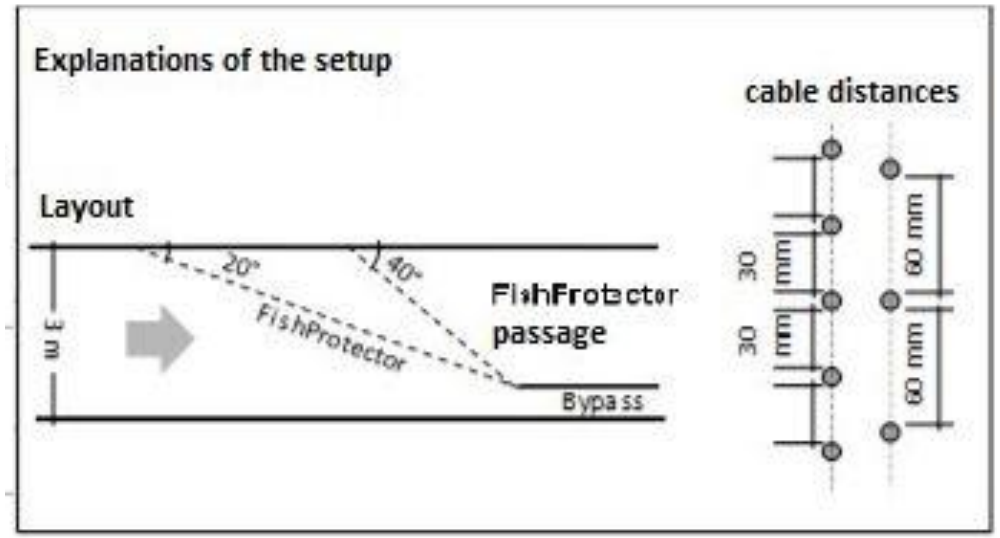


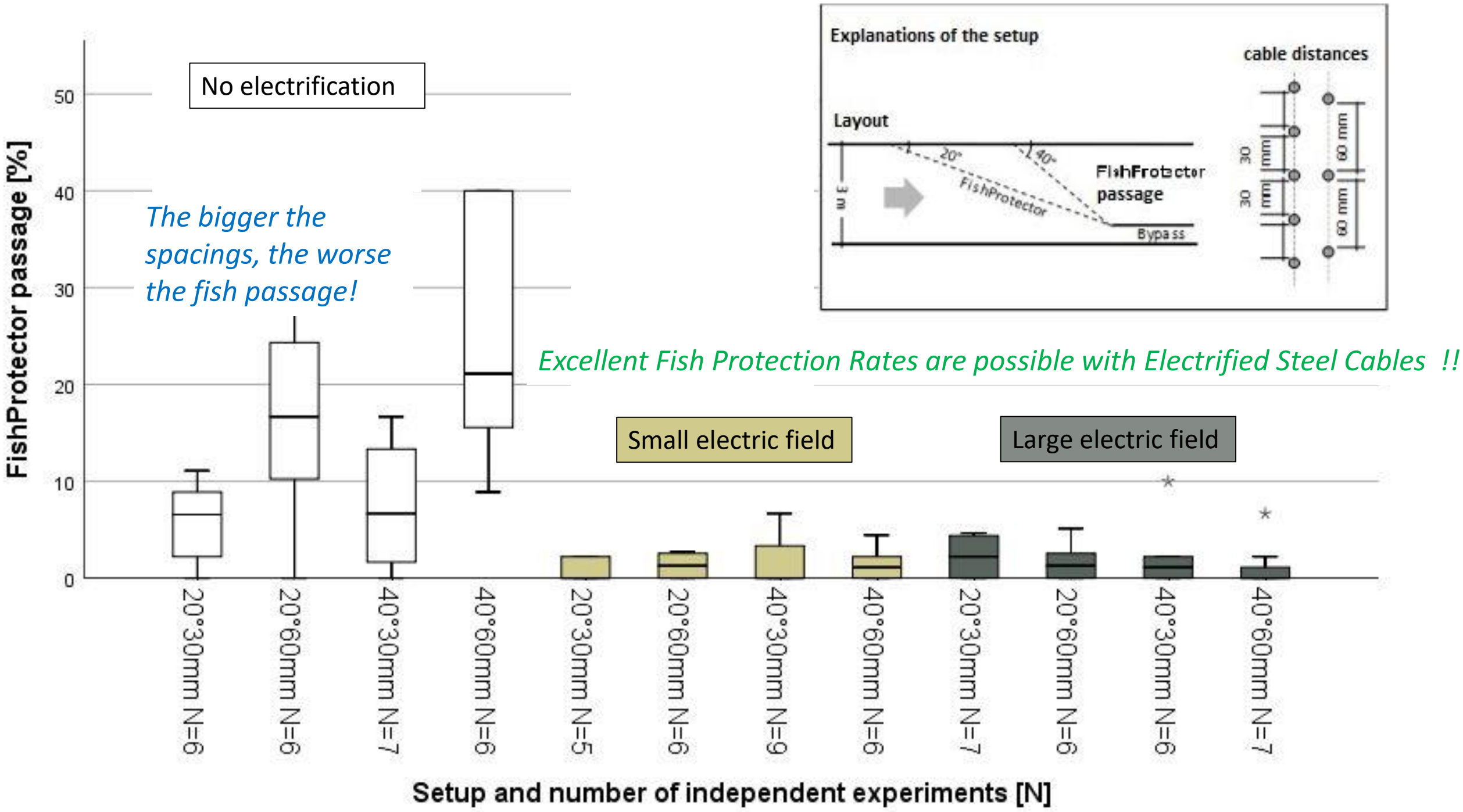
Institute of Hydrobiology and Aquatic Ecosystem Management (IHG)

No electrification

The bigger the spacings, the worse the fish passage!






No electrification
The bigger the spacings, the worse the fish passage!
Explanations of the setup
Layout
3 m
20°
40°
FishProtector
FishProtector passage
Bypass
cable distances
30 mm
30 mm
60 mm
60 mm
Excellent Fish Protection Rates are possible with Electrified Steel Cables !!
Small electric field
Large electric field
FishProtector passage [%]
0
10
20
30
40
50
20°30mm N=6
20°60mm N=6
40°30mm N=7
40°60mm N=6
20°30mm N=5
20°60mm N=6
40°30mm N=9
40°60mm N=6
20°30mm N=7
20°60mm N=6
40°30mm N=6
40°60mm N=7
Setup and number of independent experiments [N]

- Technical Features of the FishProtector
- Hybrid fish protection
- **First Projects**
- Conclusions

→ www.hyfish.at

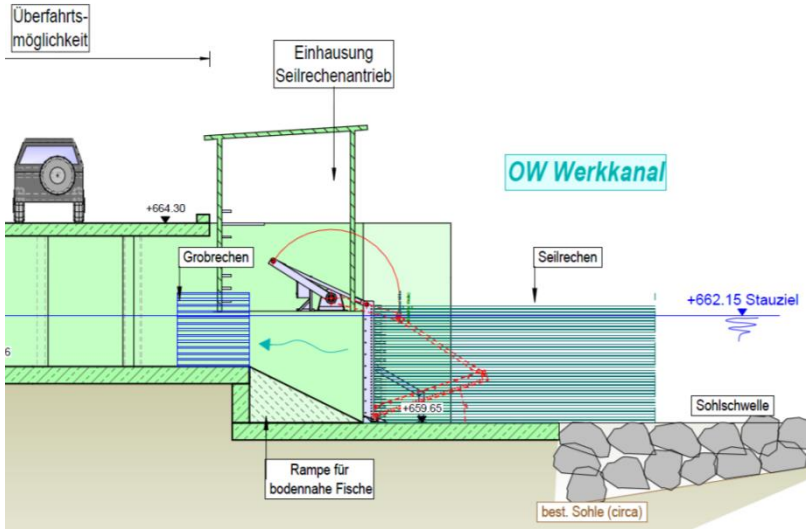
Pilot site HPP Leinau/Wertach (Germany)

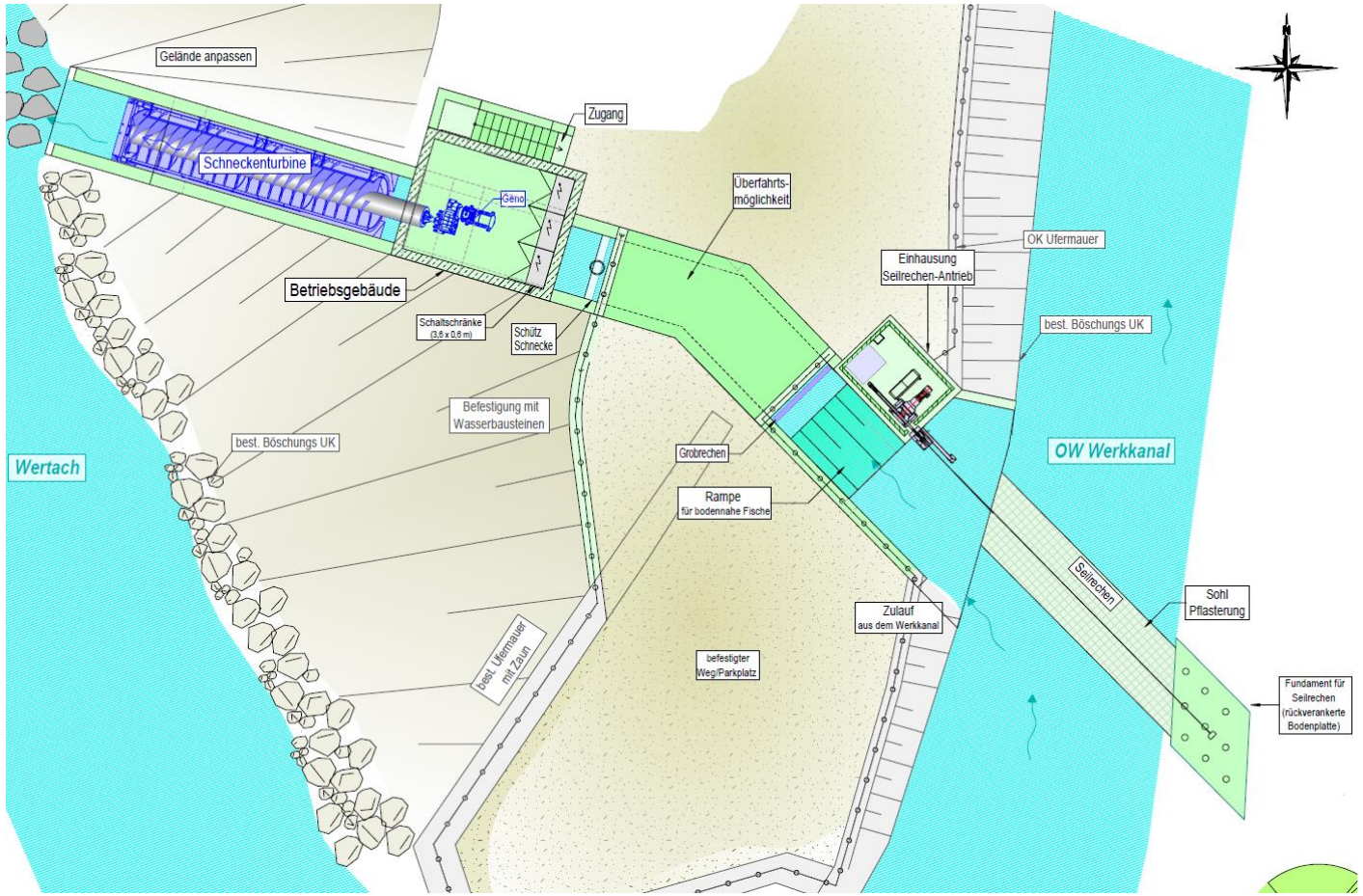
Pilot site HPP Leinau/Wertach (Germany)

Dimensions	
Length	20 m
Height	2,6 m
Spacing	60 mm

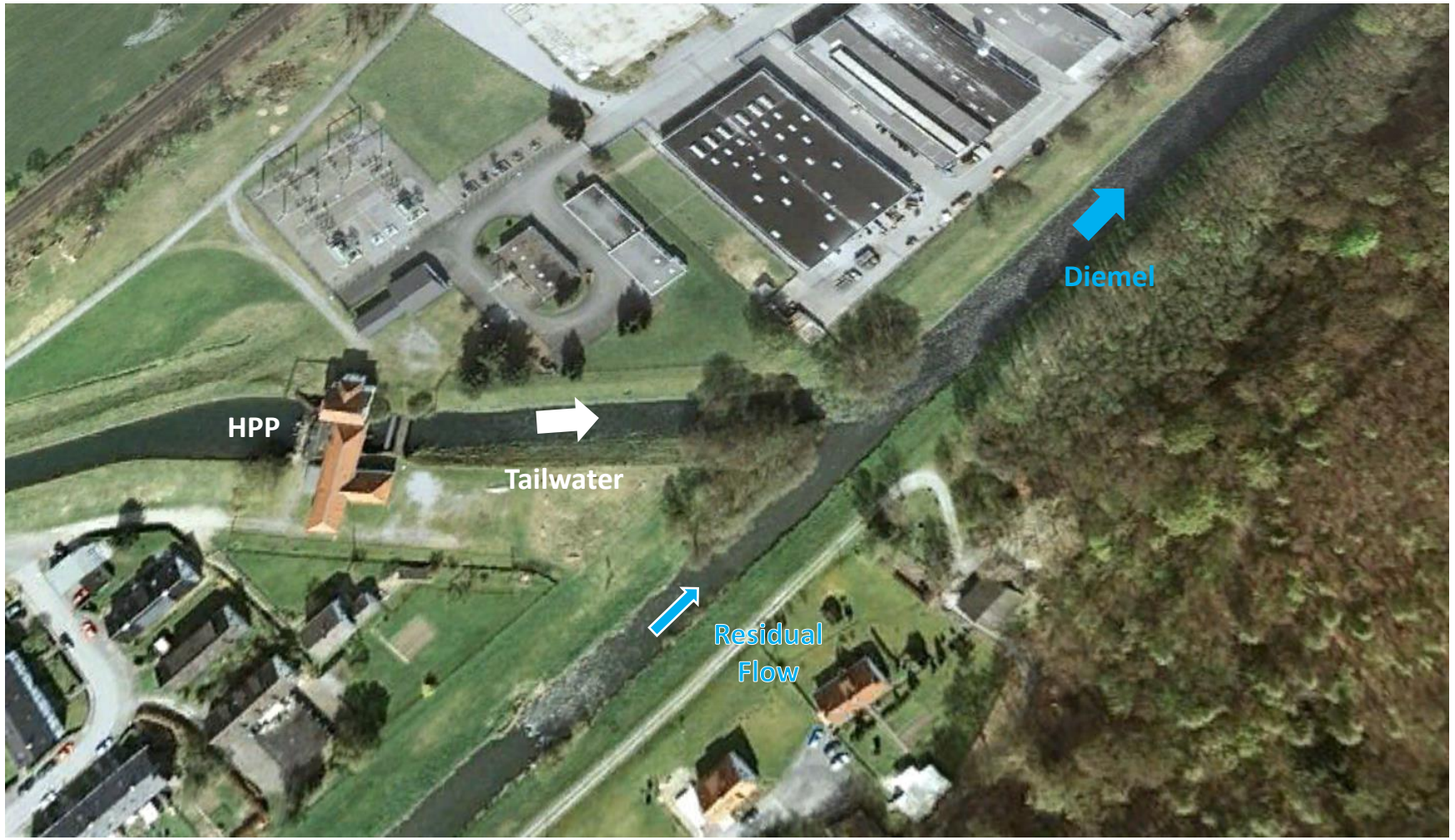
Pilot site HPP Leinau/Wertach (Germany)

- Technical design submitted for approval
- Monitoring concept planned



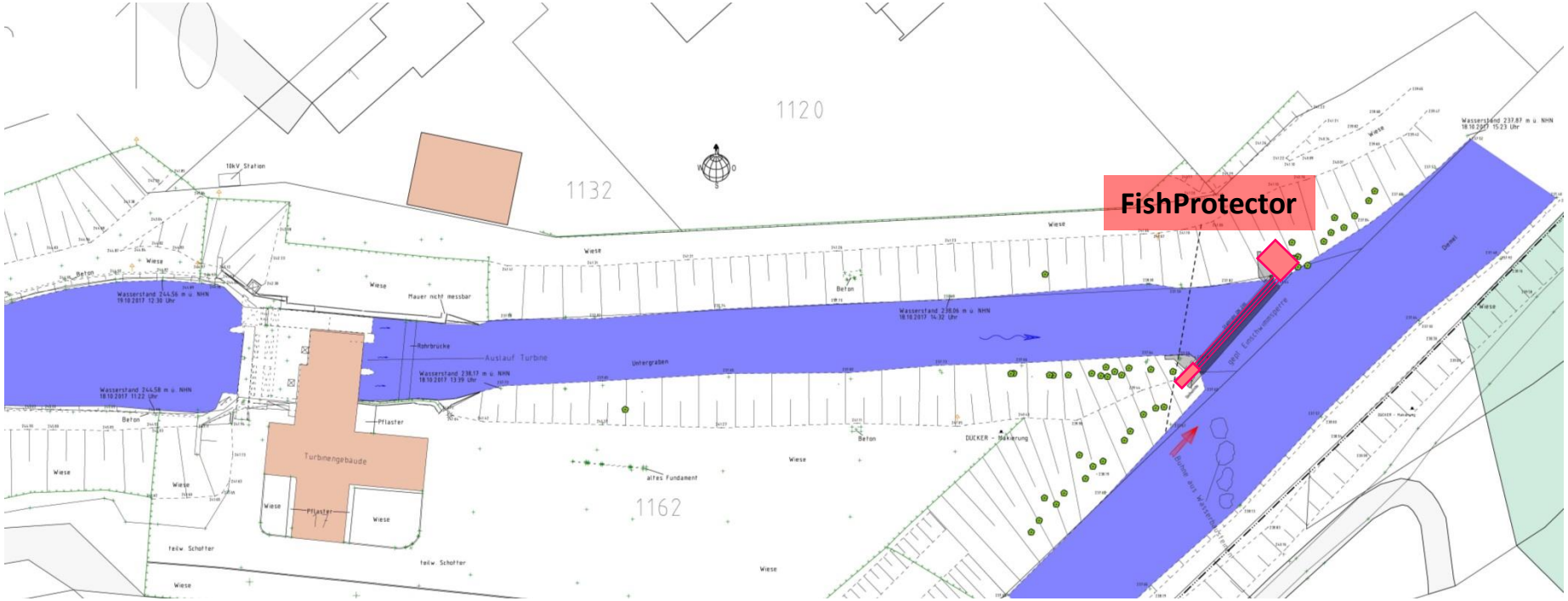


Pilot site HPP Niedermarsberg (Germany)



Pilot site HPP Niedermarsberg (Germany)

- FishProtector used as fence in the tailwater of a HPP
- Technical design already approved
- Waiting for construction decision of the hydropower company



Dimensions	
Length	14 m
Height	2,3 m
Spacing	60 mm

- Technical Features of the FishProtector
- Hybrid fish protection
- First projects
- **Conclusions**

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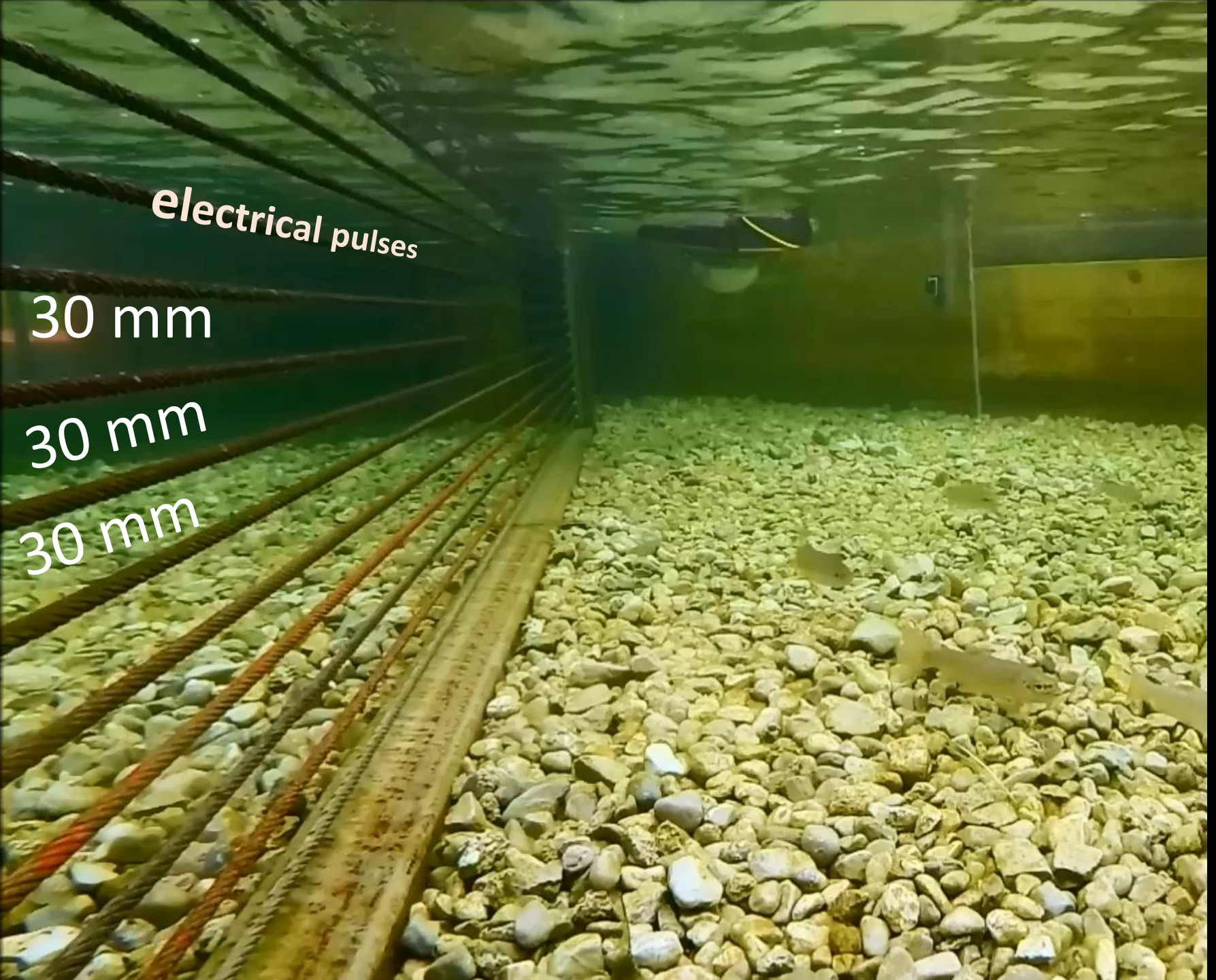

Conclusions

- Construction: feasible!
- Costs: low
- Ethohydraulic effectiveness: Given
- Operation:
- First
- Projects
- in 2020

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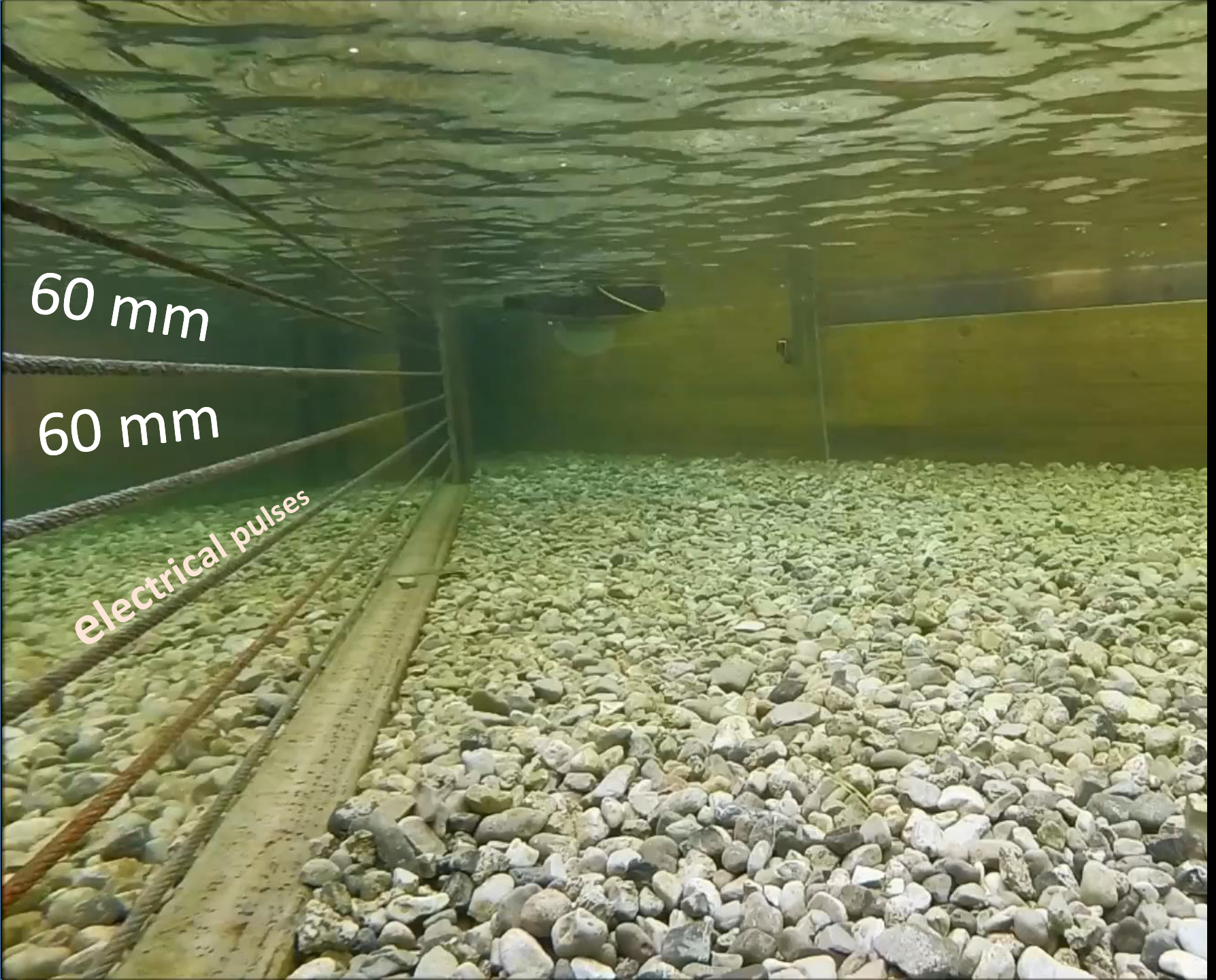

Conclusions

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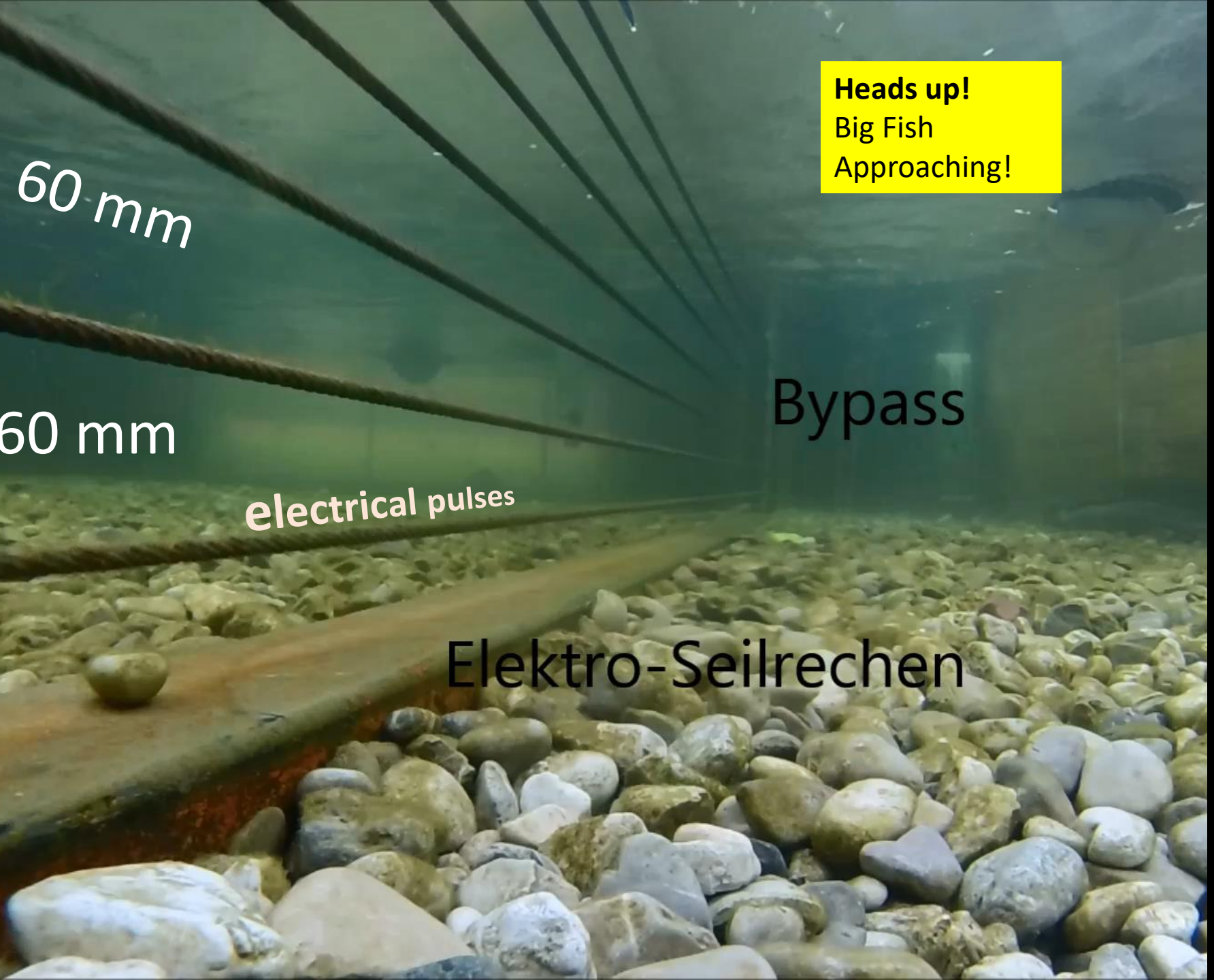

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- Projects
- in 2020 ✓

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- Hydropower and River Ecology –

Current developments in fish protection

AHM AIRBORNE MAPPING

HyFish //FishProtector

Markus Aufleger

Trondheim, 4th of February 2020

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