

Improvement of navigation conditions on the Danube (Calarasi-Braila and Lower Danube)

-

Ecological concerns?

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Topics of the presentation

- Major pressures and threats on Danube River system relating to improvement of navigation
- Typical structural interventions and ecological concerns of ISPA project Calarasi-Braila
- Recommendations and request for action



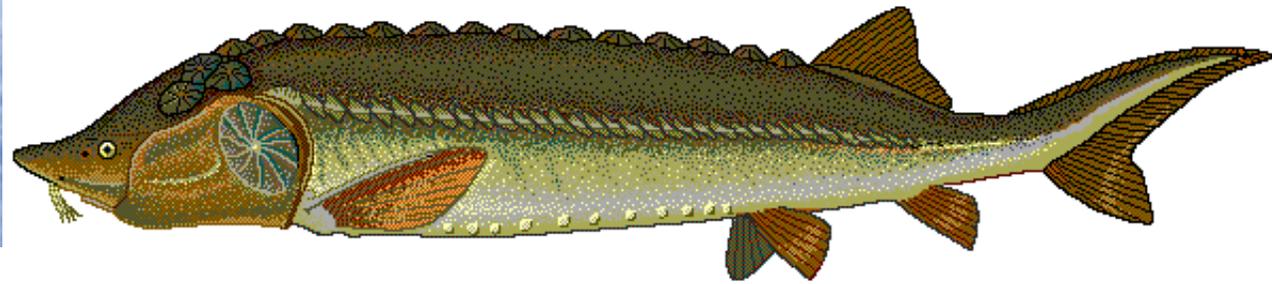
Major pressures or threats

- Improvement of navigation conditions
- Sturgeon at risk of extinction
- Ensuring and improving flood protection
- Deficit in sediment balance
- Additional structural interventions
- Implementation of EU-Regulation
- Climate change



Improvement of navigation conditions

- Enlargement of fairway dimensions
 - Increase of draught, esp. at low flow stages
- Increase in transport volume
 - Increase in frequency of waterway traffic
 - Size of transport units (no. of barges, length?)
- Improvement of reliability of fairway conditions
 - River Information System
 - Restrictions for morpho-dynamic processes?
- Other non-structural approaches?



Conservation of sturgeon

- Lower Danube provides best remaining habitat for sturgeons in the whole Black Sea region
- Sturgeons sensible to hydro-morphological alterations
 - Preservation of migration paths (long memory?)
 - Sturgeons avoid hydraulic structures
 - Sturgeons prefer to move in deeper water
- Specific requirements for spawning habitat
 - Coarse sediment particles with open cavities



Ensuring and improving flood protection

- Ensurance of conveyance capacity
 - Maintenance of hydraulic capacity of all river arms
 - Preservation of hydro-morphological processes
 - Local relocation of flood protection dykes
- Restoring retention areas
 - Relocation of dykes and creation of retention basins (polder)
- Flood risk management
 - Control flood risk development (ports?)



Deficit in sediment balance

- Dredging of river sediments over decades far beyond natural transport volume
 - River bed incision all along free flowing Danube river
- Damming of Danube main stem and major tributaries on large sections
 - Reduction of natural transport volume
- Rectification and embankment on large free flowing sections
 - Prevention of lateral morphodynamics and recharge of sediments



Sediment extraction and channel incision along the Danube and selected tributaries

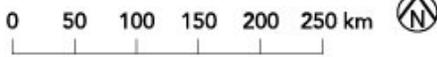




Estimated bedload less than 0,5 Mill. m3

Free flowing river stretches with sediment deficits (in particularly bedload) and channel incision

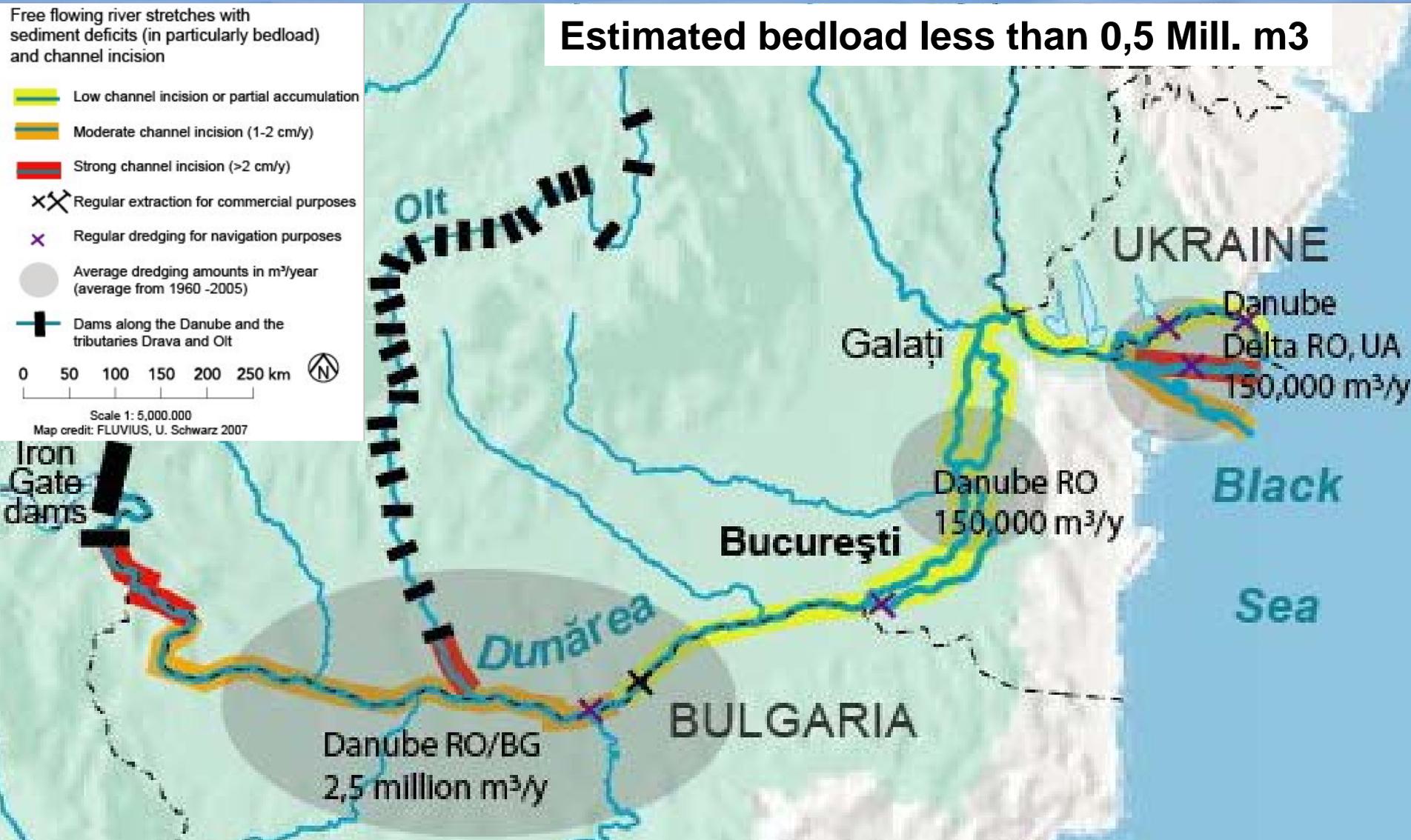
- Low channel incision or partial accumulation
- Moderate channel incision (1-2 cm/y)
- Strong channel incision (>2 cm/y)
- Regular extraction for commercial purposes
- Regular dredging for navigation purposes
- Average dredging amounts in m³/year (average from 1960 -2005)
- Dams along the Danube and the tributaries Drava and Olt



Scale 1: 5,000,000

Map credit: FLUVIUS, U. Schwarz 2007

Iron Gate dams

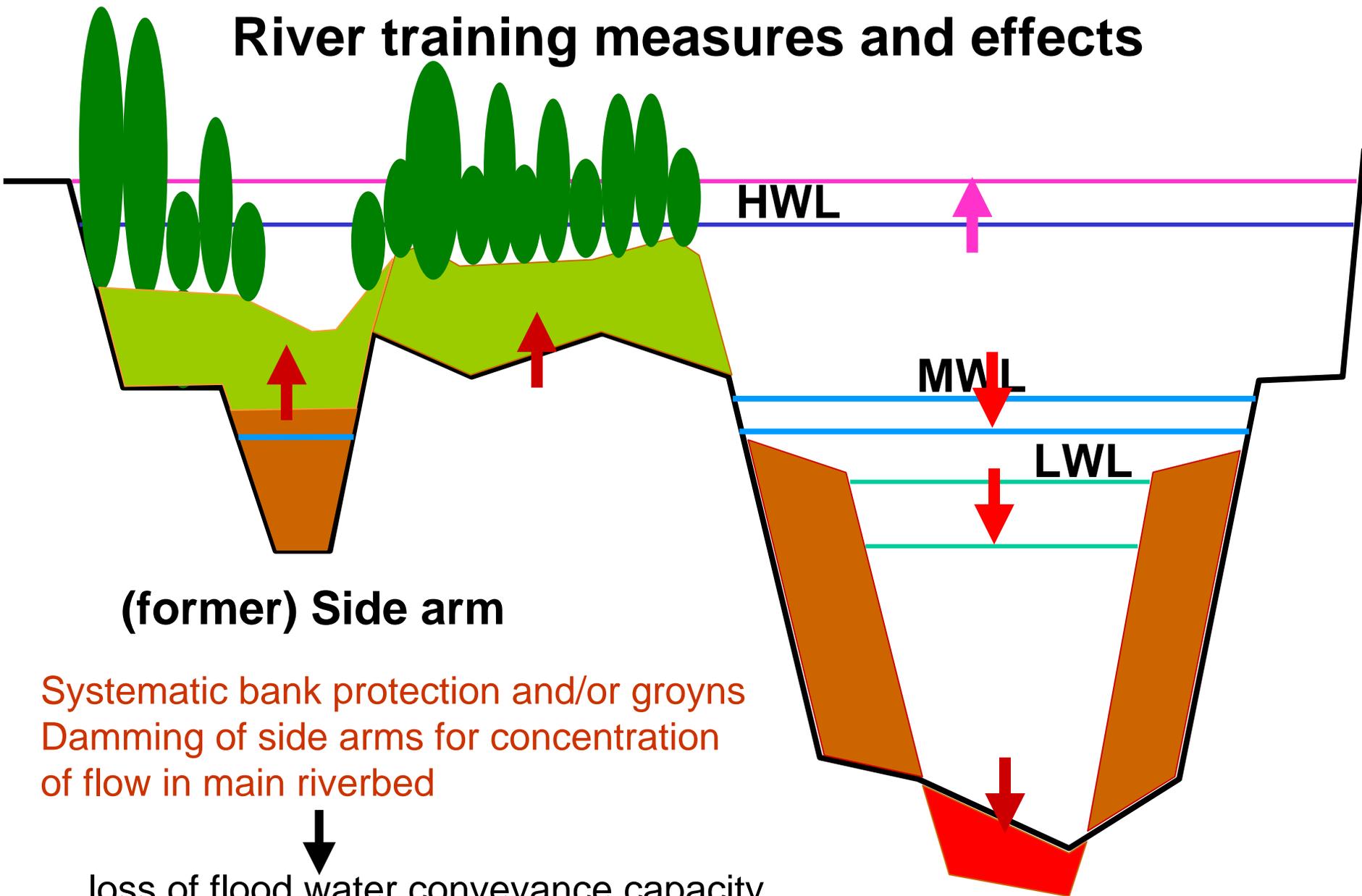




Additional structural interventions

- Additional river sections with plans to improve navigation conditions
- Extension of Nuclear Power Plants
 - Availability of cooling water (Cernavoda), damming of side arms (Belene?)
- Other infrastructure
 - Canals and Ports
 - Bridges

River training measures and effects



(former) Side arm

Systematic bank protection and/or groynes
Damming of side arms for concentration
of flow in main riverbed



... loss of flood water conveyance capacity,
further increase of flood water levels and decrease of low water levels



Rhine river - Waal branch near Nijmegen

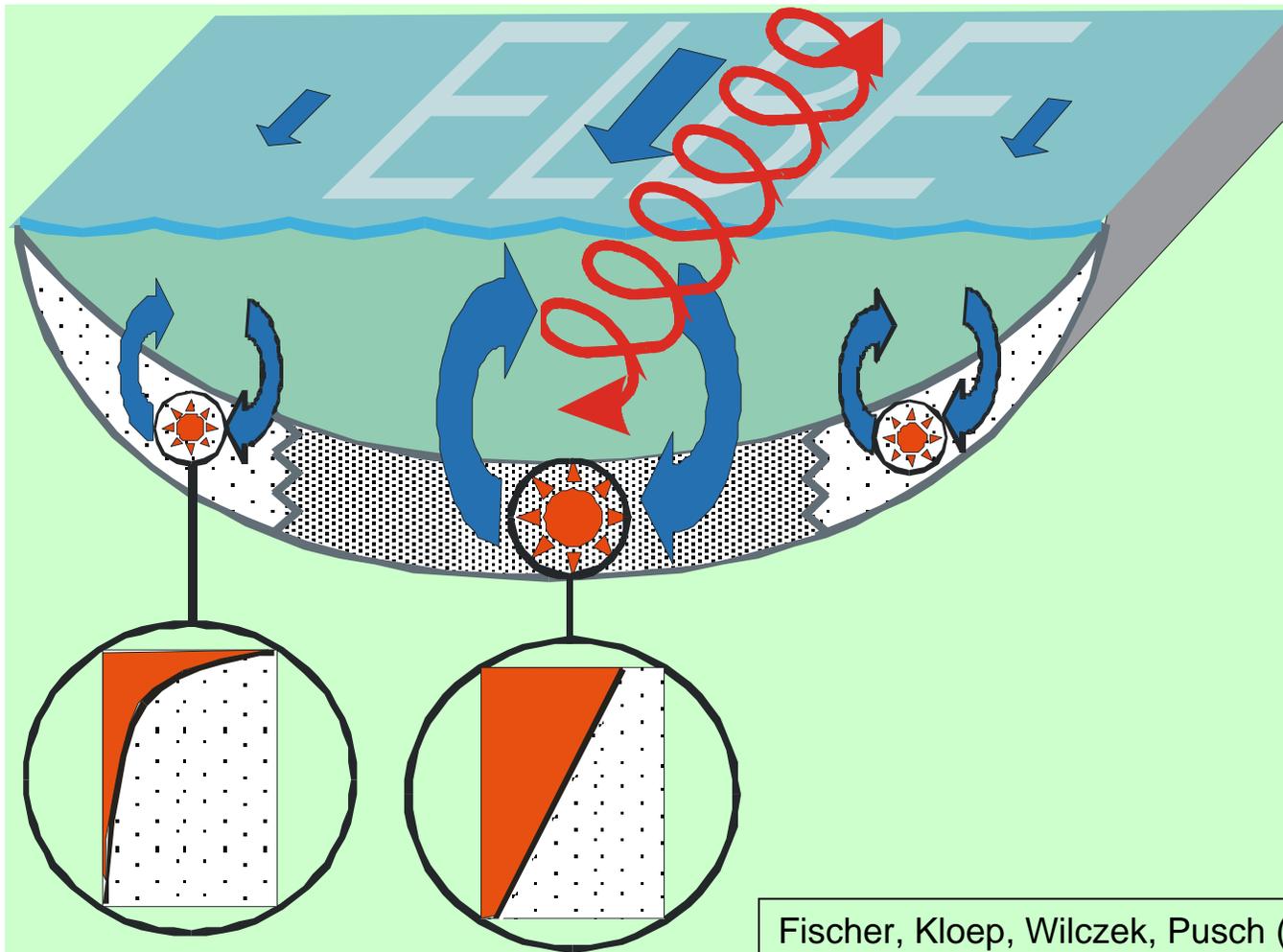


Implementation of EU-Regulations

- Water Framework Directive
 - No deterioration clause for all water bodies, also relevant for water dependant protected areas (floodplains, delta)
- Fauna-Flora-Habitat- and Birds-Directive
 - Habitats and species, indirectly processes
 - Sturgeons (priority interest)
- Conventions (ESPOO, Transboundary Waters, Black Sea, Biodiversity,..)

Central channel sediments - the 'river's liver'

Bottom sediments swiftly overflowed by river water
form a hot spot of microbial activity



Fischer, Kloep, Wilczek, Pusch (2005) *Biogeochemistry*



Climate change

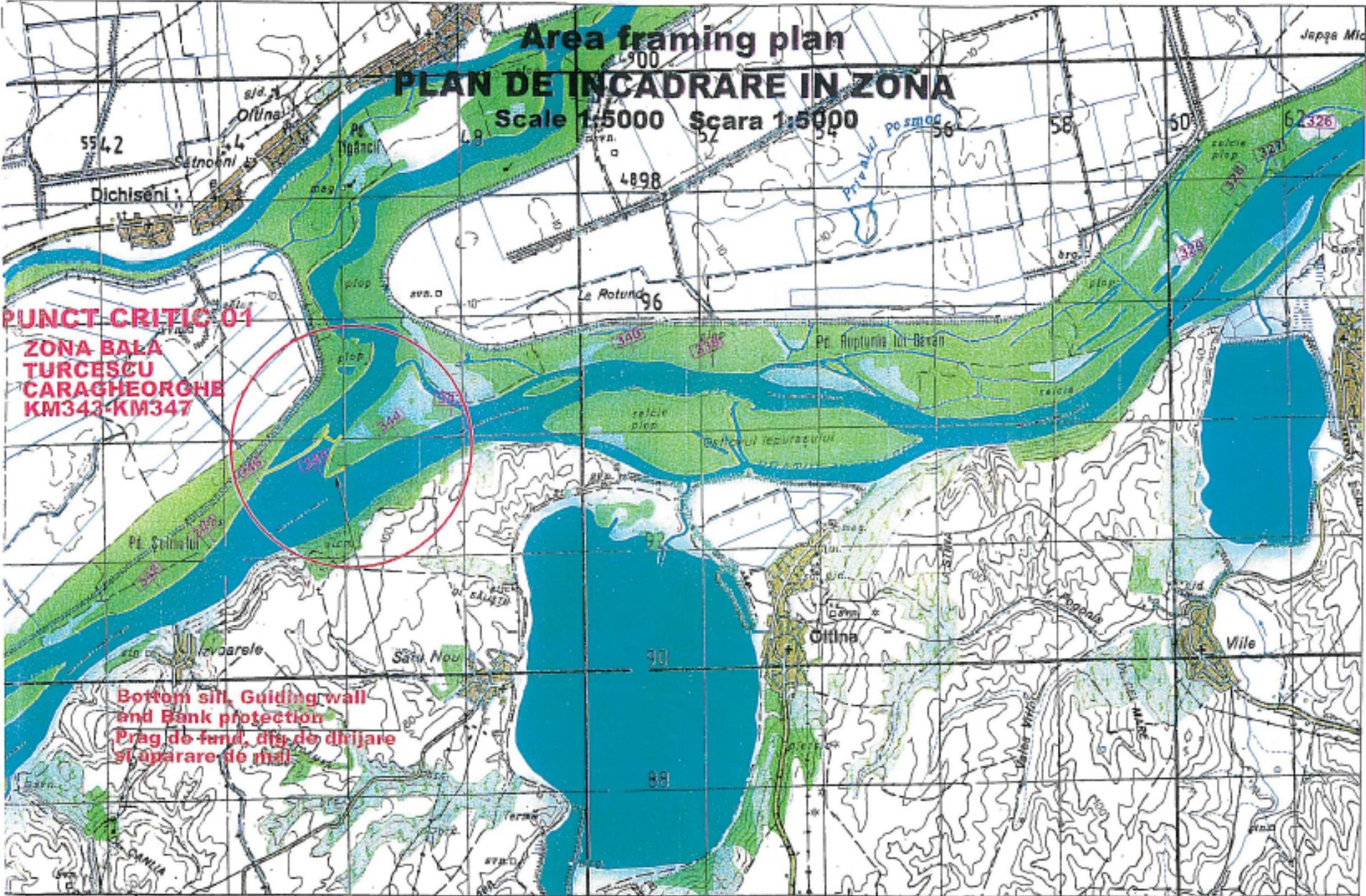
- Prolongation of low flow periods (most likely also reduction of low flow)
 - Deteriorating navigation conditions
- Increase of water temperatures
 - Water quality problems, esp. in stagnant waterbodies
- Most likely increase in flow dynamics (changes accelerated, higher floods)
 - Unexpected morphological alterations?
- Changes in sediment transport
 - Less coarse sediment, more suspended solids?



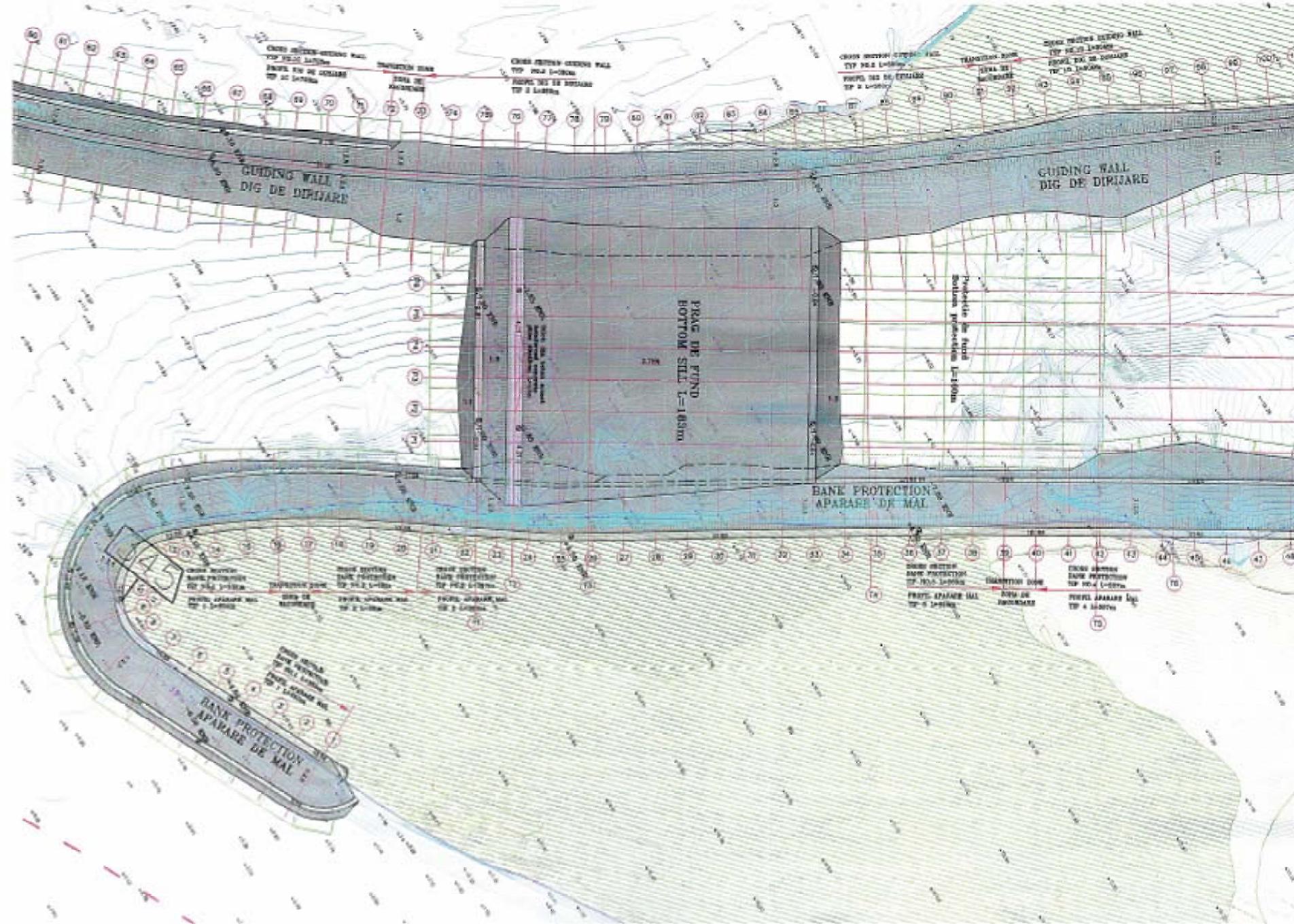
ISPA Project Danube Calarasi-Braila

- 4 types of measures:

- Alteration of bi-furcation with guiding wall and bottom sill (crest level: ENR – 1.8m, av. Q – 5 m)
- Restriction of flow in side arms with/without bottom culverts, pipes at 1 m diam. (crest av. Q)
- Narrowing of main branch (guiding walls) (crest av. Q)
- Bank reinforcement

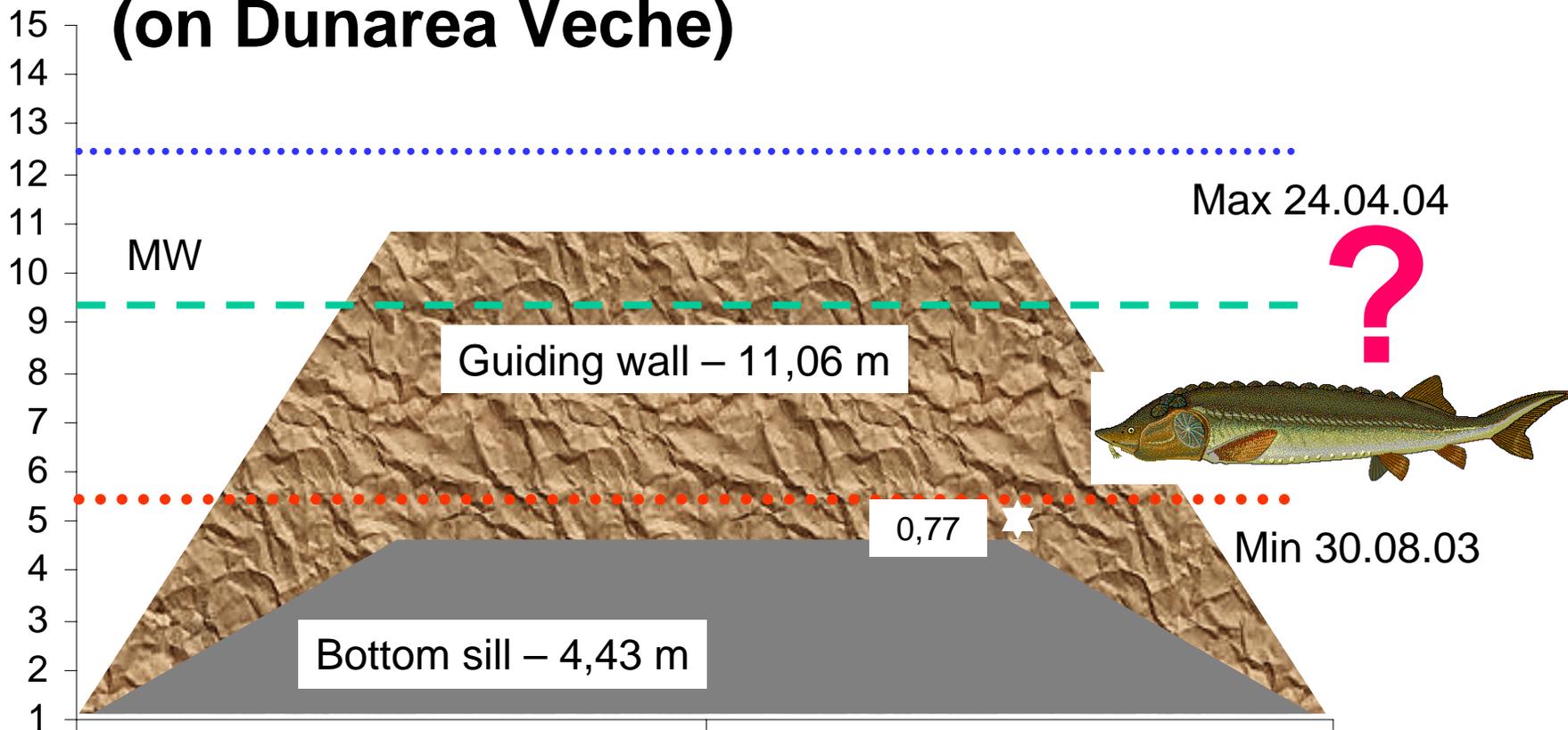


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Checked:	Eng. L. Ginescu	Scale: 1:5000				Revision: 2	MEASURE 2502/10/18/P/PI/011	DRAWING CODE	12030-TS-13-01-001A
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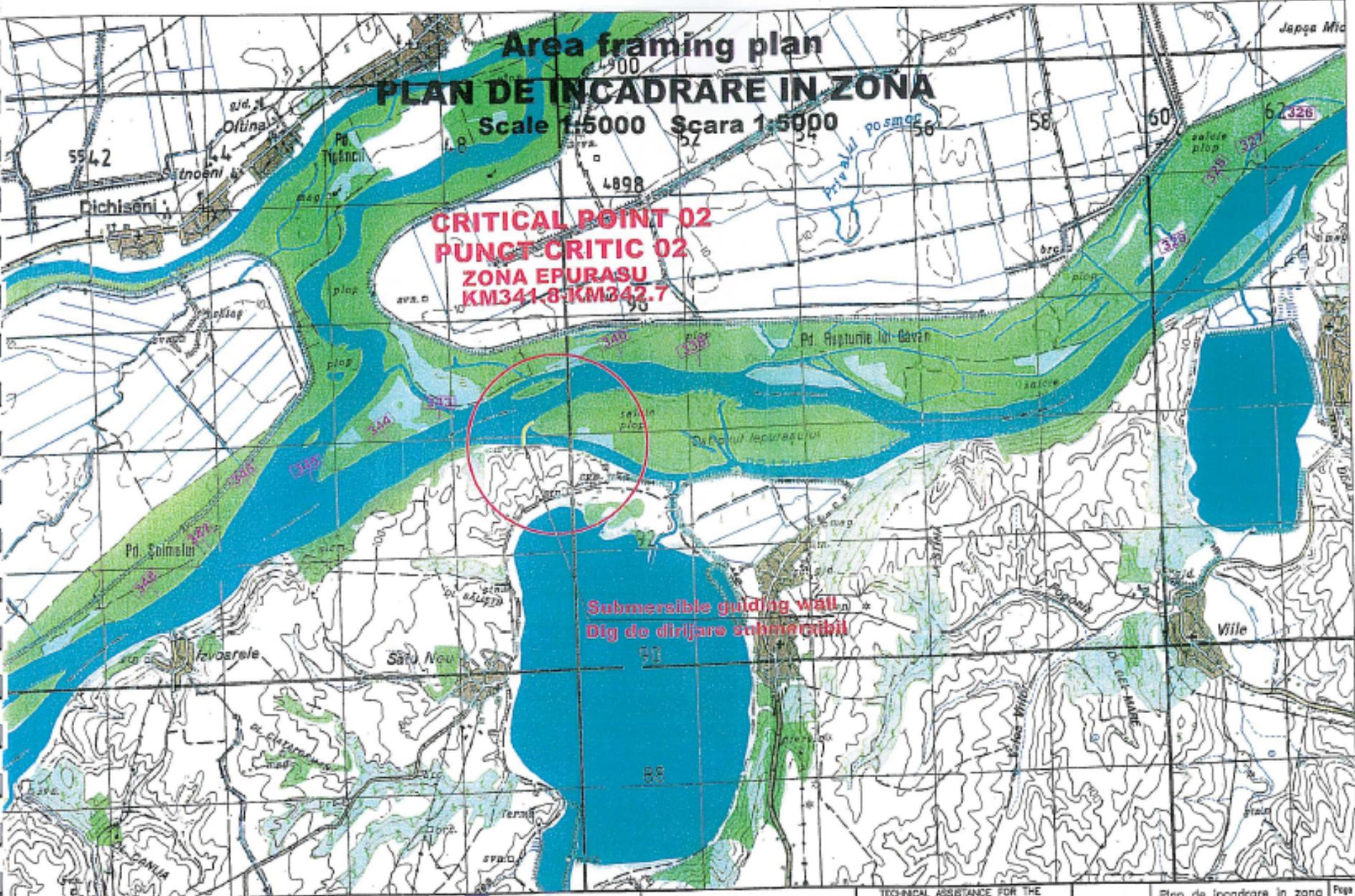




Water levels (2003 & 2004- mBSC) – Izvoarele (on Dunarea Veche)



Water column above the bottom sill at low water levels = 0,77



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Area framing plan
PLAN DE INCADRARE IN ZONA
 Scale 1:5000 Scara 1:5000

CRITICAL POINT 03B
PUNCT CRITIC 03B
SEIȚA AVAL
KM327

Bottom sill and Bank protection
Prag de fund și apărare de mal



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Trapeç S.A.
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 ON THE DANUBE
 I.S.P.A. MEASURE 2002/RO/14/P/PA/011
 DRAWING 1 - General - Stud. Critical point 03B-Site description

DRAWING NAME	Plan de încadrare în zona	Page	1/1
DRAWING CODE	12030-T5-13-03B-001A		
TABLE CODE	DL105B/C129RoC		



Recommendations

- Avoid structural impacts
 - Non-structural prior to structural measures, whole range to be considered
- Keep the ecosystem alive
 - Maintenance of key ecological functions
- Work with natural river structures, not against
 - (e.g. orientation on planform, islands, pool-riffle-system)
- Keep this decision making process open
 - Measures implemented keep alternative options feasible



Request for action

1. Hold implementation of this ISPA project and development of further, similar proposals
2. Do not modify major bi-furcations (i.e. Bala-Borcea)
3. Make assessment of alternative solutions accessible and transparent (acc. WFD Art. 4.7)
4. If not available/sufficient, complete assessment
5. Make analysis of long term effects on morphology and flood protection accessible and transparent



Request for action (cont.)

6. Make analysis acc. to WFD/FFH/Birds-Directive and other relevant regulation accessible and transparent
7. Re-assess impacts on sturgeons involving international institutions
8. Modify dredging practise (no net extraction from riverbed)
9. Do not build further bank reinforcement (exc. for safety reasons)
10. Apply near-natural island structures for narrowing river bed sections



Thank you for attention