

EUDA WORKSHOP ON “GREEN INNOVATIONS KEEP THE EUROPEAN DREDGERS AT GLOBAL LEADING EDGE”

WEDNESDAY 3RD NOVEMBER 2010, BRUSSELS



Port of
Rotterdam

PROJECTORGANISATIE
MAASVLAKTE 2



MAASVLAKTE 2

Monitoring and Evaluation

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Associate Professor Ports and Environment, Delft University of Technology

Maasvlakte 2 building in progress

January 2009



September 2009



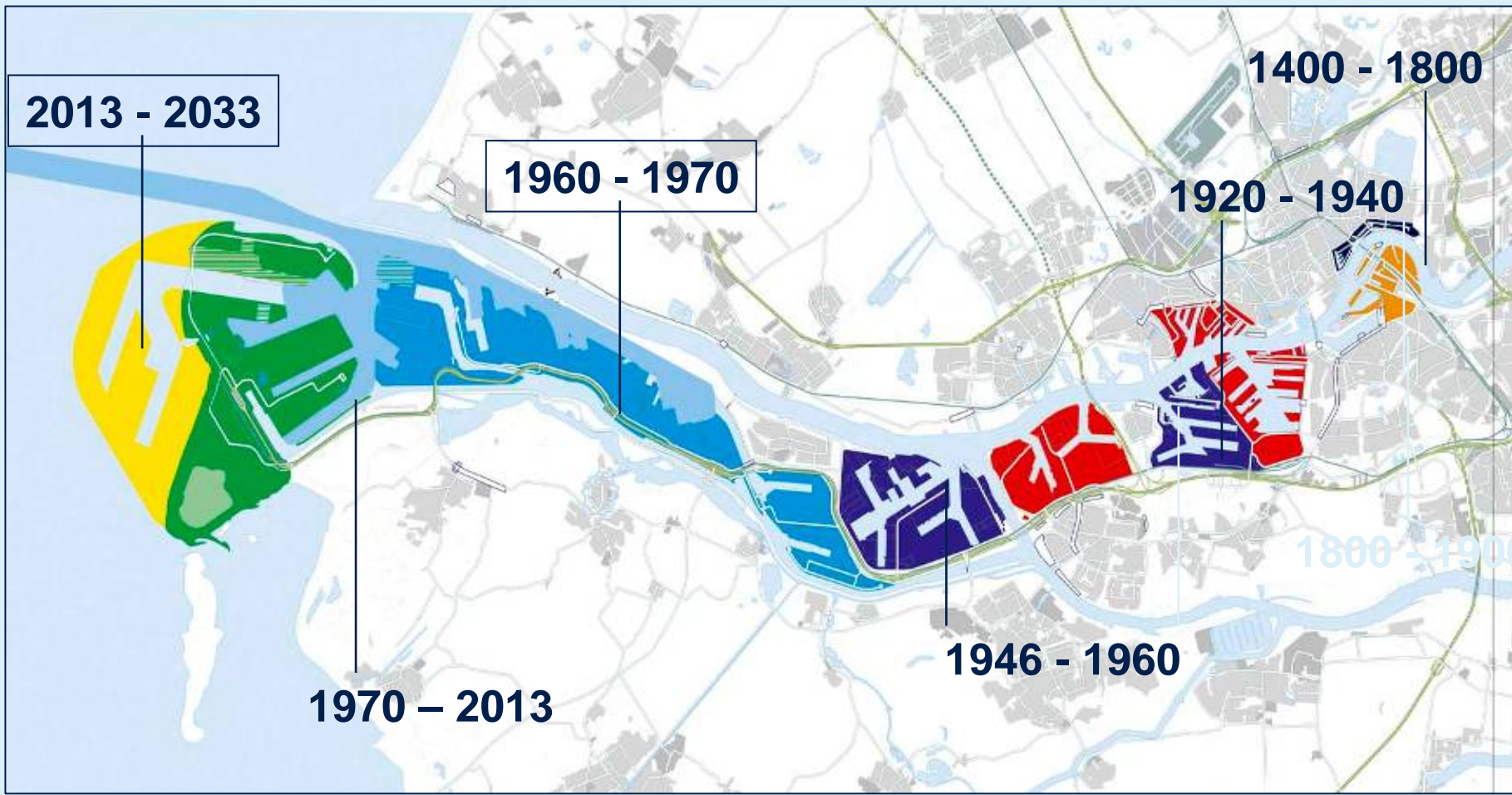
January 2010



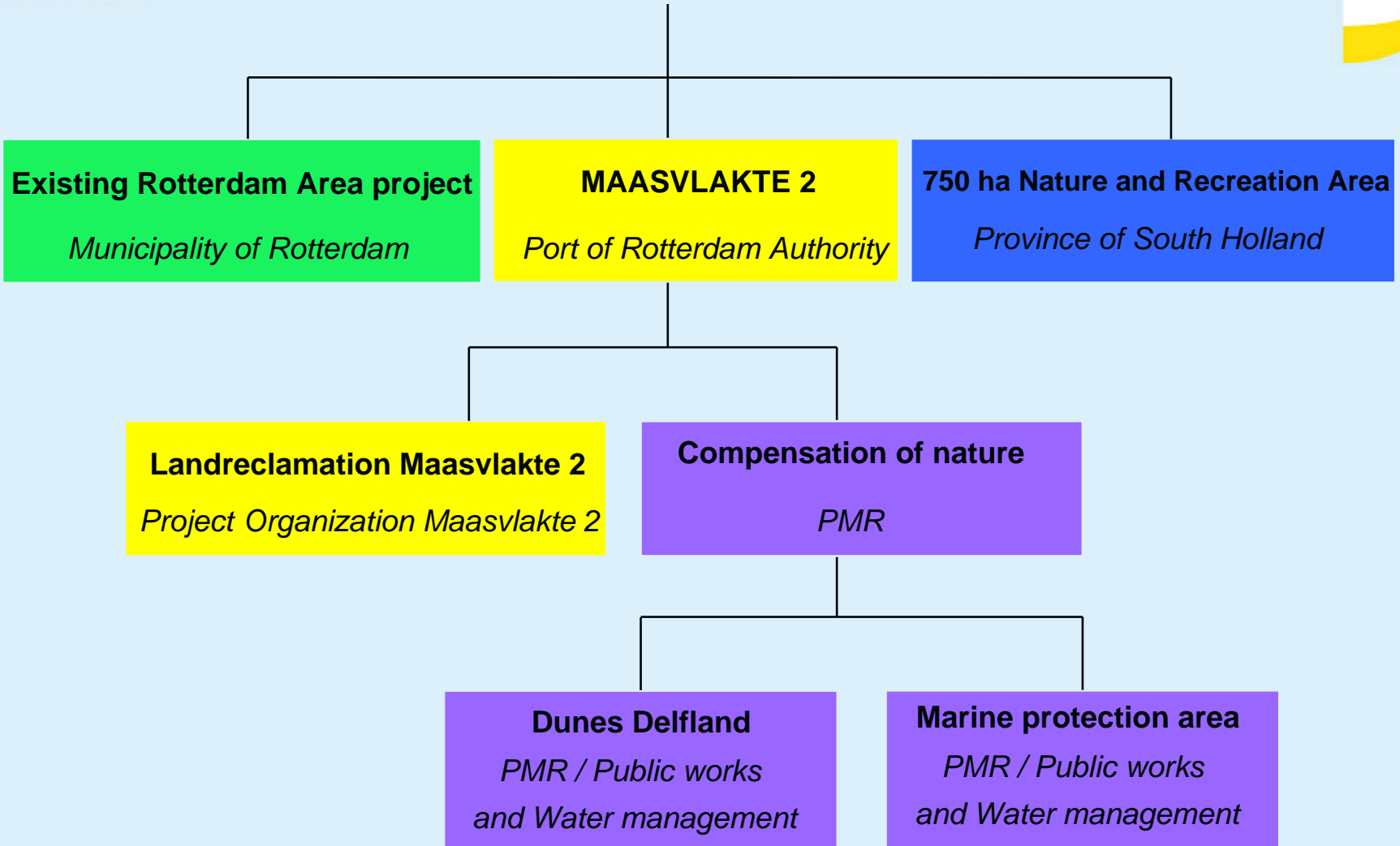
October 2010



Development of the port of Rotterdam



Rotterdam Mainport Development Project



Artist impression Maasvlakte 2



Dual objective (PMR)

The “Voordelta”
Special Protected Area
for Birds & Habitat



Marine protection area: 25.000 ha

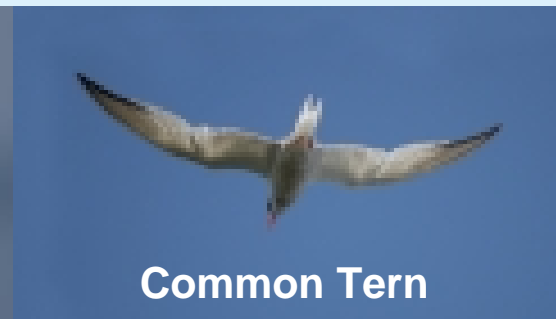
- Why:
 - MV2 covers protected marine subsea area
 - Decrease in free area for protected birds
- What: prohibition of trawl fishing and realisation of bird resting areas
- For whom:



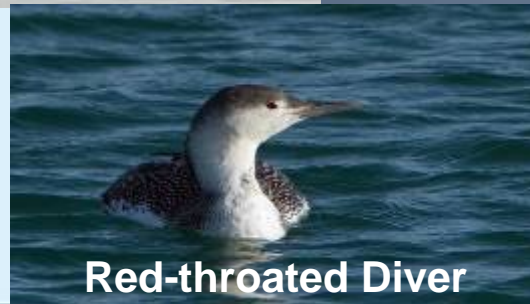
Common Scoter



Sandwich Tern



Common Tern



Red-throated Diver



Common Eider

Dune compensation 35 hectare

Increase in acid rain in protected dune areas, due to the exploitation of Maasvlakte2



Orchid



Monitoring and Evaluation Process

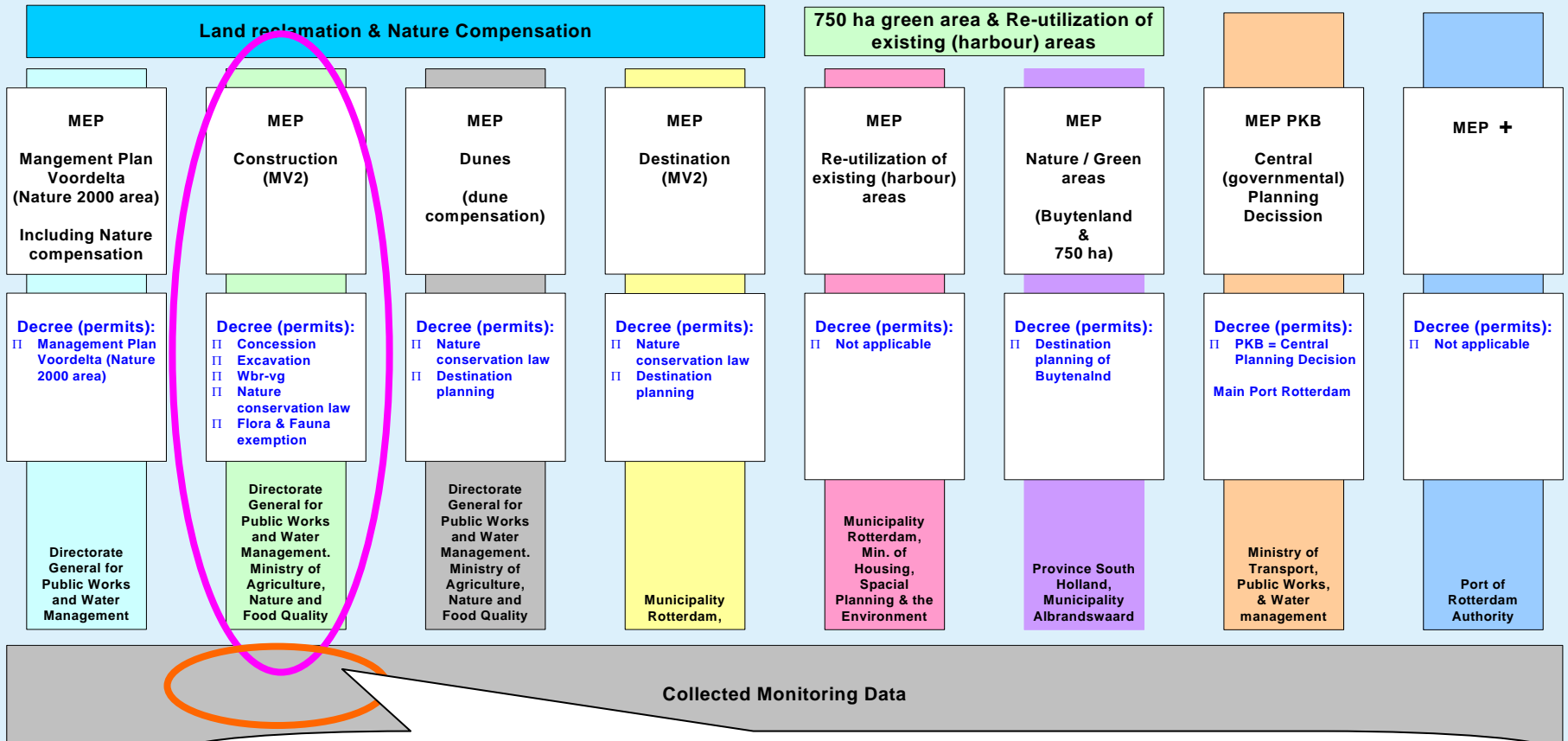
- Environmental Impact Studies
- Evaluation requirements
- Appropriate Assessments effects on Nature 2000
- Environmental permits
- Monitoring requirements



- Evaluation programs
- Monitoring plans

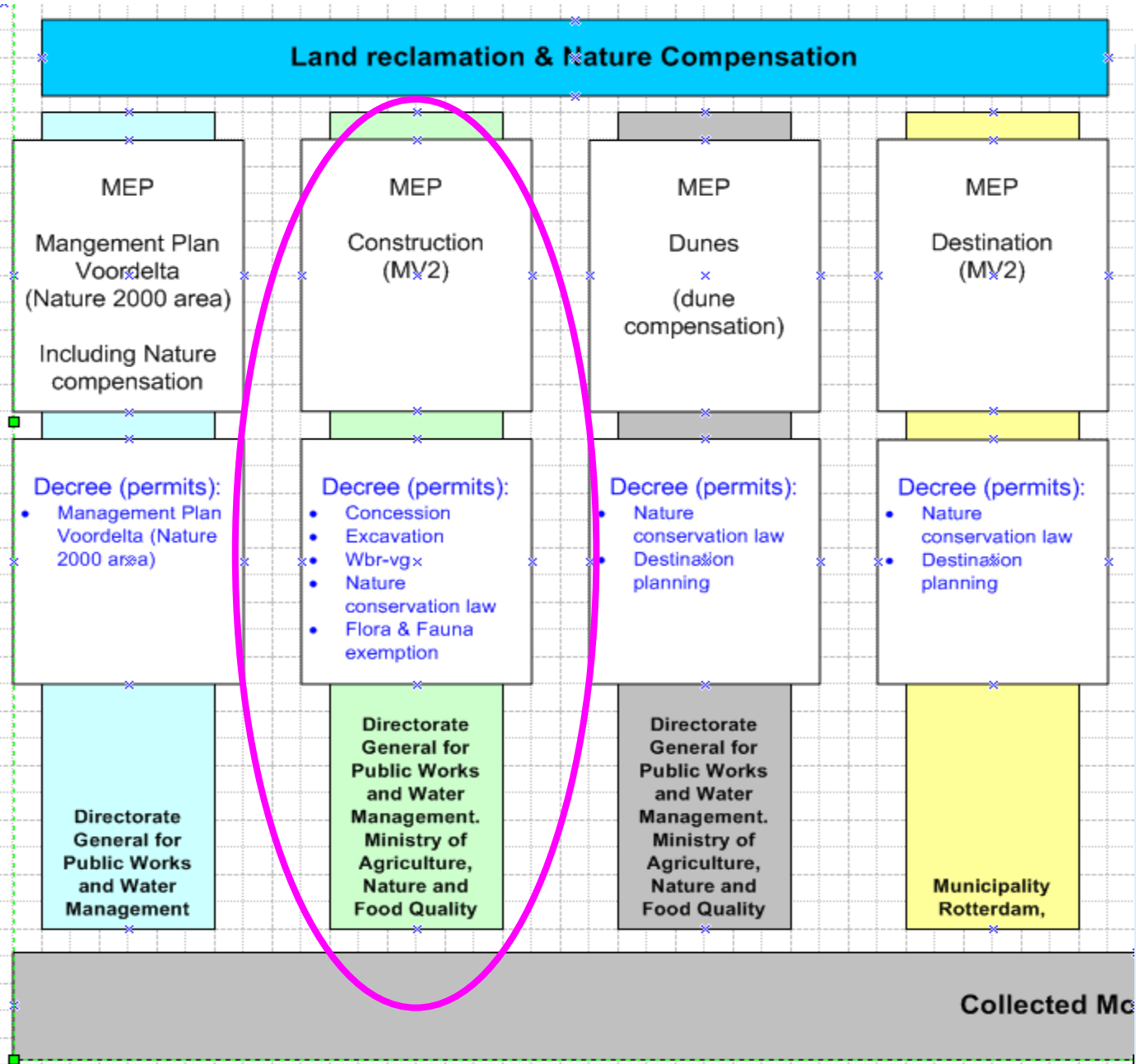
Seven (7) Monitoring & Evaluation Programs (MEPs) falling under Main Port Rotterdam set-up The pink ellipse relates only to the Construction of MV2. The MEP is the responsibility of the Authorities; RWS & LNV. POR delivers data to RWS & LNV through the Monitoring Program derived from MEP

**Monitoring & Evaluation Program's (MEP's)
Program Main Port Rotterdam**

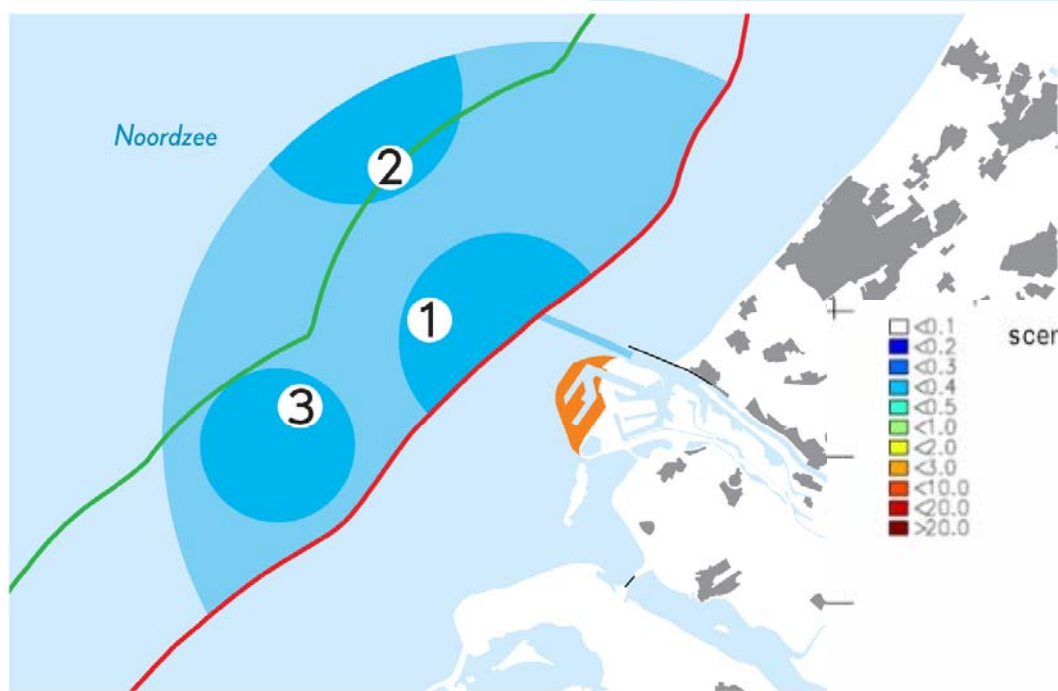


Orange ellipse : Monitoring by POR for the (temporary) effect of the construction of MV2.

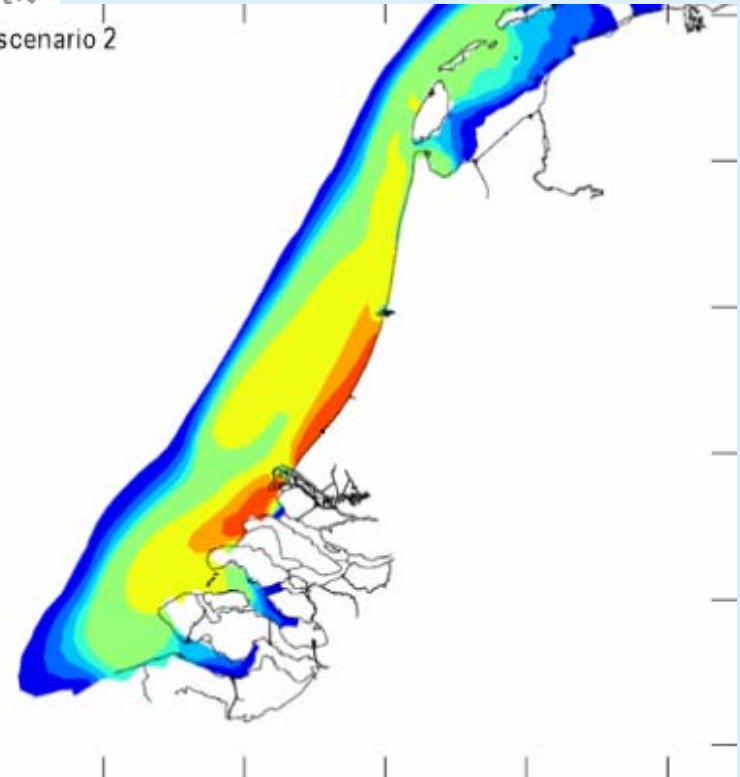
Data shall provide input to main & sub-questions to be answered by PMR (read : Authorities) in the final evaluation i.e. 5 years after start of project.



Sandmining increases turbidity



scenario 2



- vlekken
- zoekgebied zandwinning
- 12 mijlszone
- NAP -20m lijn

Conclusions appropriate assessment effects Waddensea

- Non of the designs will have a significant impact on the dynamic processes that guarantee the natural coherence of the Waddensea Natura 2000 SAC.
- The furthest in sea extended design could have an impact on the nutriënt transport, related shellfish quantity and thus on the common eider, the rednot and the oystercatcher, but this impact is not significant.



Data collection / monitoring activities

construction Maasvlakte 2

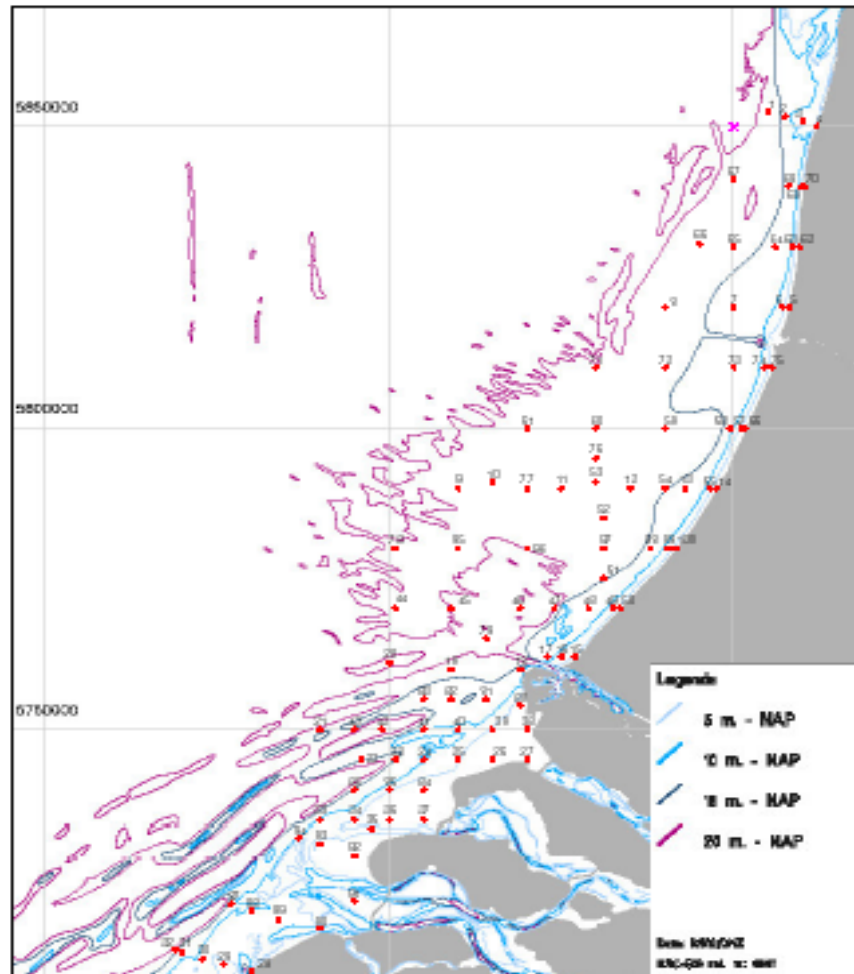
- Juvenile fish, Benthos
- Turbidity, Silt transport
- Algae bloom and shellfish
- Underwater sound
- Archaeology and palaeontology

Environmental Monitoring Maasvlakte 2

- **Silt & Juvenile fish simultaneously (100 points) in 2007 April, July & October**

**Juvenile fish :
Demersal & pelagic fish**

**Silt survey with siltprofiler:
Compl. vertical profile,
watersamples &
lab analysis**



Statistische analyse van remote sensing beelden mbv multiple regressie

Baseline Juvenile Fish

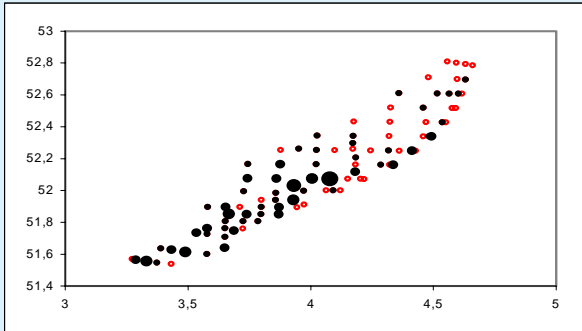
Sampling

- 20 lines (perpendicular to the coast)
- Ca. 5 point on each line (depth related)
- Total 100 points
- Demersal (bottom) fish -> beam-trawl
- Pelagic (water column) fish -> Plankton-gear

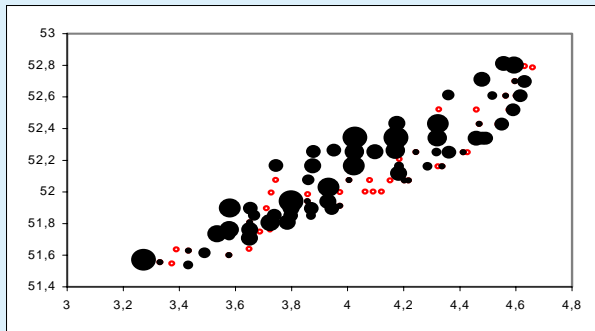
Aim / Goal :

Establish condition of Juvenile Fish expressed as the Weight – Length relationship for ALL fish caught (>50.000)

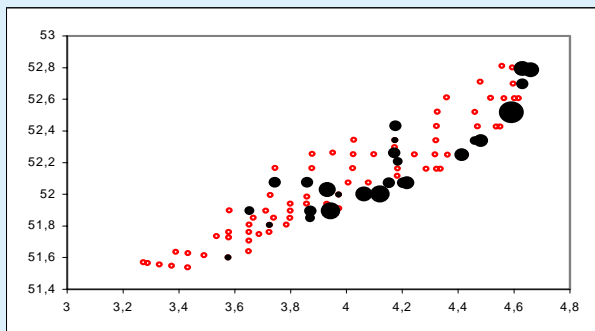
Results baseline Juvenile Fish



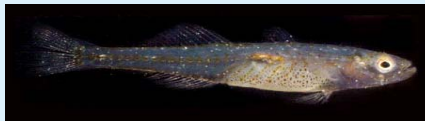
harnasmannetje, [neushangertje, oudewijfskaak, oude grootje, oude v
Pogge
Agonus cataphractus



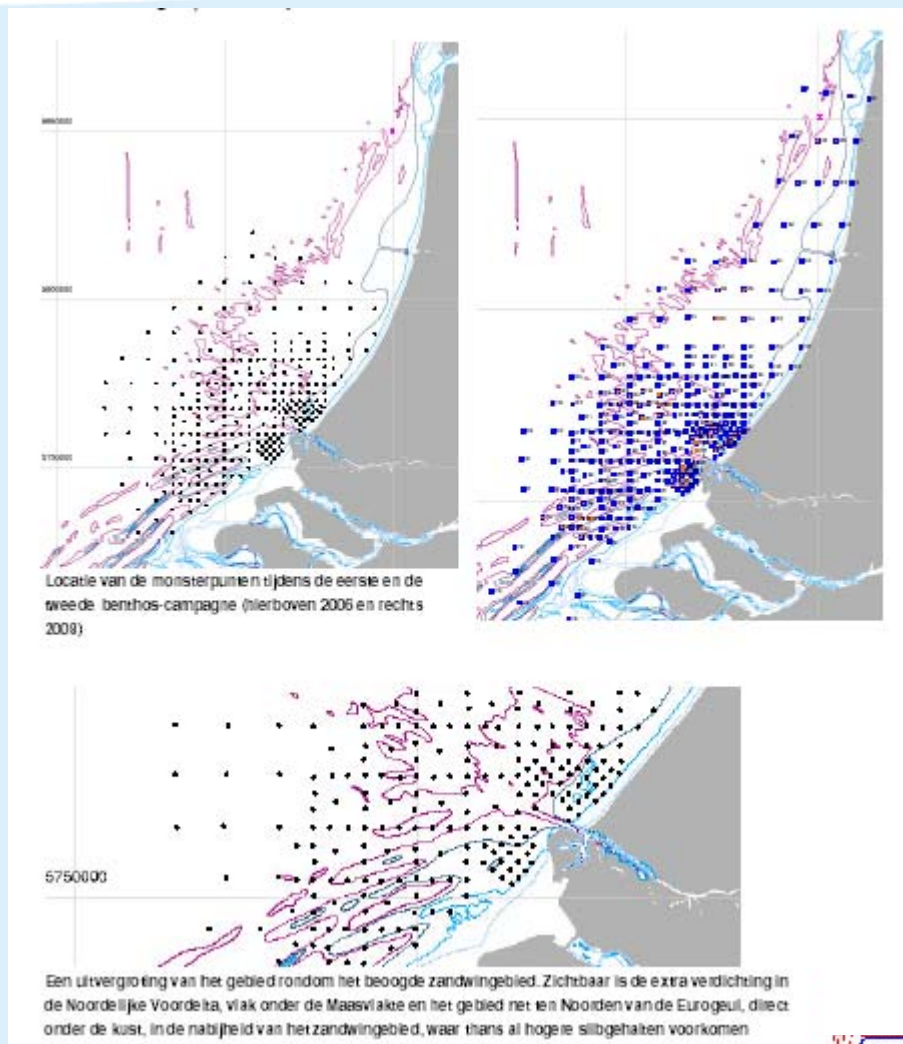
zandspiering
Sandeel lesser
Ammodytes tobianus



glasgrondel, [doorschijnende grondel]
Goby transparent
Aphia minuta



Environmental Monitoring Maasvlakte 2

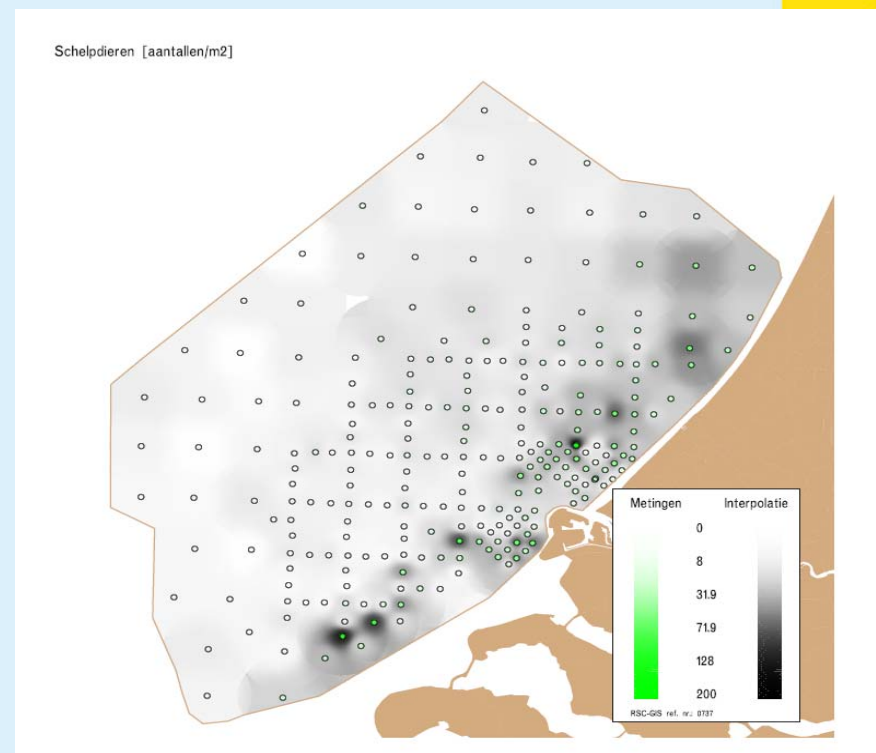
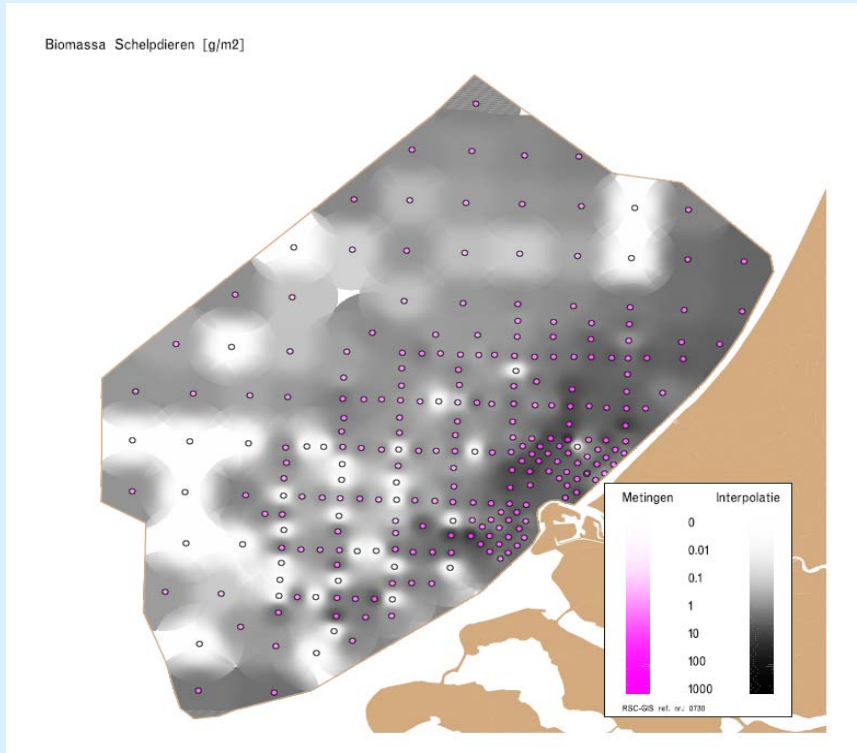


**Benthos (300 points)
2006 (left) & 2008 (right)**

**Boxcore and benthic
sledge tracks (150 m)**

**Near sand extraction pits
re-colonisation will be
monitored more in detail
(extra 50 point to be added)**

Results baseline Benthos



**Example : Biomass [gr/m2]
Shells, excluding Ensis and some (less
common) species**

**Example : No. / m2
All Shells.**

EARTH OBSERVATION (Remote sensing)

It was decided in 2006 to investigate the feasibility of the use of earth observations for the monitoring obligations

Discharge of fines at borrow area → silt concentrations (TSM) along Dutch coast → resulting changes in turbidity → impact on chlorophyll → resulting primary production → etc.

WATER QUALITY MODELLING

Executed by :

- Deltares (ex WL | Delft), Delft
- Institute for Environmental Studies (IVM), Univ. Amsterdam

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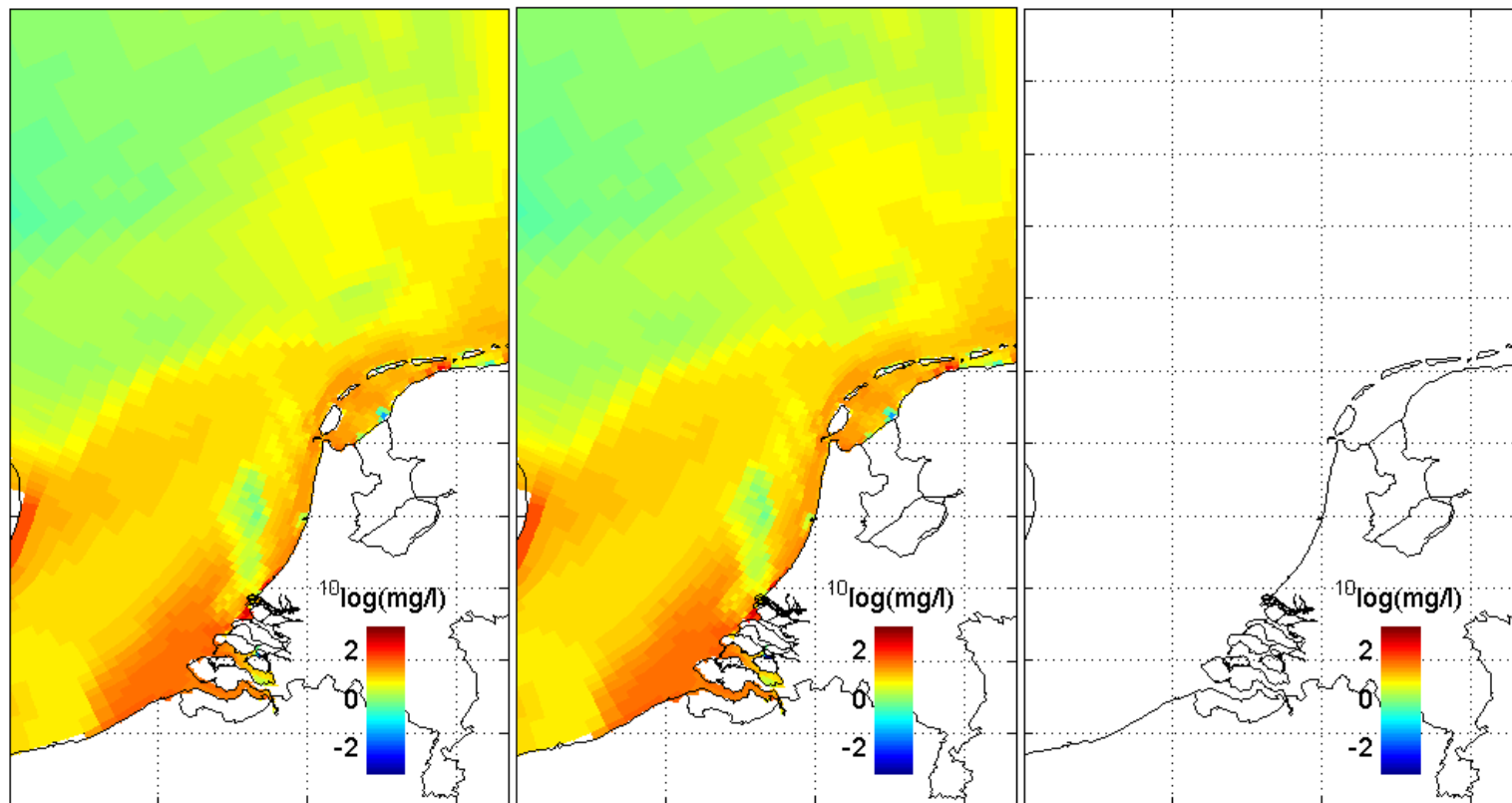
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Environmental Monitoring Maasvlakte 2

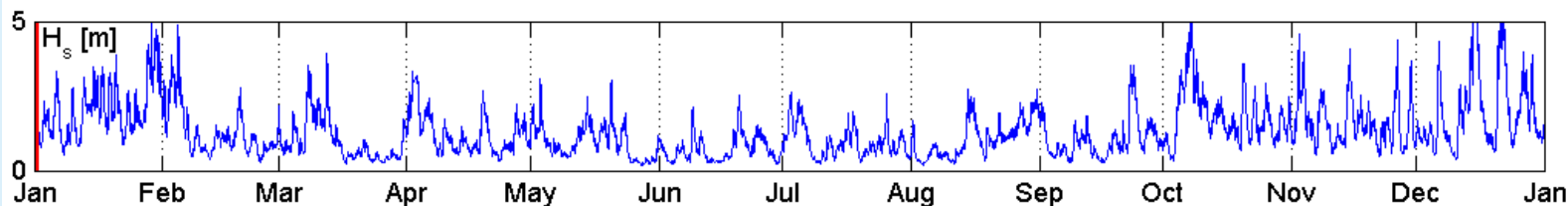
Delft3D-WAQ deterministic:
01-Jan-2003 13:00

Delft3D-WAQ assimilated:
01-Jan-2003 13:00

MERIS data:
01-Jan-2003 10:26:53



© Deltares (former WL | Delft Hydraulics) + VU, IVM, Amsterdam, TNUITSM, 2008

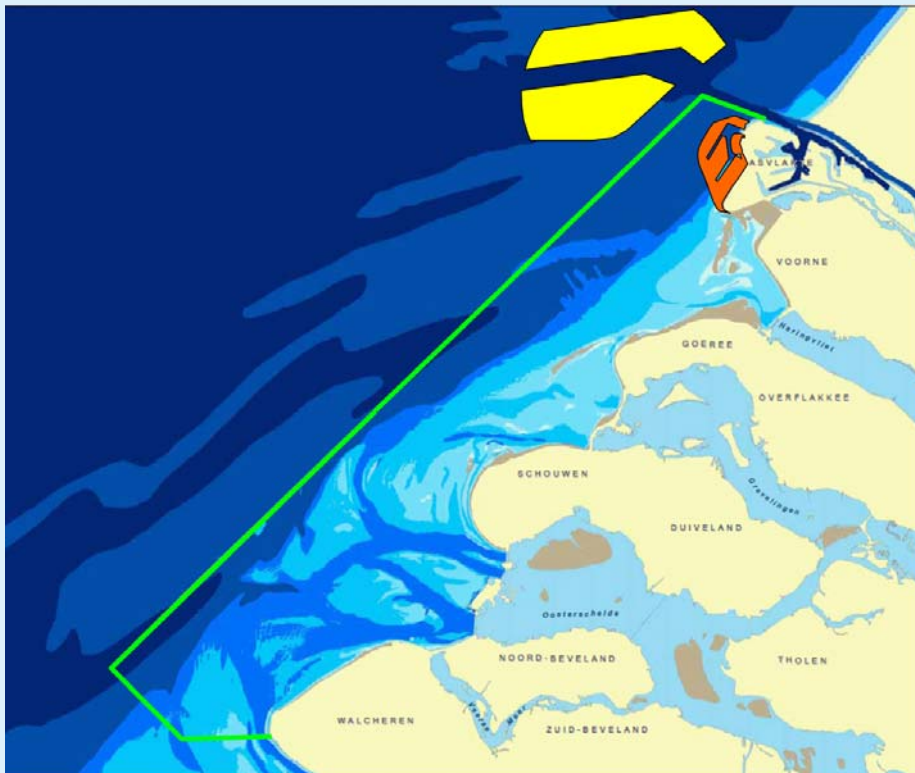


Measuring near field turbidity TSHD

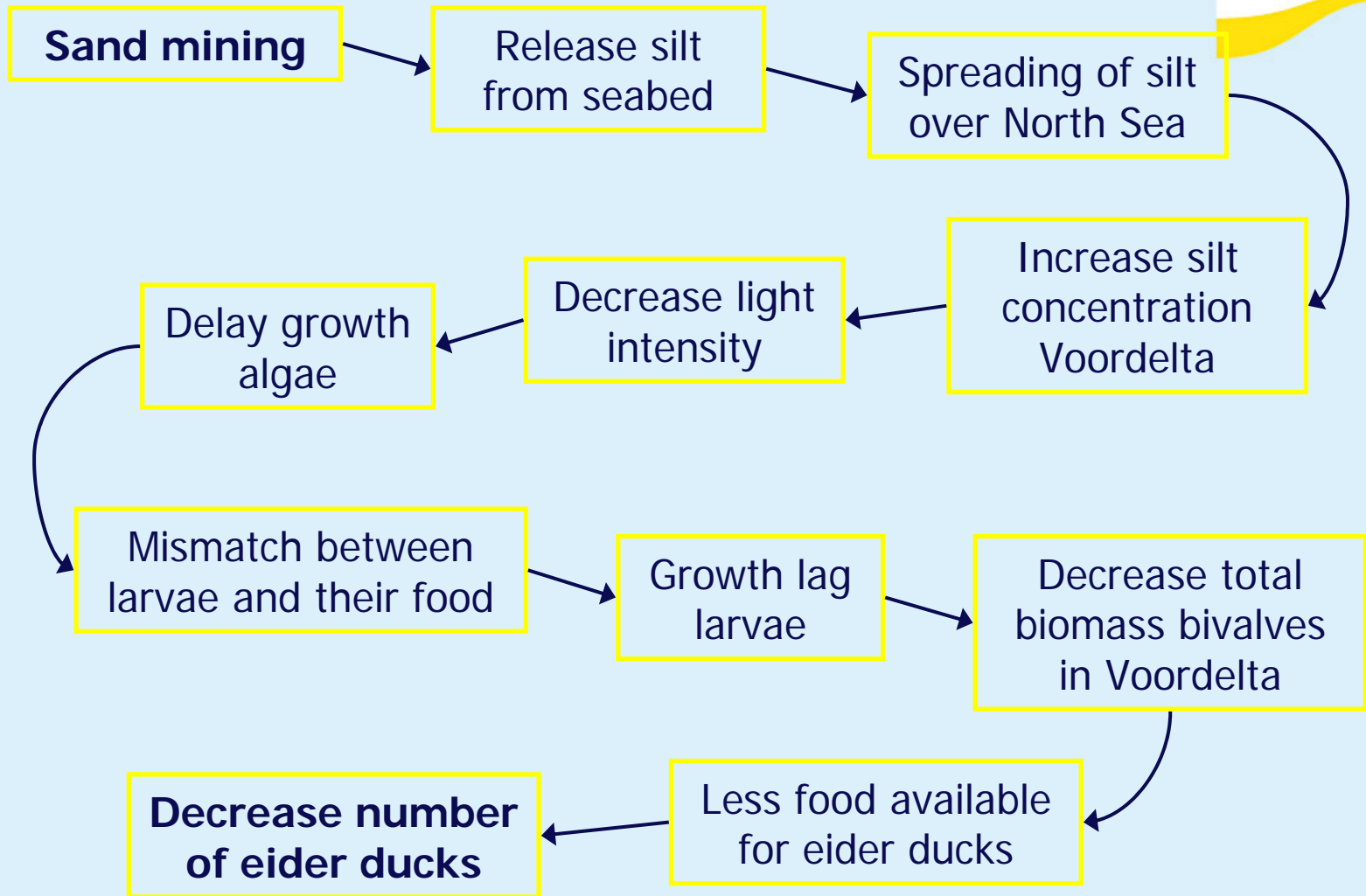


Monitoring effects on Eider Ducks

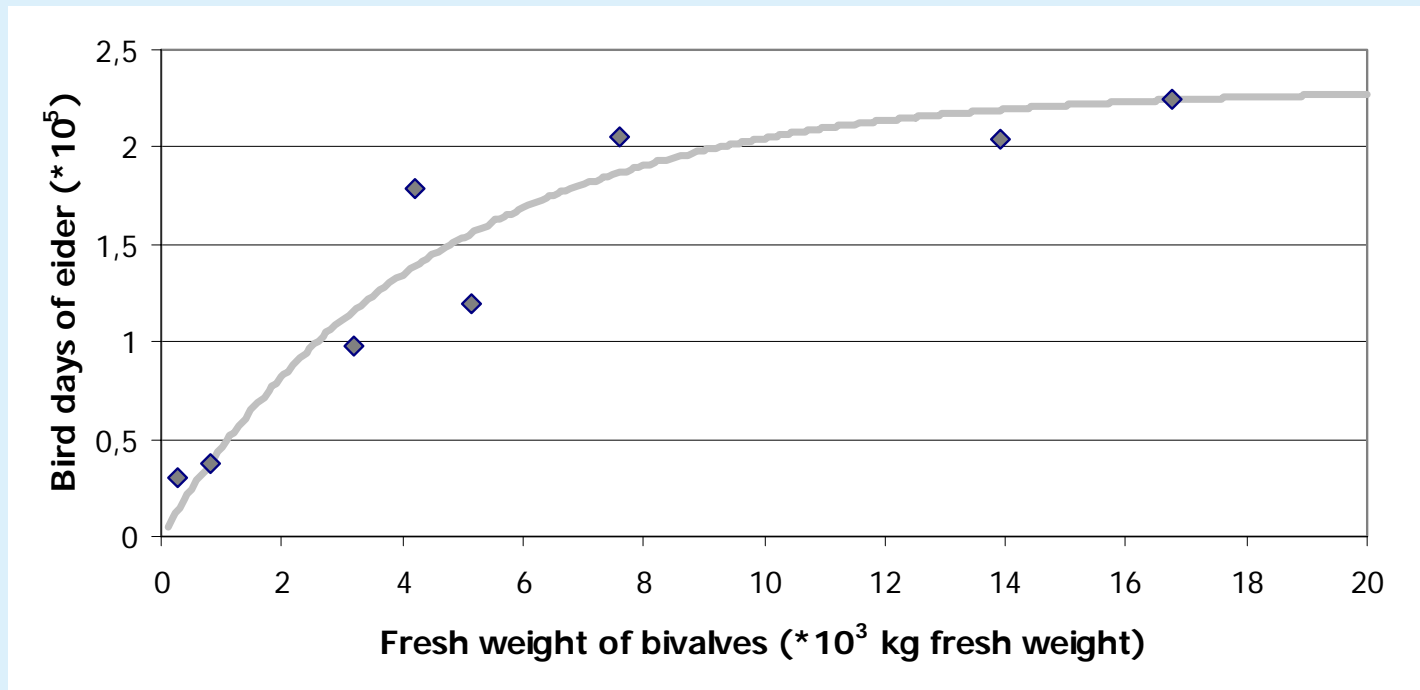
- Sand extraction close to Natura2000 area
- Possible effects on nature and environment indicated in EIA
- Predicted temporary impact on sea ducks



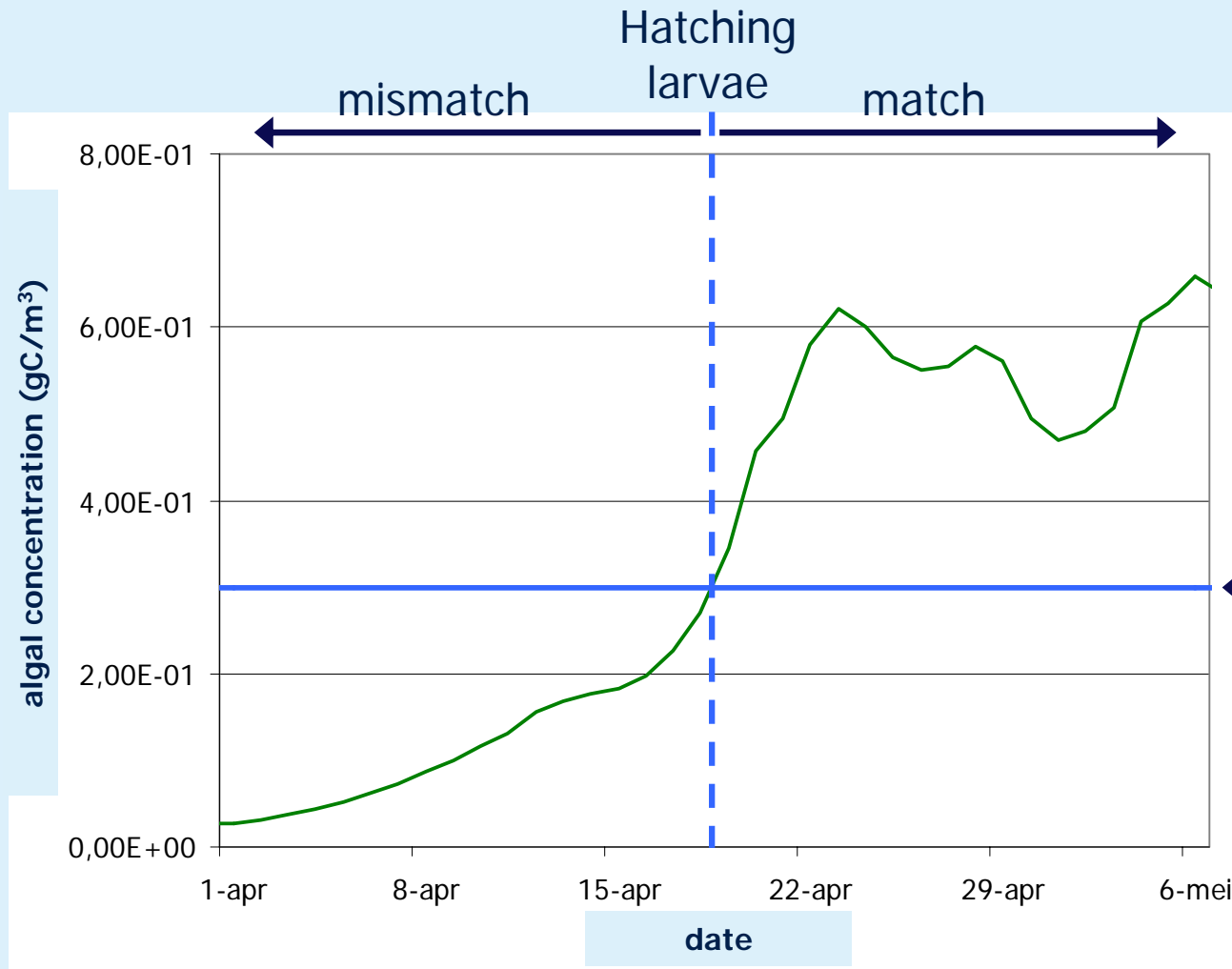
Impact-effect chain



Shellfish → eider ducks

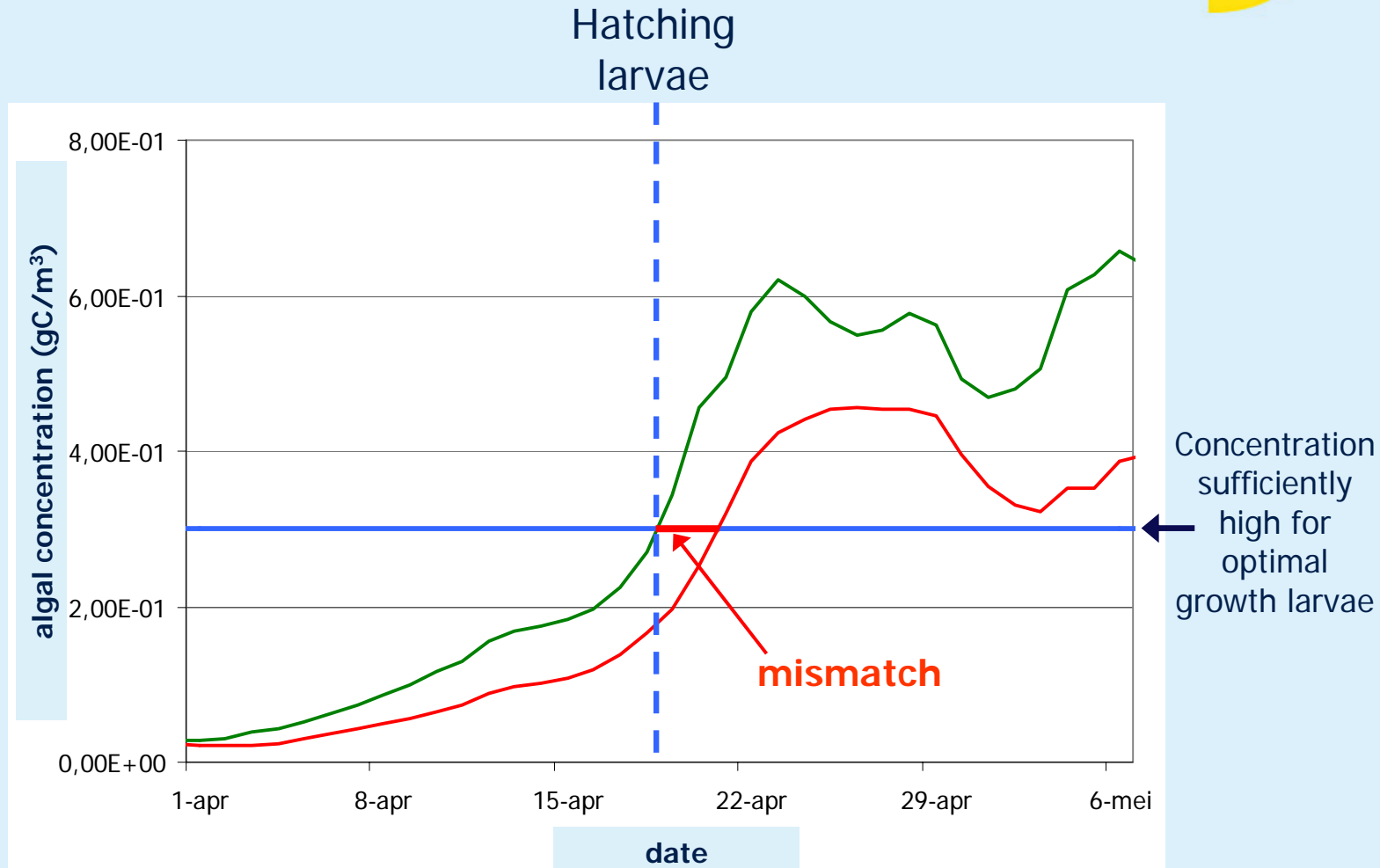


Delay bloom → shellfish larvae

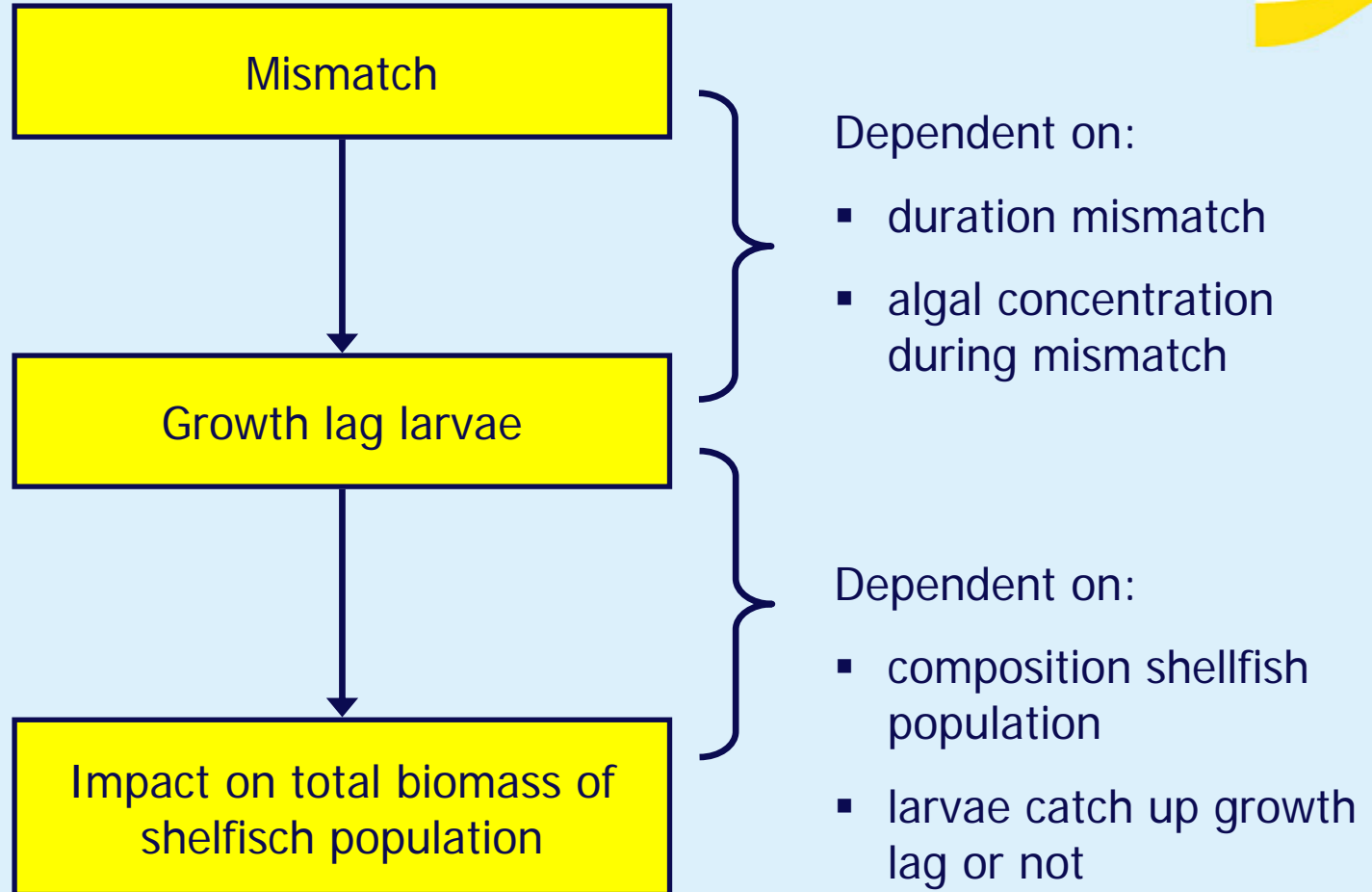


Concentration sufficiently high for optimal growth larvae

Delay bloom → shellfish larvae



Impact mismatch on shellfish population



Monitoring algae bloom and shellfish larvae



Monitoring underwater sound

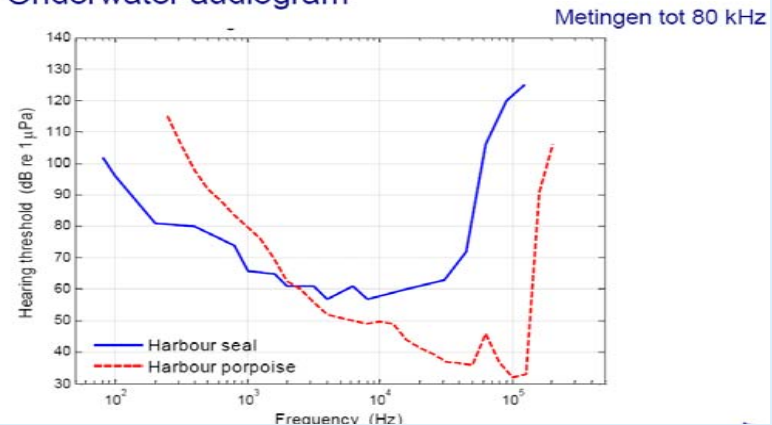
- Effects on porpoise were reported caused by off-shore windmills in Denmark

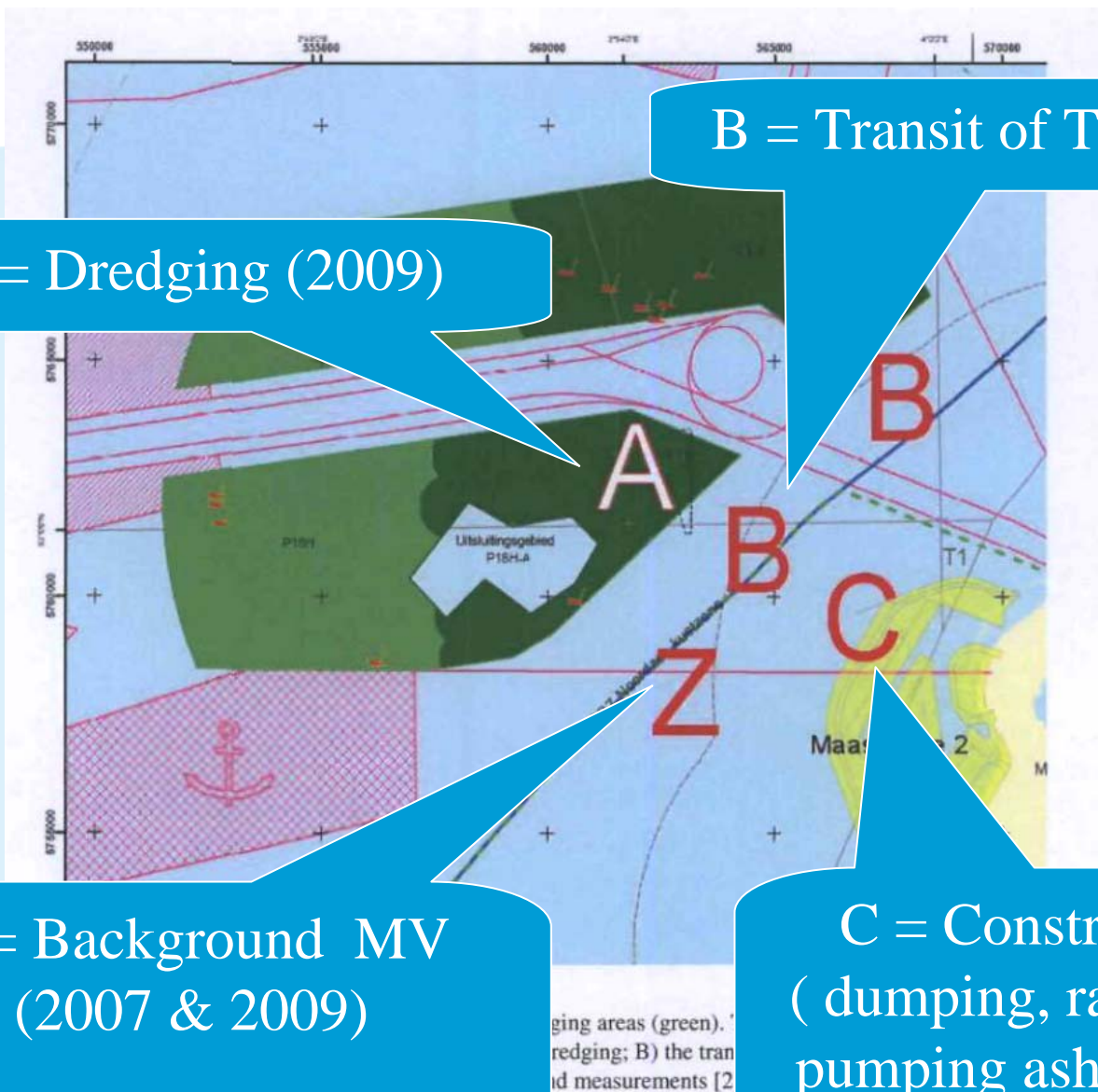


- EIS investigated noise effects on mammals and fish
- No effects were predicted but Commission for EIS advised monitoring to fill gaps in knowledge



Onderwater audiogram





A = Dredging (2009)

B = Transit of TSHD (2009)

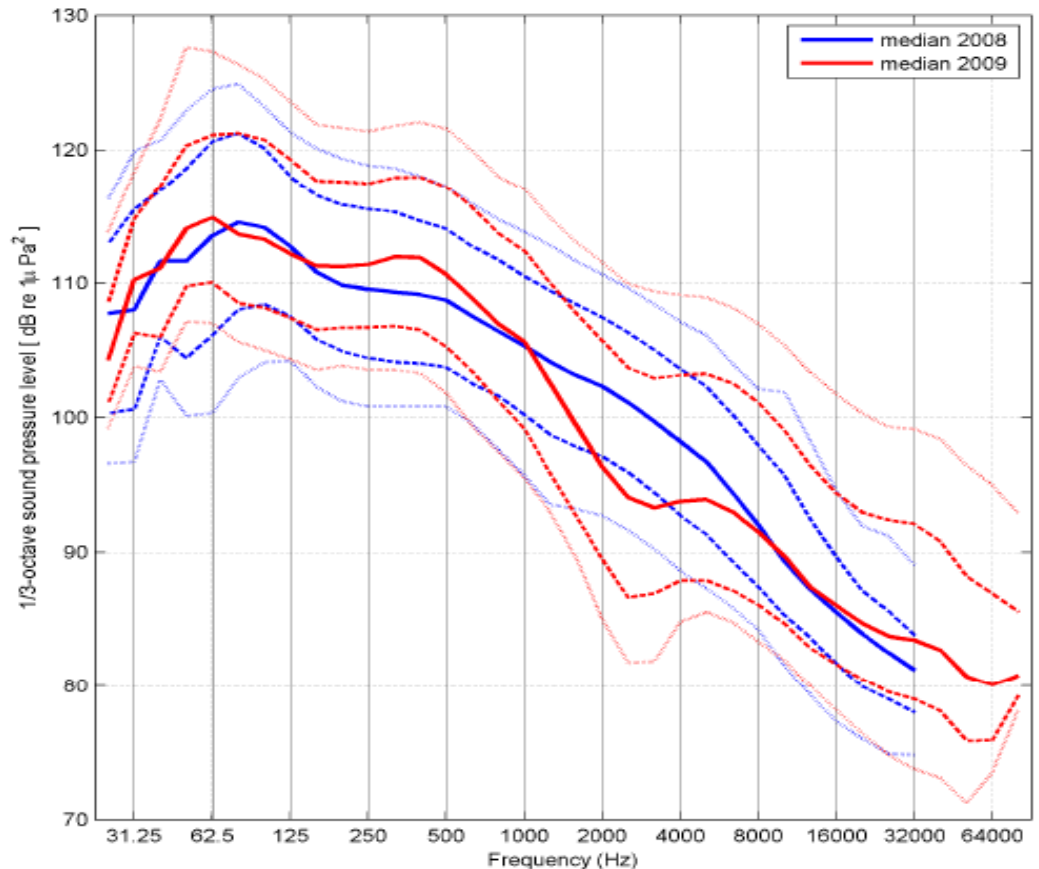
Z = Background MV
(2007 & 2009)

C = Construction site
(dumping, rainbowing &
pumping ashore in 2009)

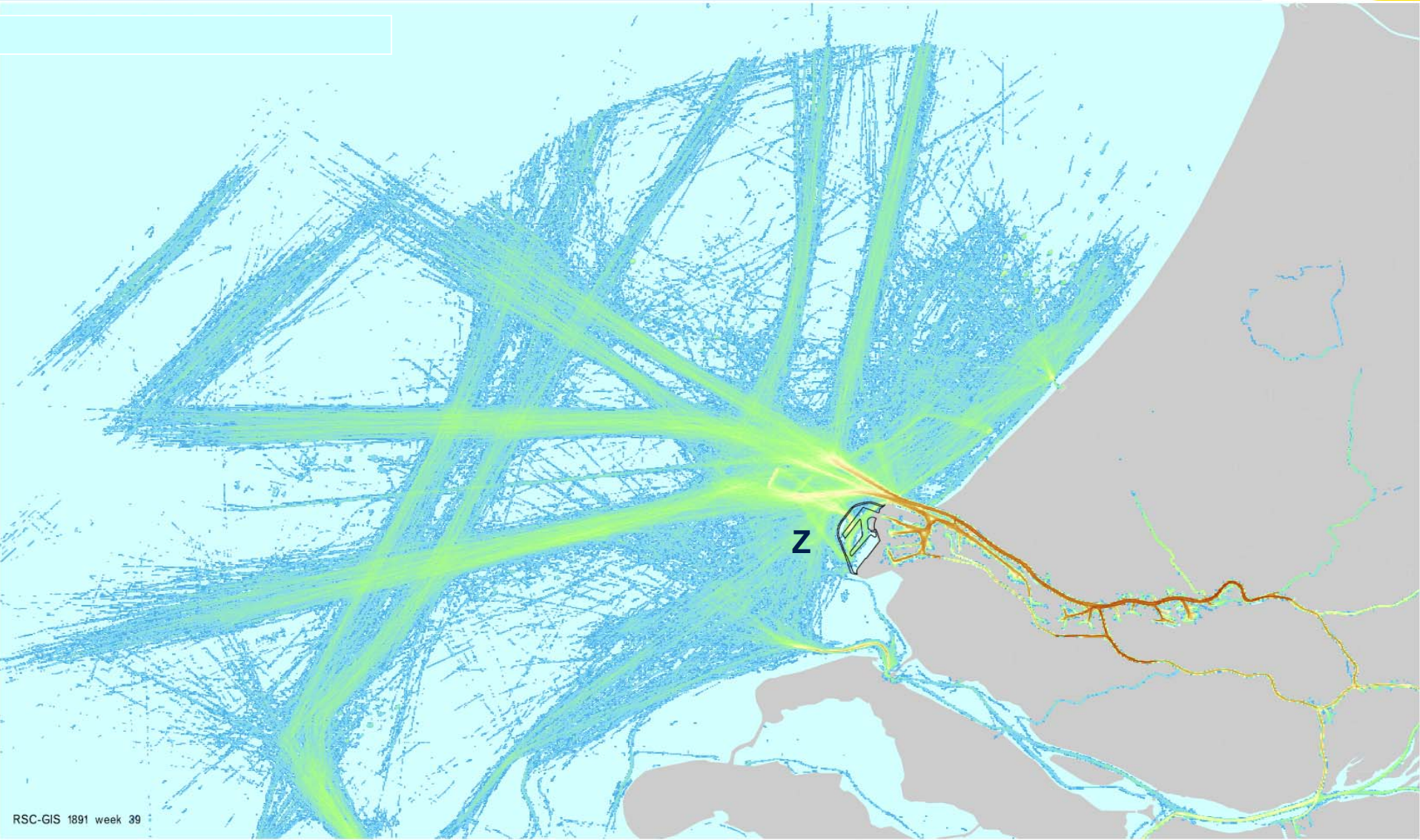
Underwater noise at the reference location with and without dredging activities for MV2

2008-2009 comparison

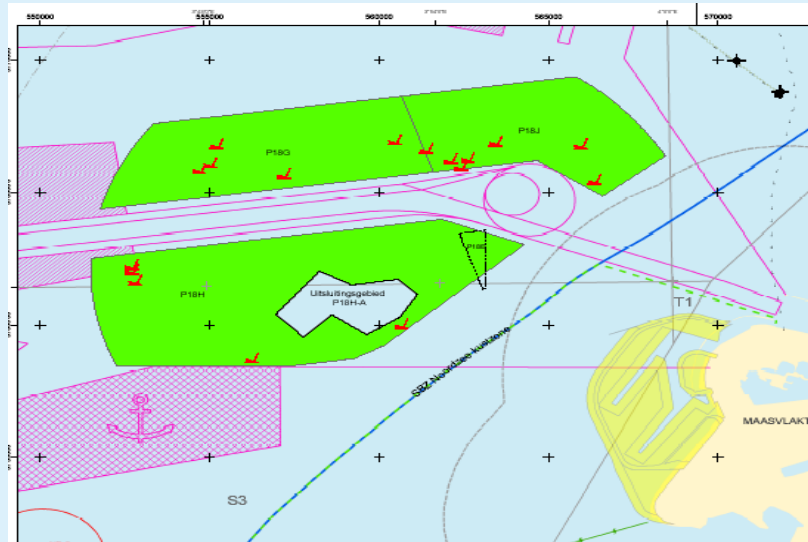
- Comparison percentiles 2008-2009
 - Clear dip between 2-4 kHz
 - Otherwise levels 2009 are mostly higher
- What causes differences?



Shipping intensity in week 39, 2009



Archaeology and Palaeontology



Archaeology and Palaeontology



Concluding remarks

- Precautionary principle for nature protection lead to a lot of research because of uncertainties in the relevant impact-effect chains
- New tools were developed for modelling silt transport and modelling ecological effects
- First ever extensive monitoring obligations
- Monitoring is more to learn than to control
- New knowledge for new projects
- Interesting knowledge for society

Questions ?



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