

Selenium contamination Delta-Mendota canal



MIKE User group meeting

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Project team

US Bureau Of Reclamation, Fresno
Chris Eacock

US Bureau of Reclamation / Lawrence Berkeley
National Laboratory
Nigel Quinn

DHI Water and Environment
Portland, Oregon
Hørsholm, Denmark

What is Selenium and why is it a concern ?

Selenium is a naturally occurring trace element that is toxic to fish, amphibians, birds, and mammals.

The main source of Selenium is from drainage water and groundwater.

The water quality objective for selenium in the Delta Mendota canal is 2 ug/l

Project Objective

The objective is to help USBR to operate the structures at the canal to provide a reliable supply of clean water to customers

The model will assist the operators of the canal to predict the effects of selenium contamination on water delivered to farms and wildlife refuges in central California.

Study area: the Delta-Mendota canal



The Delta-Mendota canal

Upstream: Tracy Pumping Plant



The Delta-Mendota canal

Mid section: Uniform canal



The Delta-Mendota canal

Lower section: Sumps (total of 6).

A sump is a underground storage with a pump



The Delta-Mendota canal

Lower section: Interior of Sump



The Delta-Mendota canal

Downstream section: Mendota pool



Modeling tools

- MIKESHE

groundwater interaction play a significant role in the transport and fate of Selenium

- MIKE11

Selenium is modeled as a conservative substance in MIKE11 using the AD module

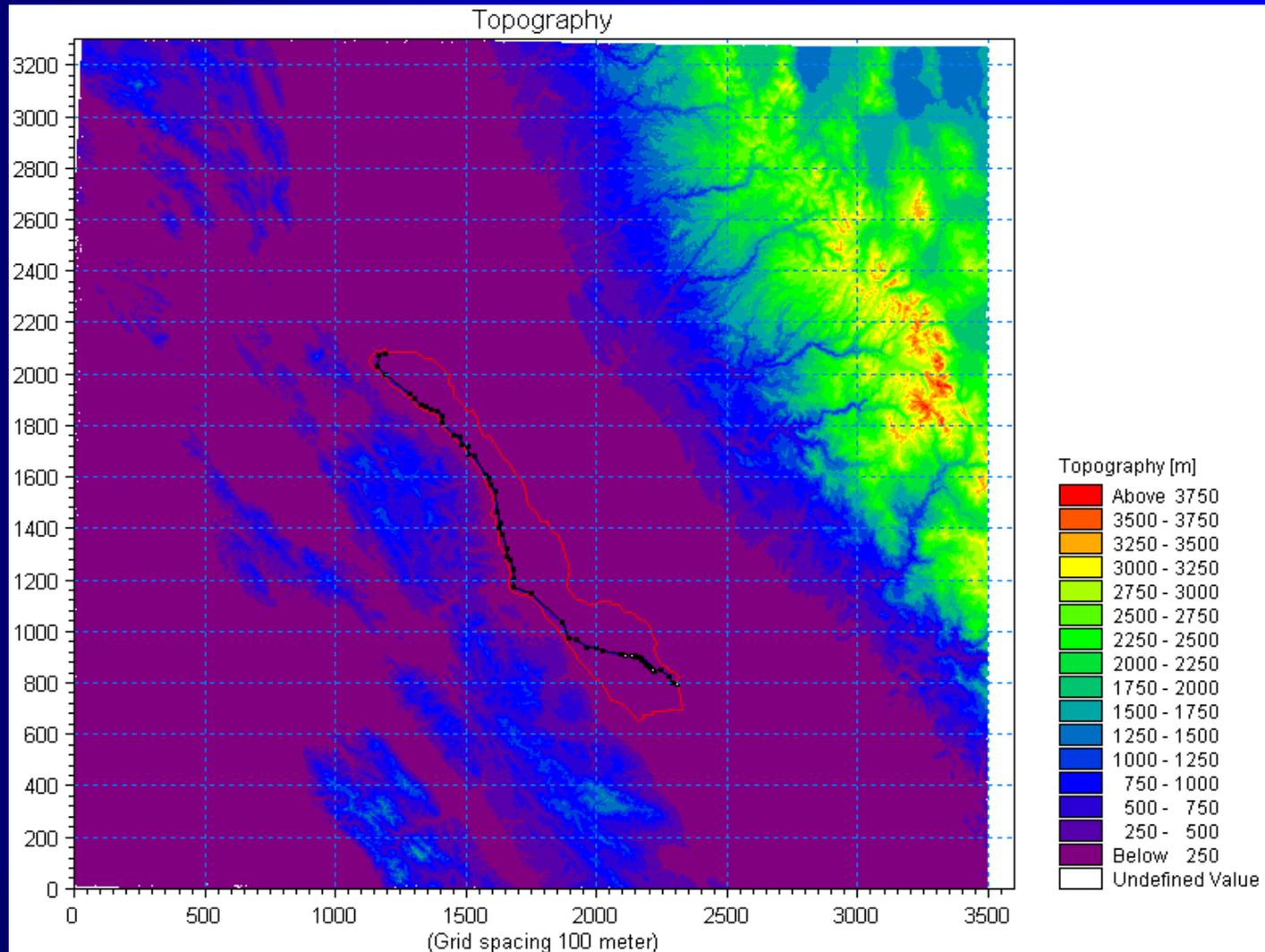
- MIKE11 Structure operation

The operation of the pumps can be used to minimize the impact from selenium contamination

MIKESHE set-up

- The DEM is based on topography data downloaded from NASA's homepage.
- The discretization is 500x500 m in the horizontal direction.
- A 100x100 m DEM has been generated
- "State Plane 1983, California IV".
- The model area covers approximately 1,200 square miles

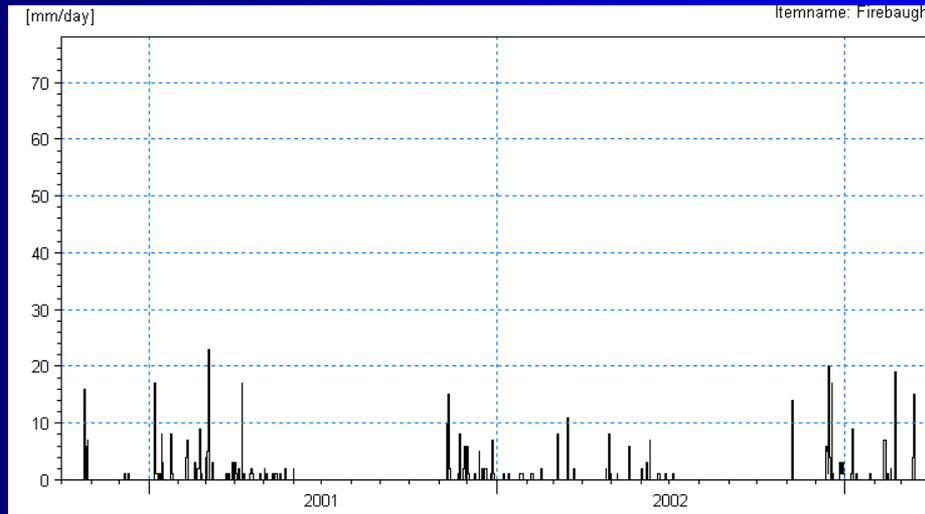
Topography



Rainfall and Potential Evaporation

- Data have been downloaded from the CIMIS homepage (California Irrigation Management Information Systems, Department of Water Resources)
- Rainfall is approximately 7.9 inches/year
- Potential evapotranspiration is about 57 inches/year

Rainfall and Potential Evaporation



Selenium data

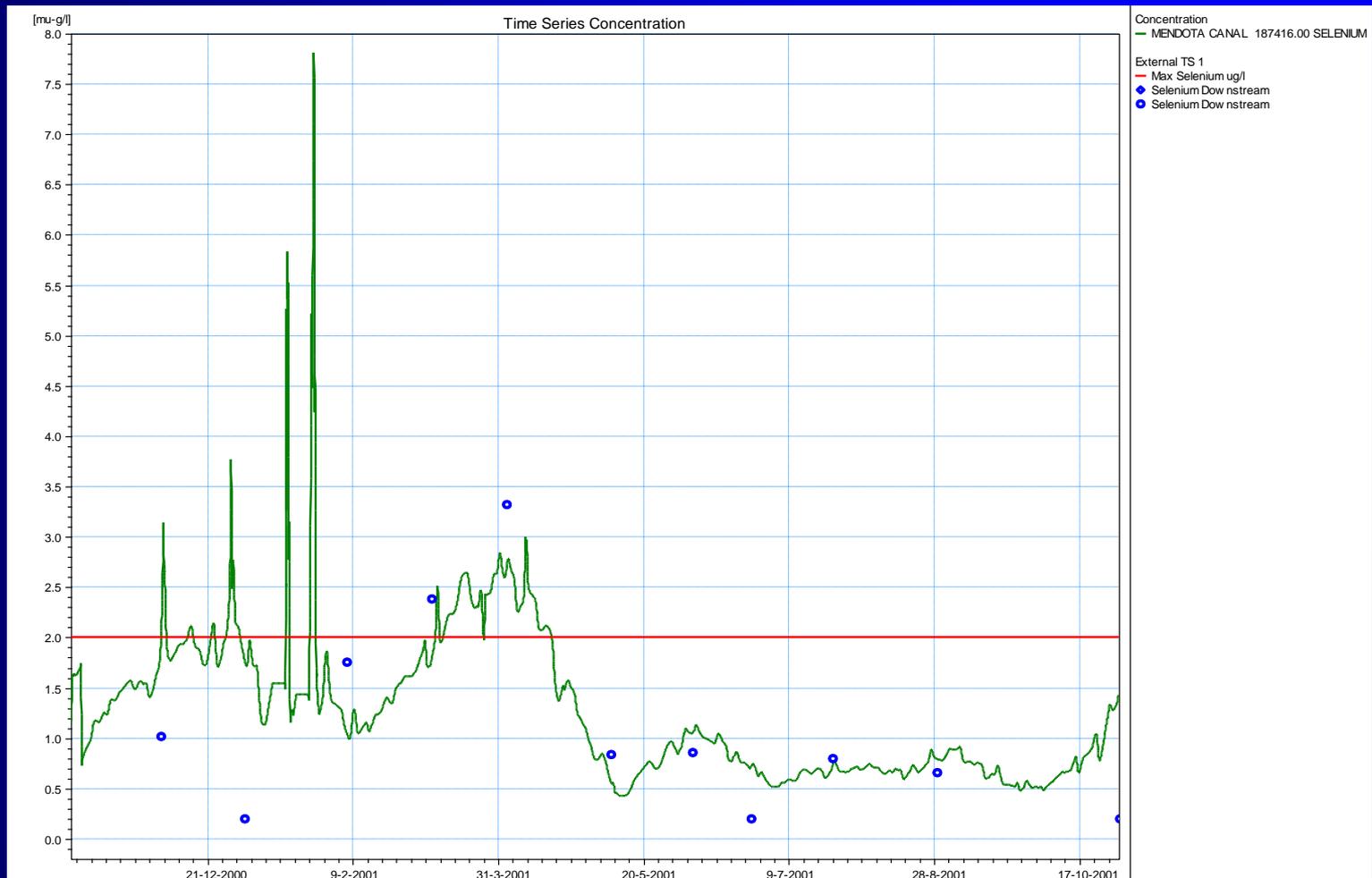
- Selenium concentrations in sumps and Delta-Mendota canal correlated to measurements of electric conductivity
- Sump pumping volumes estimated from power consumption



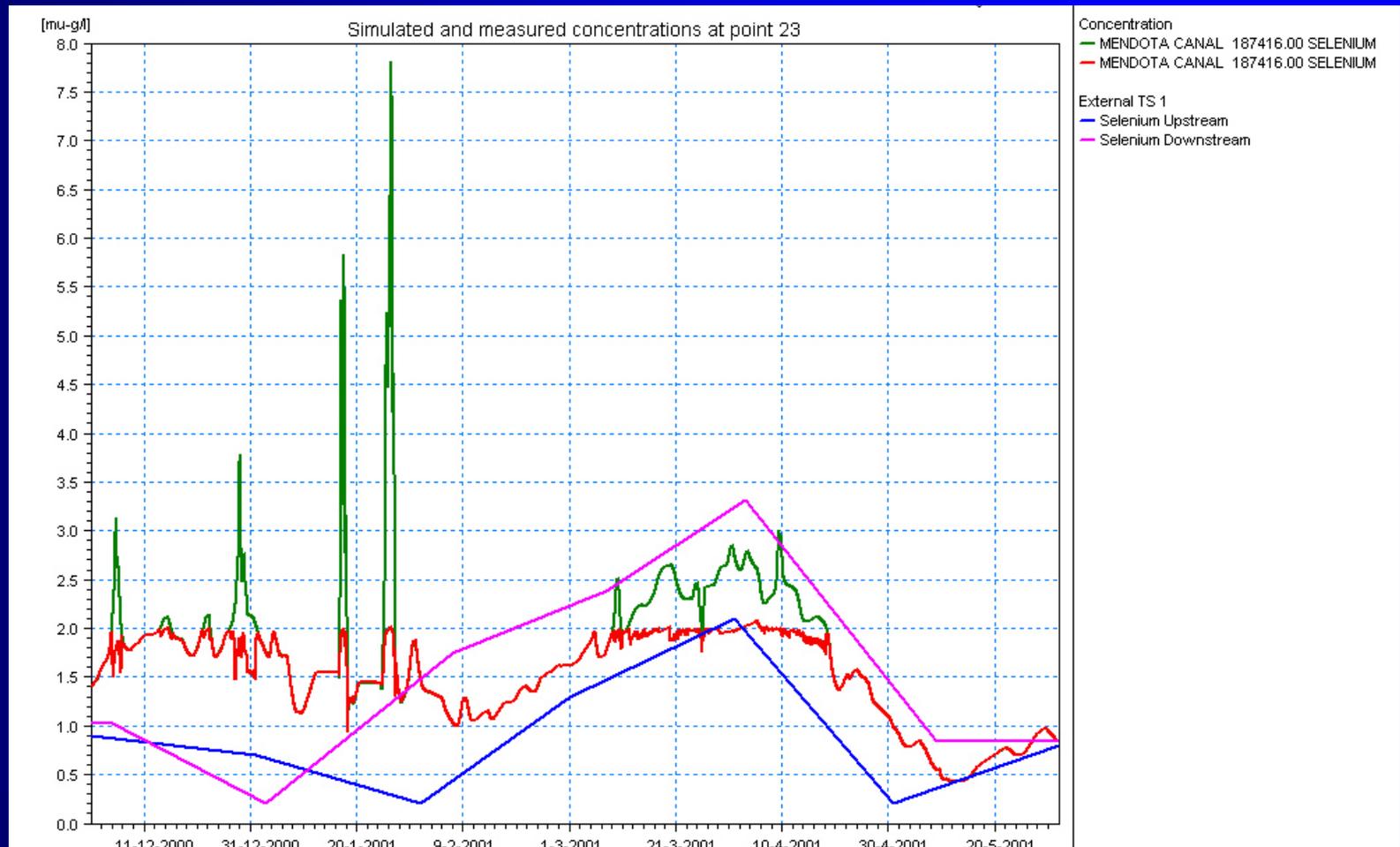
Simulation results

- Unregulated situation pumps operated according to available data
- Regulation of pumps to keep Selenium below 2 ug/l at the Mendota pool
- Pump discharges in the regulated situation

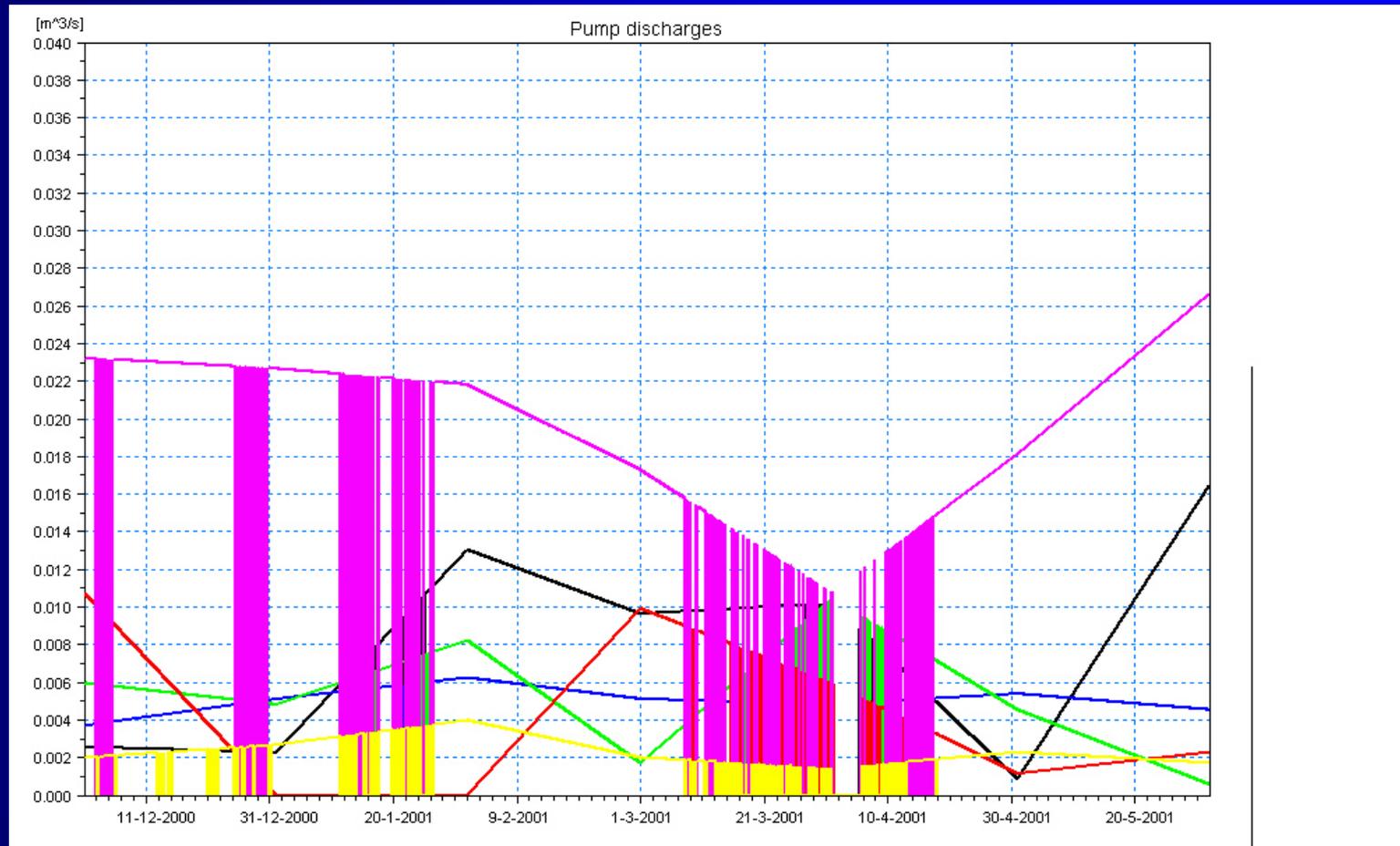
Unregulated situation



Regulated situation



Pump discharges regulated



Next step

- Mass balance analysis for Selenium
- Optimise monitoring system
- Release of water during when concentrations of selenium is low
- On-line system with operation of pumps
- Forecast system
- Use EcoLab to model the fate of Selenium
- Fell free to suggest.....