# Experience from testing of $EIF_{DD}$

ERMS Users Group

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# ERMS Users Group

- ERMS JIP activity
- Testing and verification
- Identify strengths and weaknesses
- Recommendations for improvement of model
- User guidelines
- Training courses
- Discussion forum, sharing of  experiences

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# Testing and verification by Users Group

**Inter-user test**
*Produced water*

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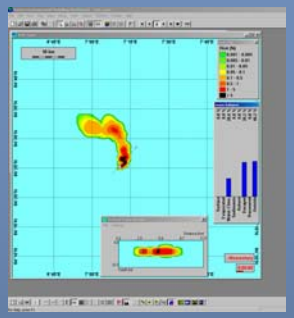
*Produced water*

**Case study**
*Management options*
*Drilling discharges*

**Inter-user test**
*Drilling discharges*

**Inter-user test**
*Drilling discharges*



**Software model development**

**Sensitivity analysis**
*Produced water discharges*

**Sensitivity analysis**
*EIF utility*

**Sensitivity analysis**
*Produced water and drilling discharges*

**Sensitivity analysis**
*Drilling discharges*

# Inter-user tests

- Variability among users
- User friendliness
- Bug identification
- Comparison of EIF from new versions against results from old version
- Improved understanding of the model by the users

➢ Recommendations for model improvements

**Case 1**

| Data for discharge from the 26" drilling section: | |
|---|---|
| Drilling section diameter: | 26" |
| Section length, m: | 600 |
| Washout factor, % | 10 |
| Total mud discharge, tons | 400 |
| *Compound in discharge* | *Amount in tonnes* |
| Cuttings | Calculated/model |
| LUBR-1 | 0.0100 |

**Case 2**

| Data for discharge from the 26" drilling section: | |
|---|---|
| Drilling section diameter: | 26" |
| Section length, m | 600 |
| Washout factor, % | 10 |
| Total mud discharge, tons | 400 |
| *Compound in discharge* | *Amount in tonnes* |
| Cuttings | Calculated/model |
| LUBR-1 | 0.0100 |
| Data for discharge from the 17.25" drilling section: | |
| Drilling section diameter: | 17.25" |
| Section length, m | 900 |
| Washout factor, % | 10 |
| Total mud discharge, tons | 150 |
| *Compound in discharge* | *Amount in tonnes* |
| Cuttings | Calculated/model |
| Barite | 80 |
| LUBR-1 | 0.0150 |
| Drill-chem-1 | 30 |
| Data for discharge from the 8 ½" drilling section: | |
| Drilling section diameter: | 8.5" |
| Section length, m | 500 |
| Washout factor, % | 0 |
| Total mud discharge, tons | 100 |
| *Compound in discharge* | *Amount in tonnes* |
| Cuttings | Calculated/model |
| Barite | 20 |
| LUBR-1 | 0.008 |
| Drill-chem-1 | 2 wt% of the cuttings in the discharge |

# Inter-user tests

- Initiated measures to reduce user variability
  - ✓ EIF utility
  - ✓ Reduce user control in drilling module
  - ✓ Guidelines
  - ✓ Preparation of input data
- Model improvements
  - ✓ EIF utility
  - ✓ Graphical presentation of results
  - ✓ Duration
  - ✓ Simplifications
  - ✓ Bug fixing
- Recommendations on future changes in reporting
  - ✓ EIF max → EIF time-average
  - ✓ Near-field module (PW)

# Management options Case study

- Real cases to identify strengths and weaknesses of the model
- 3 “real” cases
  - Exploration drilling with WBM
    - ✓ “yellow” chemical versus PLONOR chemicals and barite versus no discharge for deeper well sections
  - Production drilling with WBM
    - ✓ Wells drilled in parallel versus in series
  - Exploration drilling with WBM/OBM
    - ✓ WBM versus OBM, cuttings grain size, NaCl brine versus Barite, jack-up grease

# Management options
# Case study

- Graphic presentation of results
- Change in grain size the dominant stressor in the sediment for two of the cases
  - Importance of this stress factor (versus toxicity, burial and oxygen deficit)?
  - Limited duration?
- Oxygen deficit dominating stressor in the sediment for one case
  - Due to one chemical that ends up in the sediment (large log Pow) where it biodegrades and consumes the oxygen

# Sensitivity analyses

- Sensitivity to variations in input parameters and model settings
- Multivariate design and analysis
- Identification of most important parameters
- Does the model behave as expected?

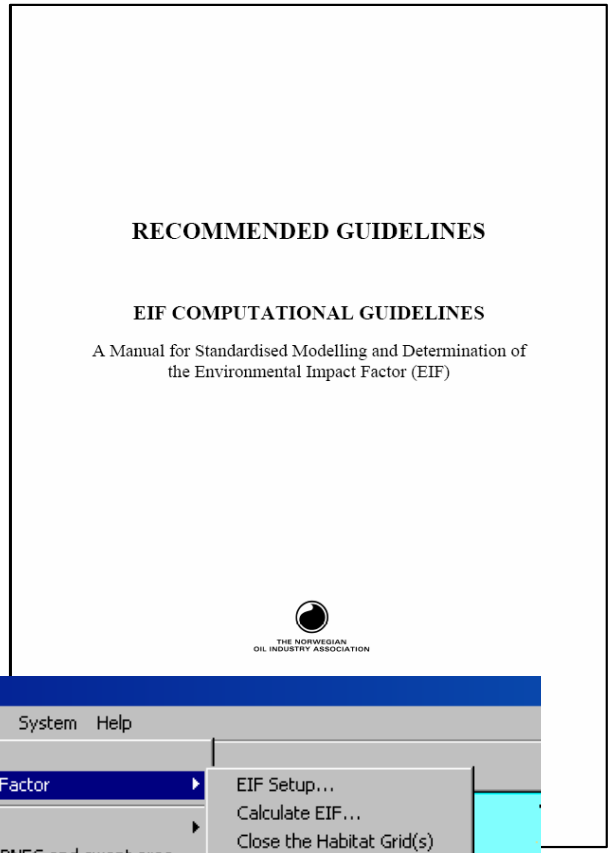
➢ Recommendations for model improvements

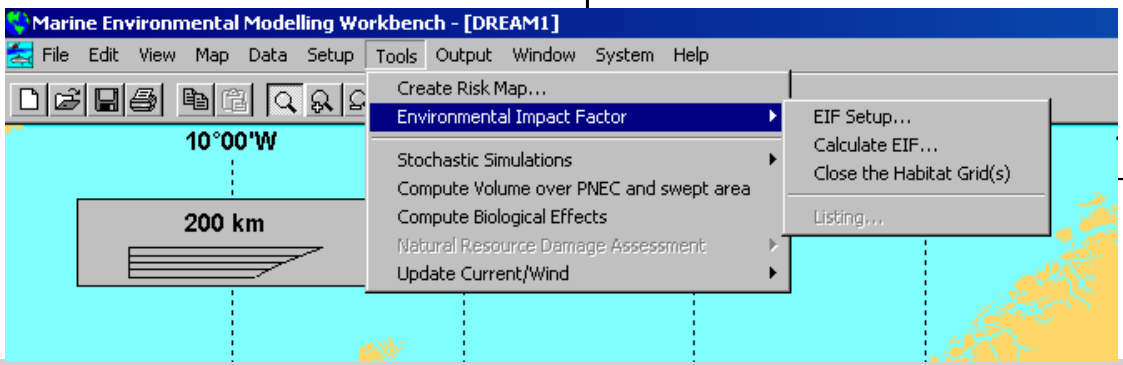
# Sensitivity analyses

- Produced water
  - Most important parameters for $EIF_{PW}$ is PNEC values and biodegradation rate
  - Influence of analytical variance in compound classes
  - EIF max versus EIF time-average
- Drilling discharges
  - Improvements and simplifications to model set-up for $EIF_{DD}$
- Ongoing sensitivity analysis - model behaves well

# User guidelines

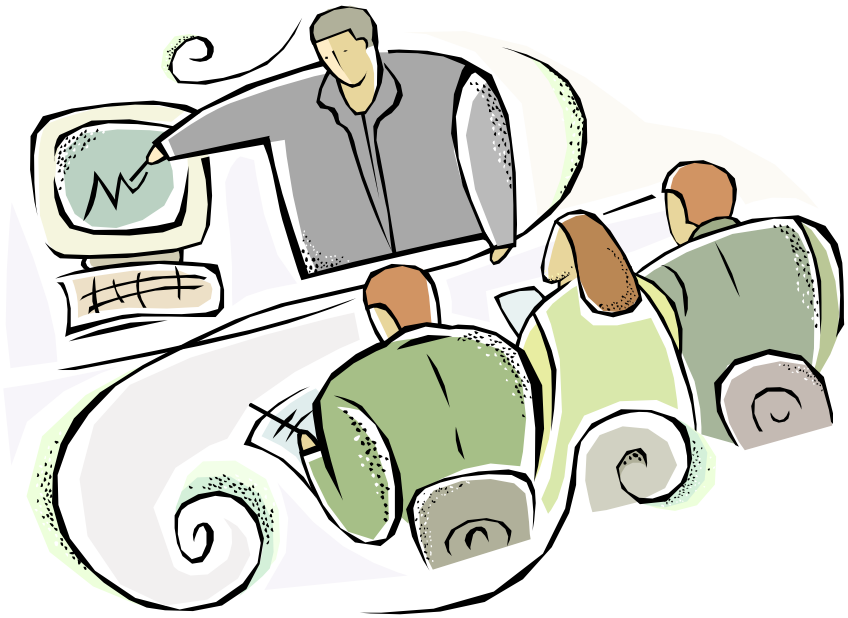
- OLF EIF computational guidelines
- EIF utility
- Guidelines for handling of production chemicals in the water column in DREAM
- Users guideline for drilling discharges and model validation



# Training courses

- 1-2 courses per year
- Next will be in November 2007



SINTEF

**DREAM Training Course Overview**
November, 2006
MEMW / DREAM Version 3.4

**Day 1**
09:00 - 10:00 General concepts and structure of DREAM and water column EIF
10:00 -12:00: Installation, introduction to the software
- Representation of the physical environment and physical-chemical processes in DREAM
- Setting up, running, and viewing example scenarios

12:00 – 13:00 Lunch
14:00 – 17:00 Computation of water column EIF in DREAM
- Using existing chemical compounds
- Adding new process chemicals
- Using the EIF Wizard

**Day 2**
09:00 – 12:00 Introduction to the DREAM/ParTrack Drilling Discharge Model
- Conceptual theoretical background
- Utility for setting up a drilling discharge

12:00 – 13:00 Lunch
13:00 – 16:00 Example scenarios
- Setting up and running simulations
- Viewing simulation results
- Post-processing for sediment and water column EIF results

**Note**: Each participant should bring a PC with Windows XP (or newer), 200 Mb free space, and **administrative privileges.**. If the latter issue presents difficulties, the software should be pre-installed by your IT people prior to arrival at the course.

**Location:**
Probably at SINTEF SeaLab in Trondheim. Confirmation coming soon.

# Summary

- A number of Inter-user tests and sensitivity analyses have been performed
  - Improved user friendliness, model set-up simplifications
  - Model improvements
  - Recommendations on future changes in reporting of EIF's
  - Current sensitivity analysis $\rightarrow$ model behaves well
  - Next inter-user test to be performed Q4 2007
- User Group activity will be continued

# Acknowledgement

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