Meeting between SSM/Consultants/SKB

Briefing Notes - Hydrology in SR-Site and the translation to the TR-10-06 radionuclide transport model

Background

SSM's consultants have recently completed the current assignment in the main-phase review (biosphere issues) of the SR-Site license application. There were two main areas of interest; the interpretation of site-specific hydrology supporting the radionuclide transport model described in TR-10-06 and the derivation of nuclide-specific parameters (k_ds, CRs, etc.).

Whereas the nuclide-specific data described in TR-10-07 was readily traceable and requests for information where readily (and successfully) communicable to SKB via electronic communications it was felt that the most efficient way to clarify aspects of the hydrological model and to submit information requests to SKB was via a face-to-face meeting.

The review of the hydrology has resulted in a number of questions and request for data. These are outlined below. Note that a presentation will be given at the start of the meeting to further explain some of the details. These notes are used to illustrate the nature of the requests.

Questions and data requests

Application of MIKE-SHE and definition of the "Average Object"

This section of the review deals mainly with the definition of the "average object" based on the application of MIKE-SHE in the report R-10-02.

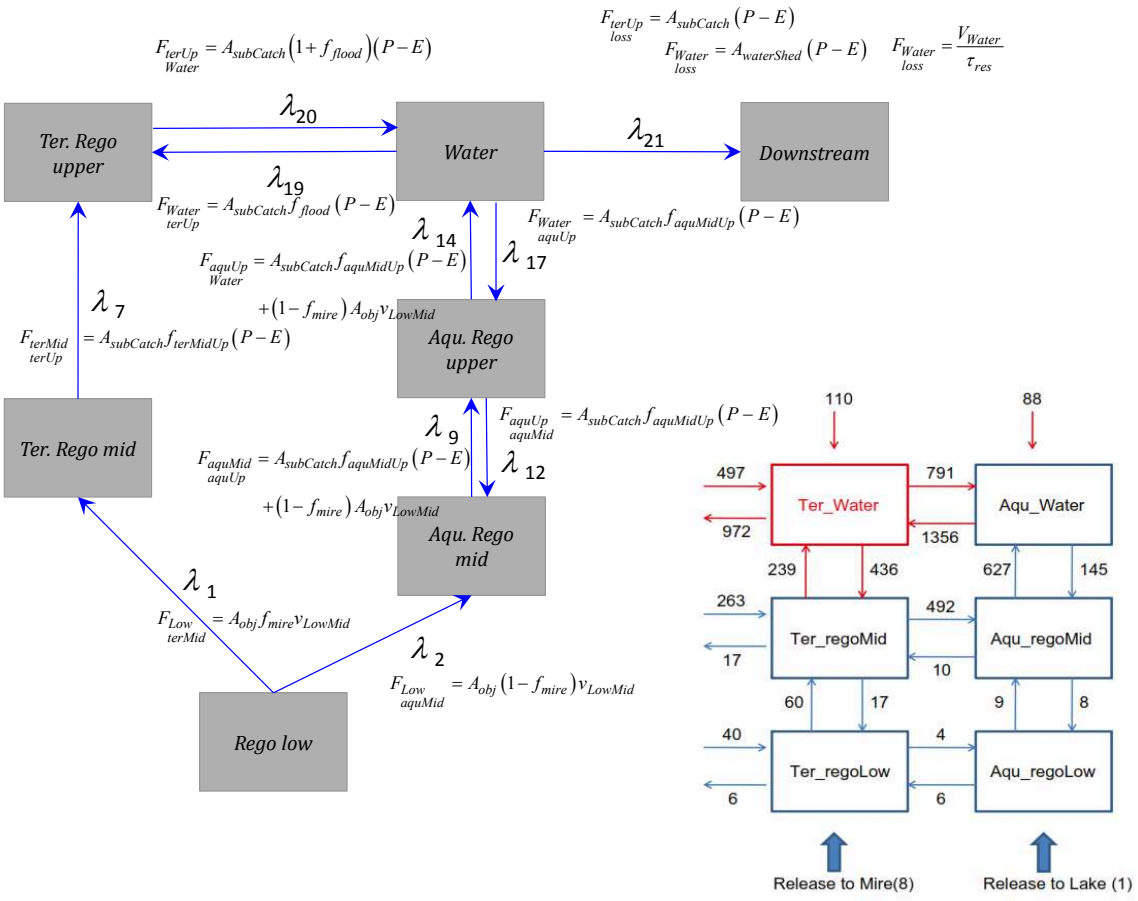
- Are there substantive differences between the MIKE-SHE results for the SDM-Site area, the pre-modelling area and the SR-Site regional model area? (R-10-02 Chapter 8, Fig 8-1 and associated material).
- The "average object" has a mass balance presented as Figure 8-5 in R-10-02. We understand that this is based on the mass balance for six objects (Figures 8-2 and 8-3 of R-10-02). MIKE-SHE outputs mass balance for the objects under consideration:
    - Can we obtain the mass balance results corresponding to the six objects at the times 2000, 3000 and 5000 CE? (How are these related to Fig 8-4 and Fig 5-22?).
    - Can SKB illustrate how these objects are combined to generate the "average object"?
- Noting that MIKE-SHE has a water balance utility that can output water balance as "area normalised flows" (R-10-02 p304); it seems that these "advective fluxes" were used in the derivation of the "average object":
    - For each of the objects used to define the "average object" what is the normalising area? Does this area change in time? If so what are the relevant values at 2000, 3000 and 5000 CE?
    - What is the normalising area of the "average object"?
    - Would mass balance in the "average object" be different if water flow rates (m^3 $year^{-1}$) had been used instead of velocities (m $year^{-1}$)?
- Is it possible to access (from SICADA?) results from the flow fields calculated by MIKE-SHE?
- Is it possible to use MIKE-SHE to characterise fluxes in agricultural systems imposed on the natural ecosystems, ie including modified drainage?

- In MIKE-SHE, does the volumetric flow of water from the bedrock change on the transition from aquatic to terrestrial conditions at the surface?

Interpretation of the "average object" in the radionuclide transport model

Accepting that the "average object" is the representative hydrological entity carried forward to the dose assessment modelling there are issues concerning the transition from the "average object" to the hydrological model employed in the model.

- At what stage was the compartmentalisation of the contaminated object decided?
- From the description of the radionuclide transport model in Appendix 1 of TR-10-06, our understanding of the advective *fluxes* is as follows:



Is this correct? Have we missed any or have we misinterpreted any?

- Compared to the water balance of the "average object" the flux map is simplified. What is the justification for this?
- Hydrology of the radionuclide transport model is based on six constant parameters:
  - Water flux from the till (*adv_low_mid*);
  - Water flux from the postglacial/glacial deposits to the peat layer (*Ter_adv_mid_up_norm*;
  - Water flux to and from lake sediments normalized by the flux from the mire (*Aqu_adv_mid_up_norm*);
  - *Runoff*;
  - Fraction of the water flux that goes to the mire (*fract_mire*); and
  - Water flux describing the lake flooding (*Flooding_coef*).

  The derivation of these parameters is given in TR-10-01, pages 341 – 345. We find the descriptions given too brief. Can SKB walk us through the derivation of the numerical values

for each of these parameters? The derivation should be directly related to the numerical values in the mass balance for the "average object" and should show how the values are combined and what the mass balance considerations were that justified the choices of values.

- Discussion would be helpful regarding:
  - estimation of discharge area and object area, respectively
  - estimation of soil depth over which activities relate

Inflation: Downscaling and upscaling

- There are a large number of logic-controlled switches in the radionuclide transport model. Does the Appendix to TR-10-06 capture all of them? Would it be possible to see the actual coding used to implement the radionuclide transport model? Was it implemented in Pandora or Ecolego?
- Were there practical considerations that influenced the decision to use the "average object" approach rather than employing the MIKE-SHE results for the individual basins as a function of time?