

Week 5

5.1. Conceptualization

Compiling geological, hydrogeological, and topographical data

Defining hydrostratigraphic units

Analyze water balance

Conceptualize the flow system

5.2. Mathematical Models

Develop fundamental physical equations for the conceptual flow system and select the proper numerical to solve the system for solutions.

Finite difference, finite element, analytic element, and analytic solution

One-dimensional models

Two-dimensional model

Three-dimensional model (quasi and full)

In groundwater system

Confined aquifer

Unconfined aquifer

Leaky aquifer

Surface water groundwater interactions

Recharge and boundary conditions

In surface water system

Overland flow

Channel flow (hydrologic or hydraulic approach)

Soil moisture flow

Evapotranspiration

Surface water groundwater interactions

In sediment and solute transport

Flow

Geochemical reactions

Transport

5.3. Model Development

Defining grid (horizontal and vertical distribution, and orientation)

Grids will depend what the conceptual model is developed and type of models will be used for the problem.

Finite difference, finite element, analytic element, and analytic solution

One-dimensional models

Two-dimensional model

Three-dimensional model (quasi and full)

Spatial scale

What resolution is it needed to reasonably resolve the conceptual flow system?

Uniform or un-uniform scales?

Data requirement and availability

Computational time and memory requirements

Temporal scale

What the temporal resolution is it necessary to resolve the system and to obtain accurate numerical solutions?

Uniform or un-uniform scales?

Data requirement and availability

Computational time and memory requirements

Using existing models or developing new models

Use existing models as much as possible because they have been tested for the correctness of numerical solutions and modeling results for certain problems have been validated against the known solutions or analytic solution.

Newly developed models need to include the test for the accuracy of numerical solutions and validation of solutions.