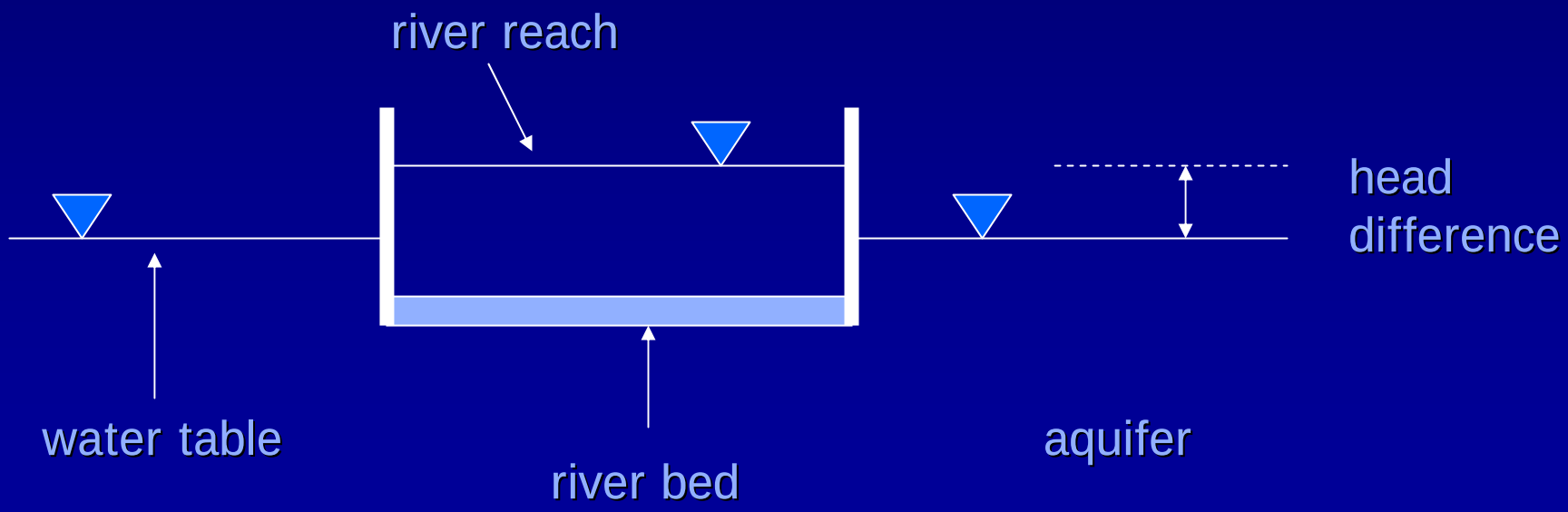
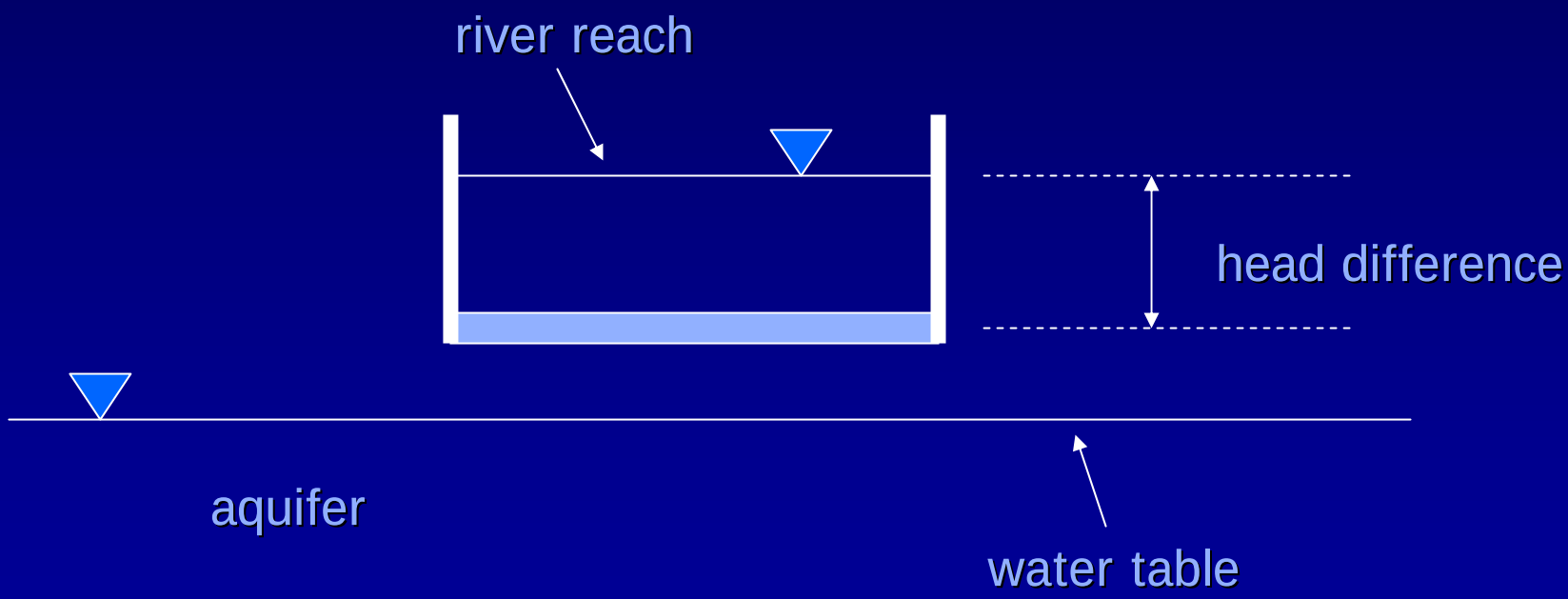
Surface and Groundwater Interaction in RiverWare

Enhancements to Reach Object

- New seepage method to solve for seepage given river elevation and water table elevation (same technique used in MODFLOW – STR or RIV package)

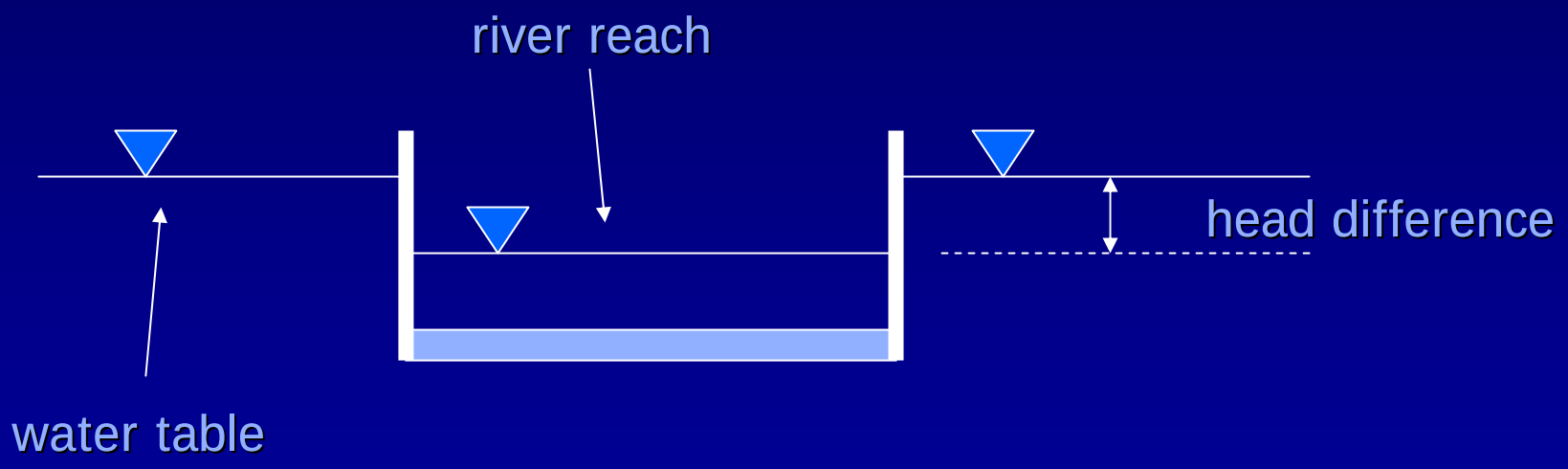


Enhancements to Reach Object



Enhancements to Reach Object

Gaining Reach



Enhancements to Reach Object

- Reach elevation computed by stage method
- Water table elevation linked to groundwater object

- Seepage = Head Difference * Conductance
  - Conductance = K*Lw/m
  - K = hydraulic conductivity of riverbed material
  - L = reach length
  - w = reach width
  - m = streambed thickness

- Head difference is current timestep reach elevation minus previous timestep water table elevation (to avoid iteration)

Distribution Canal

- Same seepage method added to Distribution Canal object
- No stage method, instead input Canal Elevation

Enhancements to Groundwater Object

- New solution method added to groundwater objects
- Connected to reach or canal for SW/GW interaction based on aquifer and reach/canal elevation
- Connected to adjacent groundwater objects to compute groundwater flows based on head differences between groundwater objects
  - All flows are computed based on previous elevations to avoid iteration
  - Each GW object acts like an aquifer cell or element

Enhancements to Groundwater Object

- Evapotranspiration
  - Method to compute ET as a function of water table elevation (user input table)
- Deep Percolation
  - Method to compute flow to deep aquifer as a function of water table elevation and deep aquifer elevation/head (user input value)

Enhancements to Groundwater Object

- Groundwater Flow and Deep Aquifer flow:
  - Based on head difference between adjacent gw objects
  - GW Flow In = Conductance * (Adjacent Previous Timestep Elevation – Previous Timestep Elevation)
    - Possible GW Flow value for each of the four sides of a GW object (user selectable)
  - Deep Aquifer Flow Out = Conductance * (Previous Elevation – Previous Deep Aquifer Elevation)

Groundwater Solution

- Storage (t) = Storage (t-1) + Seepage from SW + Net Inflows from Adjacent GW Objects – Pumping – ET – Deep Aquifer Flow

- Elevation (t) = Elevation (t-1) + (Change in Storage / (Specific Yield * Area))

Direct Connection to MODFLOW

- Exploring direct connection between RiverWare and MODFLOW
- Will make use of the ability to call DMIs from Rules
- DMI executables will take RiverWare output and translate to input for RIV and/or STR packages
- MODFLOW will pause between each stress period and send output back to RiverWare via DMI

Feedback

- Questions/Suggestions?