

Proposal For Alluvial Groundwater Study

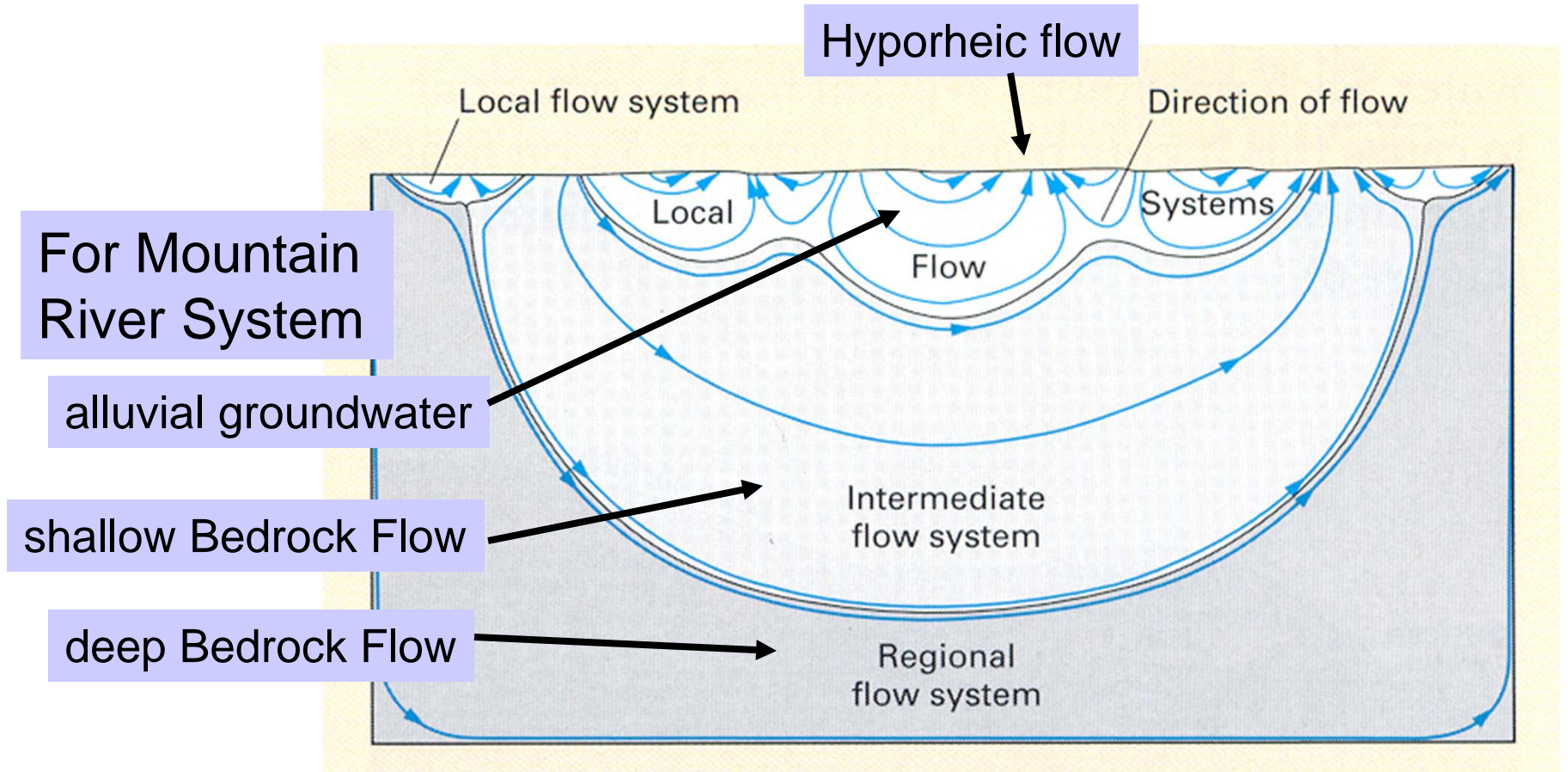
N. R. Grosso, DuPont
South River Science Team Meeting
August 9, 2005

Estimates for groundwater discharge to South river range from 25% to 70% of the total flow in the river

Purpose of Discussion

- Get input from Science Team on plan
- Get input from Science Team on timing of the study (should other studies be conducted first?)
- Agree on next steps

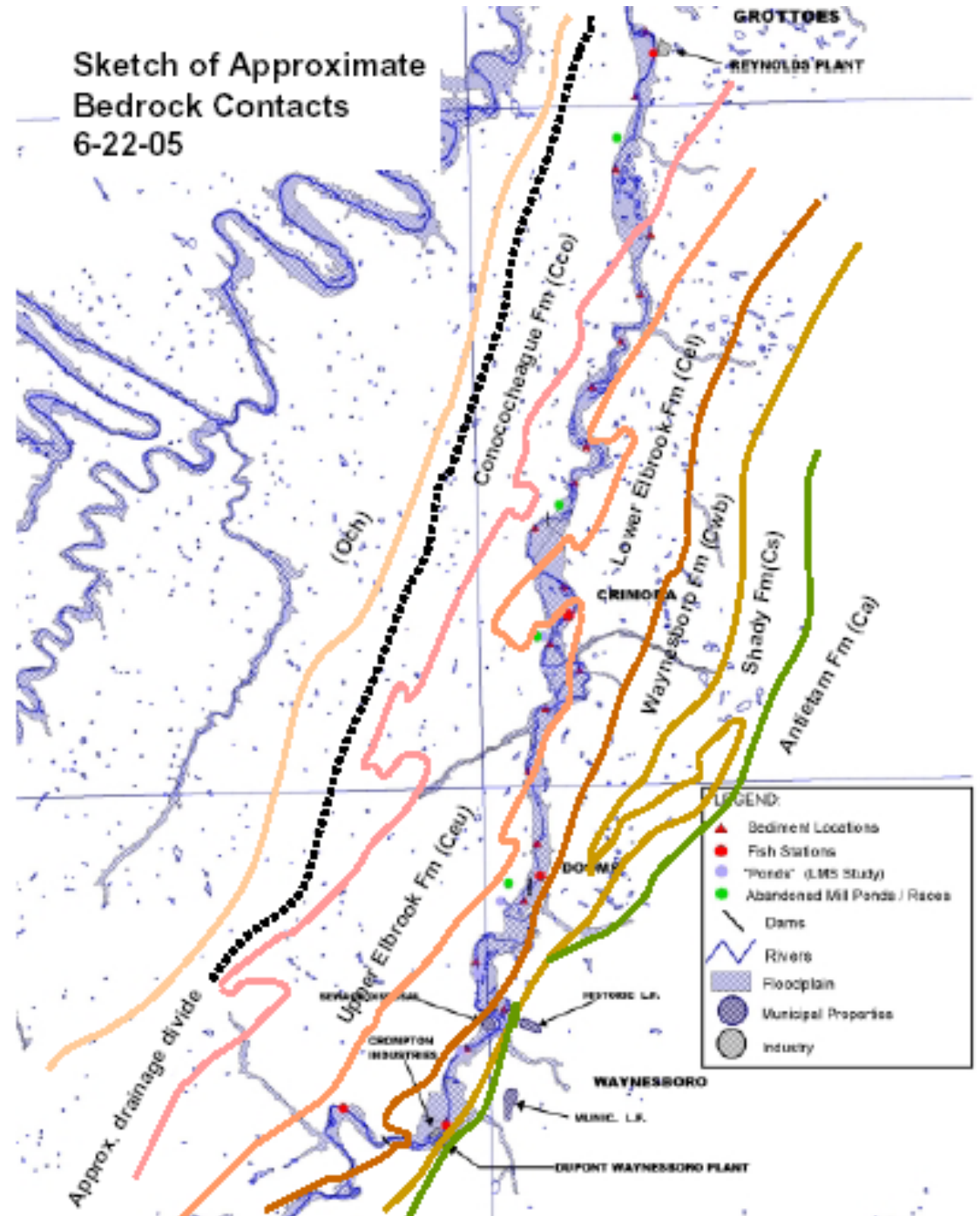
Spatial Scales of Groundwater Flow Regimes



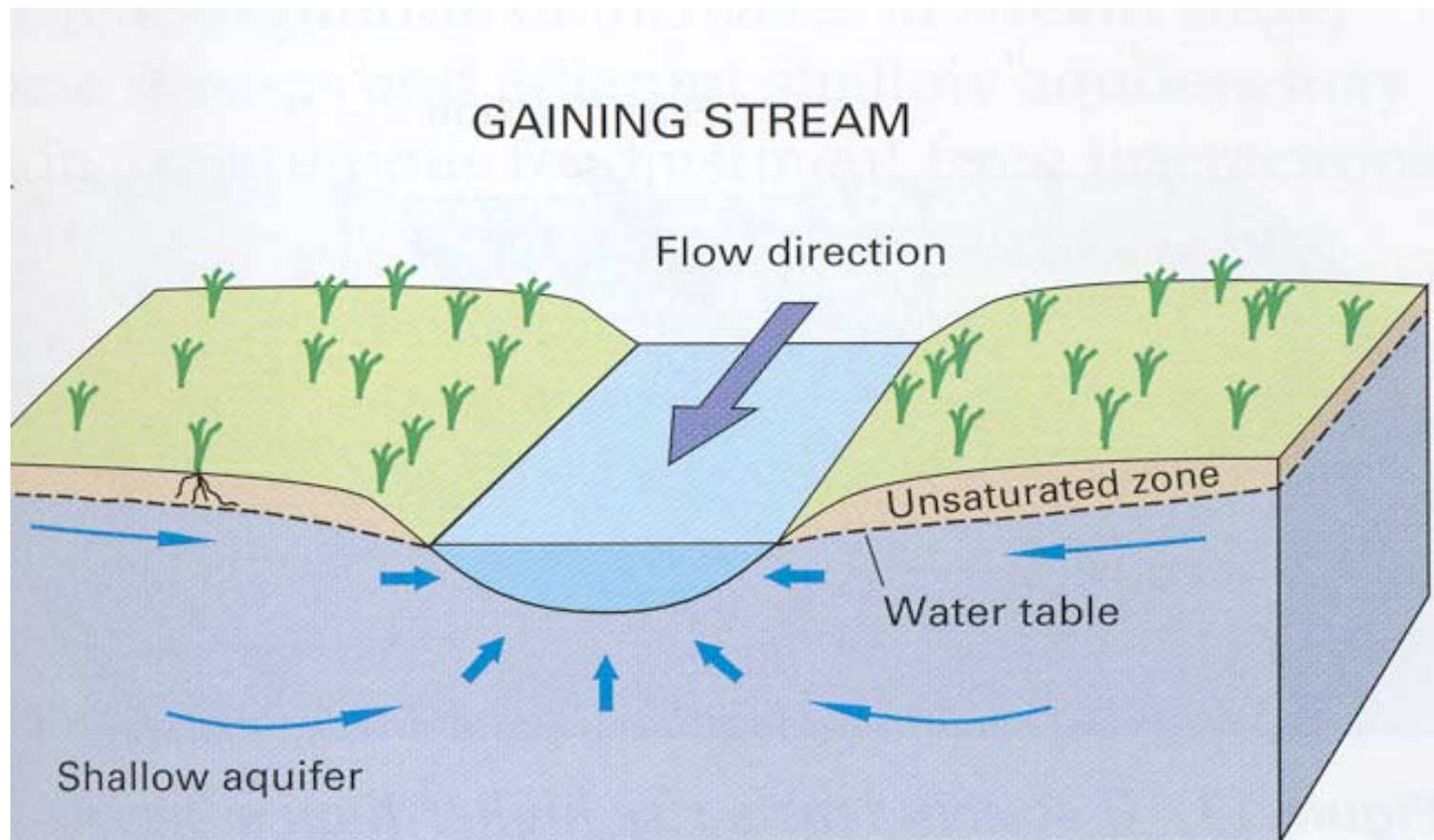
Winter et al., 1999 (mod. From Toth)

Bedrock GW Flow Regime

Based on Gathright et. al., 1977



Alluvial GW Flow Regime



Winter et al., 1999

Hyporheic GW Flow Regime

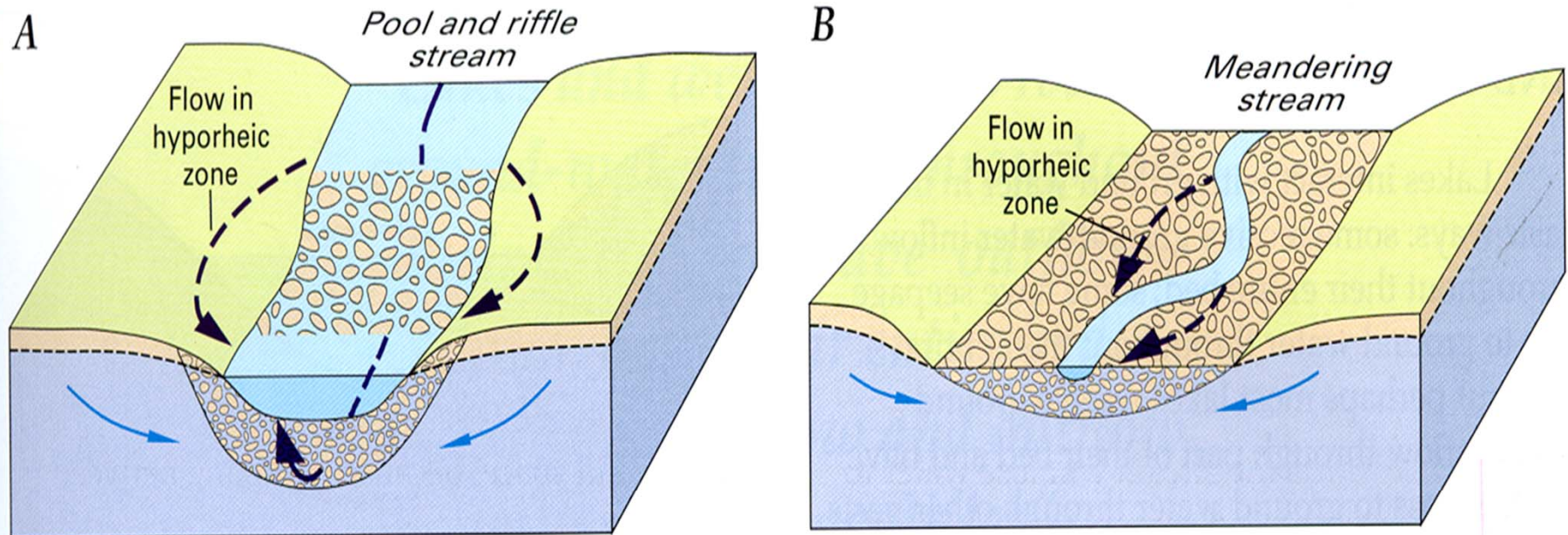


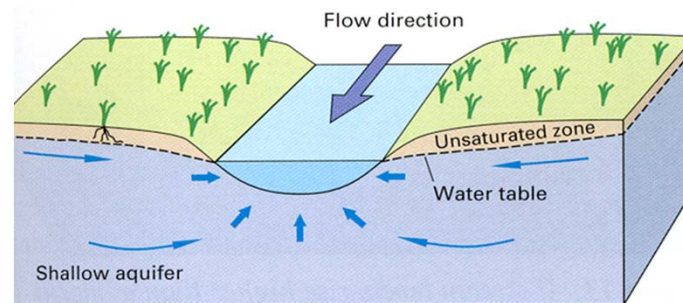
Figure 14. Surface-water exchange with ground water in the hyporheic zone is associated with abrupt changes in streambed slope (A) and with stream meanders (B).

Winter et al., 1999

The Question

Is alluvial groundwater that discharges to the river an important diffuse source of dissolved mercury to the aquatic system?

- A. Are the layers / seams of higher mercury concentrations in the subsurface floodplain soils ongoing sources of Hg to groundwater?*
- B. If yes, does this impacted groundwater constitute a significant portion of the flow in the river?*

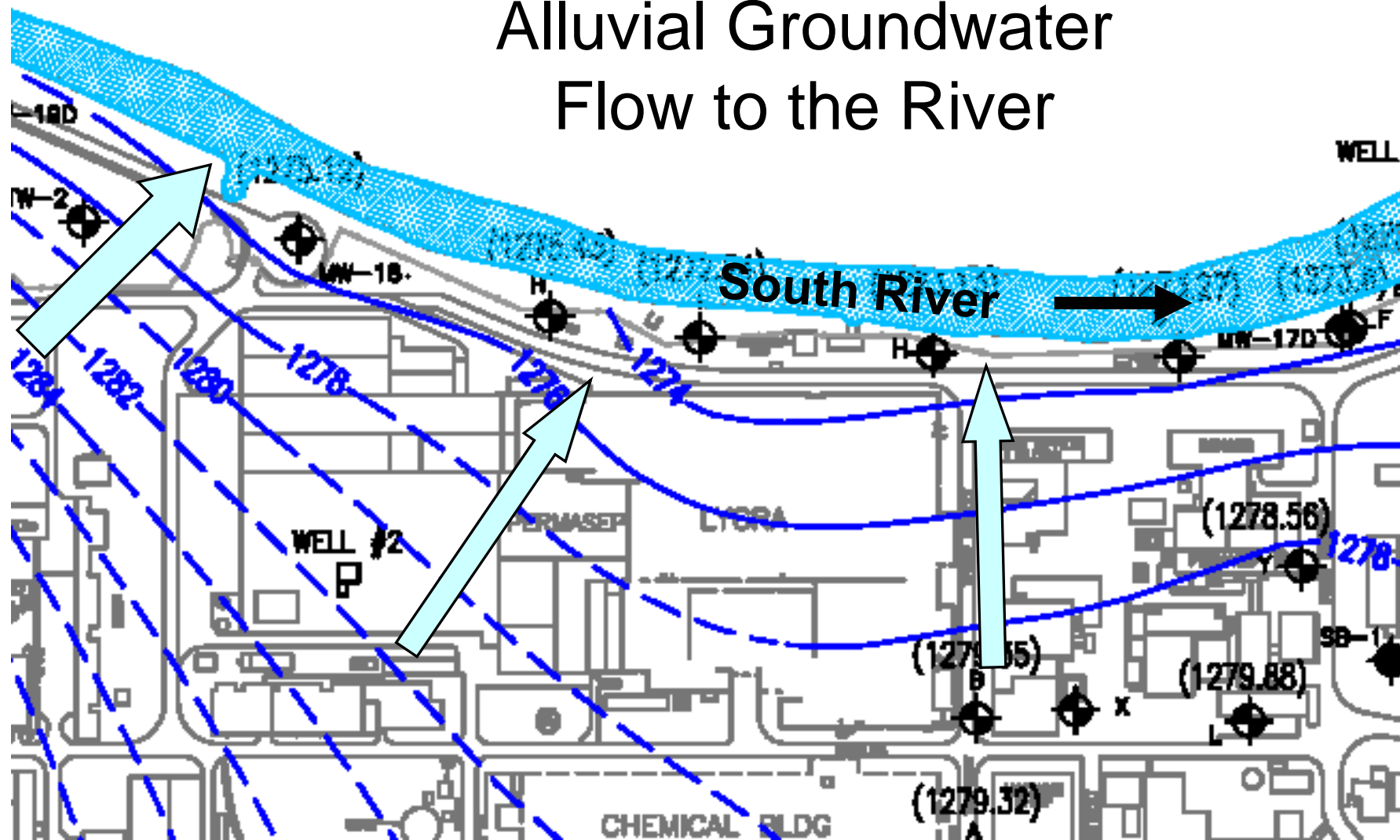


Evaluating Alluvial GW Contribution to Aquatic System

Approach:

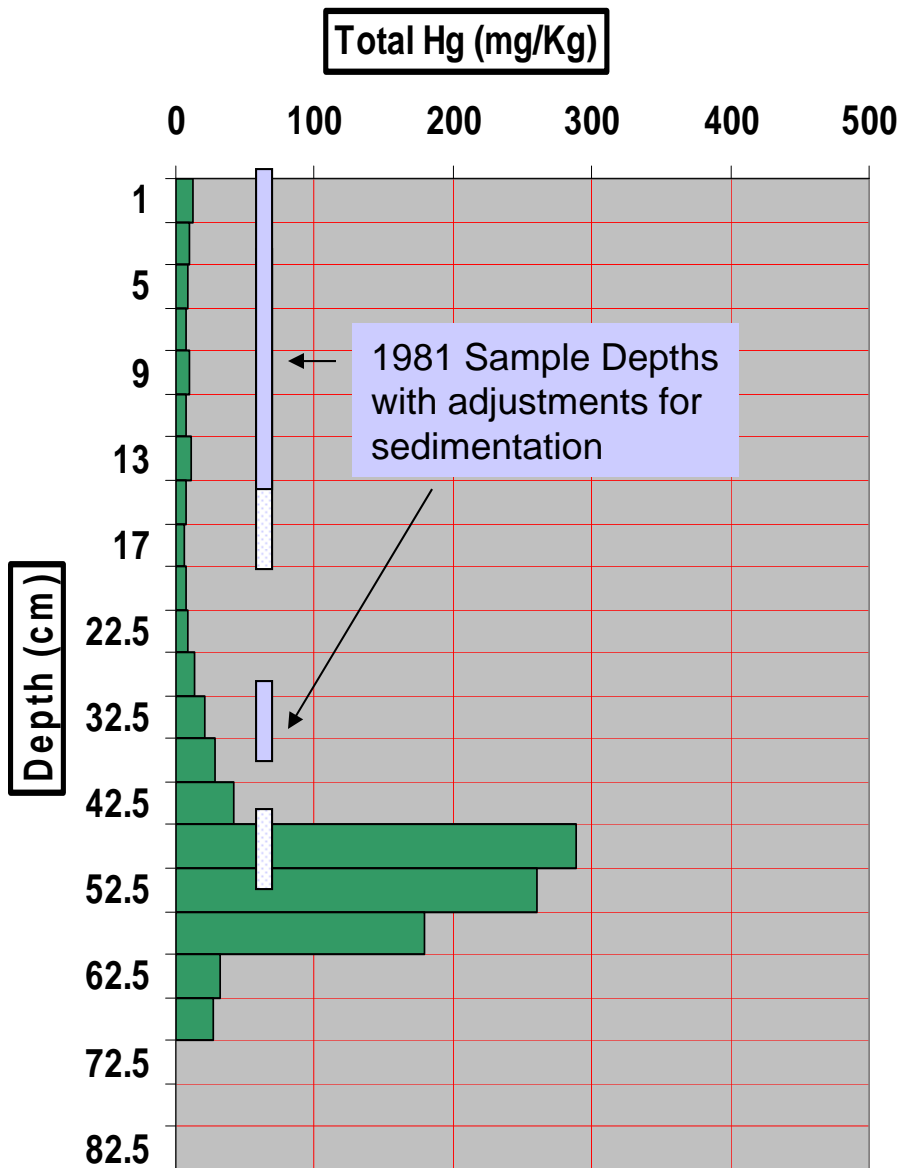
- Attempt to test worst case scenario for A (does the contaminated soil leach to GW?)
- If the answer to A is yes, evaluate the significance of contribution to the system.

Alluvial Groundwater Flow to the River

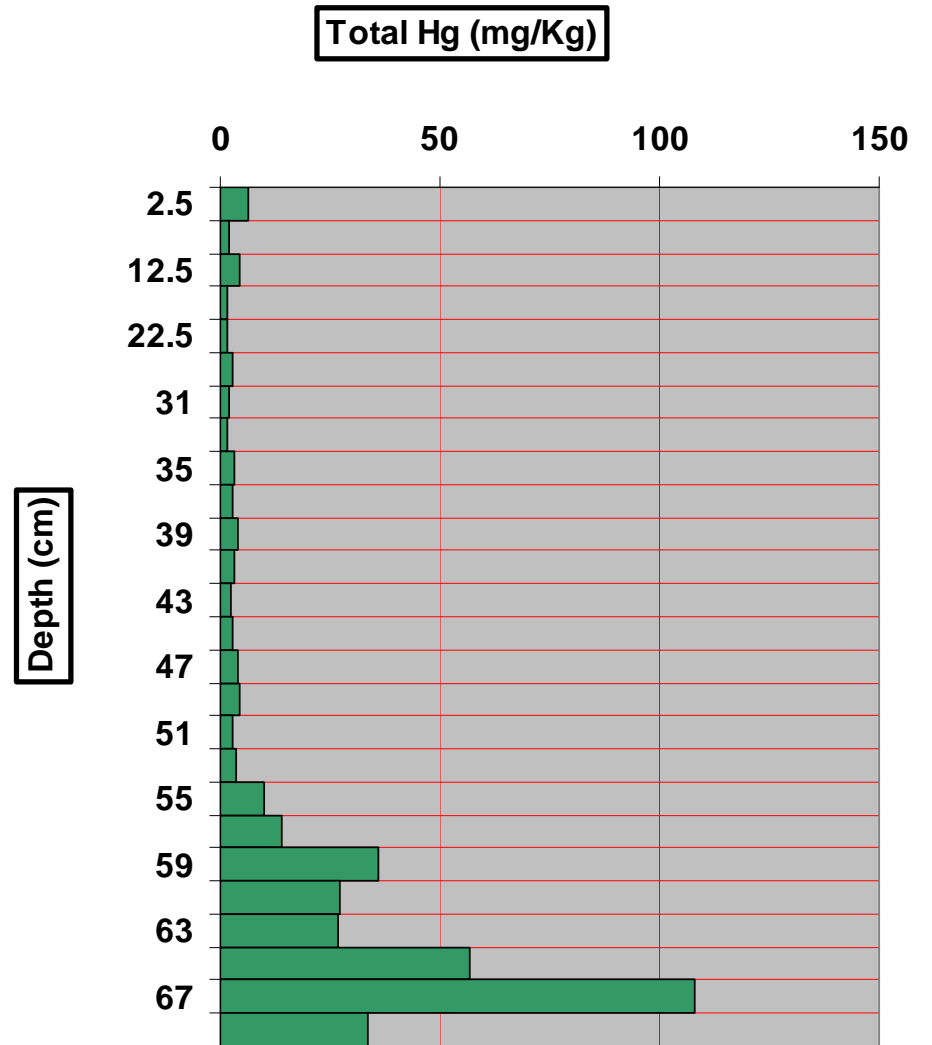


From DuPont RFI, 2003

**Site 1 (Dooms' Dam)
– Core 4**

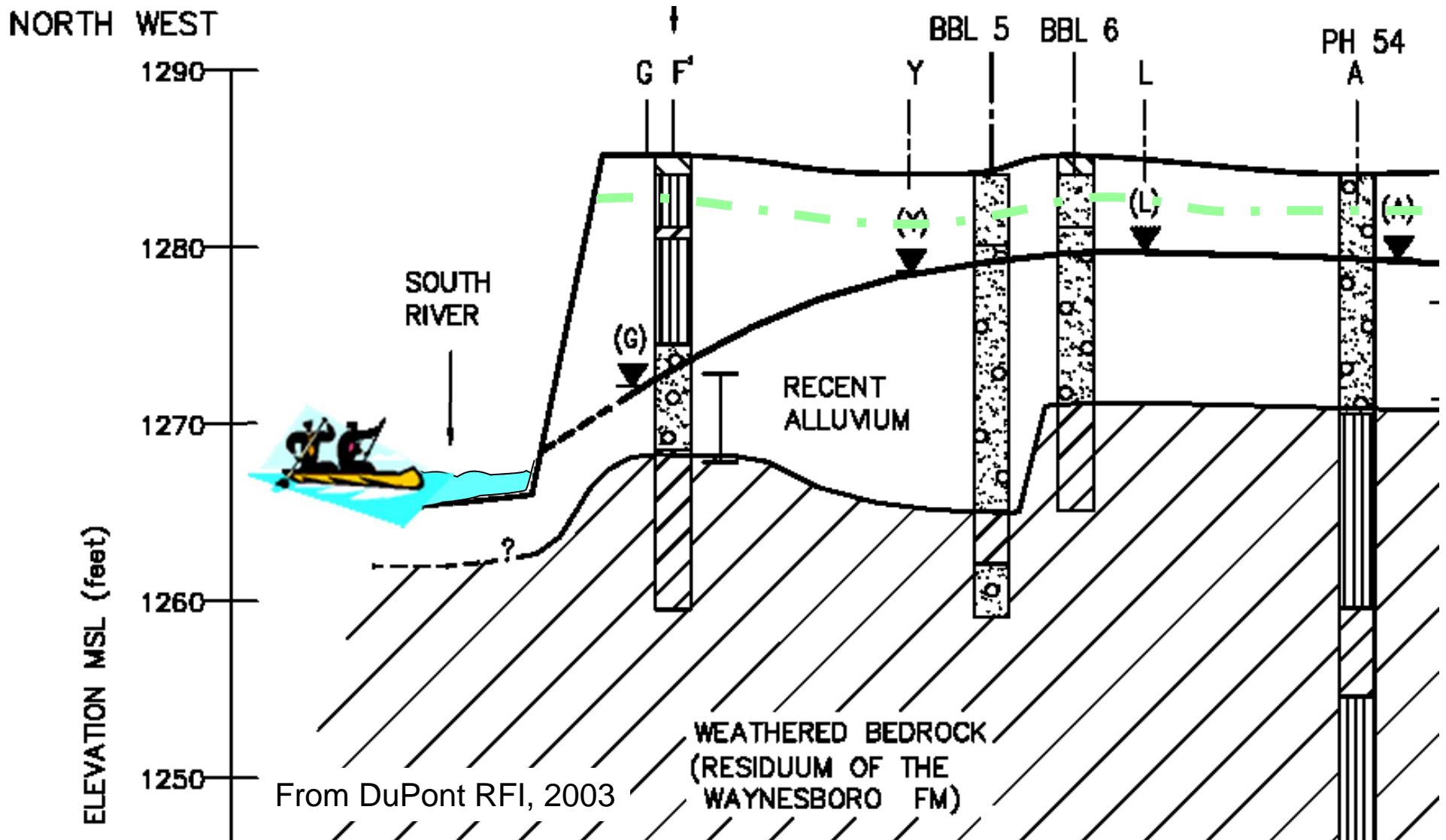


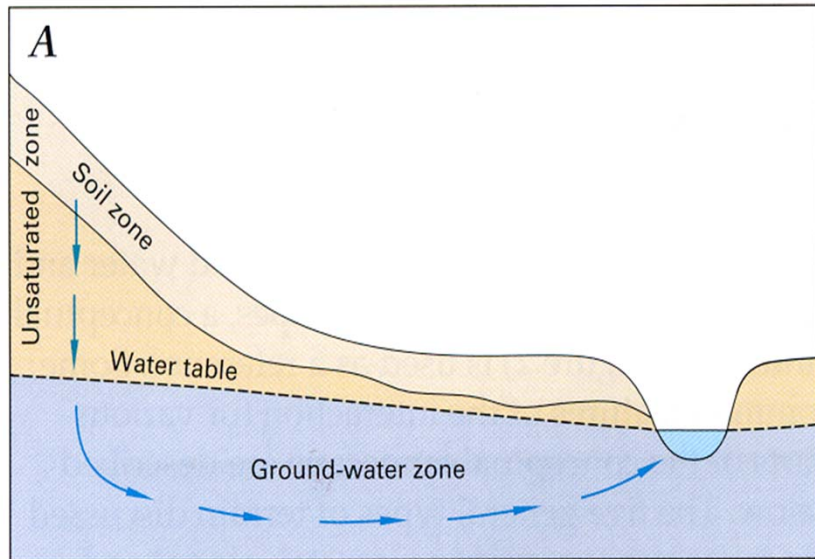
**Site 2 (Tributary)
– Core 2**



Cross Section of Alluvial Groundwater Flow

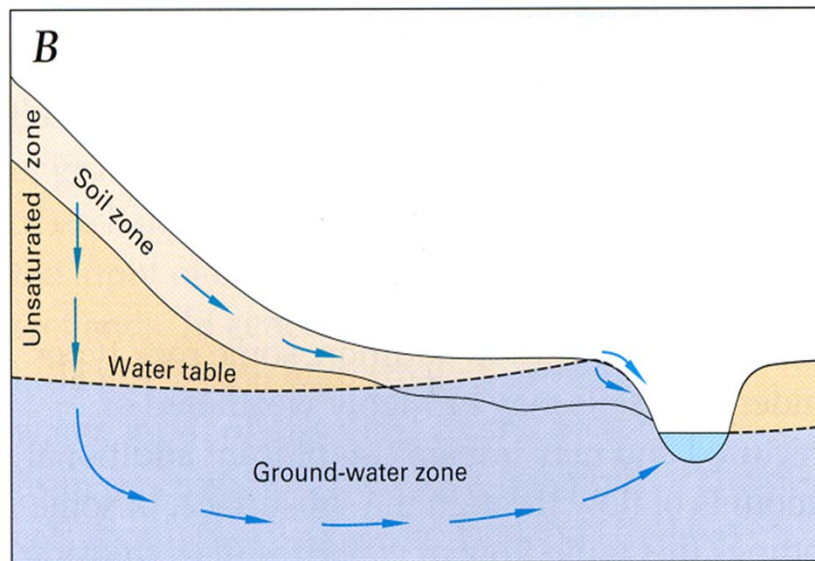
@ Waynesboro for illustration purposes





Water from precipitation into mountain Streams - Seasonal Variations:

A. Between storms and snowmelt periods, most inflow to streams is from groundwater.



B. When infiltration to the water table is sufficient, the water table will rise to the land surface and flow to the stream is from groundwater, soil water and overland runoff.

Winter et al., 1999

Seasonal variation in DuPont wells is as much as 3 ft. Depth to ground water is 5 to 20ft below ground surface.

Considerations and Actions

- Review deep floodplain soil results (sufficiently characterized/evaluated?)
- Review infiltration characteristics of the landscape
- Allow for seasonal variation in water table
- Prepare workplan
 - Scout areas for depth to water/presence of water using a hydropunch - grab samples for indications of the presence of Hg
 - Basing on scouting, install alluvial wells in specific locations

Floodplain Soil Sampling

- Most samples shallow - approximately 1 ft.
- 2003 - 2004 Floodplain Sampling
 - highest sample at Augusta Park 100 to 104 mg/kg at 12 to 21”
- 2002 Cores at Dooms Site
 - 170 to 300 mg/kg at 17 to 23”
- 1981 Sampling at three locations 12 -15” (now 17 to 20”?)
 - River mile 1 - 30 mg/kg
 - River mile 3 - 720 and 320 mg/kg
 - River mile 5 - 180 and 208 mg/kg
- Recent Hopeman Parkway sample (May 2005)
 - 600 mg/kg @ 13”

Potential Locations for Wells

- Loth Spring area
- North Park
- Waynesboro Shops
- Basic Park
- City of Waynesboro property near Genicom
- Augusta Park, Crimora
- Forestry Center
- Grand Caverns Park
- Grottoes Park
- Port Republic Park

Proposed Next Steps

- Statistical review of floodplain data according to depth and location
- Evaluate aerial photos and new topo for land cover and slope of floodplain (for infiltration characteristics)
- Prepare Workplan for Scouting
- Scout Areas
- Propose well installation if appropriate

DISCUSSION