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Okanagan Basin Water Board Groundwater Symposium

January 23, 2007

Penticton

North Okanagan Ground Water Characterization & Assessment Project

by:

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Water Stewardship Division, Ministry of Environment

Penticton

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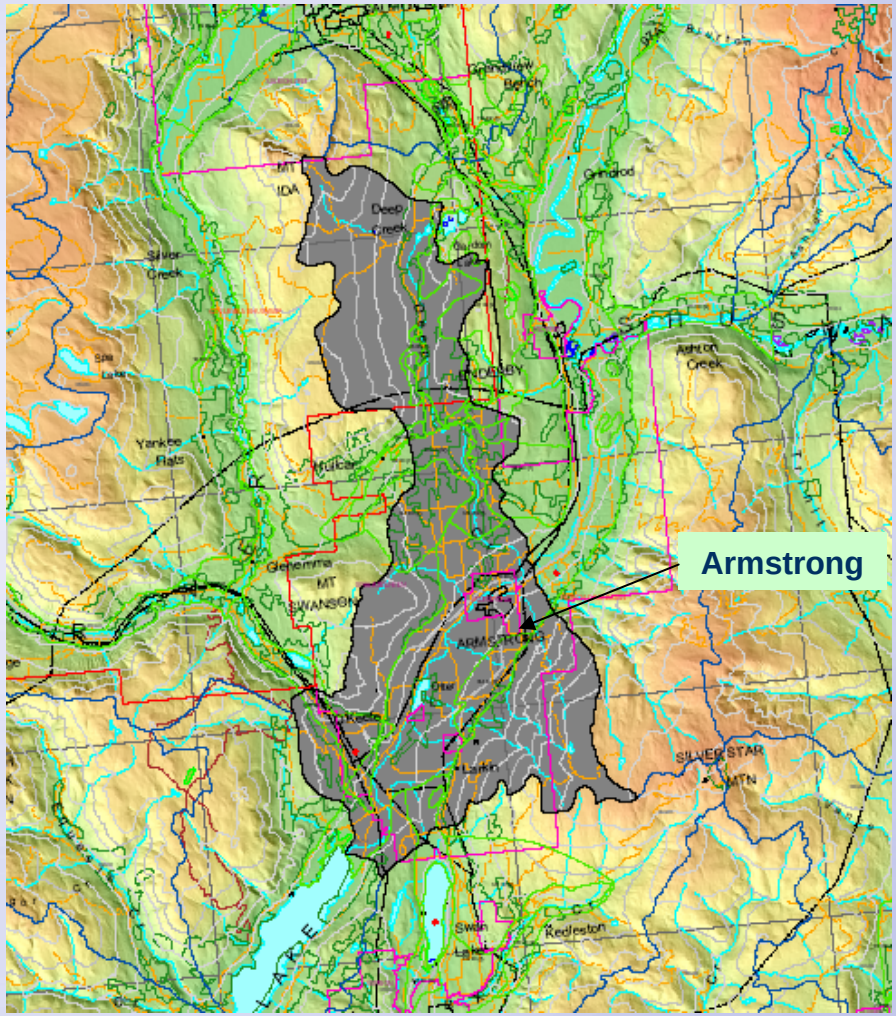
NOGWCA study location

Deep Creek Watershed

- ~300 sq. Km
- Flows to Okanagan Lake
- Snow dominated hydrology
- ~435 mm avg. ann. Precip (valley bottom nr. Armstrong)
- Land Use
  - City of Armstrong & Township of Spallumcheen
  - industrial
  - agriculture (forage/livestock)
  - forestry (hill slope)



From Trina Stewart

Partners & Roles

- Agriculture Canada – WSEP Funding
- Spallumcheen Township - Administration
- UBC-Okanagan – Numerical Modeling
- Geological Survey of Canada – Land Use Allocation Model
- Ministry of Environment – Database Development, Water Quality, Project Management and Funding

- Other contributors: Manitoba Geological Survey, Golder Associates
- Significant in-kind contributions from all partners

Background

1970's Exploration Program

- Part of Canada – British Columbia Basin Agreement (1974)
- Drilling and seismic survey in L. Deep Cr & O'Keefe valley
- 5 major aquifers, low to high potential yields
- "Underflow" to Okanagan Lake

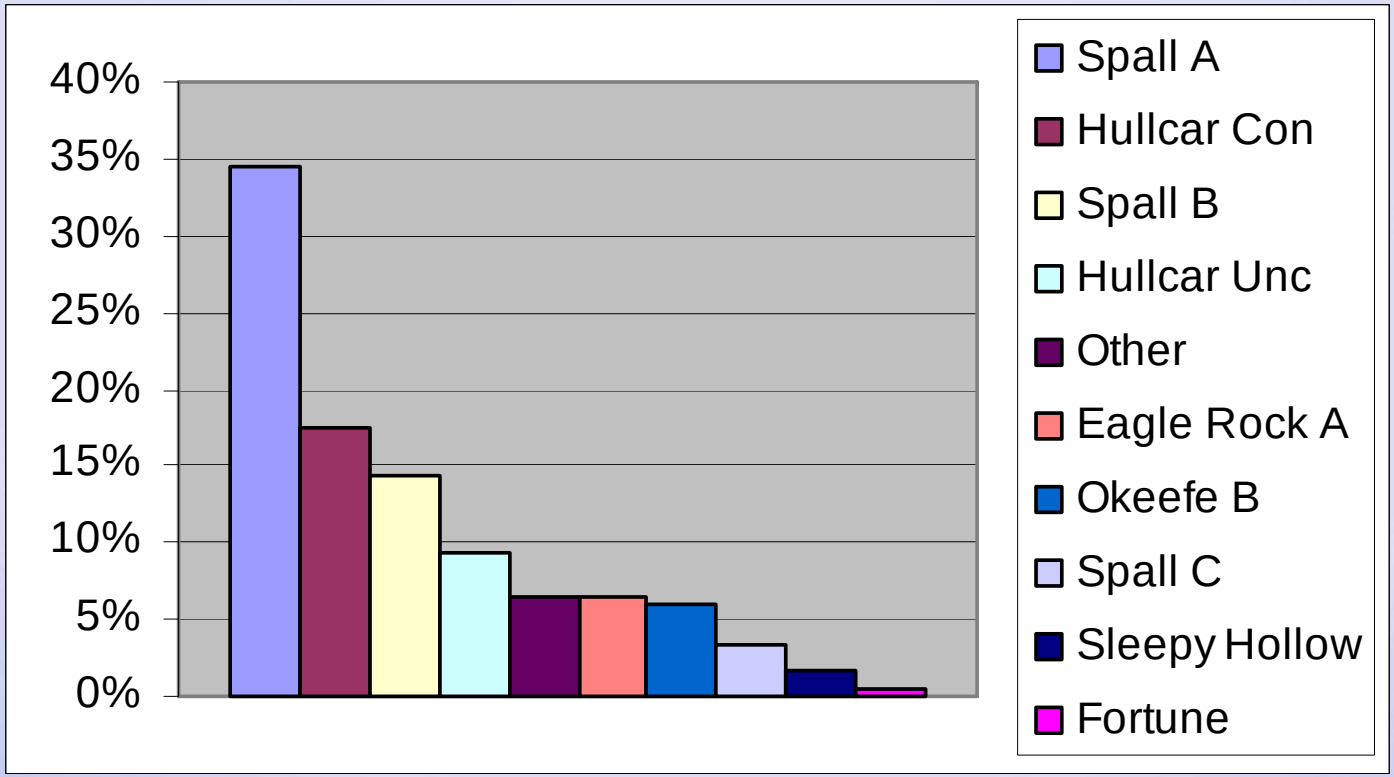
  ~ 95 Litres / sec (range of accuracy +/- one order of magnitude)

Rationale for NOGWCA

- Surface water fully allocated (licensed)
  - increase in water ground water use since 1970's
  - linkage to surface water?
- "Underflow" estimate ~95 L/s equivalent to ~1,500 USgpm
  - low relative to current use
- Water Master Plan – Township of Spallumcheen
- Additional data/tools: wells, reports and models

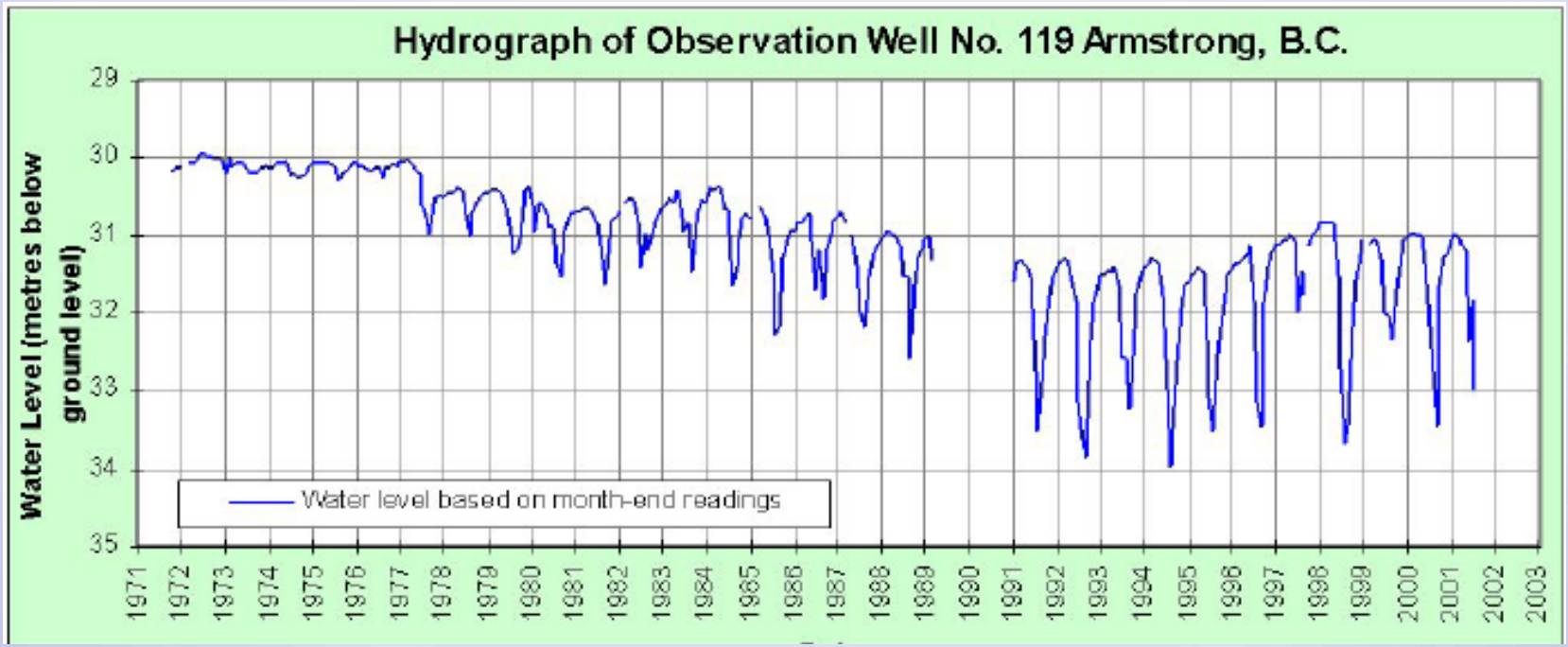
Need NOGWCA for planned growth & achievement of water quality and quantity objectives

Ground Water Use by Aquifer



Data based on preliminary survey results

Spallumcheen A



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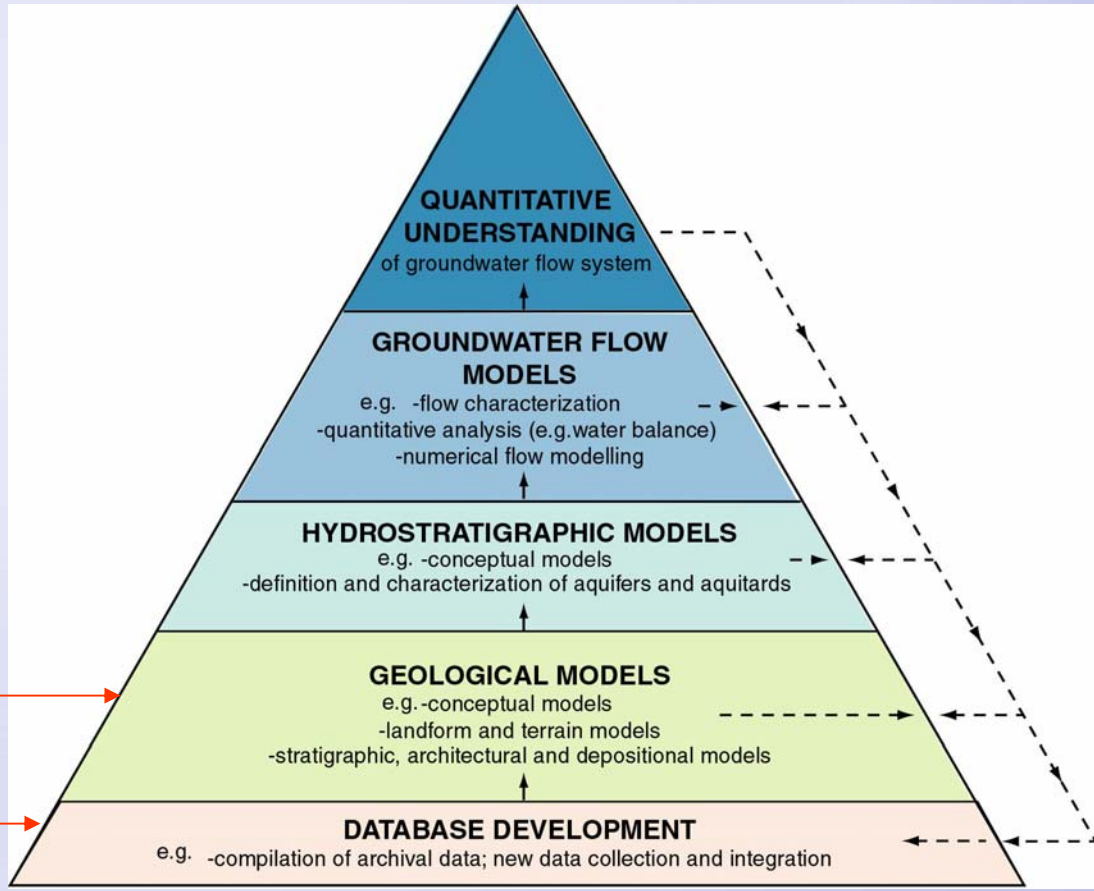
Goal

- Long-term water supply security

Key Objectives

- sustainable use (quantity objective)
- protect vulnerable aquifers (quality objective)

Regional Ground Water Flow Model Components



This presentation

Trina Stewart presentation

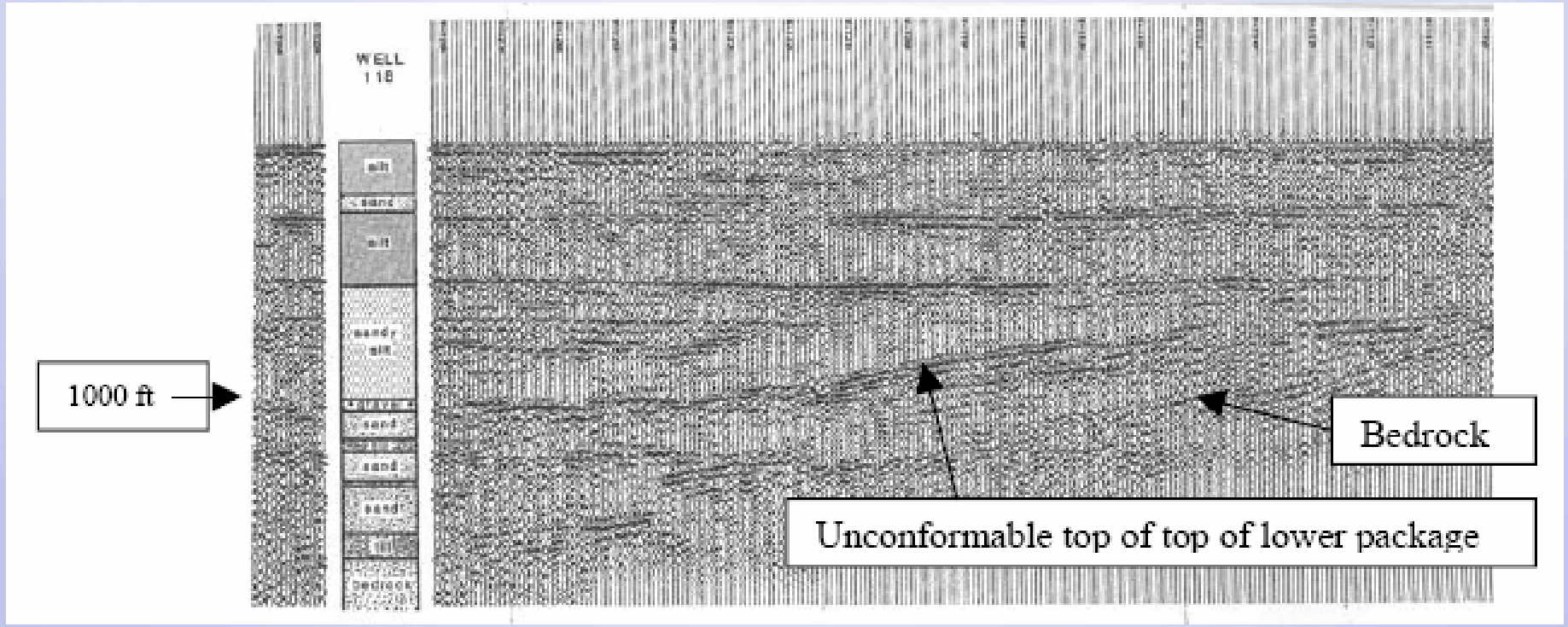
From Sharpe, et al. (2002)

Geological Model

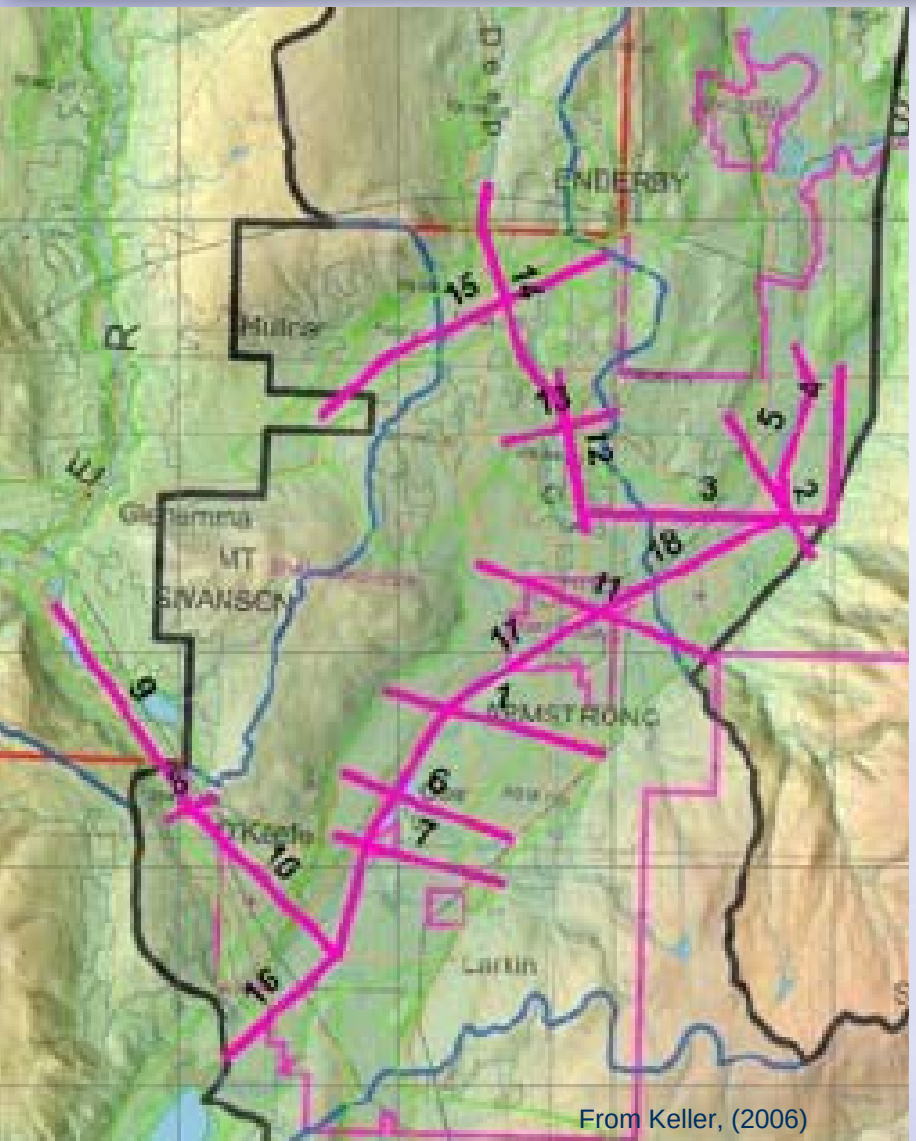
- Aquifer mapping – 17 units (Monahan, 2006)
- Depositional interpretation (Fulton, 2006)
- 3-D model (Keller, 2006)

Cross-section drafted using:

- WELL database update
- 320 well logs
- Seismic data
- Reports & publications



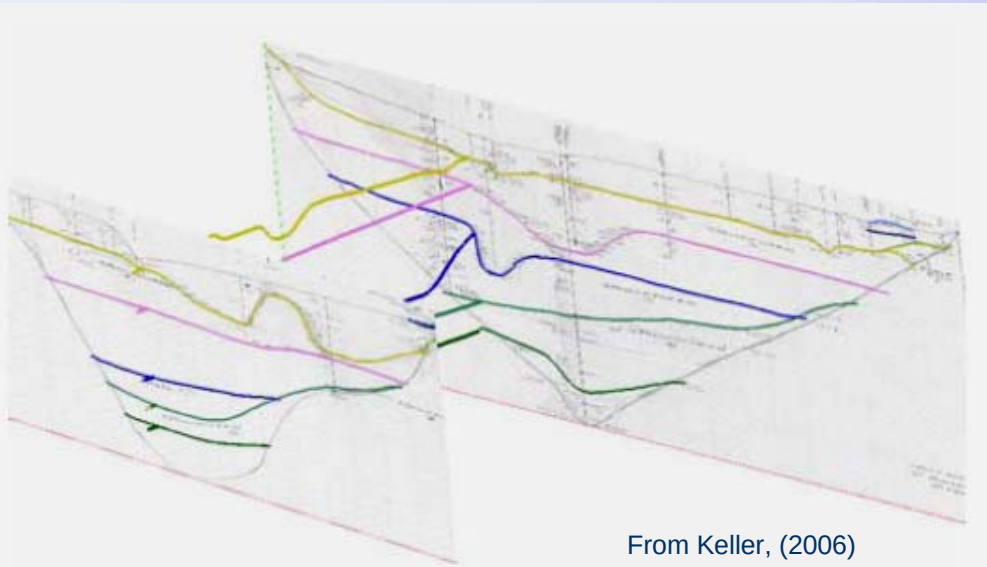
From Pullan, et al. 1992



From Keller, (2006)

18 paper cross sections

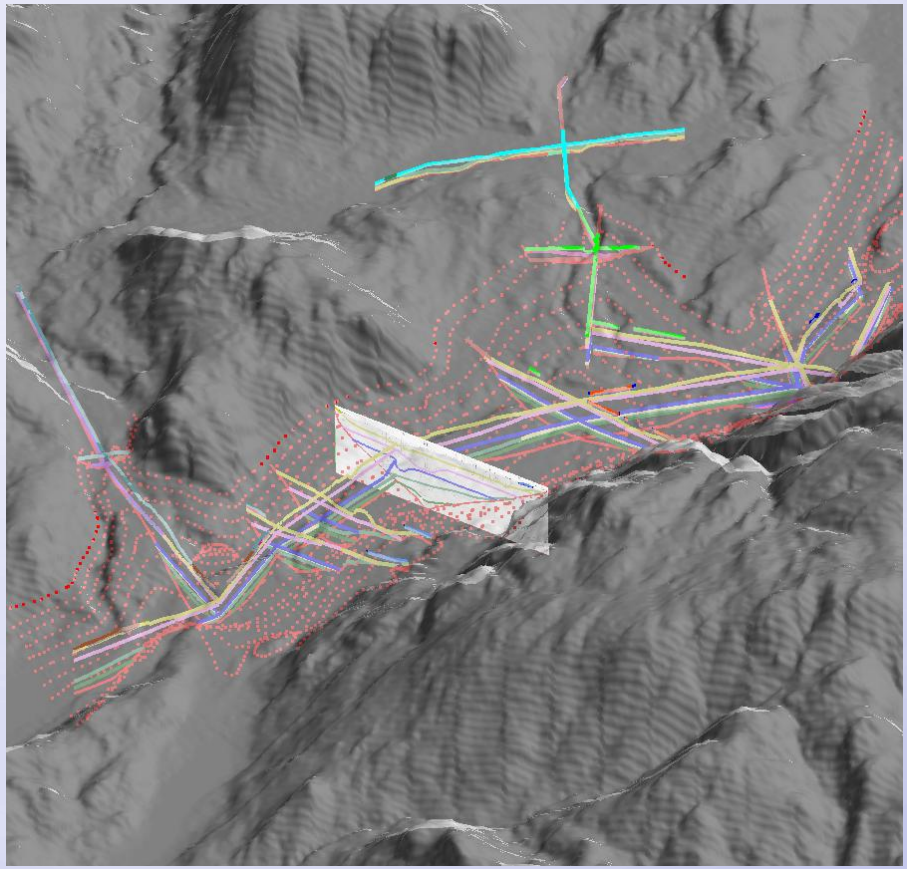
Digitized



From Keller, (2006)

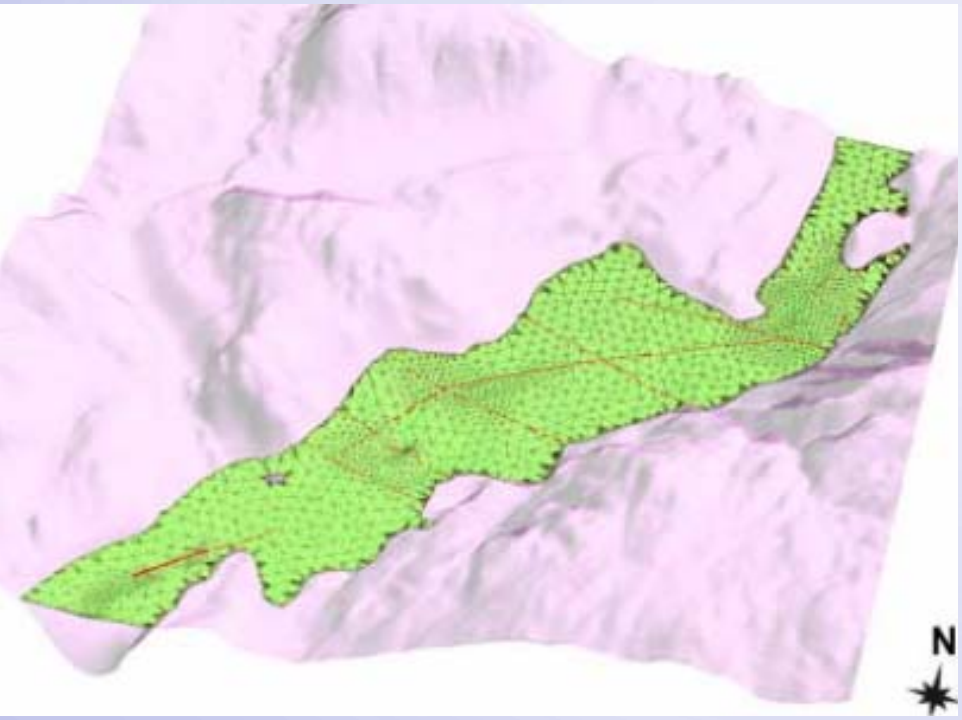
Digitized sections

- spatially represented
- merged with bedrock topography & digital elevation model of land surface



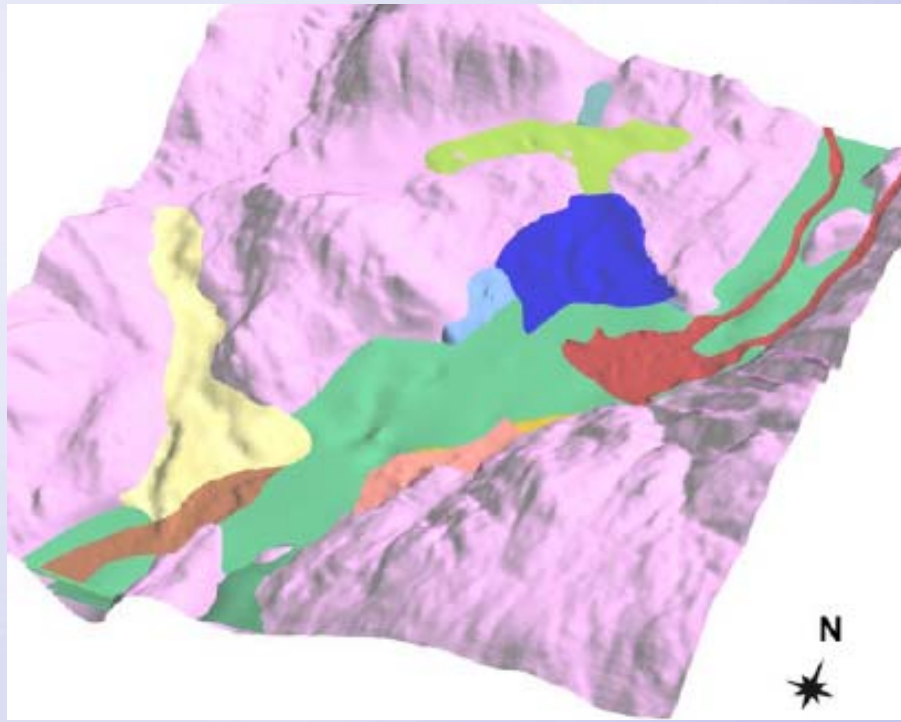
From Keller, (2006)

Aquifer top & bottom using TIN
(Triangulated Irregular Network)



From Keller, (2006)

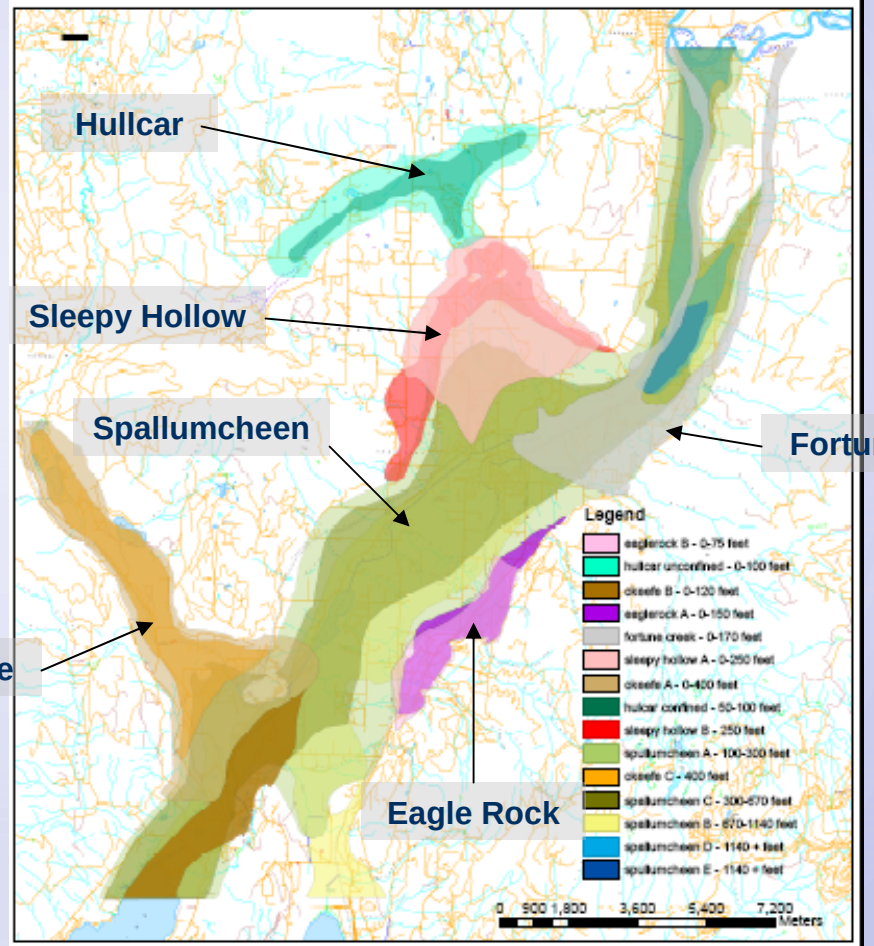
15 Aquifer surface delineated



From Keller, (2006)

15 aquifers mapped

North Okanagan Mapping Project Aquifer Delineations (Monahan, 2006)



Relative stacking of Aquifers

NOAMP Aquifer	Aquifer Depth From Surface (ft)	Aquifer Maximum Thickness (ft)	Material
Spallumcheen A	100 - 300	300	Fine Sand Silt and Clay
Spallumcheen B	670-1140	300	Sand and Gravel
Spallumcheen C	300-670	500	Gravel and Silt
Spallumcheen D	1140+	unknown	Sand and Gravel
Spallumcheen E	1140+	unknown	Sand and Gravel
O'Keefe A	0	400	Sand and Gravel Silt and Clay
O'Keefe B	0	120	Sand and Gravel
O'Keefe C	400	100	Sand and Gravel
Eagle Rock A	0	150	Outwash lake drift Sand and Gravel
Eagle Rock B	0	75	Sand and Gravel
Fortune Creek	0	170	Sand and Gravel
Sleepy Hollow A	0	250	Sand and Gravel
Sleepy Hollow B	250	100	Sand and Gravel
Hullcar Unconfined	0	100	Sand and Gravel
Hullcar Confined	50-100	75	Sand and Gravel

By Trina Stewart from Monahan (2006)

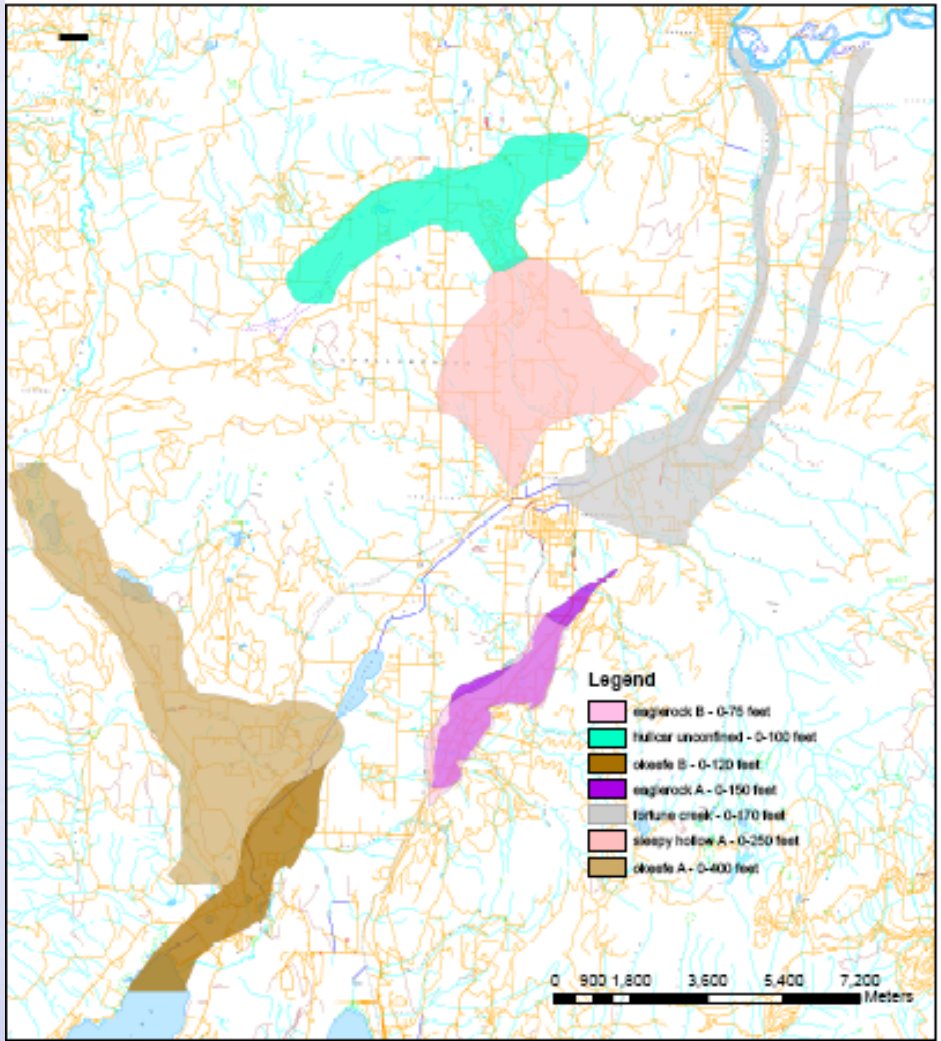
Shallow Aquifers

(< 300 ft)

Potentially more vulnerable to land use

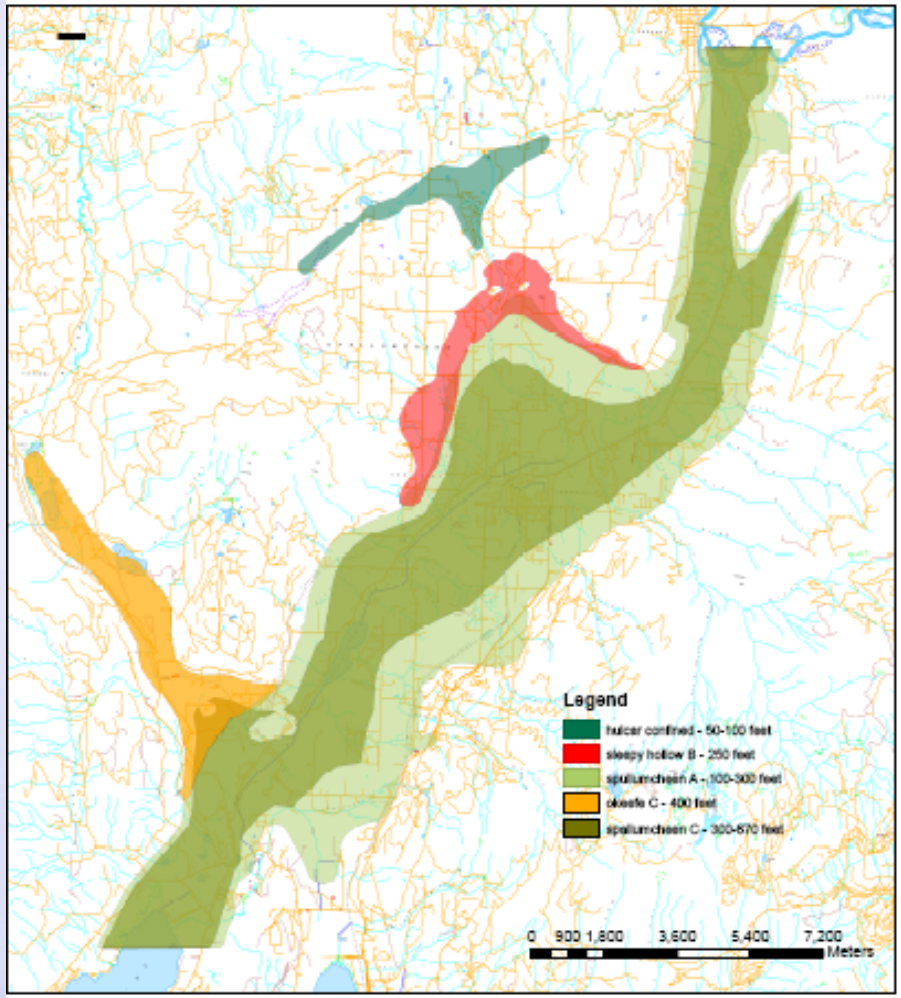
Potential for interaction with surface water

North Okanagan Mapping Project Aquifer Delineations (Monahan, 2006)
Surface Aquifers



Moderate Depth Aquifers
(300 to < 670 ft)

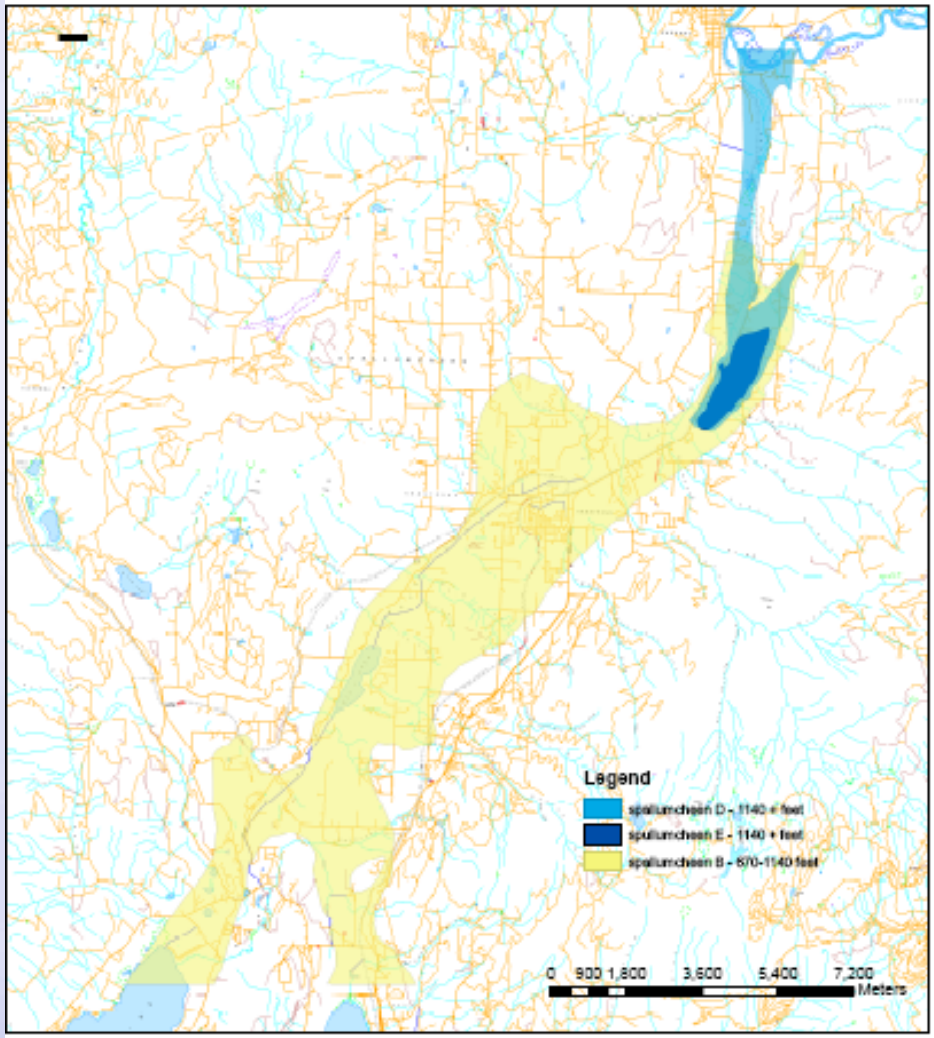
North Okanagan Mapping Project Aquifer Delineations (Monahan, 2006)
Moderate Depth Aquifers



Deep Aquifers
(670 to 1140+ ft)

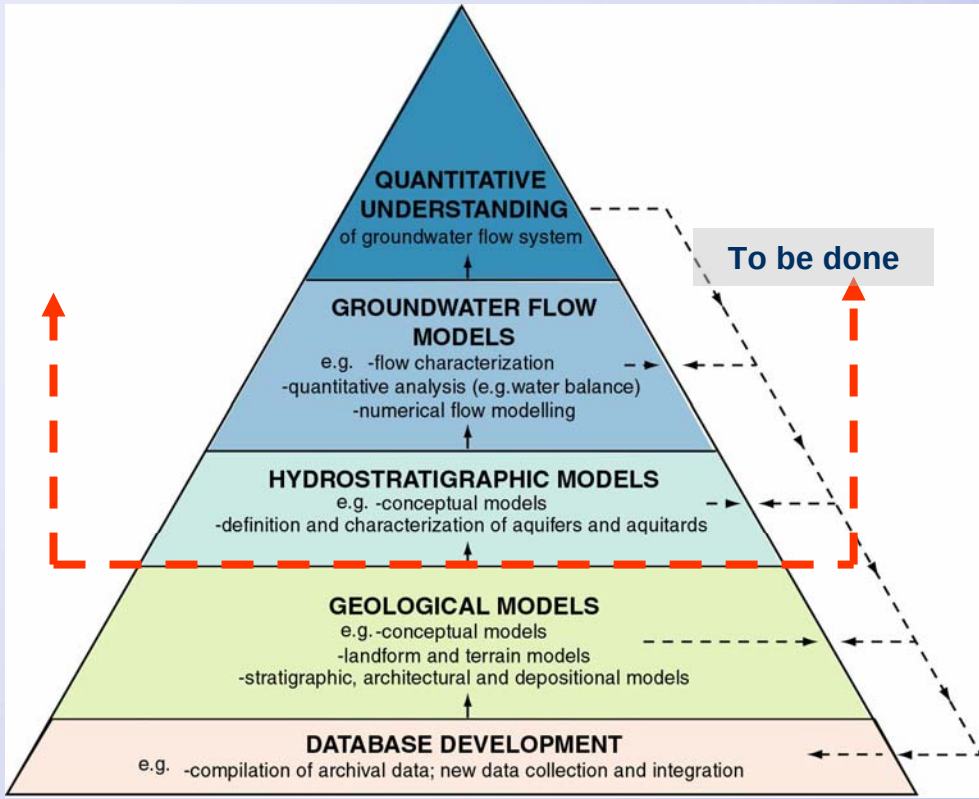
Fewer wells – greater uncertainty

North Okanagan Mapping Project Aquifer Delineations (Monahan, 2006)
Deep Aquifers



UBC – Okanagan Numerical Modeling

- Post-doctoral fellow re-hired
- Numerical modeling
  - Regional ground water flow
  - Interaction
    - between aquifers
    - shallow aquifers & surface water
    - recharge
  - Water budget
  - Constrained by insufficient data?
  - Completion by March 2008



Modified from original by Sharpe, et al. (2002)

Other related work

- Fracture mapping (McElhanney, 2006)
- Pumping test analyses (Kenny, 2006)
- Exploration / monitoring well
- Well water level survey & monitoring
- Hydrometric stations
- Land Use Allocation Model

Thank you!

Questions?

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Ground Water Portal:
http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/index.html