

Ottawa County  
Comprehensive Water Resources Study

# Hydro-geologic Issues in Ottawa County

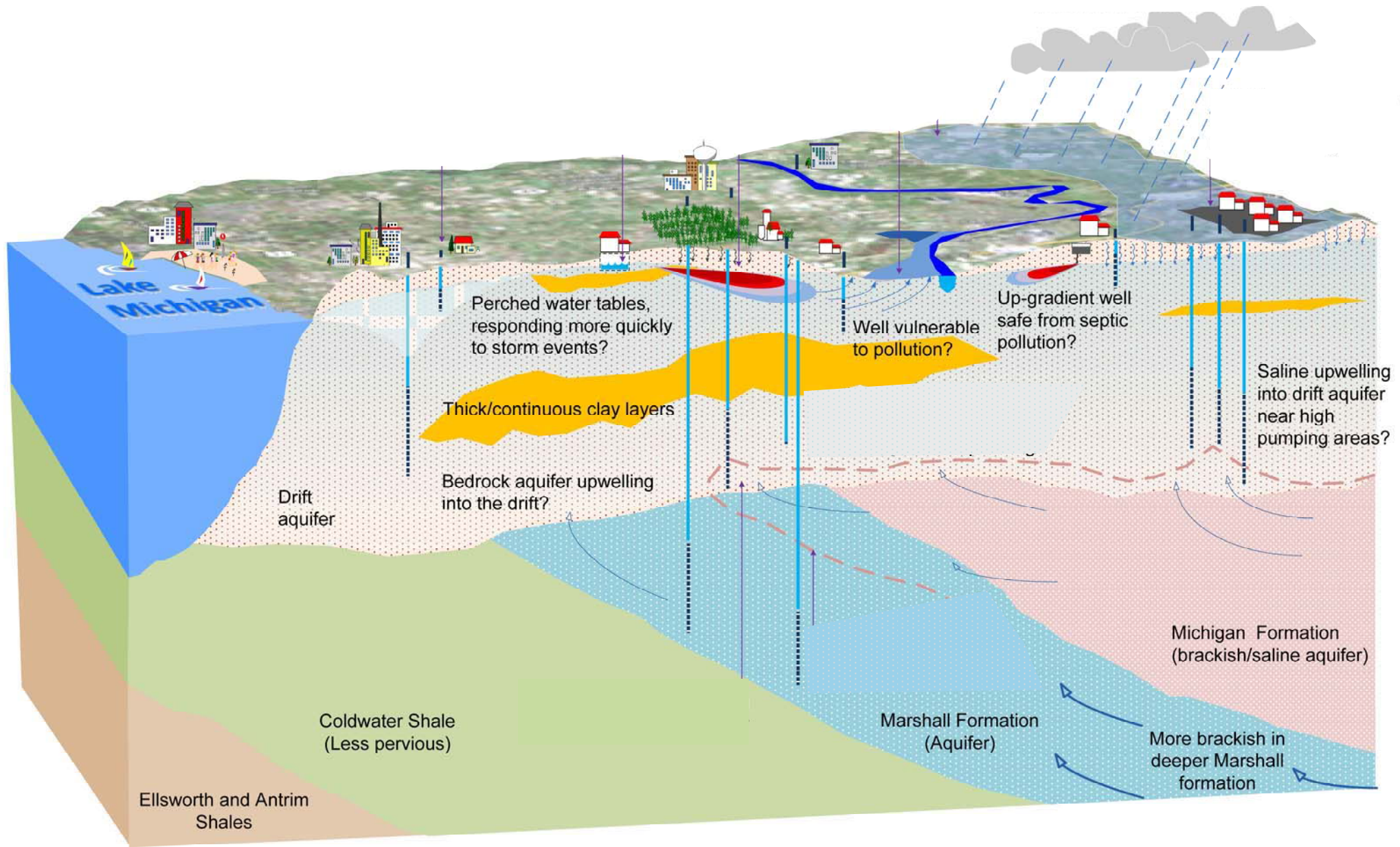


Image courtesy of MSU

# Groundwater Quantity – Sustainability



# Groundwater Quantity - Cause and Effect

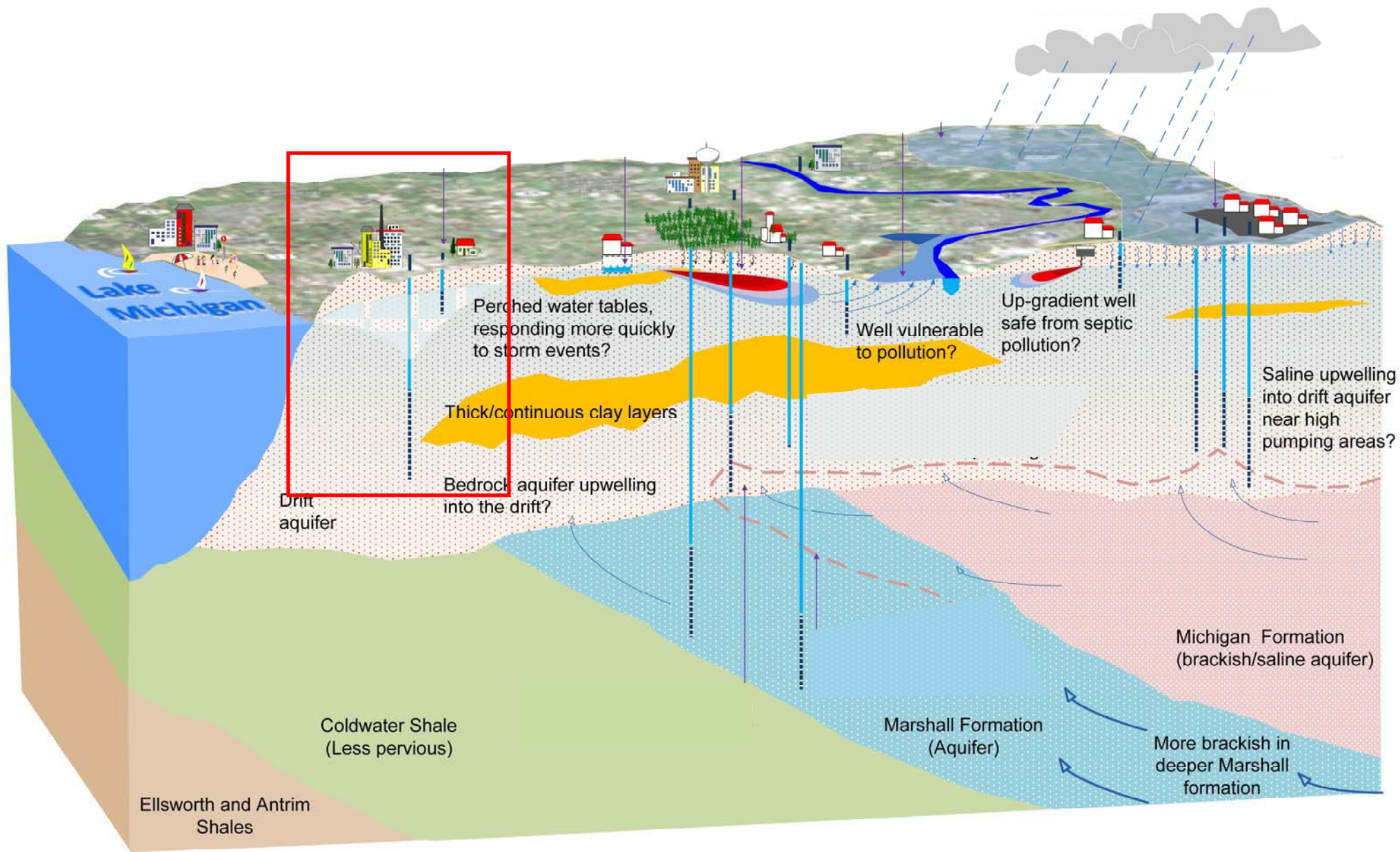


Image courtesy of MSU

Ensure that aquifers are able to sustain current and future water withdrawal demands and minimize adverse effects on surface water levels



# Groundwater Quality – Naturally Occurring Contaminants



# Groundwater Quality – Cause and Effect

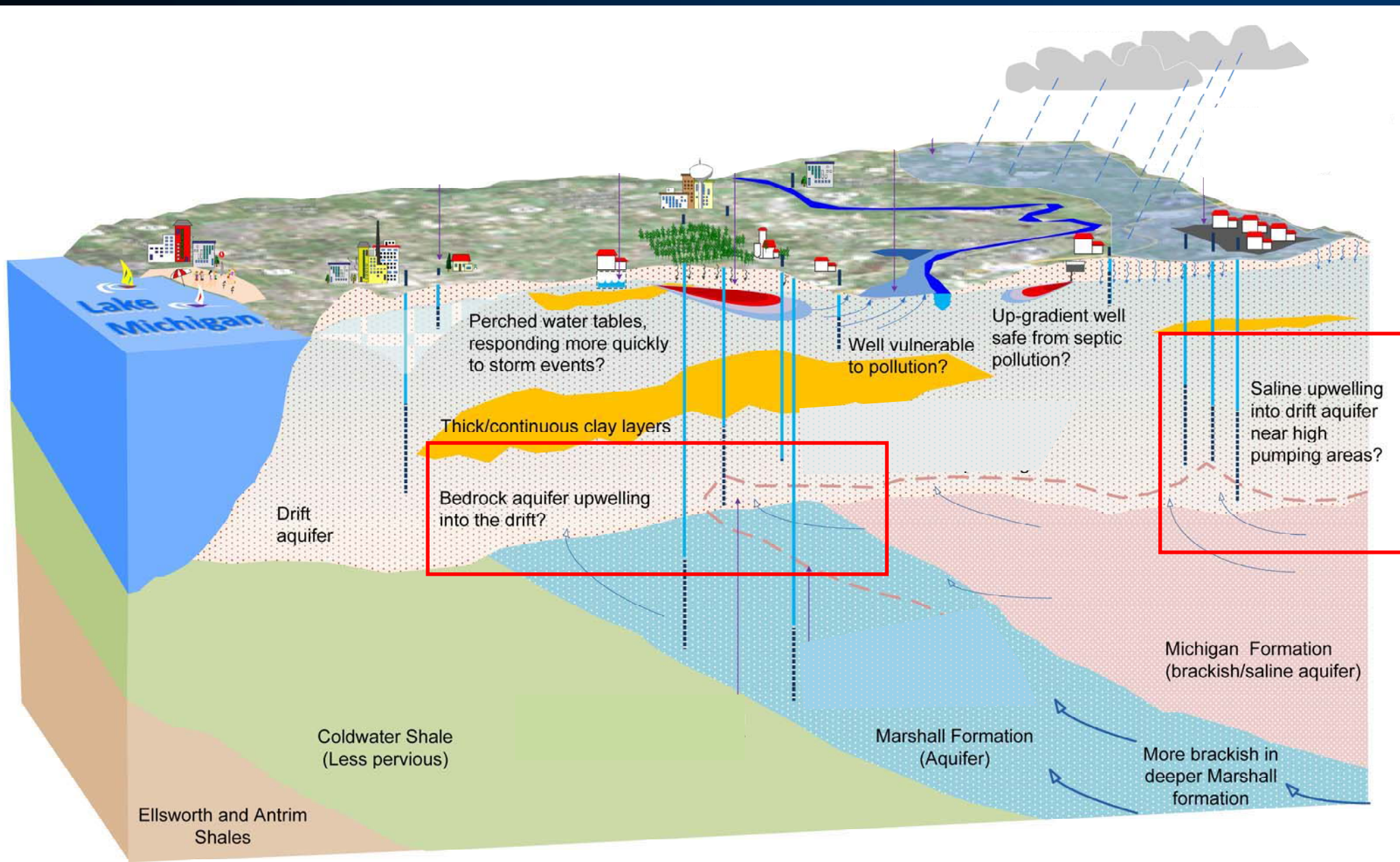


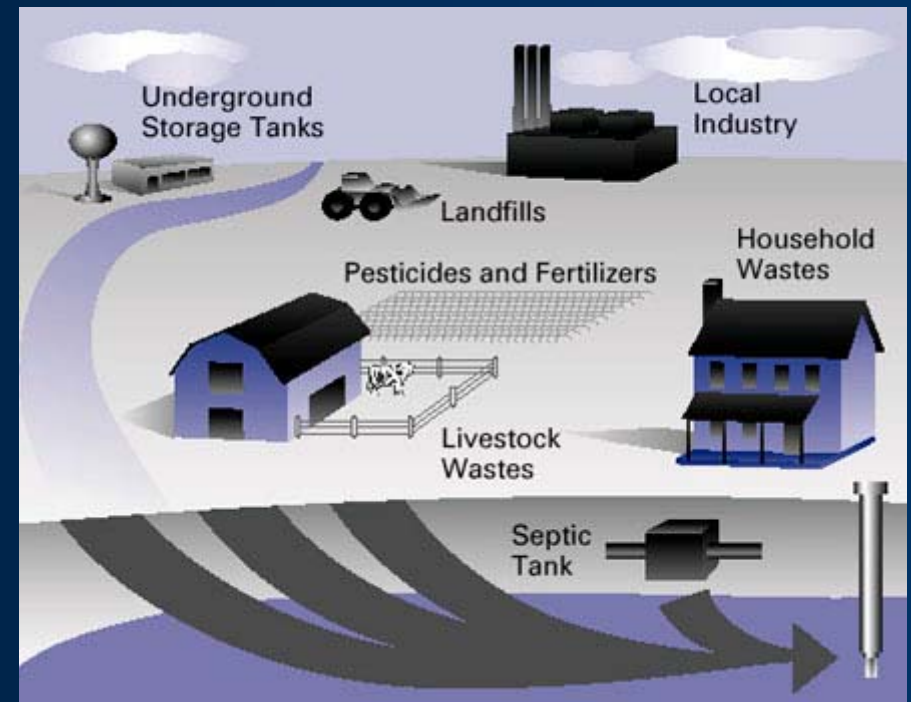
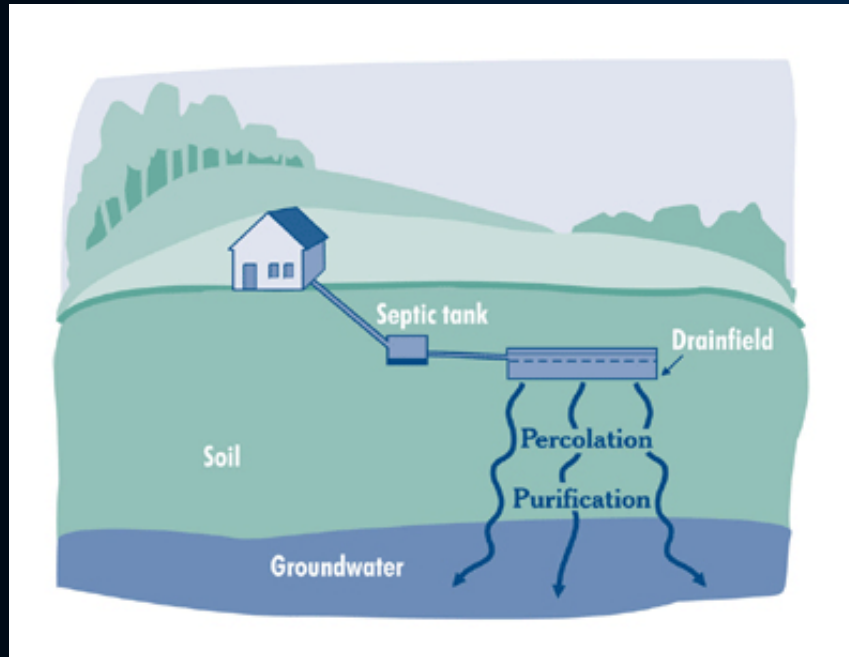
Image courtesy of MSU

# Groundwater Quality - Objective

Minimize the impact of water withdrawals on domestic well quality



# Groundwater Quality – Man Made Contaminants



# Groundwater Quality – Cause and Effect

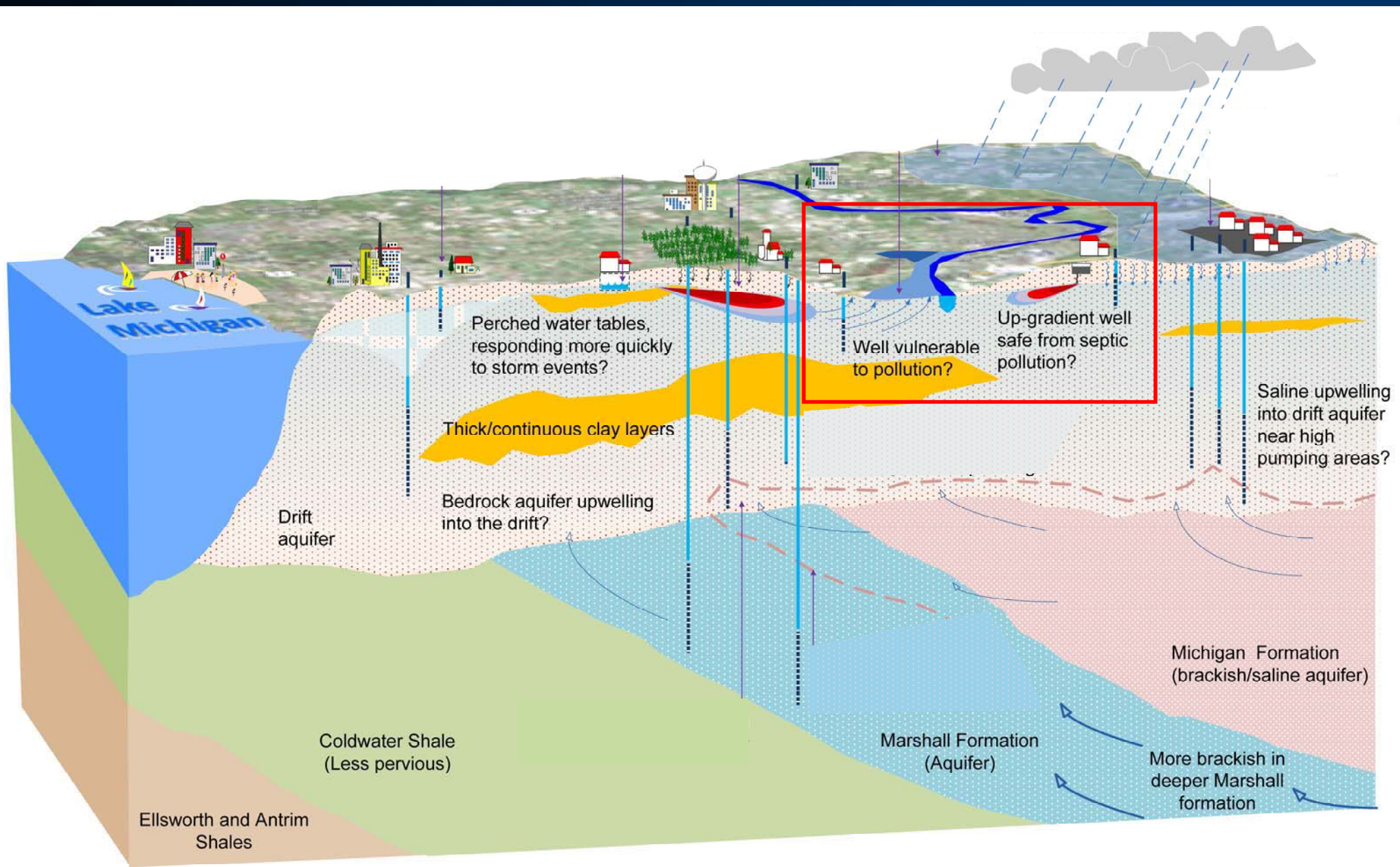
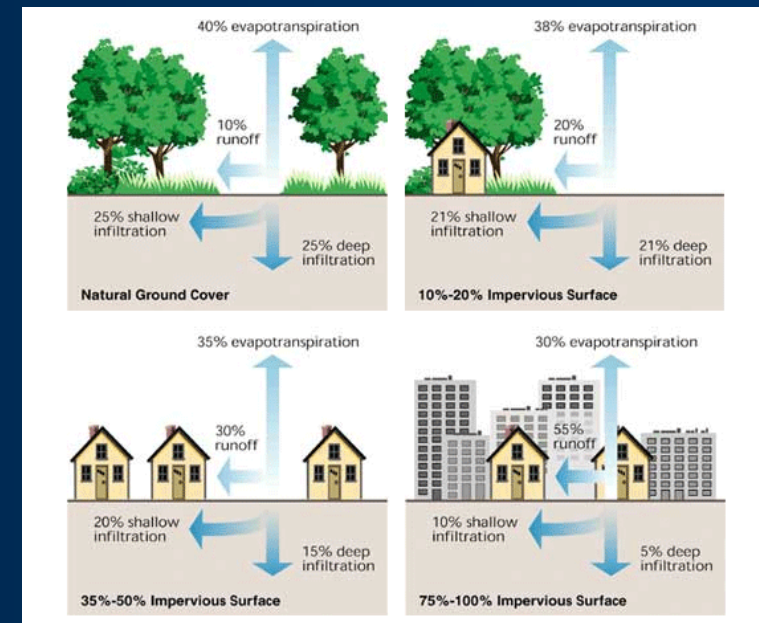
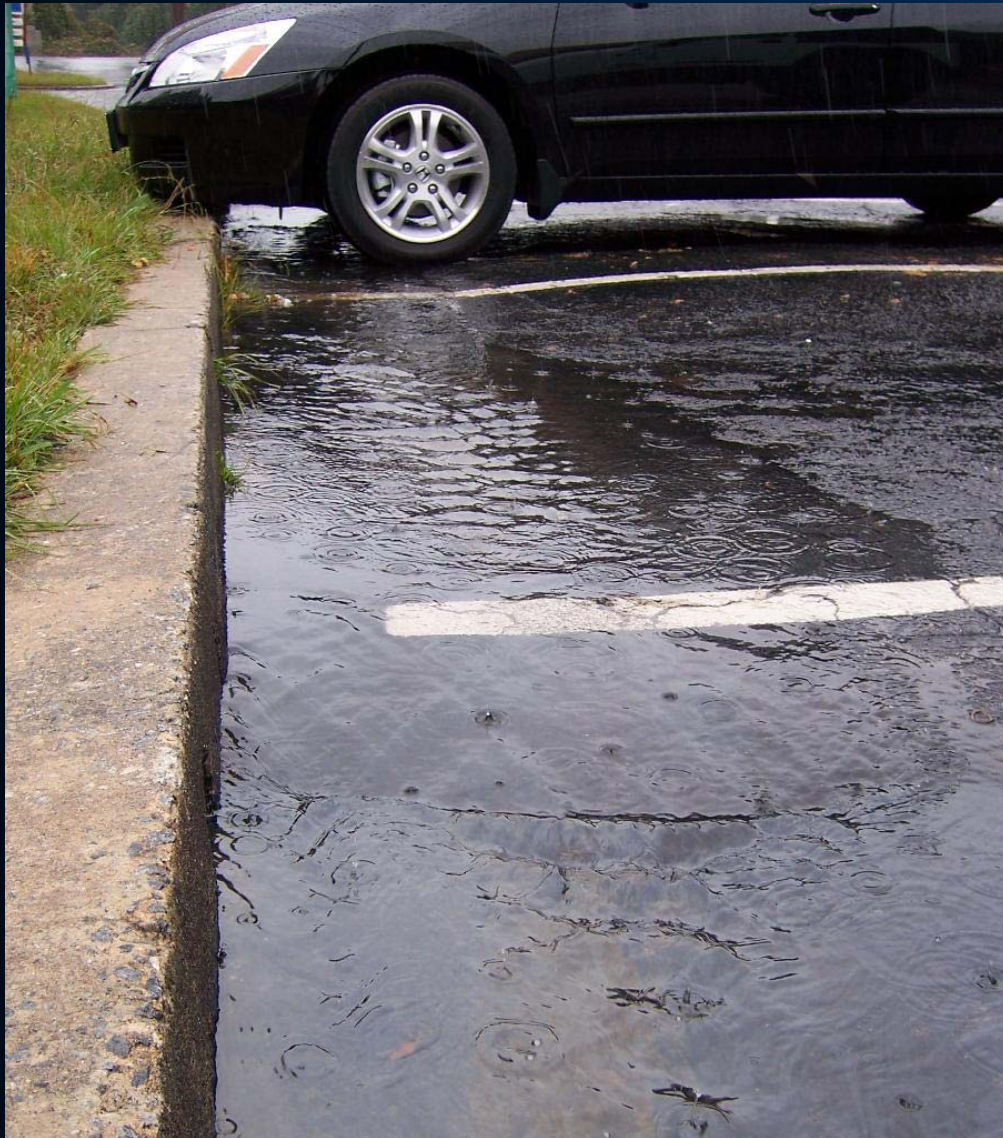


Image courtesy of MSU

# Groundwater Quality - Objective

Minimize the potential infiltration of wastewater contaminants (e.g. nitrates, phosphates, pharmaceuticals, industrial/household chemicals) in areas relying on septic systems and domestic wells

# Groundwater Water Quantity and Quality – Impervious Service



# Groundwater Water Quantity and Quality – Cause and Effect

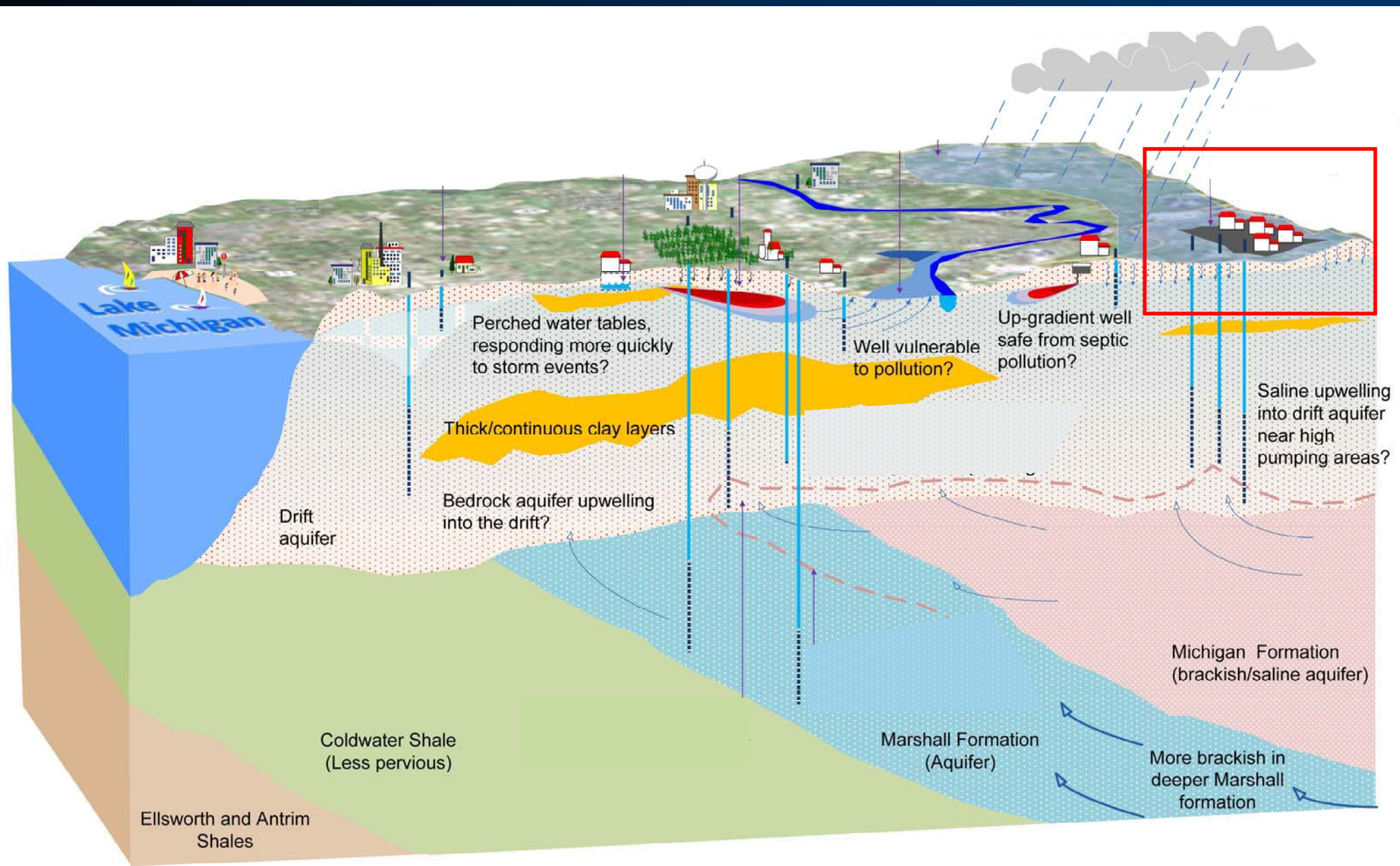


Image courtesy of MSU

# Groundwater Water Quantity and Quality – Objective

Minimize the hydrologic impacts of impervious surfaces on groundwater recharge and surface water quality



# Elevated Water Table Levels – Structural Damage



# Elevated Water Table Levels – Cause and Effect

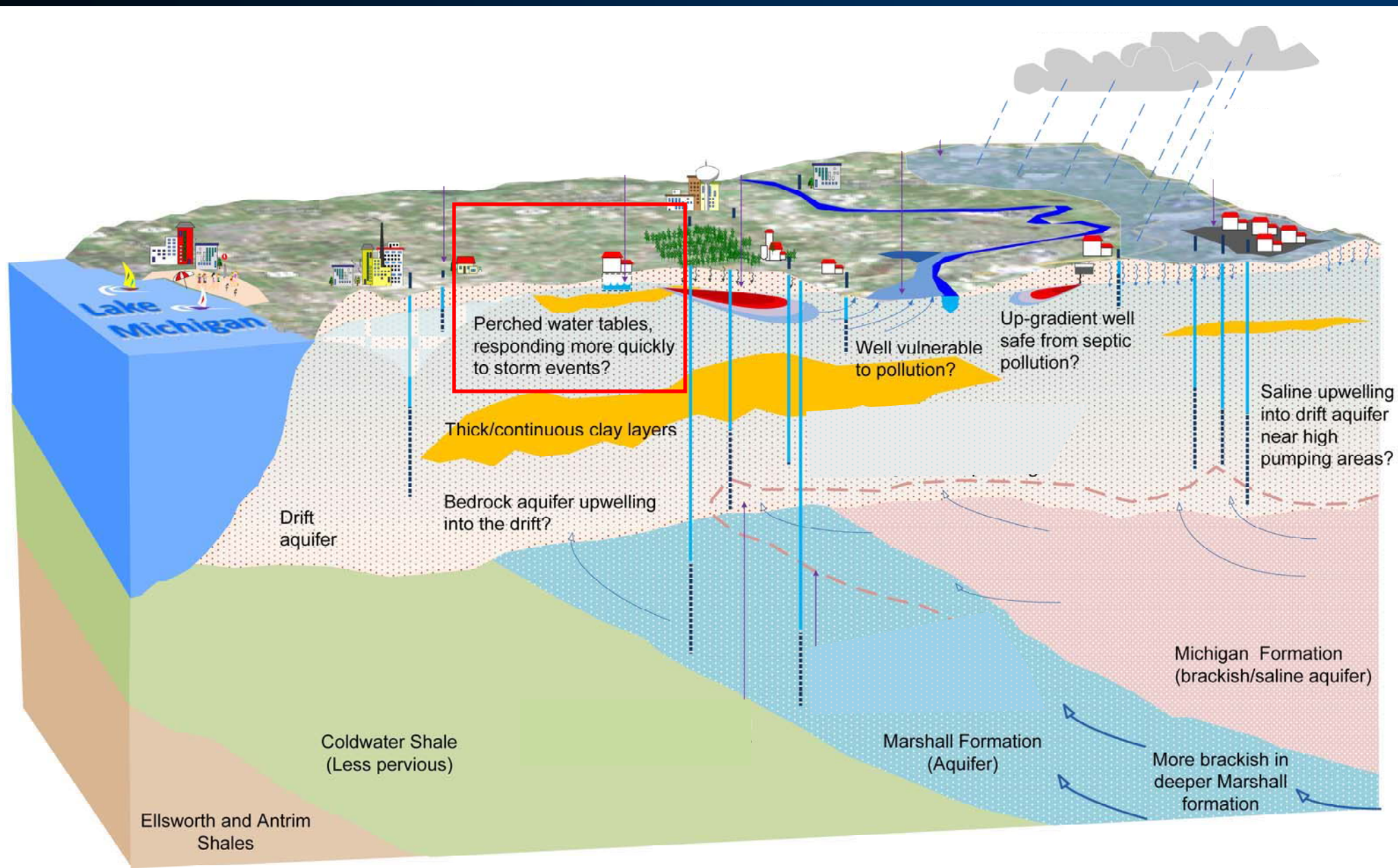


Image courtesy of MSU



# Elevated Water Table Levels - Objective

Prevent the negative effects of elevated water table levels on new development



# Hydro-geologic Issues in Ottawa County

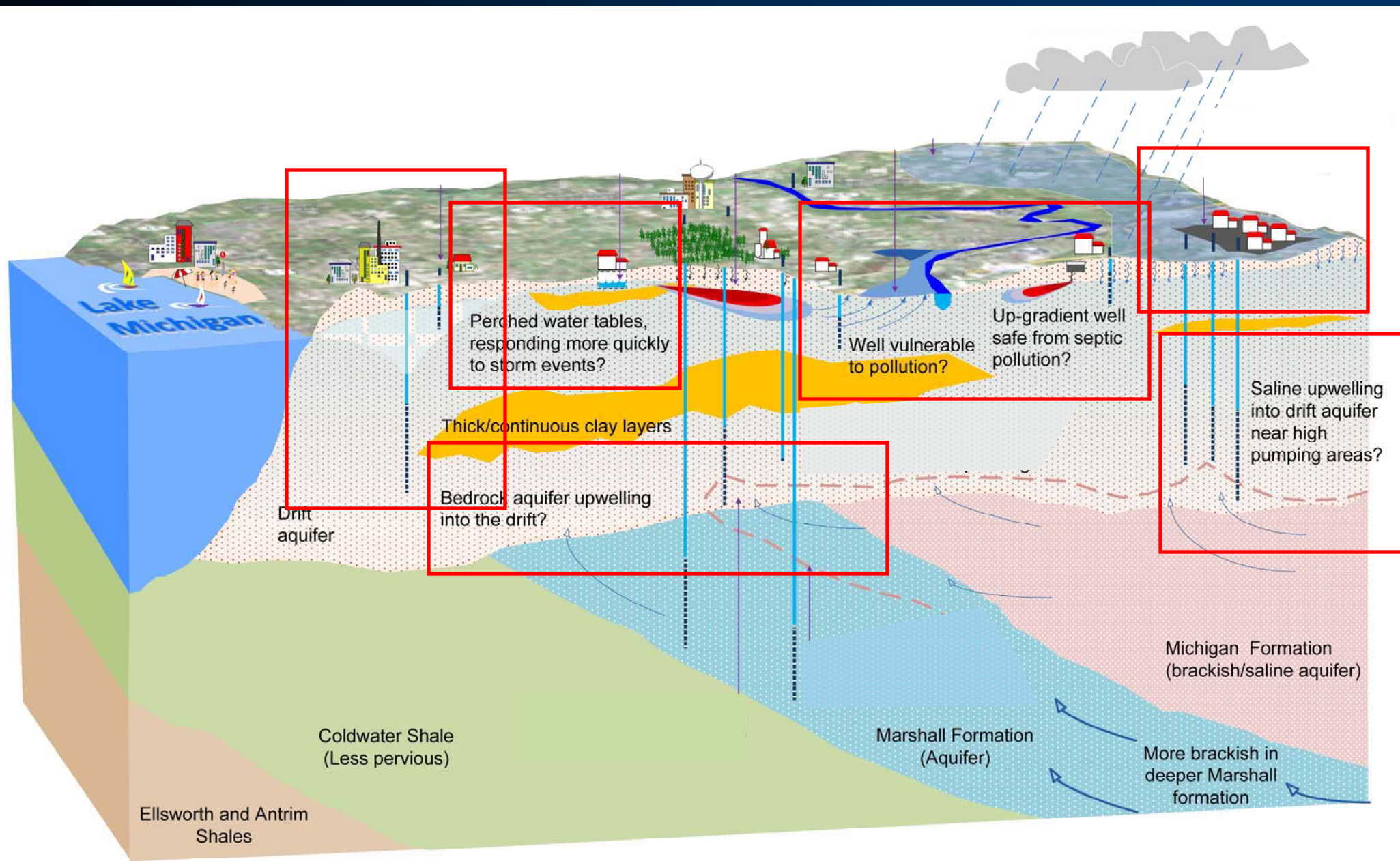


Image courtesy of MSU

# Project History

## First RFP - 2008

Proceeded by a \$1.4 million proposal

## Pre-Bidders Conference

Consensus that more focus is needed

## Individual Follow-up Meetings with Consultants

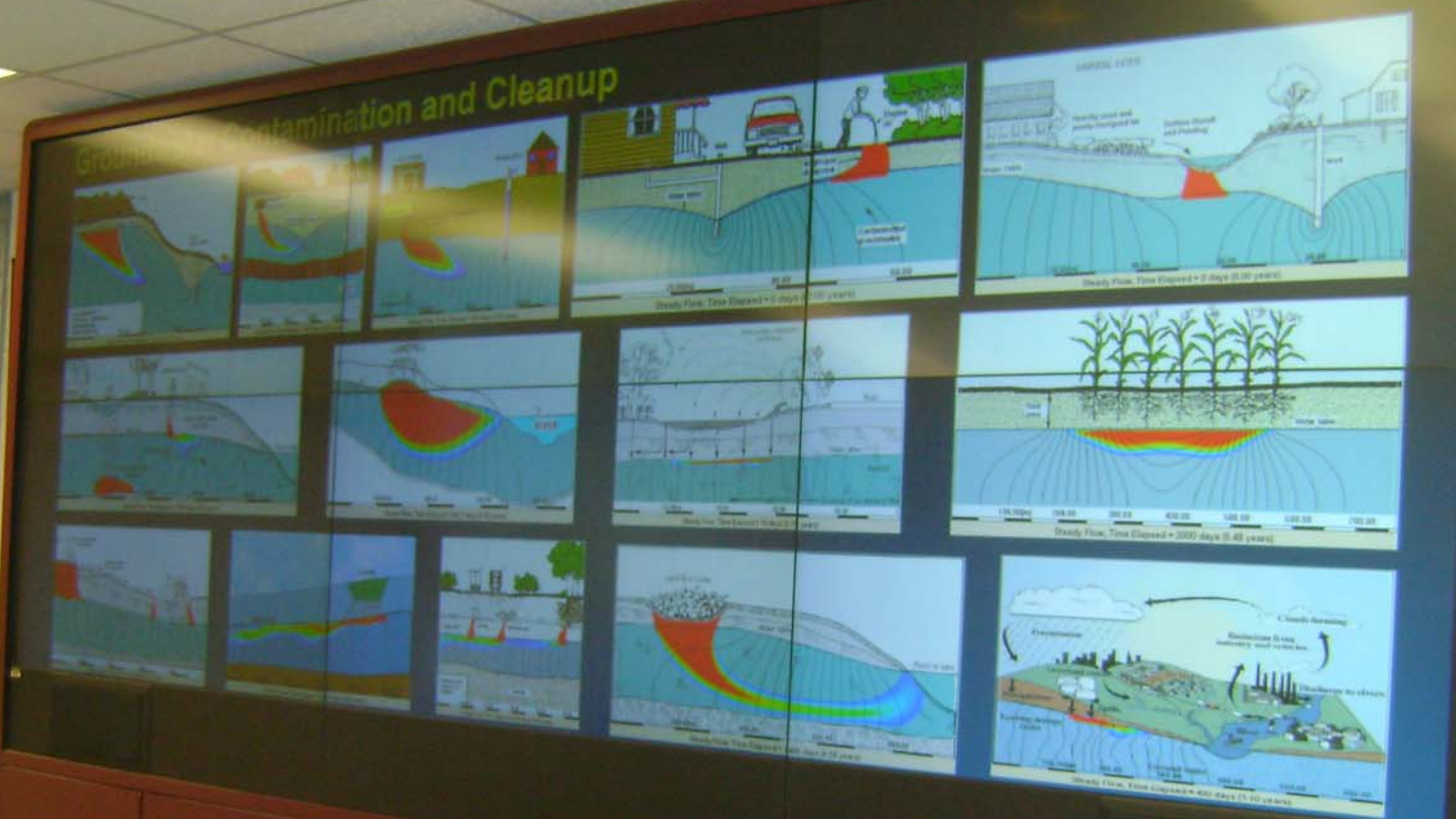
No Consensus on how to focus or accomplish goals

## Second RFP – 2010

Open-ended – propose approach

Eleven proposals received

# Groundwater Contamination and Cleanup

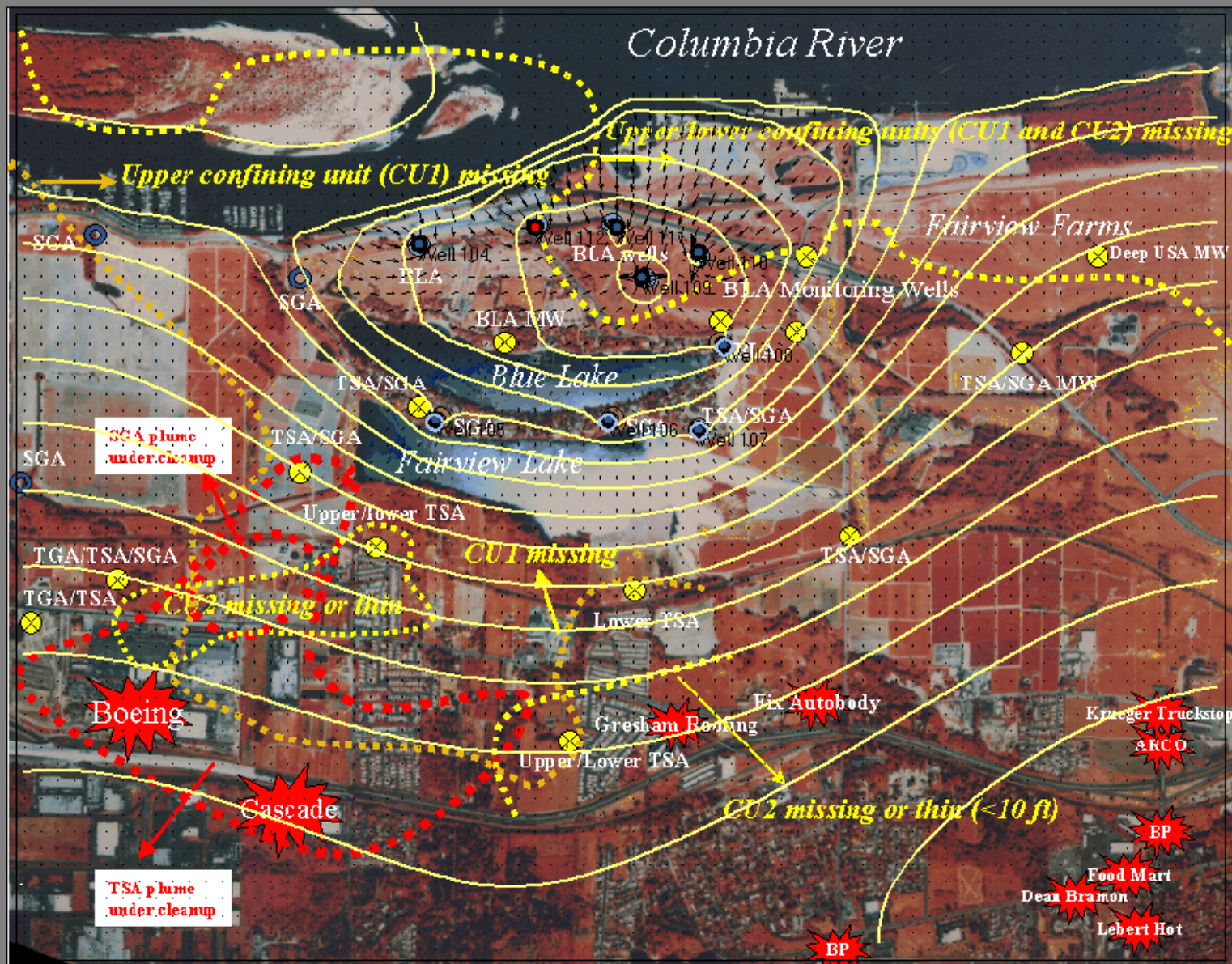


# Contamination Flow Modeling

Interactive Groundwater 3.0 --> Untitled

File Utility Display Help

Interactive Groundwater 3.0 software interface toolbars including file operations (Open, Save, Print), navigation (Home, Previous, Next, End), and editing tools (Move, Rotate, Scale, etc.).



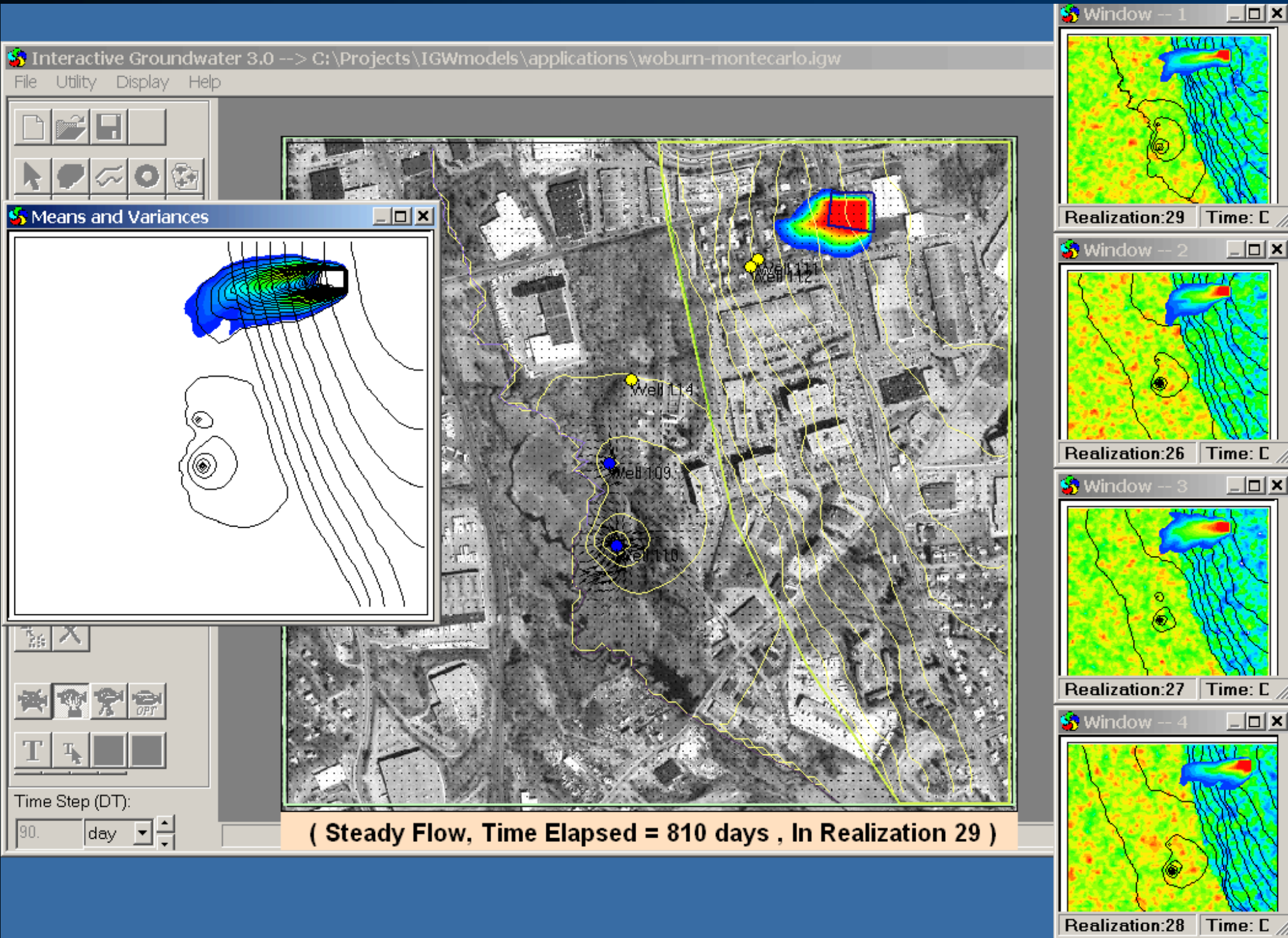
- Monitoring Head and Co
- Monitoring Probability W
- Monitoring Probability A
- Zone Mass Balance

Choose Parameters at Cur

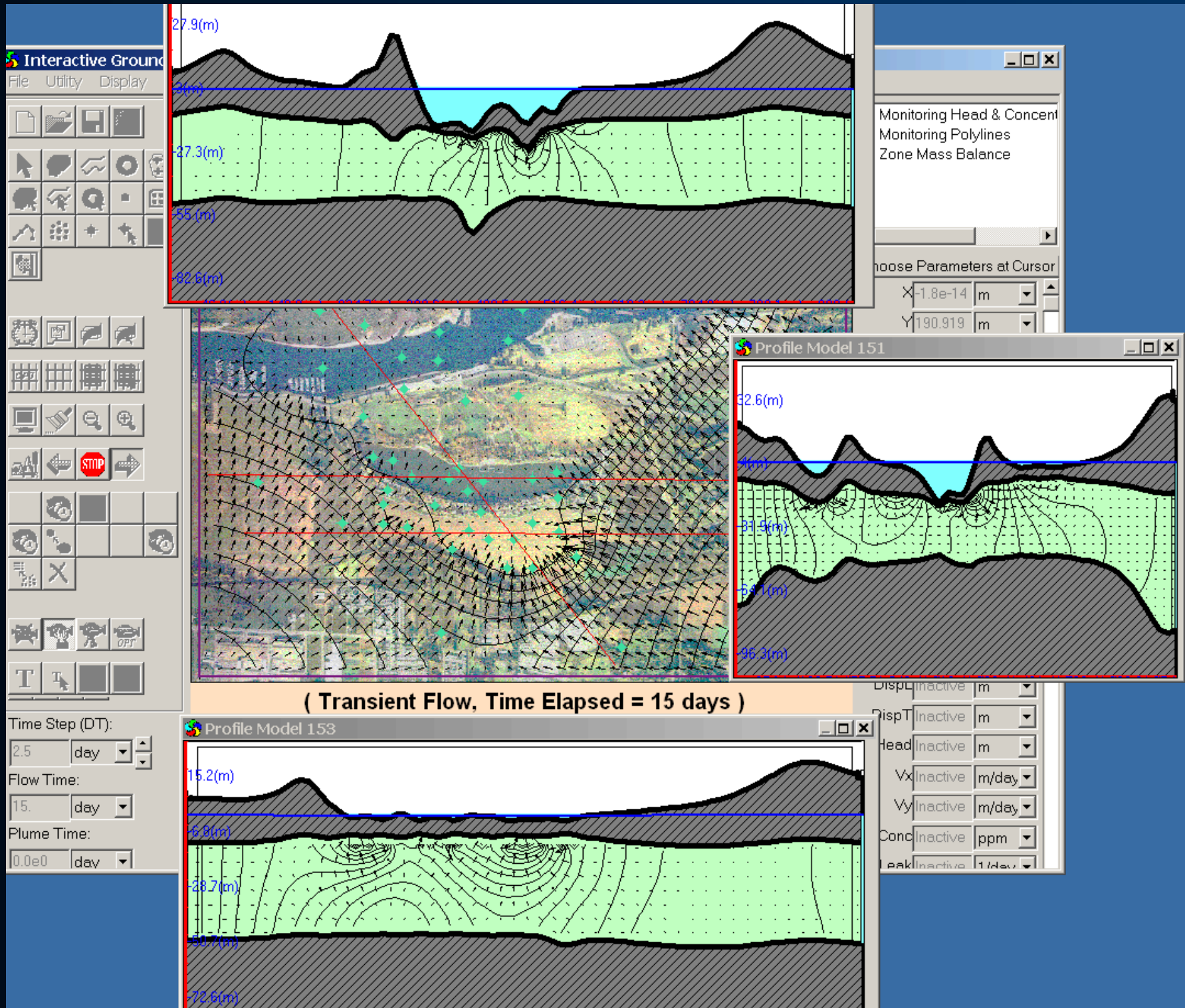
X	9.1093	m
Y	811.166	m
Aq_Top	Inactive	m
Aq_Bot	Inactive	m
Thick	Inactive	m
n	Inactive	
Kx	Inactive	m/day
Tx	Inactive	m <sup>2</sup> /day
Ky/Ky	Inactive	
SS	Inactive	1/m
S	Inactive	
SY	Inactive	
Rech	Inactive	m/day
DispL	Inactive	m
DispT	Inactive	m
Head	Inactive	m
Vx	Inactive	m/day
Vy	Inactive	m/day
Conc	Inactive	ppm
RivLeak	Inactive	1/day
RivHead	Inactive	m
RivBotF	Inactive	m

( Steady Flow, Time Elapsed = -100 days )

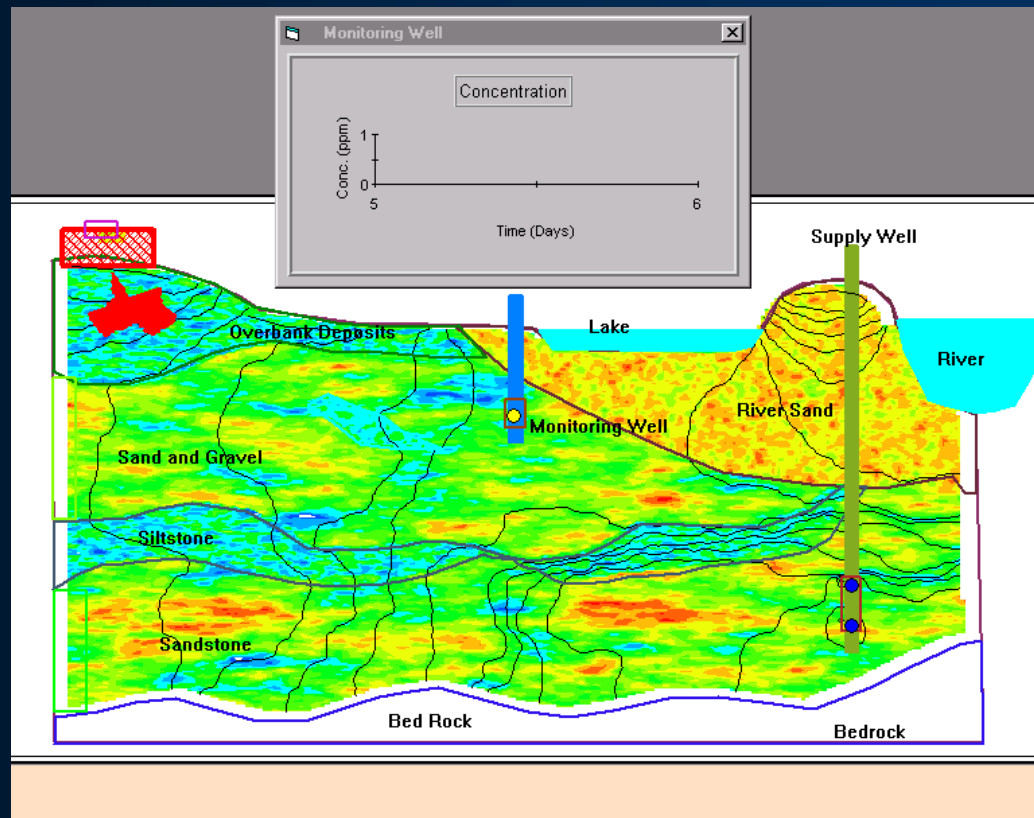
# Flow Pattern from a Contamination Plume



# Ground water modeling



## Particle Transport in an Aquifer System (weblink)







# Consultant Selection

University Institute of Water Research (IWG)

Map groundwater levels and flow directions

Map groundwater recharge areas/capture zones

Map land use, contamination sites, non-point source contamination (e.g. nitrates)

Map aquifer vulnerability to surface contamination or saline (brine) upwelling

Map vulnerability of proposed development to high water table levels

Develop 3-D/interactive and static models for a decision support system



# Questions