

**Coalbed Methane
Natural Gas-in-Coal
and
Groundwater**

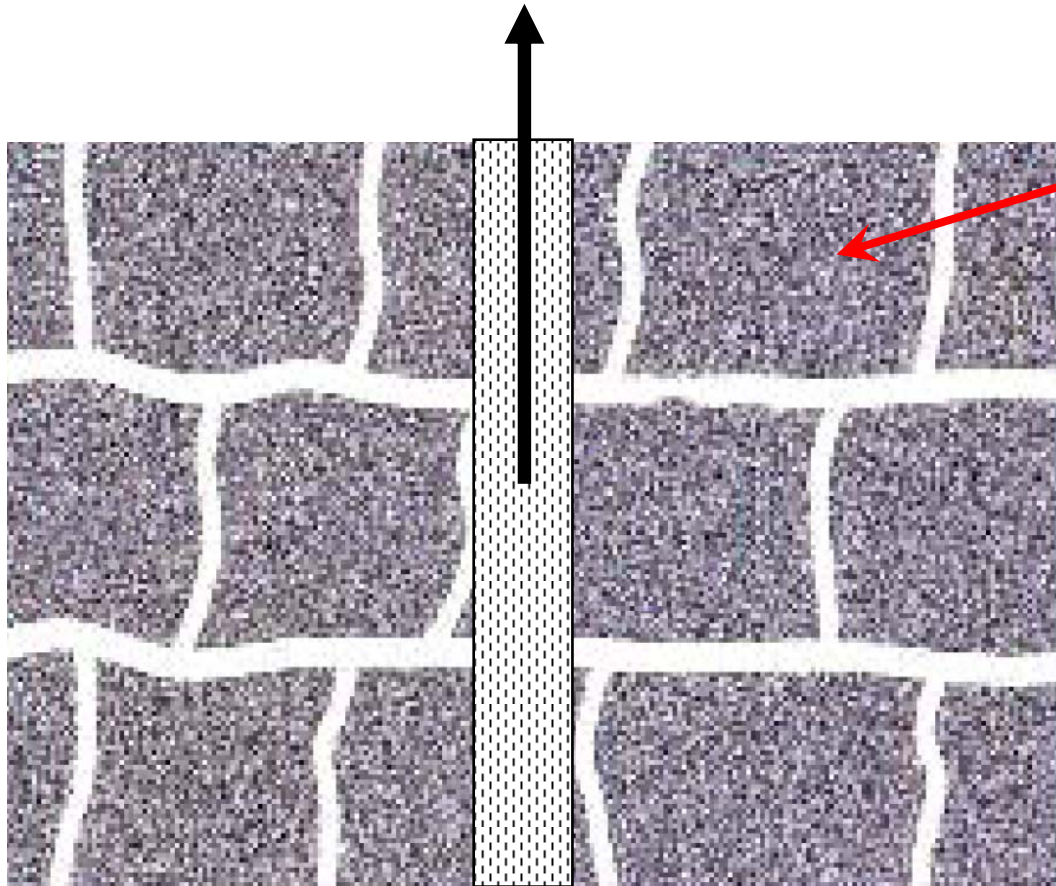
**Alberta Environment
Conference May 2-5, 2006
Nga de la Cruz**

Presentation Outline

- What is CBM / NGC ?
- The Importance of Groundwater
- Protection of Groundwater
 - **Current Policy**
 - **New Approach – Leading the Way**
 - Risk-based approach
 - Standard for Baseline Water-Well Testing
 - Groundwater mapping
 - Monitoring and Research Initiatives

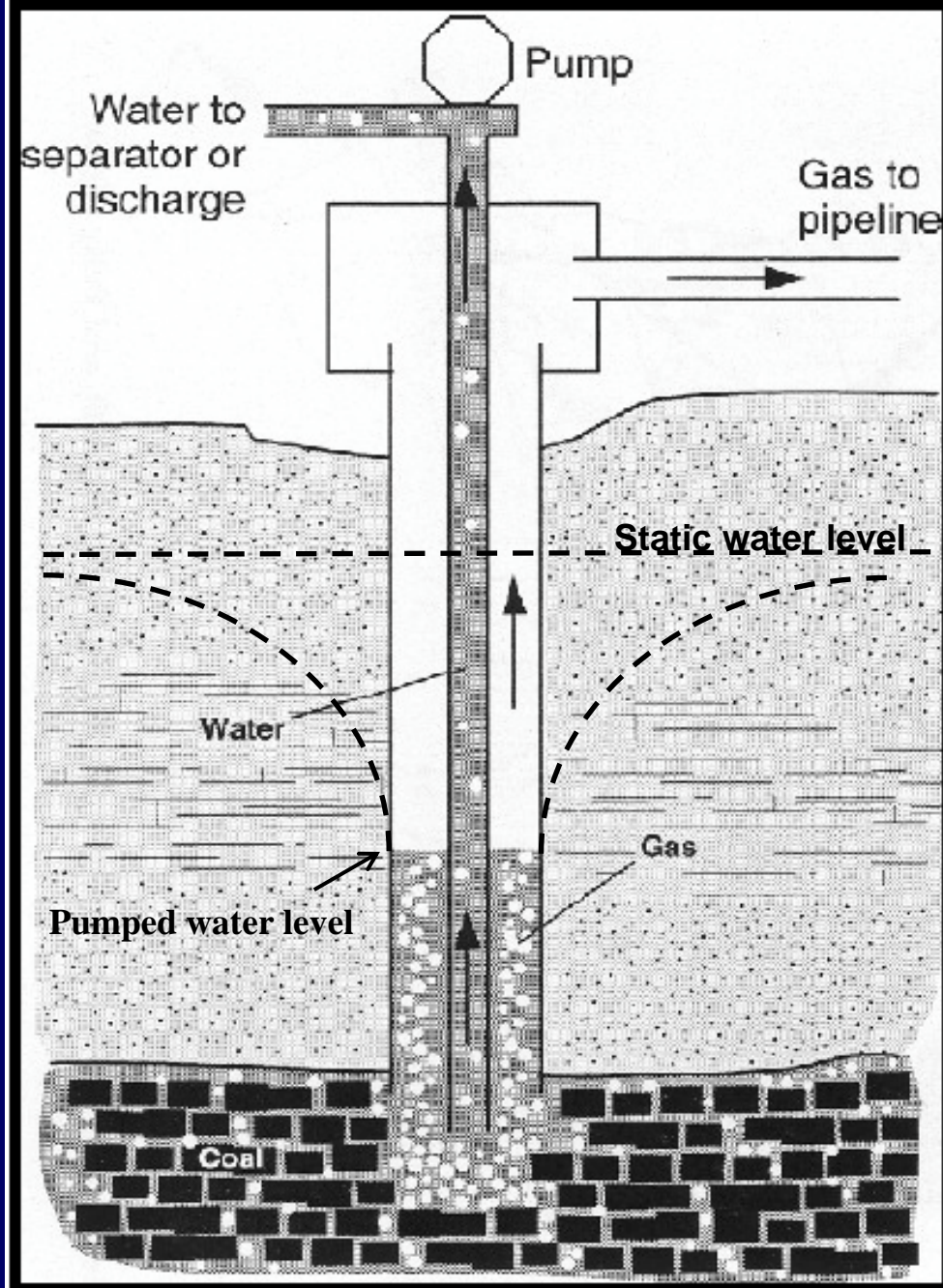
What is CBM / NGC ?

Gas Adsorbed on Coal



Gas adsorbed within
Coal (by pressure)

Fractures (cleats) allow
Gas and water to move
through coal seam



Modified from USGS Fact Sheet FS-123-00

What is CBM / NGC made of ?

- ~ 95 % methane
- some nitrogen and carbon dioxide
- trace amounts of ethane and propane
- No H₂S or liquid hydrocarbons

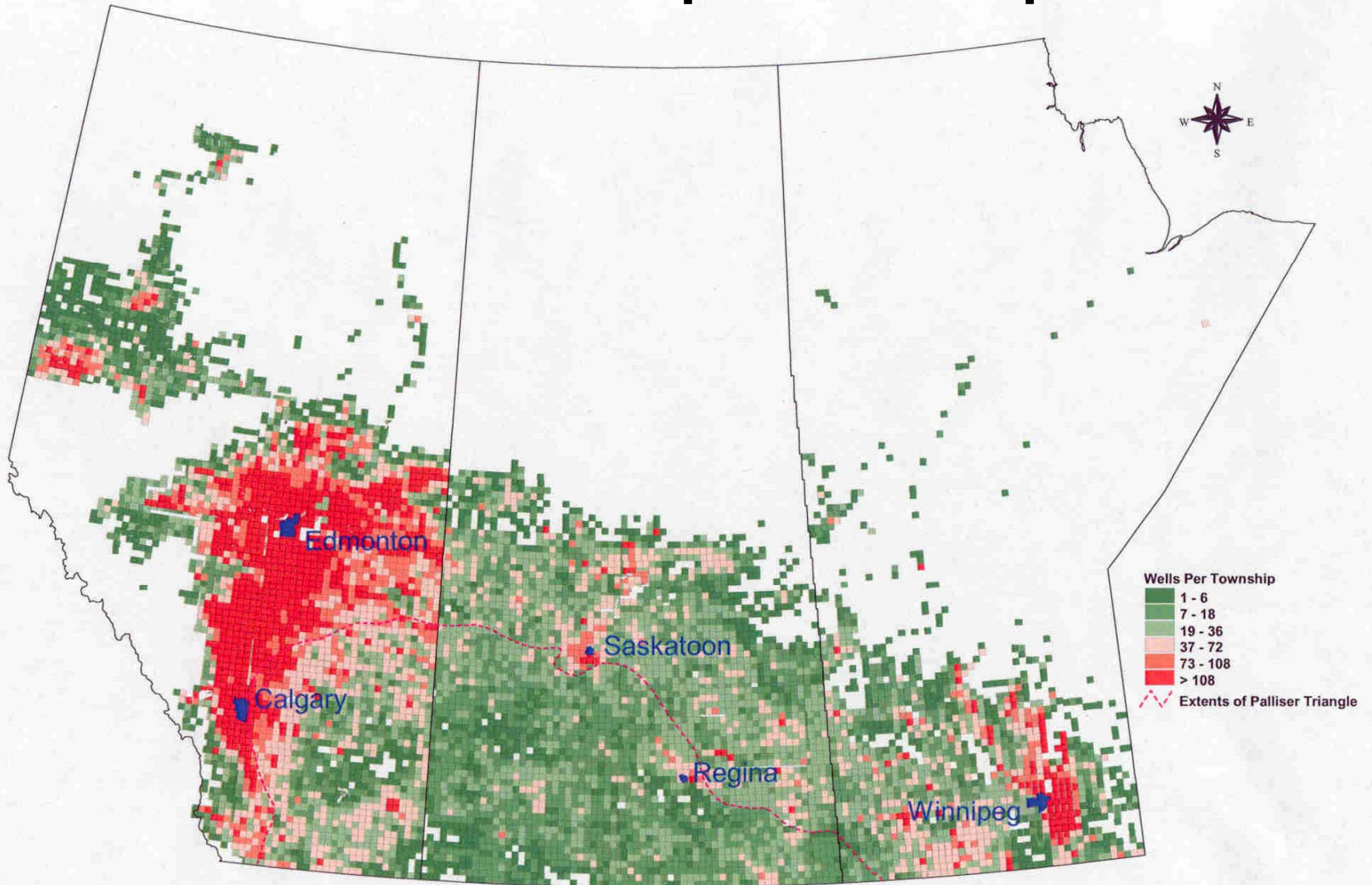
Source: EUB, 2005

Importance of Groundwater

Use of Groundwater in Alberta

- **2.5 % of all water consumed**
- **90 % of rural Albertans use groundwater for household purposes**
- **600,000 domestic wells exist, 7000 added each year**
- **25 % of water pumped used for agricultural purposes**

Water Wells per Township

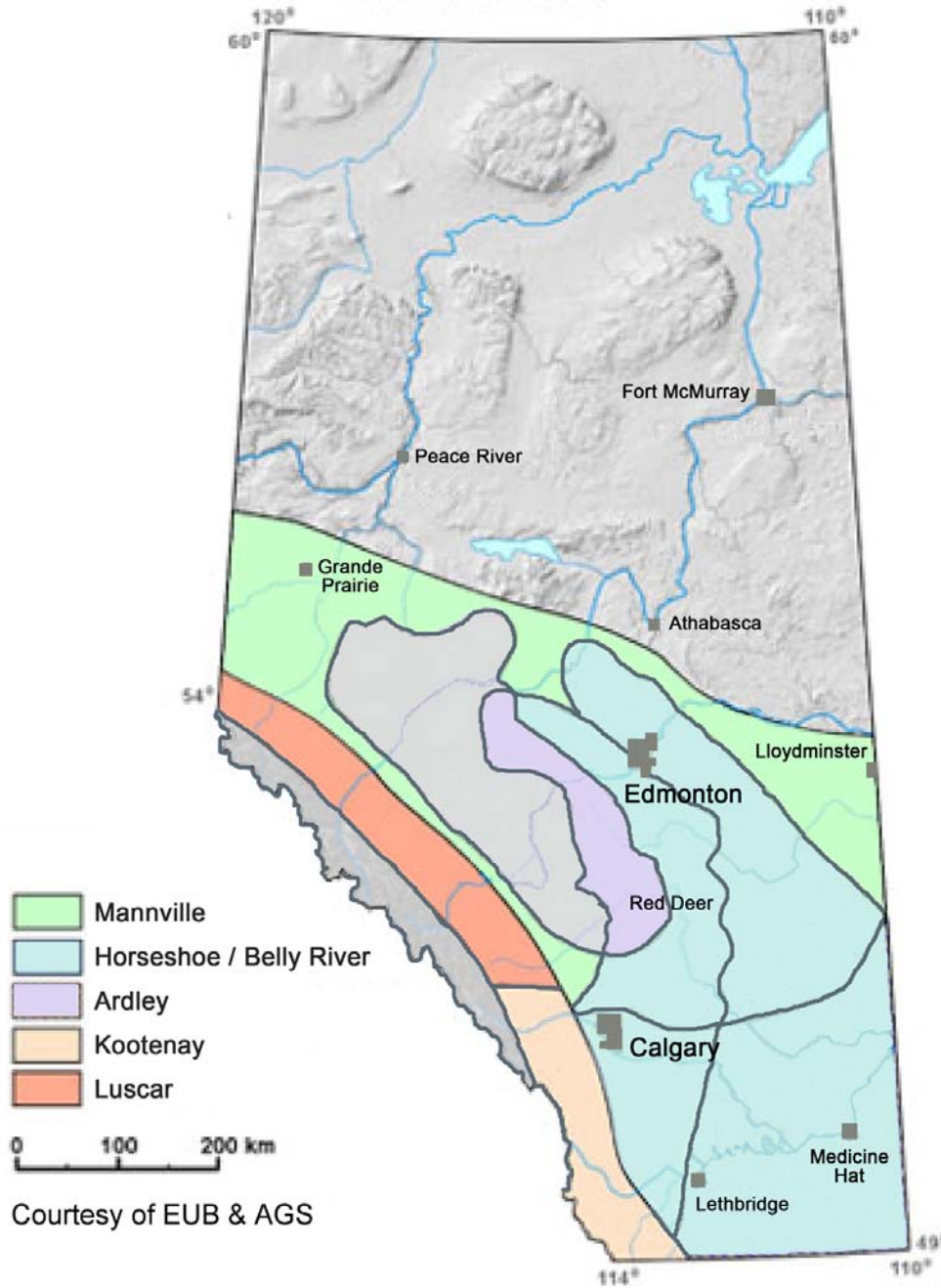


Source: PFRA, 2000

Water for Life

Alberta's Strategy for Sustainability

- **Safe, secure drinking water supply**
- **Healthy aquatic ecosystems**
- **Reliable, quality water supplies for a sustainable economy**

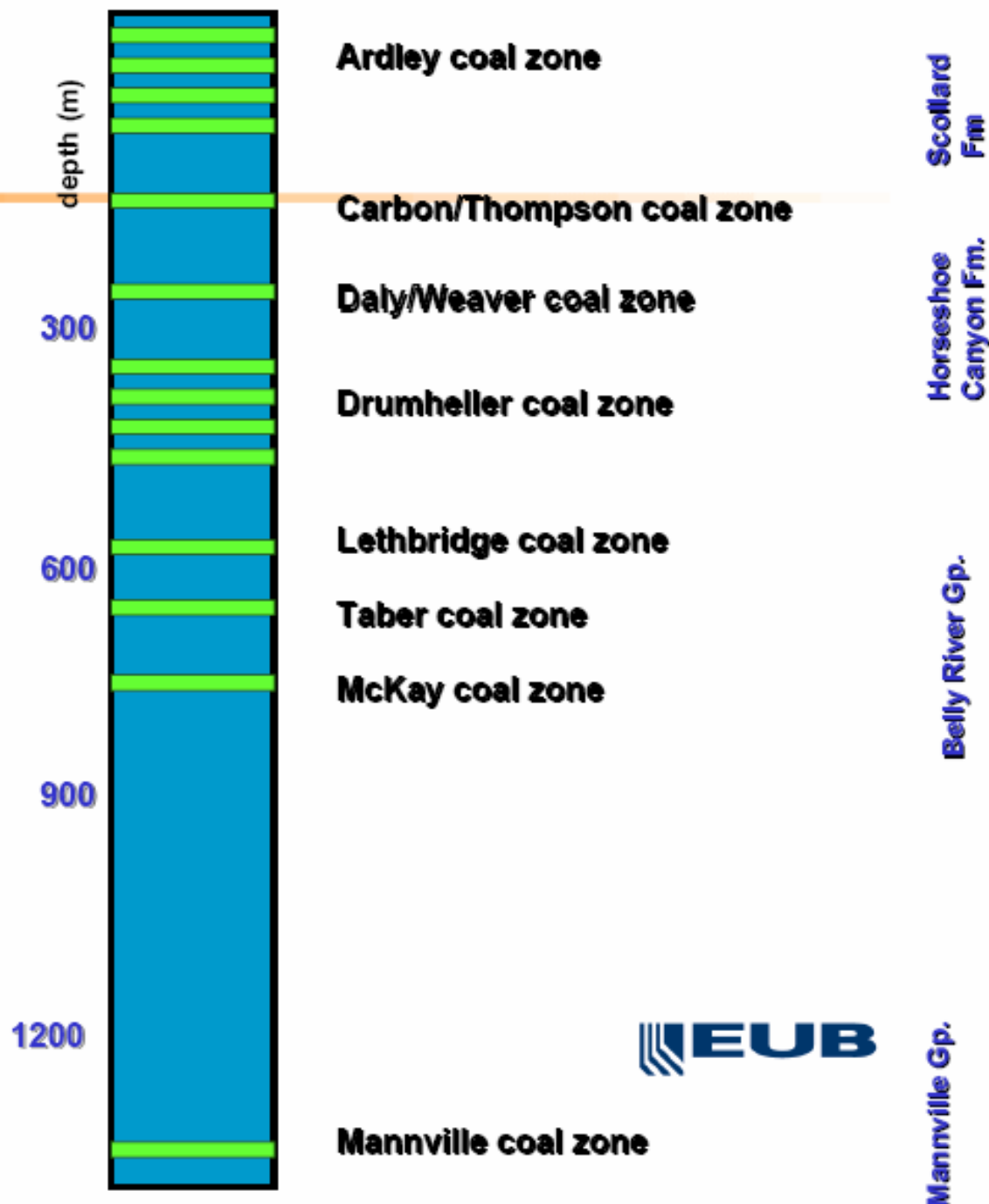


COAL ZONES WITH CBM/NGC POTENTIAL

CBM/NGC's Potential Impact on Groundwater

- **Groundwater production :**
may cause water level decline & yield reduction in water wells
- **Produced water disposal:**
may cause SW & GW quality degradation
- **Methane gas release and migration:**
migration into shallow aquifers, house basement explosion, etc.

Generalized Coal Zone Stratigraphy, Alberta Plains



Source: EUB, 2005

PROTECTION OF GROUNDWATER

Current Policy

- Non-saline (fresh water) CBM/NGC groundwater diversion requires an approval/licence
 - ⇒ Requirement to show no adverse effects
..(must do groundwater assessment)
 - ⇒ Approvals have public notification
..requirements
- Base of groundwater protection has been mapped for most of the province
(Depth above which groundwater is considered non-saline i.e. less than or equal to 4000 mg/l total dissolved solids)

Current Policy (continued)

- **Alberta Environment Guidelines for Groundwater Diversion for Coalbed Methane /Natural Gas in Coal development April 2004**
 - Require Preliminary Groundwater Study
 - Detailed description geology & hydrogeology, and proposed project
 - Field-verified water well survey
 - Drill and Test well (max. 30 days)
 - Technical report supporting application under the *Water Act*

Regulatory Framework

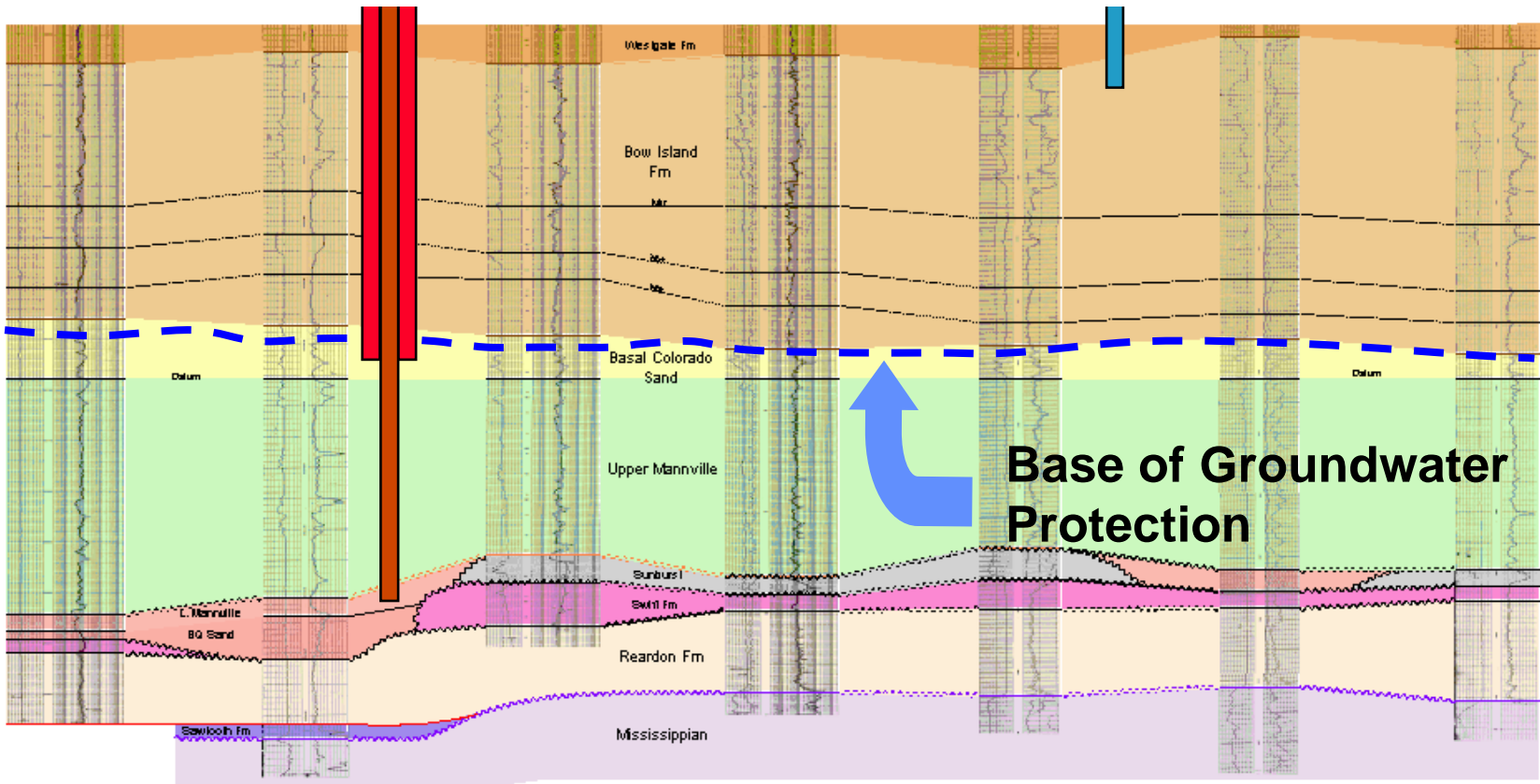
Water Ministerial Regulation

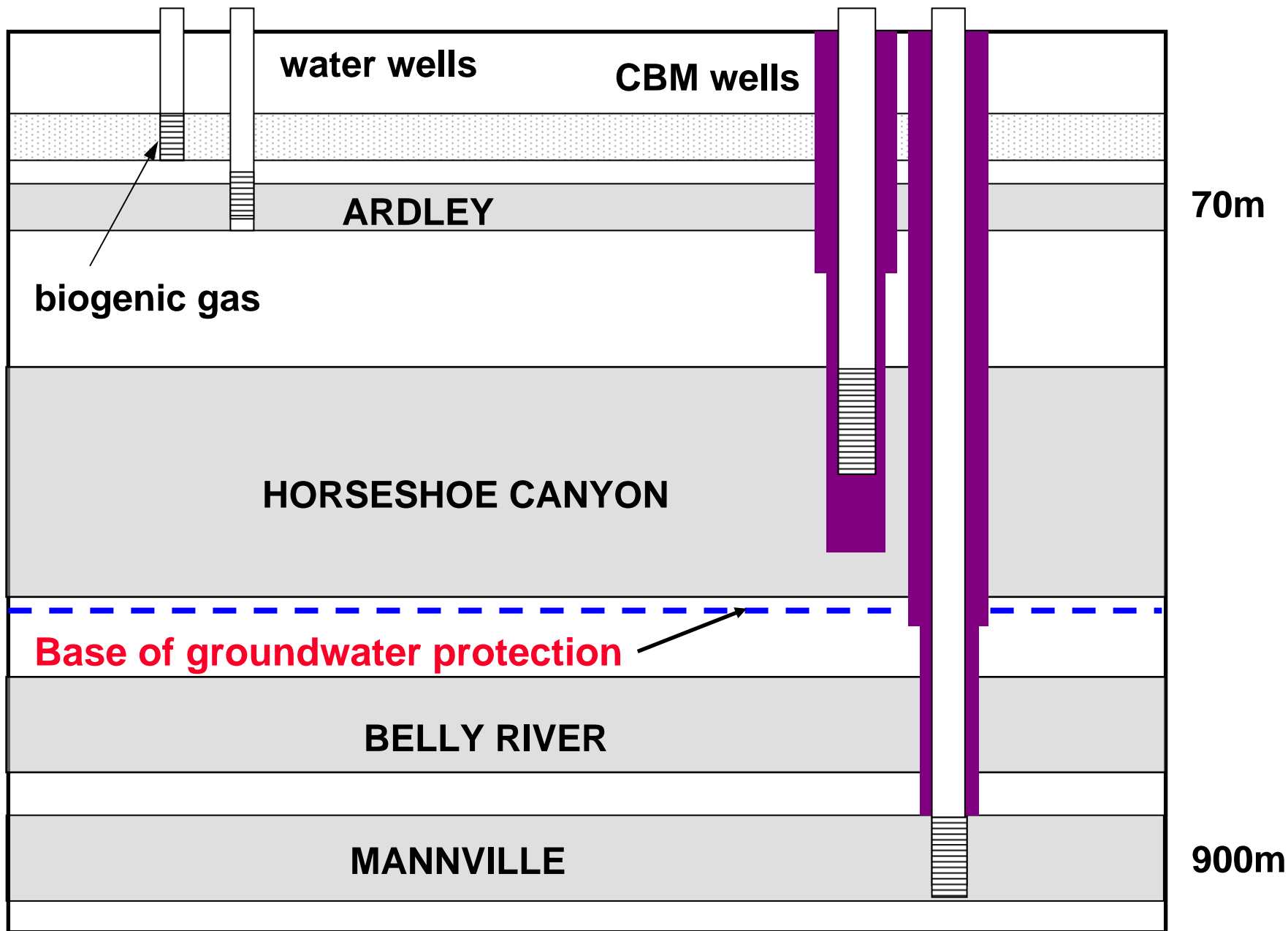
A CBM/NGC well must be constructed and operated to protect the aquifers, domestic water supplies, and to prevent commingling of different water quality

Base of Groundwater Protection

Resource Well

Water Well





New Approach

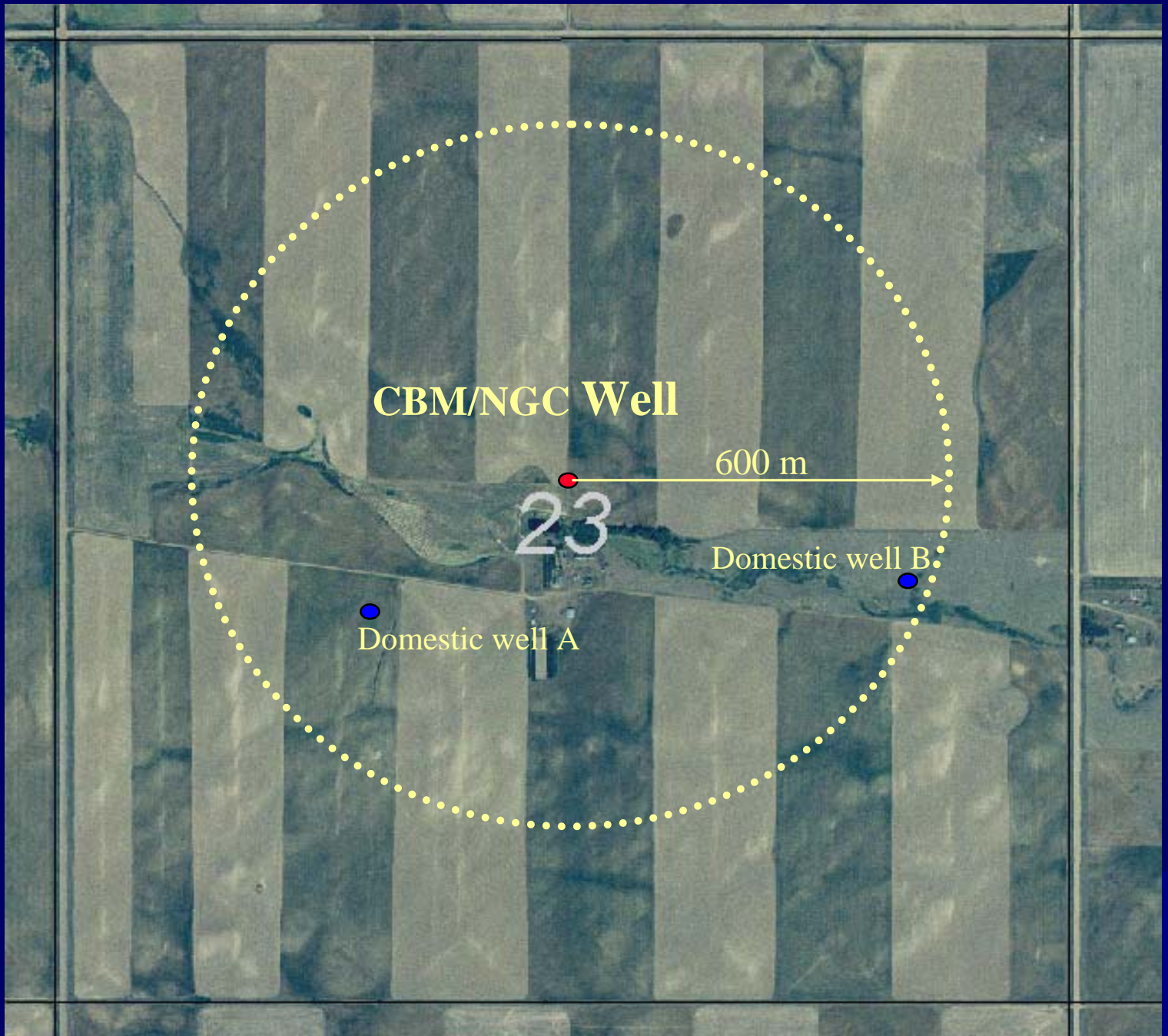
- Risk-based Approach
- Standard for Baseline Water-Well Testing
- Groundwater Mapping
- Improved Monitoring
- Research Initiatives

Risk-based Approach

- Approval or licence required for all water diversions
- New proposed exemption:
 - Minimum Threshold Volume
 - Code of practice

Standard for Baseline Water-well Testing

- Effective May 1, 2006
- Companies must test all active domestic water wells within 600 m of a new or re-completed CBM/NGC well *above the base of groundwater protection*
- Wells must be tested prior to drilling or fracing
- If no wells within 600m, at least one well within 800m must be tested



CBM/NGC Well

600 m

23

Domestic well B

Domestic well A

Testing that must be offered:

- Water well capacity – 2-hour yield test
- Routine potability water quality (includes iron)
- Bacteriological analysis
 - ⇒ iron and sulphate reducing bacteria
 - ⇒ total and fecal coliform bacteria
- Presence and analysis of gas
 - ⇒ volume of gas per volume of water pumped
 - ... must be recorded

Baseline Testing Data

- Data will be submitted to landowners and Alberta Environment
- Data to be evaluated after 6 and 12 months to determine if improvements are needed
- Data can be used in future to assess impacts observed by landowners
- Landowner must contact company to re-test and register complaint with Alberta Environment ⇒ 1-800-222-6514

Groundwater Mapping

- Hydrogeological maps are available for most of the province
- The maps provide information on geology, groundwater yields, groundwater flow and groundwater chemistry
- Maps have been used extensively by consultants and drillers to develop new water supplies

Mapping the Ardley Coal Zone

- The Ardley coal zone contains mainly non-saline groundwater
- The extent of the Ardley coal zone has been studied by the Alberta Geological Survey
- A comprehensive 2-year study will be initiated by Government in April to provide up-to-date and detailed information on:
 - Groundwater quality and quantity
 - Hydraulic properties of coal zones and adjacent aquifers

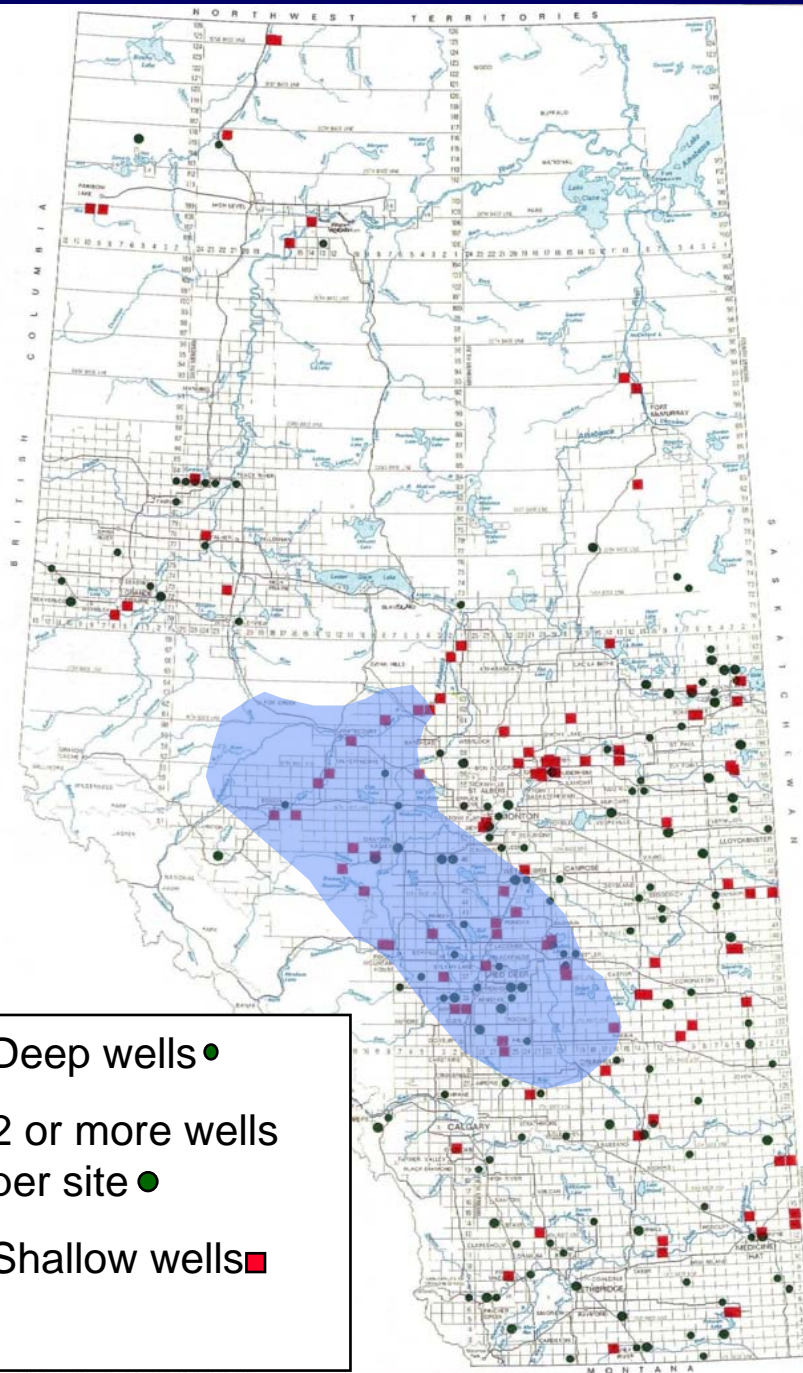


Ardley Coal Zones

Groundwater Monitoring Network

- 200 sites
- One of the best networks in Canada
- Looking to expand in the future

Deep wells ●
2 or more wells per site ●
Shallow wells ■



Proposed Research Initiatives

- **Gas Migration** – better understand potential for methane migration to water wells as a result of CBM/NGC
- **Produced Water Management** - develop new [or apply existing] technology to take advantage of non-saline and marginally saline produced water
- **Fracing** – evaluation and assessment of current practices and potential for impacts on water wells

More Information

- *“Water Wells that last for generations”*
- Residents can get information on their water wells from the Groundwater Information Centre (427 2770)
- Alberta Environment website
www.gov.ab.ca/env
- EUB website
www.eub.gov.ab.ca