

# Coal Bed Natural Gas Water Management

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Water Project Manager

# The Powder River Basin

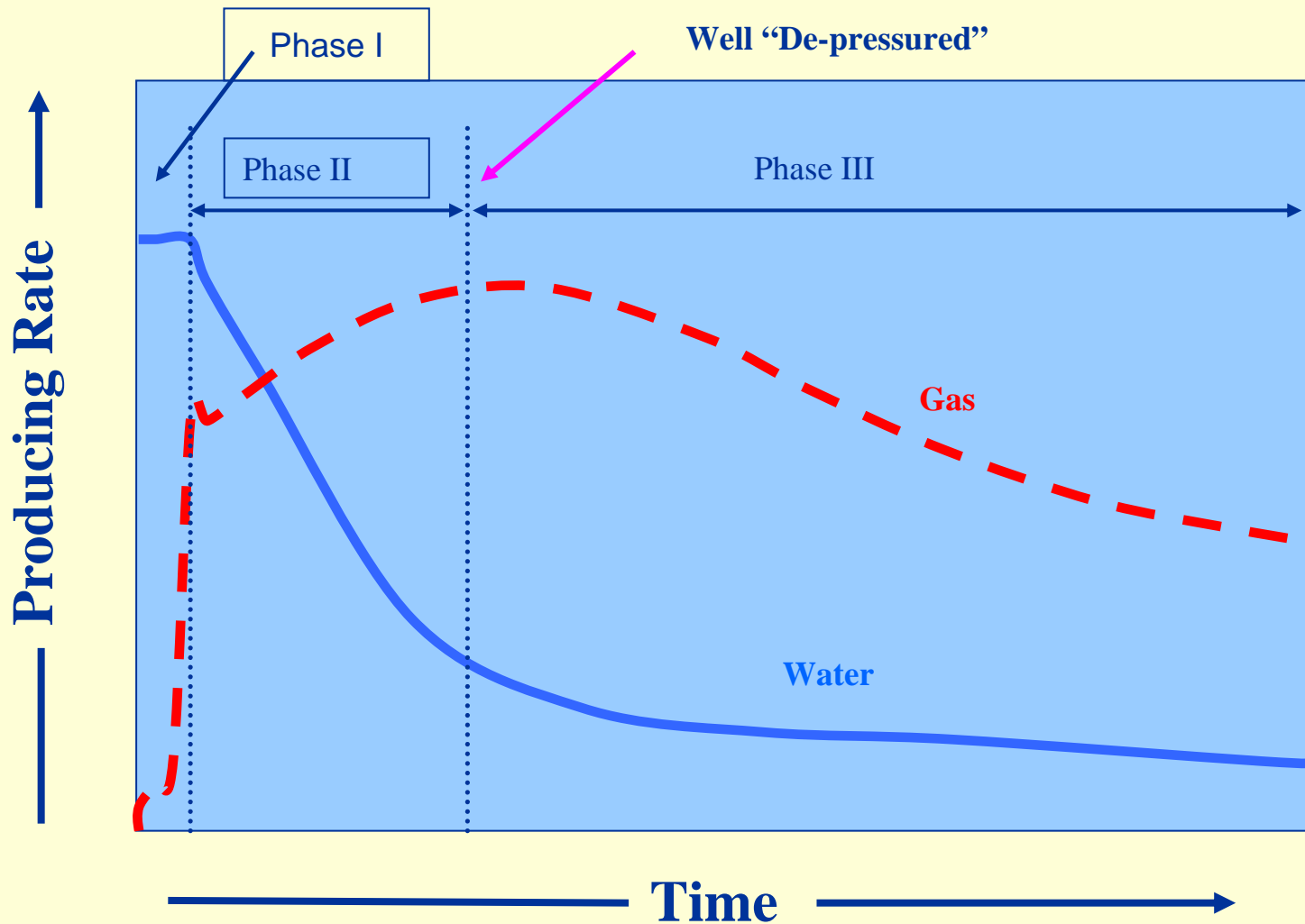




# Regulatory Agencies

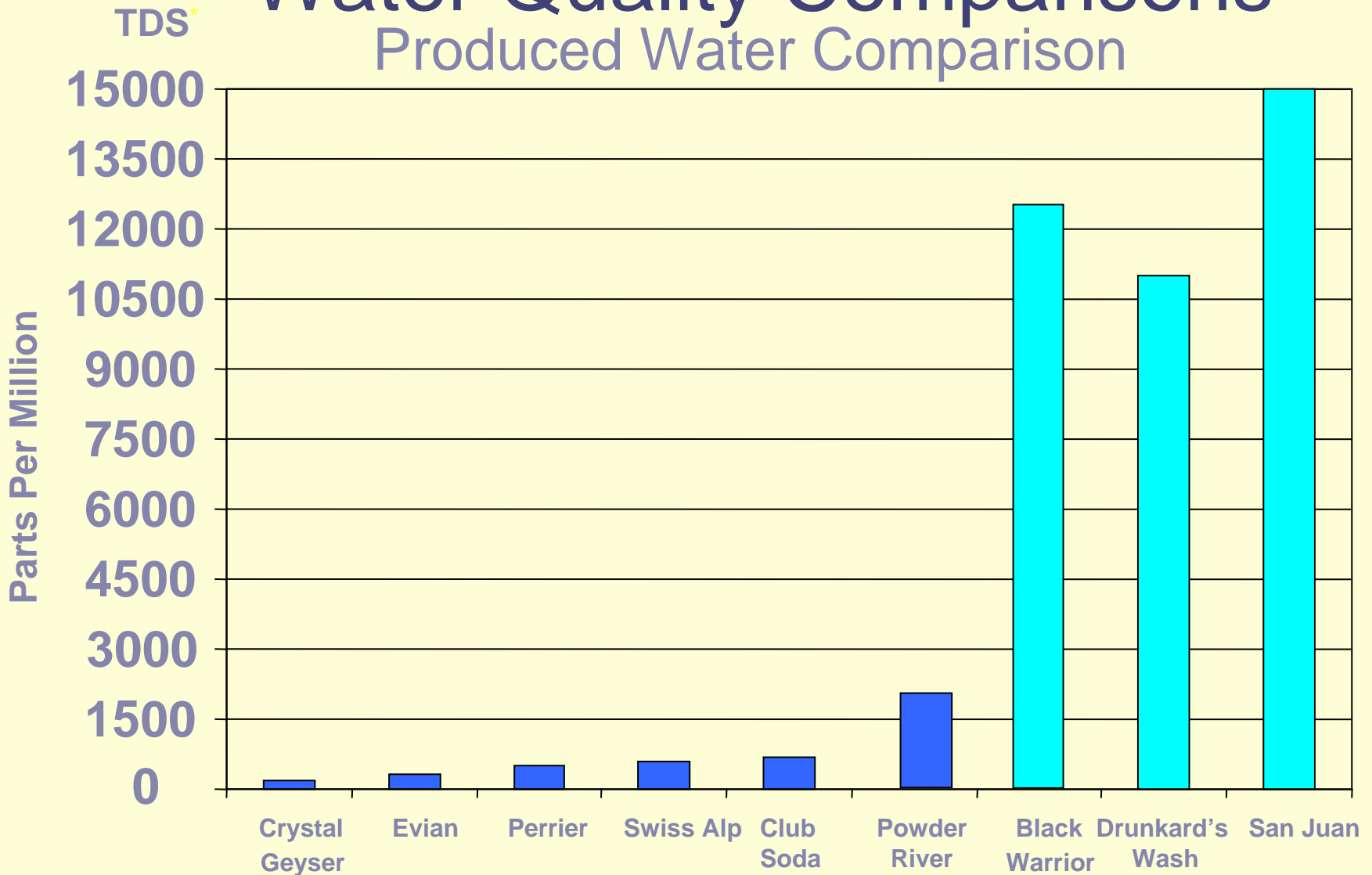
- Department of Environmental Quality
    - Water discharge & construction permits
  - State Engineer
    - Water rights & containment structures
  - Oil & Gas Conservation Commission
    - Permits to drill
  - Bureau of Land Management
    - Plans of development & permits to drill
- 

# CBNG Well Lifecycle



# Water Quality Comparisons

## Produced Water Comparison



\* TDS = Total Dissolved Solids

Source: Pace Global Energy Services

# Water Management

The toolbox is open...



# Decision Factors

- Landowner needs & requirements
  - Regulatory limits
  - Water quality
  - Soil type
  - Land use
  - Land use (downstream)
  - Amount of water
  - Terrain
  - Timing of the project
  - Economics of project
- 

# Discharge to Streams





# Discharge to Streams



# Reservoirs





# Zero Discharge Ponds



# Pond with Island





# Stock Watering

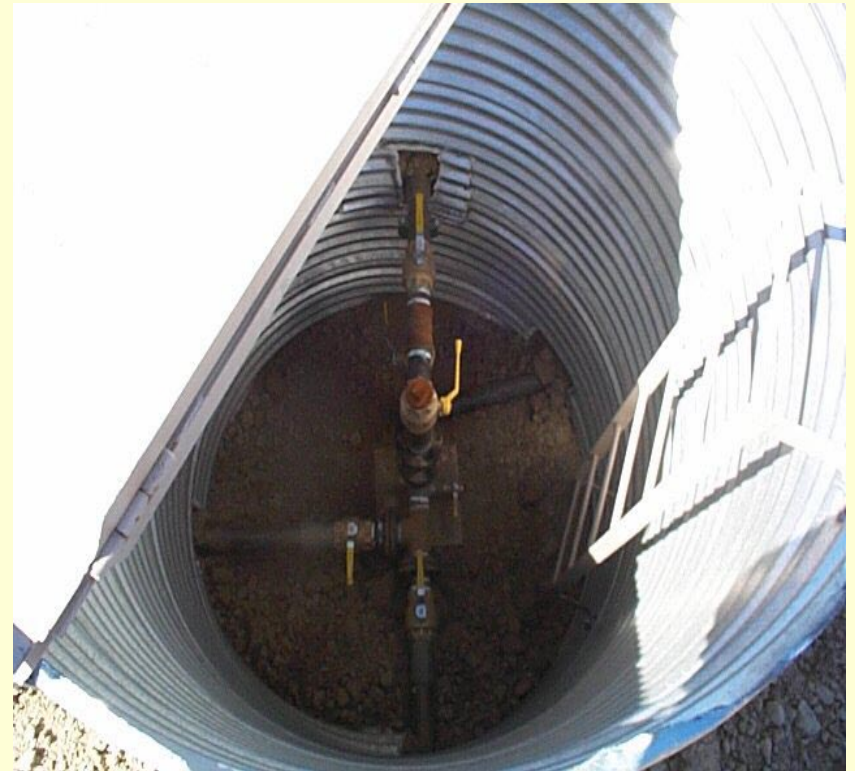


# Irrigation





# Water Management



# Injection





# Treatment



# Dust Control





# Fish



# Fish





Questions??



TDS\*  
(PPM)

1000

800

600

400

200

0

WYODAK  
AVERAGE

S. Durham  
CBM Pilot

Black Thunder  
CBM Pilot

Mtn.  
Valley

Evian

Crystal  
G.

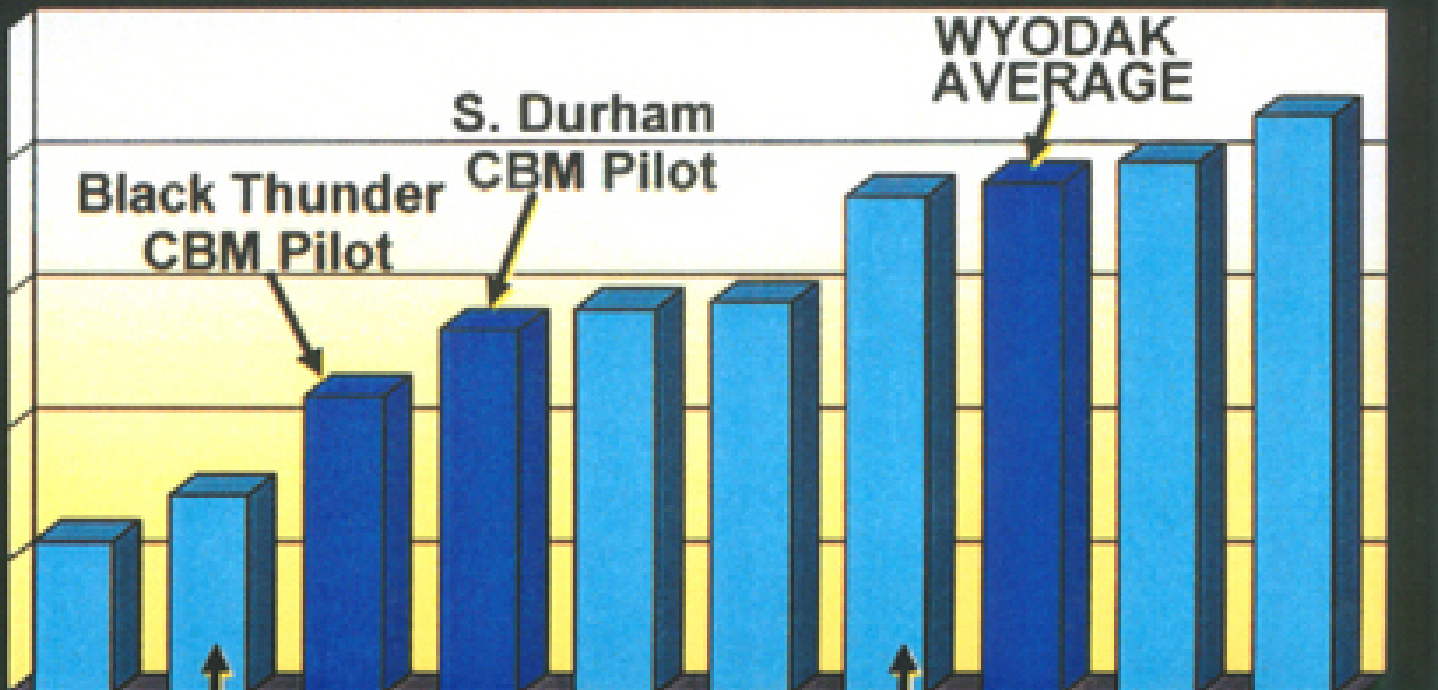
Swiss  
Alp

City of  
Gillette

Vittel

Panafiel

\*Total Dissolved Solids





# Fish



# Fish





# Fish



# Treatment



# Fish





# Paleocene Time

55 million years ago





# Reservoirs



# In-channel Reservoir

