



# Long-Term Contingencies Involving Nitrates

or...

...What We've Seen

...How We Are Managing Nitrogen in Montana

# Outline:

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- Nitrogen/Nitrate: The What
- Montana Rules and Regulations
- Nitrogen Sources and Pathways
- **Montana Examples**
- Lessons Learned - Contingencies

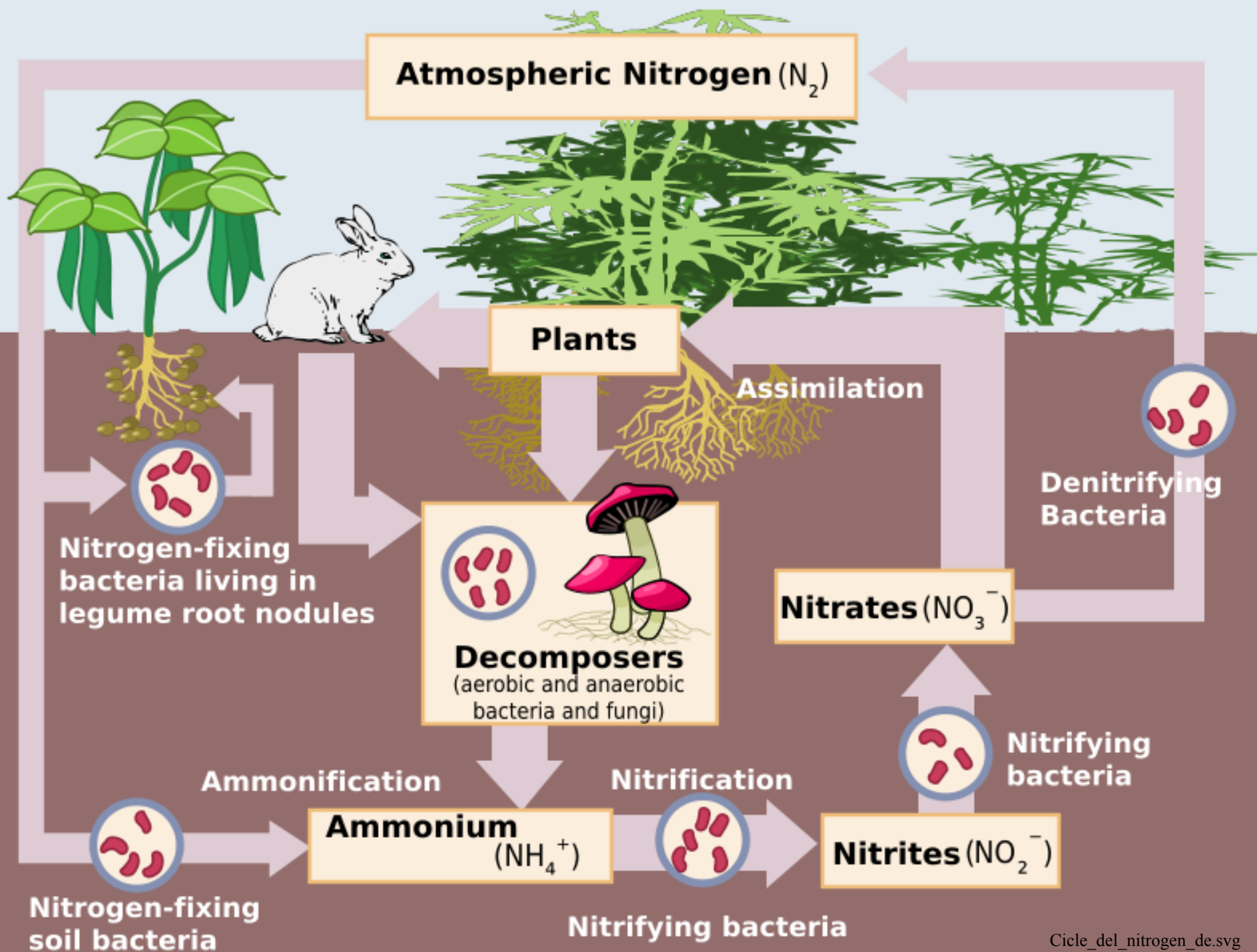


# Nitrogen: The What

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- Common element in earth/atmosphere
- Essential nutrient for life
- Common in nature and many industrial compounds (ammonia, nitrous oxide, ammonium nitrate)
- Found in living plants & animals, animal waste, soylent green





# Nitrogen: Rules and Regulations

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- **Surface Water Numeric and Narrative Criteria (ARM 17.30.637 & DEQ-7)**
  - Narrative 'free from' standards (nuisance algae)
  - Montana numeric nutrient standards (growing season TN, TP). Ecoregion specific. 1.3 mg/L TN.
  - Numeric surface water criteria forthcoming in many states..
  
- **Groundwater Criteria (DEQ-7)**
  - 10 mg/L
  - Based on MCL

# Nitrogen: Sources & Pathways

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- A variety of processes, sources, pathways contributing to nitrate conditions....
- Background/Baseline Sources: natural, livestock, urban/suburban, agricultural, septic
- Blasting residue
  - Spoil recharge/discharge
  - Runoff to ponds/infiltration
  - Pit pumping/water management
- Facilities/Runoff/Septic
- GW and SW Pathways



# Nitrogen in Montana

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- Nitrogen/Nitrates not typically a problem on Montana mines
- Dry: Ephemeral to intermittent streams
- ~14" annual precipitation
- Montana – limited NPDES discharges. Few continual discharges. Predominantly event-driven.
- Setting photos

















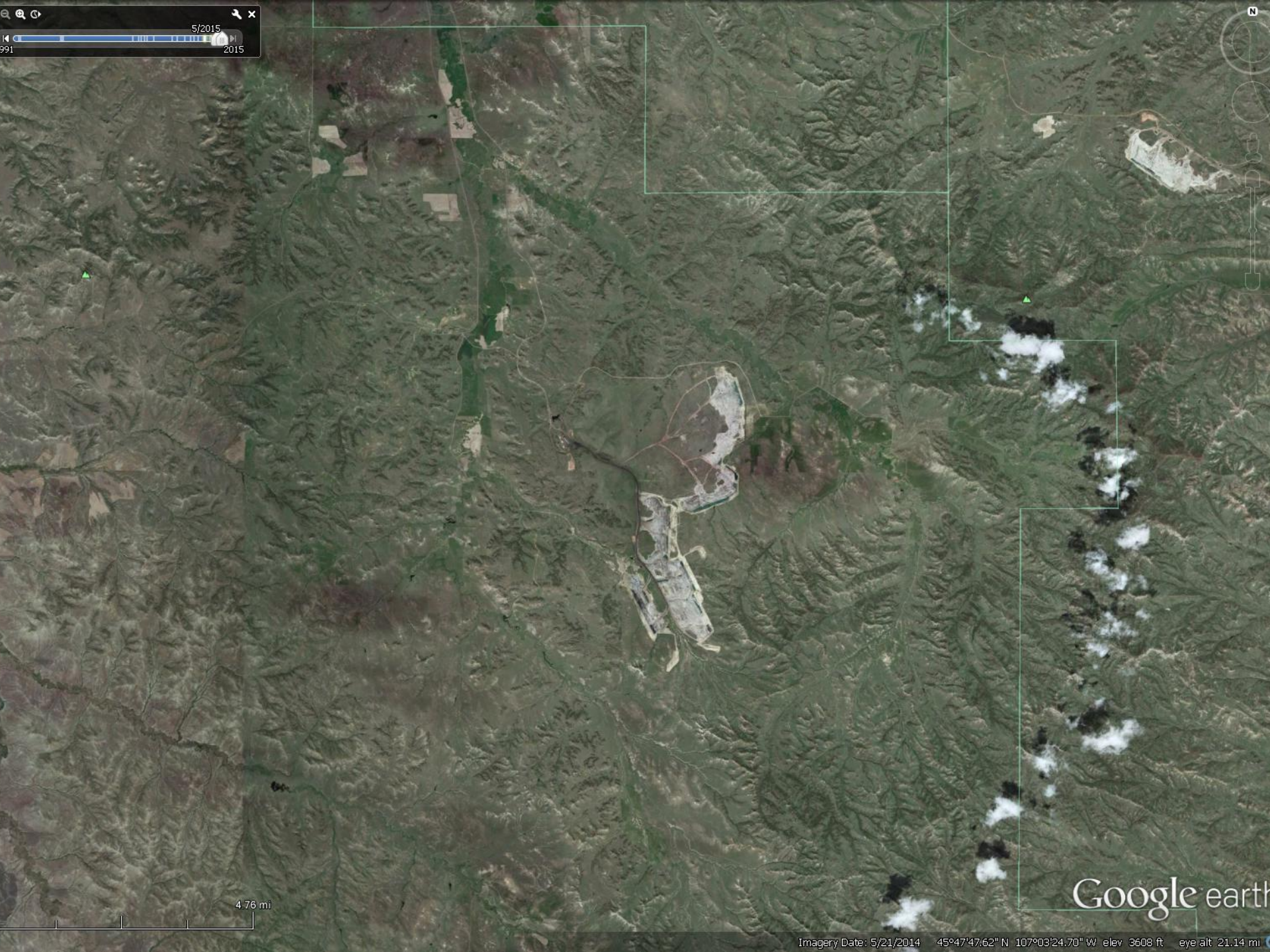




# Nitrogen: Mine #1

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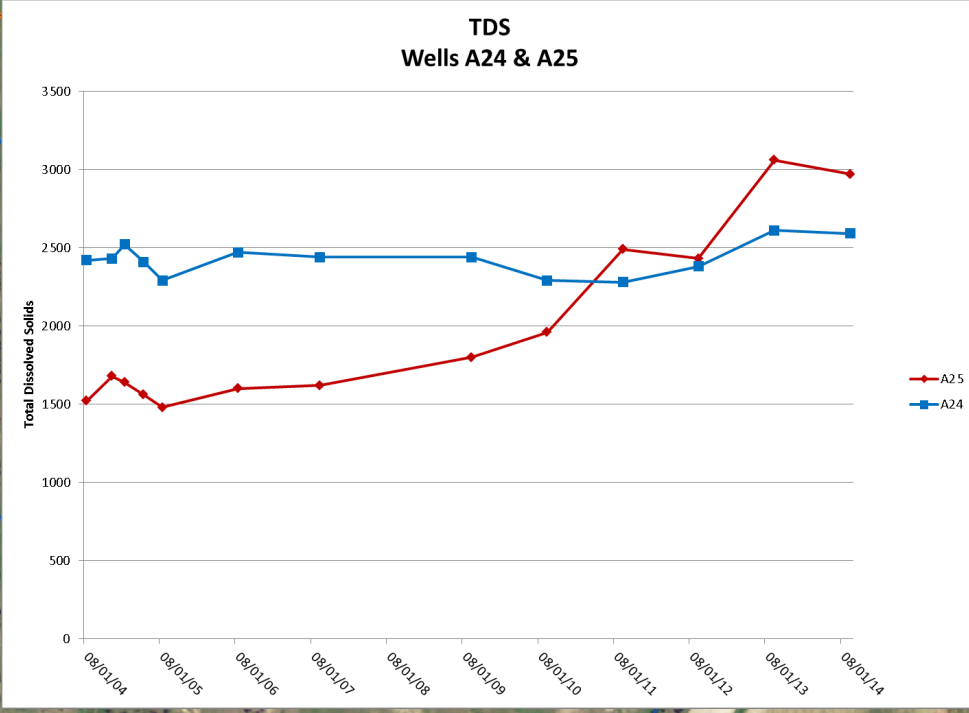
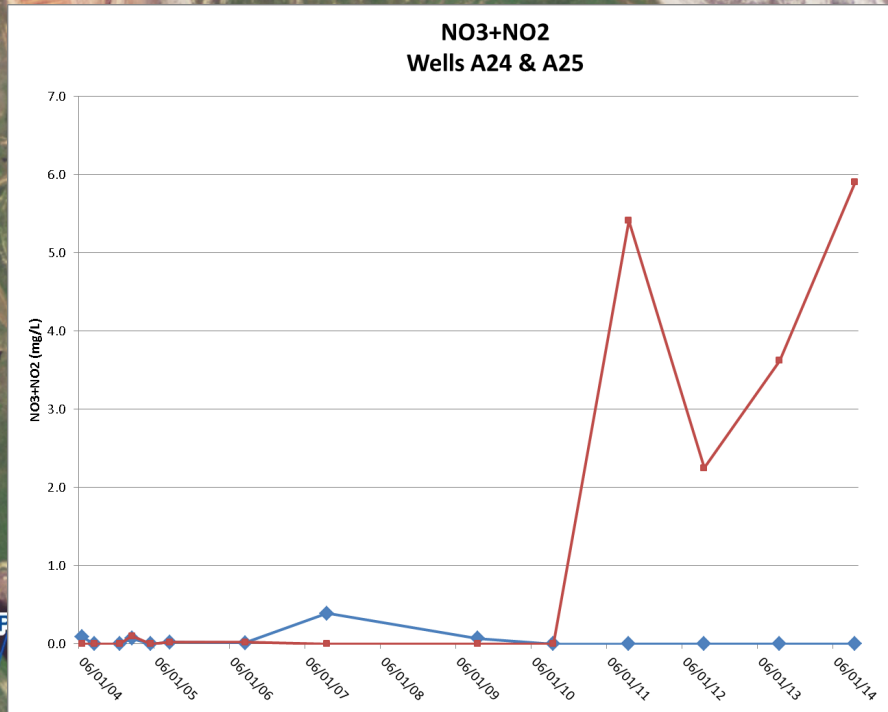
- Pit water pumped to perimeter ponds
- Alluvial wells downstream
- Nitrates – TDS



4.76 mi

Google earth



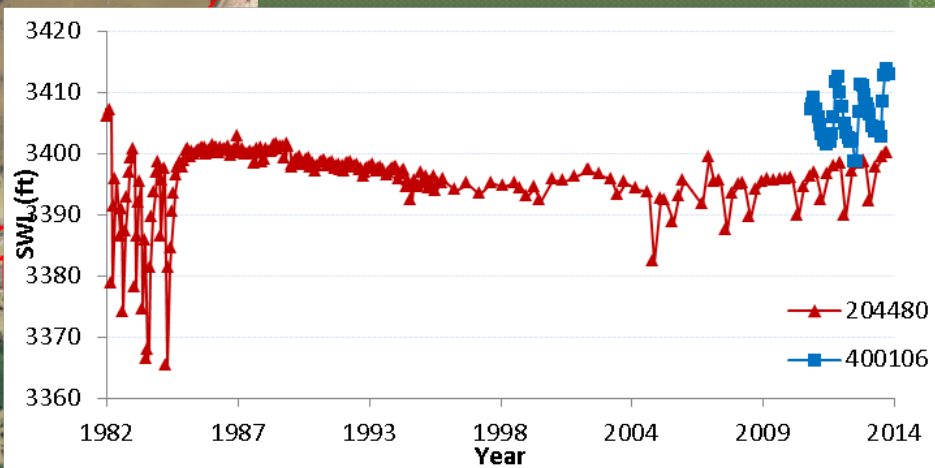
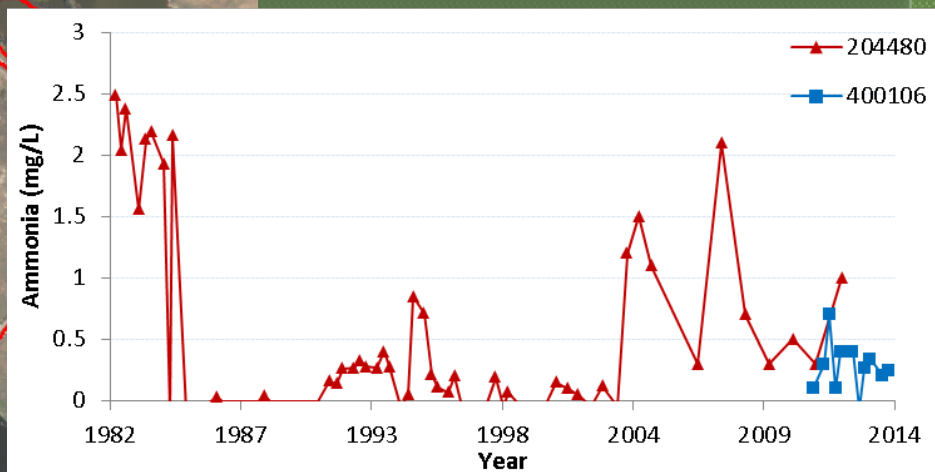
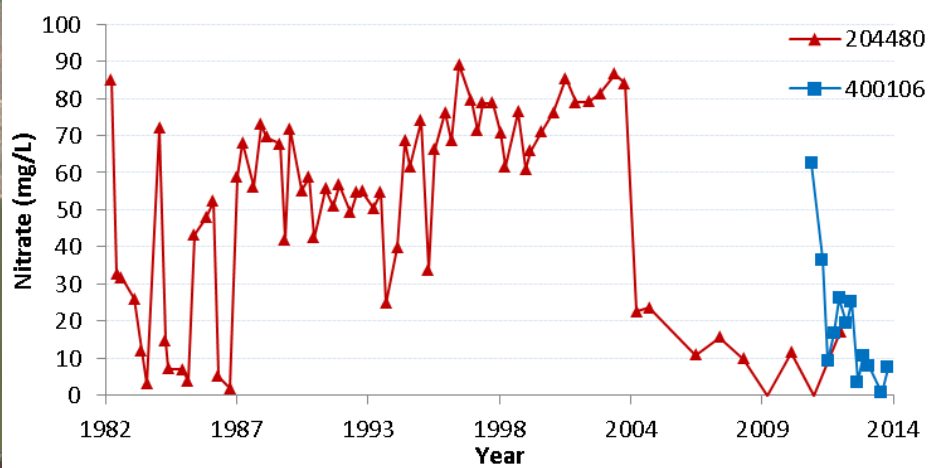
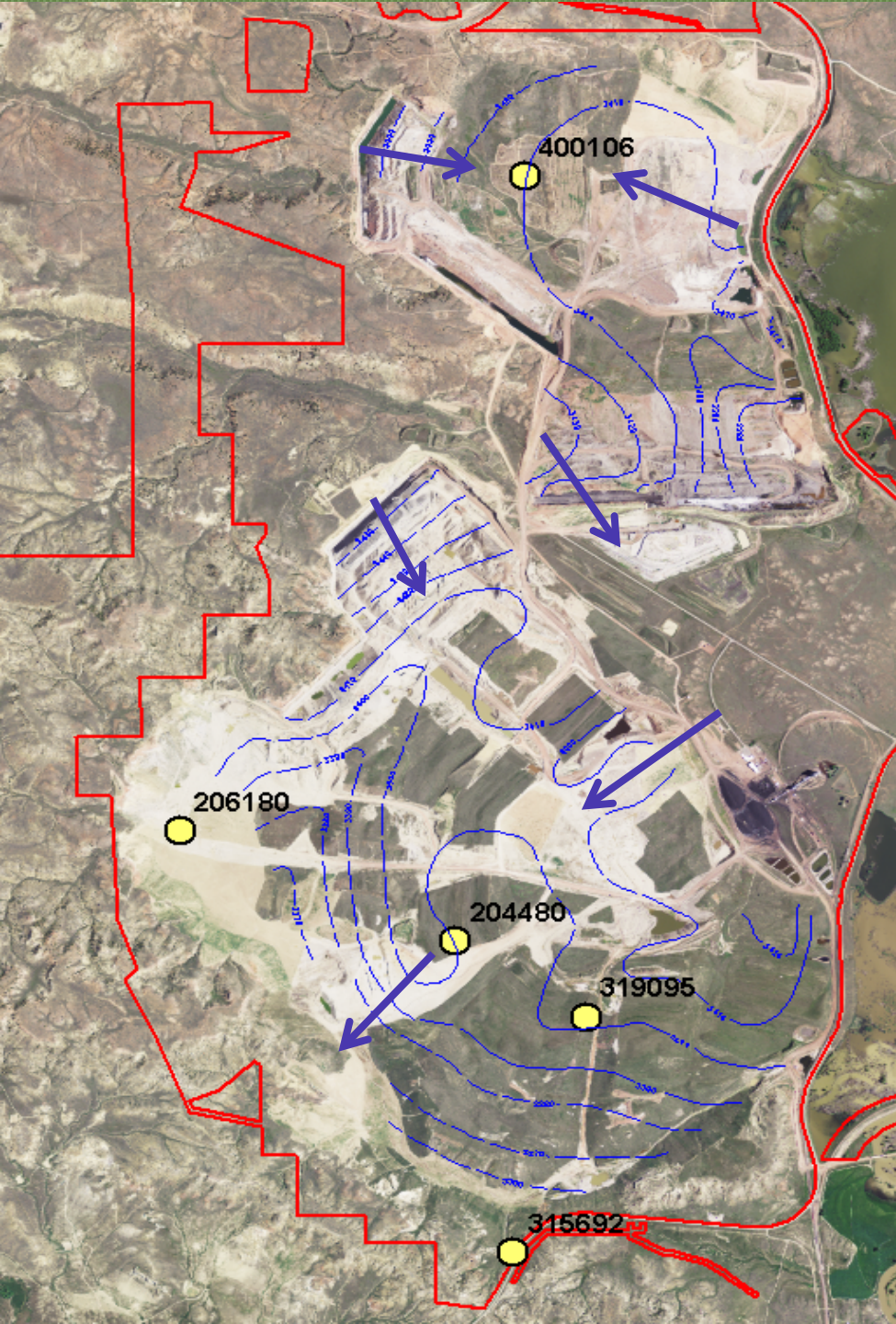




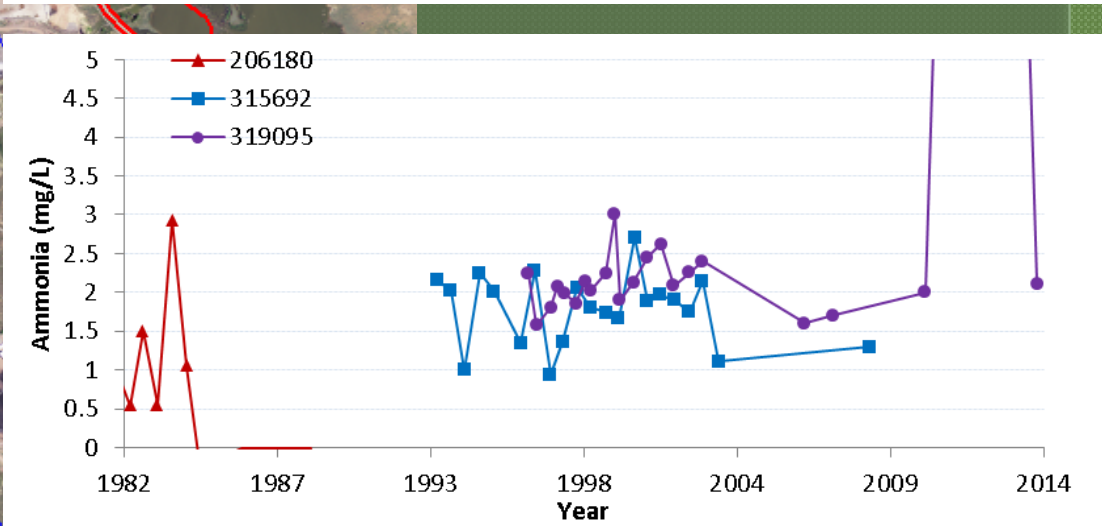
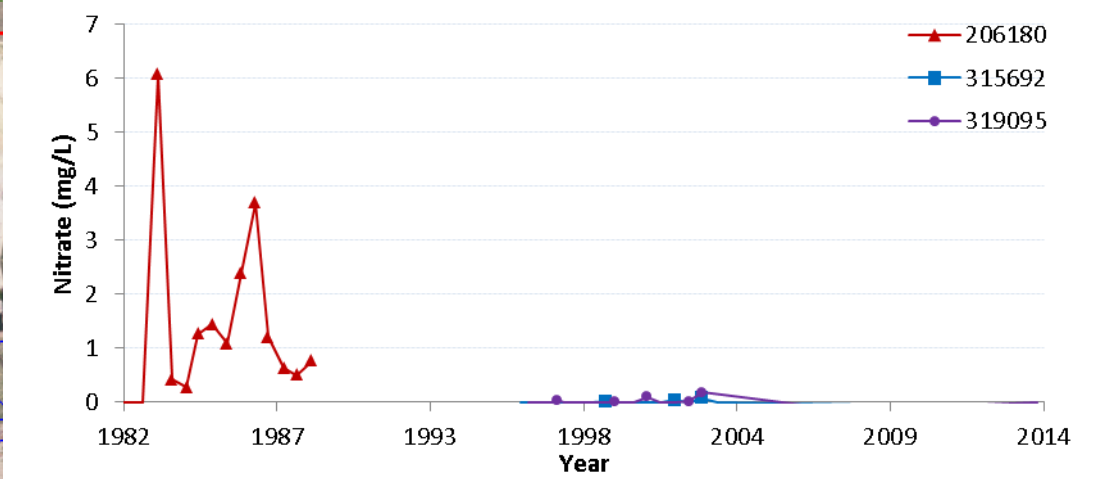
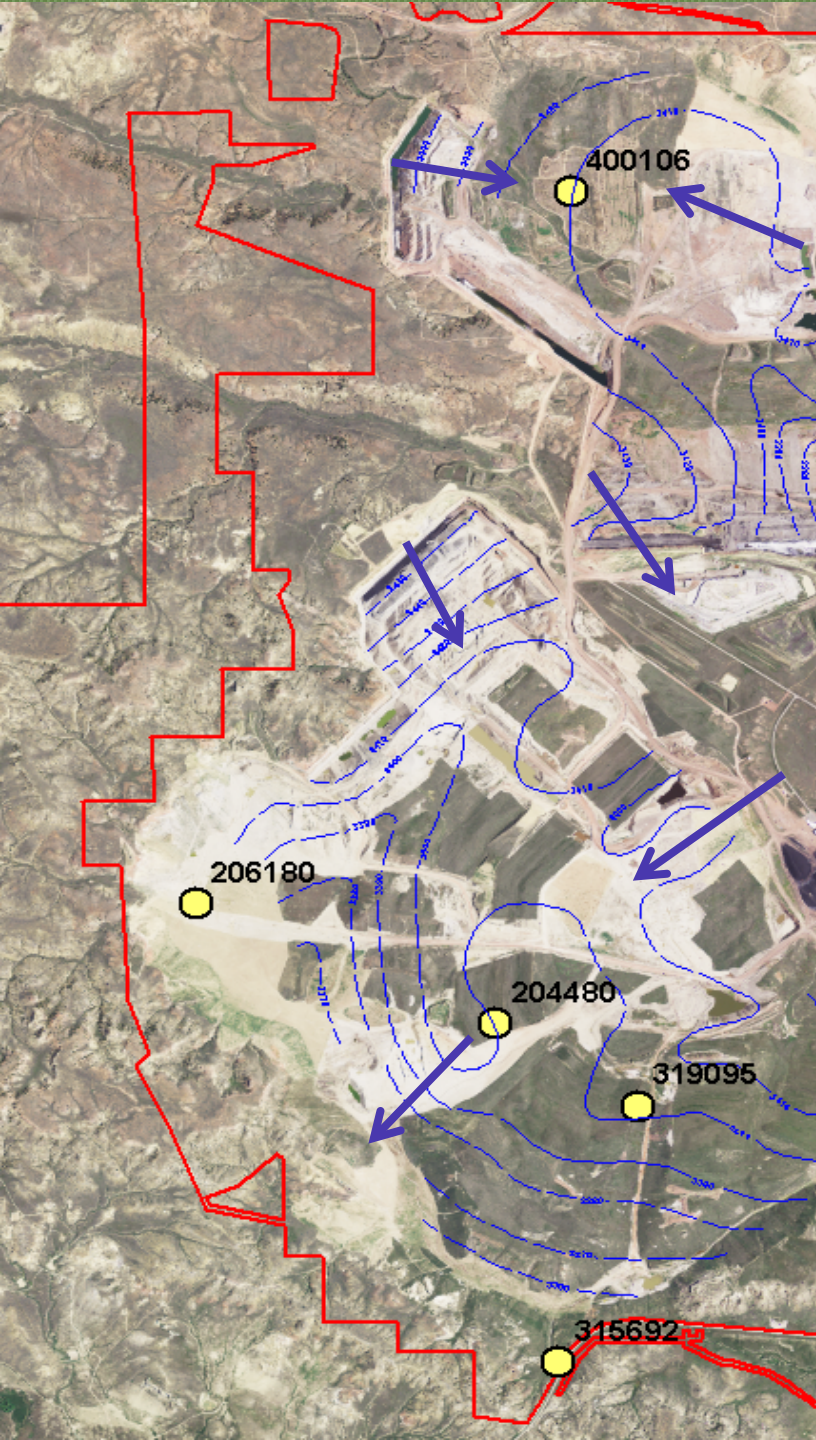
# Nitrogen: Mine #2

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- Spoil nitrate/ammonia concentrations
- Water level correlations
- Residual blasting agents
- Comparison to off-permit wells





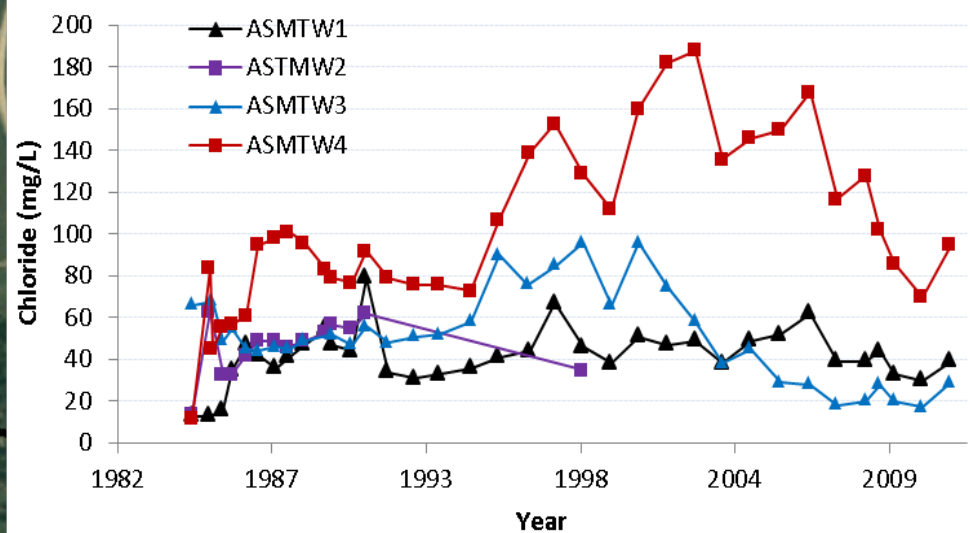
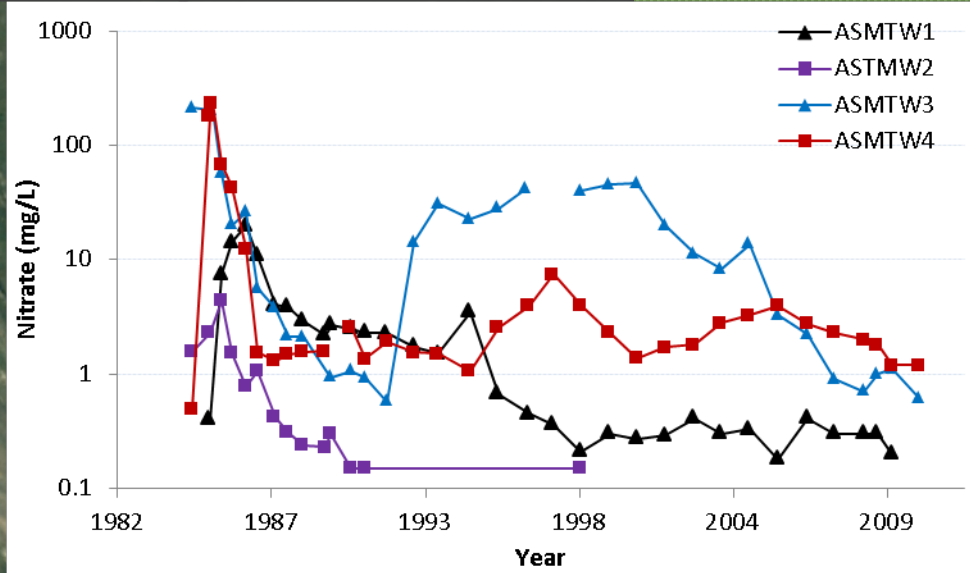




# Nitrogen: Mine #3

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- Alluvial Wells
- High nitrates, low ammonia
- High Chloride
- Facilities/washbay area

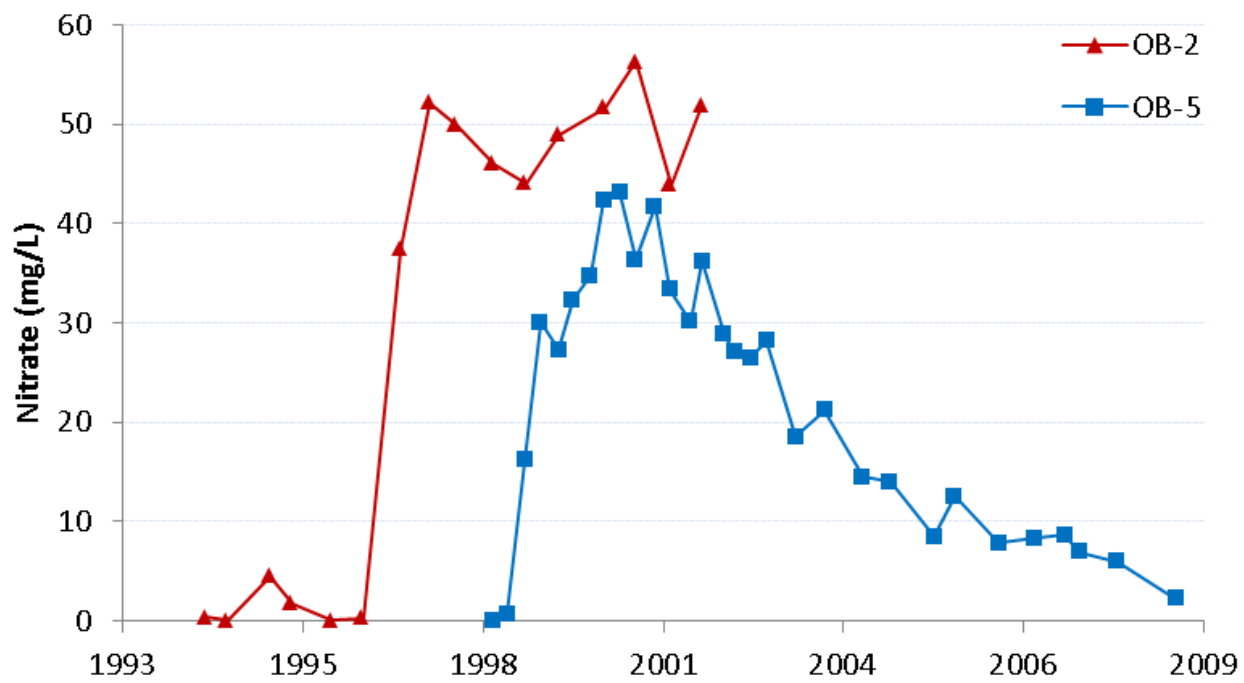
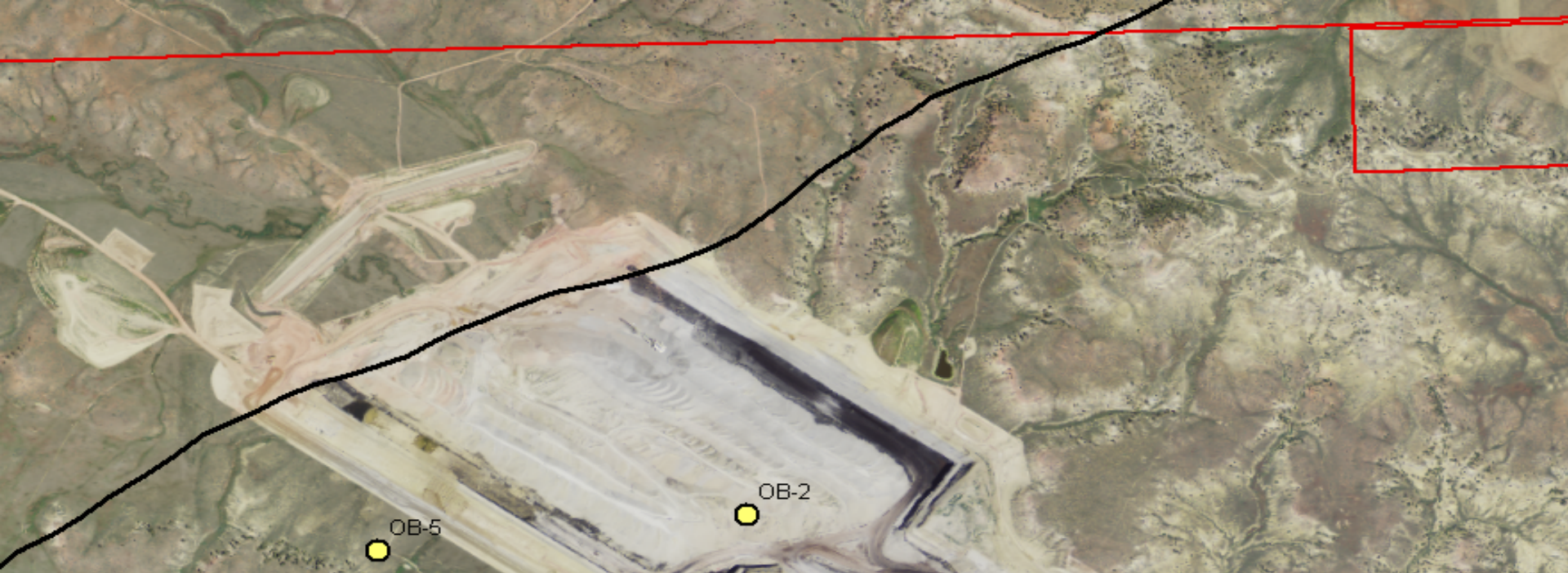




# Nitrogen: Mine #4

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- Premining baseline nitrate conditions
- Range of baseline conditions over many years
- Precipitation, water-level driven conditions

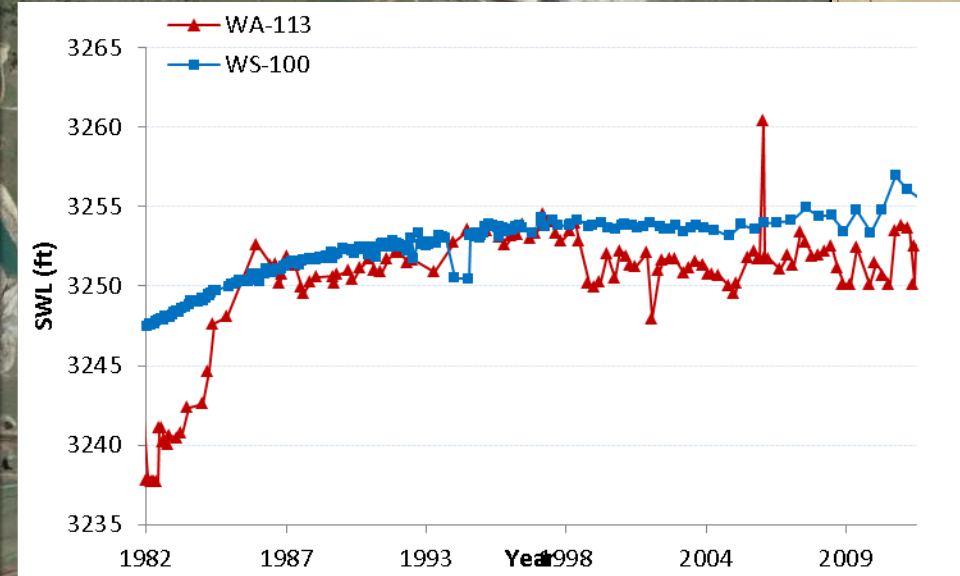
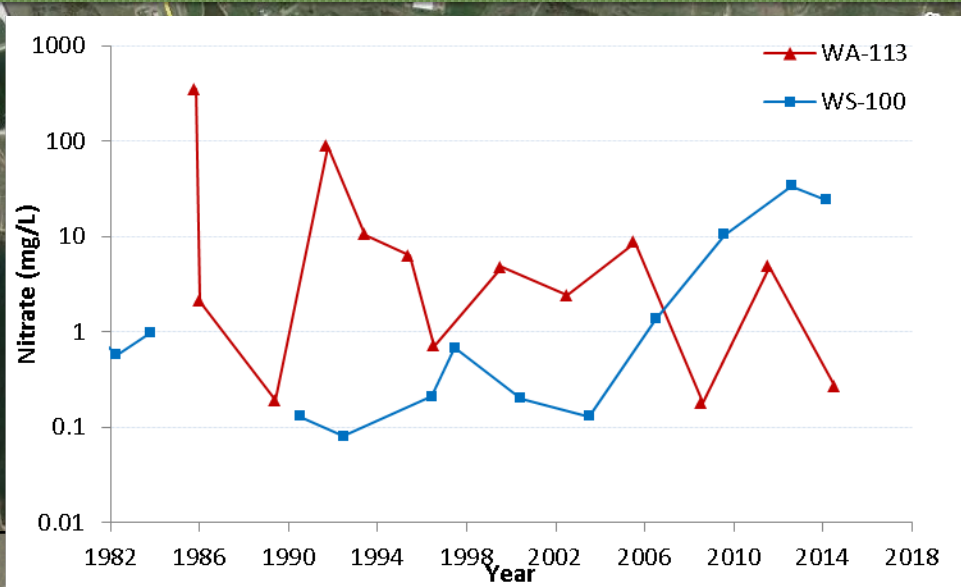




# Nitrogen: Mine #5 Recent Legal Action

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- “Nitrate plus nitrite nitrogen exceedances were found mostly in alluvium along the EFA and spoils wells. The maximum value of **351 mg/L** was detected in a sample from **alluvial well WA-113**. The most recent samples from this well contain nitrate plus nitrite nitrogen concentrations below the DEQ-7 (October 2012 edition) standard. The highest nitrate plus nitrite nitrogen concentration measured in spoils wells is 50 mg/L. High nitrate plus nitrite nitrogen in spoils could possibly be due to dissolved residuals from ammonium-nitrate explosives used in blasting coal and overburden.”





# Nitrogen: Contingency Planning

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- Understand baseline conditions, sources and variability
- Understand mining sources and pathways
- Understand applicable standards - GW & SW

# Nitrogen: Contingency Planning

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## ○ Water & Material Management

- Minimize blasting material used/residue produced
- Minimize surface runoff entering blasting areas – diversions, ditches or other control structures
- Manage pit-water appropriately

## ○ Effective Monitoring

- Baseline conditions
- Parameters and associate source indicators (NO<sub>3</sub>, NH<sub>4</sub>, EC, SWL)
- Water levels in wells, ponds,
- Source assessments



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