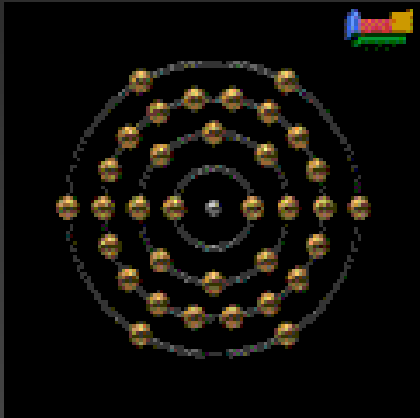


Materials Handling

SELENI
UM

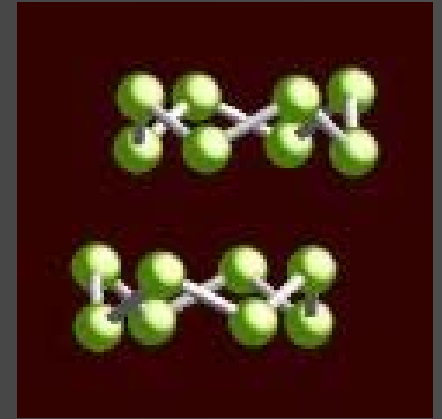
Selenium (Se)



- Closely associated with Sulfur (S), found in organic materials, sulfide ores
- Essential nutrient for plants and animals in small amounts

Selenium (Se)

- In oxidizing environments (water) can form hydrogen selenide, which is toxic
- Through bio-accumulation causes harm to fish tissue, animals, etc.

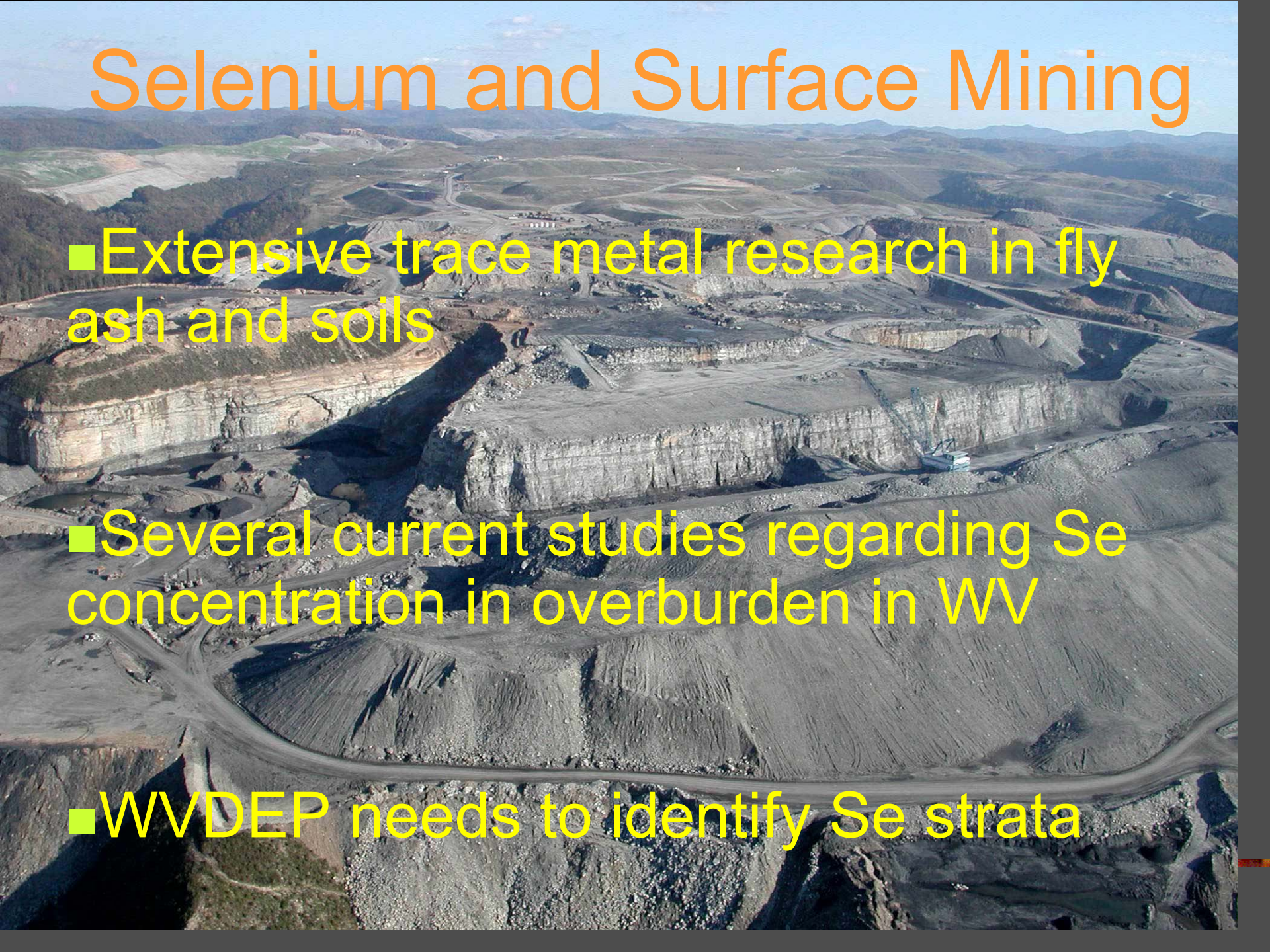


Why Selenium?

- EPA conducted extensive water testing in six WV watersheds, Se of concern when exceeded chronic water quality limit
 - Se exceeded limit in watersheds with active surface mining (Title 46 Table E)
 - Surface mines (valley fills) contributing Se
-

Selenium and Surface Mining

- Extensive trace metal research in fly ash and soils
- Several current studies regarding Se concentration in overburden in WV
- WVDEP needs to identify Se strata



Selenium and Coal

- Se concentration information in coal seams collected by WVGS
 - Concentrations not directly analyzed
 - Measured Se concentration in fly ash of the coal seams and back calculated amount of total Se for coal seam
-

Selenium and Coal

- WVGS found Se in Kanawha and Allegheny formations tends to be high (4.5 ppm)
 - Se associated with S, so Se should also be in pit cleanings, the roof and floor material, partings
-

Selenium and Coal

- Coal seams associated with high Selenium concentrations include:

Kanawha Formation

- ❑ Stockton Rider
- ❑ Stockton
- ❑ Coalburg
- ❑ Winifrede

Allegheny Formation

- ❑ No. 6 Block
 - ❑ No. 5 Block
-

When is Overburden Testing Required?

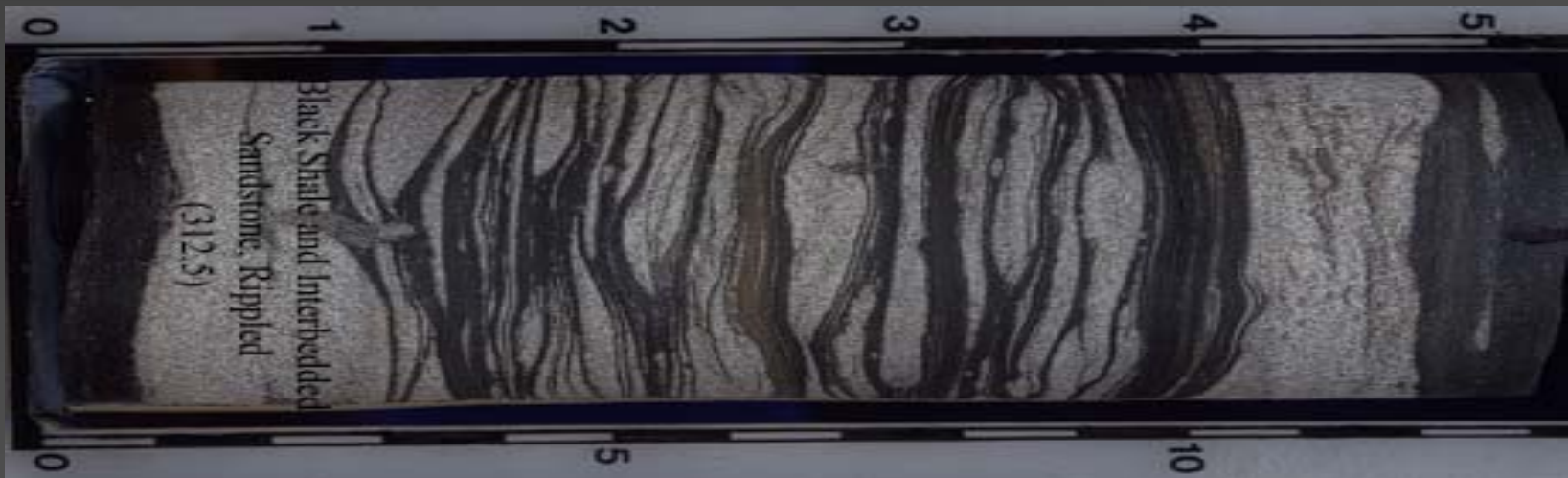
- Geologist analyzes site specific and adjacent permit water data
 - NPDES renewal Table IV-C analyses, DEP trend sites, EIS data, TMDL's, 303(d) impaired streams list, Baseline data)
-

When is Se testing required?

- If Se ≥ 5 ppb (Title 46-1 State Water Quality Limit), overburden analysis required
-

Testing Overburden for Se

- 2000' spacing for coreholes, extend to 10' below lowest seam to be mined
- Core broken into vertical sections of 5' or less is strata changes



Testing Overburden for Se

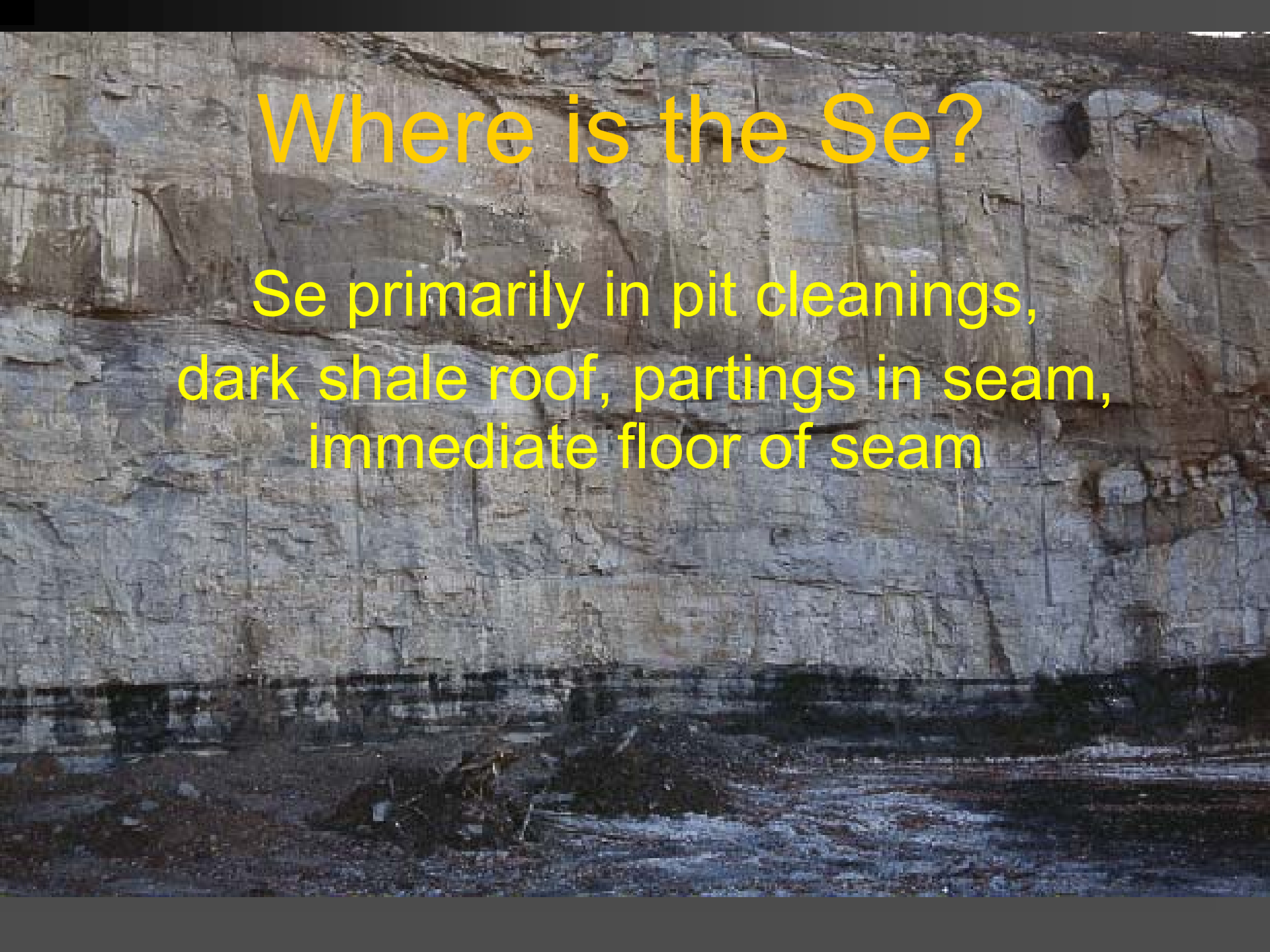
- Section analyzed by acid digestion; 1 mg/kg requires additional testing
 - Leachate test 5 ppb requires materials handling plan
-

Se Overburden Testing

- In spring 2004, 3 mining areas conducted Se testing (Phoenix 4, Hobet 21)
 - 6 holes in Logan County, 1 hole Mingo County
 - All completed holes are Coalburg and Upper Kanawha Formation strata
-

Where is the Se?

Se primarily in pit cleanings,
dark shale roof, partings in seam,
immediate floor of seam



Recommended Materials Handling Plan

- Set aside isolation material; black/dark gray visibly differentiated in the field
 - Rip up 6" to 1' of floor material so no Se material is at water/rock interface
-

Recommended Materials Handling Plan

- Place high and dry, **Never** place in valley fill
 - Isolate on 10' pad of non-Se material, covered with minimum 4' most impervious material available
-

Treating Selenium

- Research ongoing
 - EPA recommends membrane reverse osmosis – not field practical
 - Microbially active wetland that establishes an anoxic environment (not the same kind of wetland usually used to treat AMD)
-

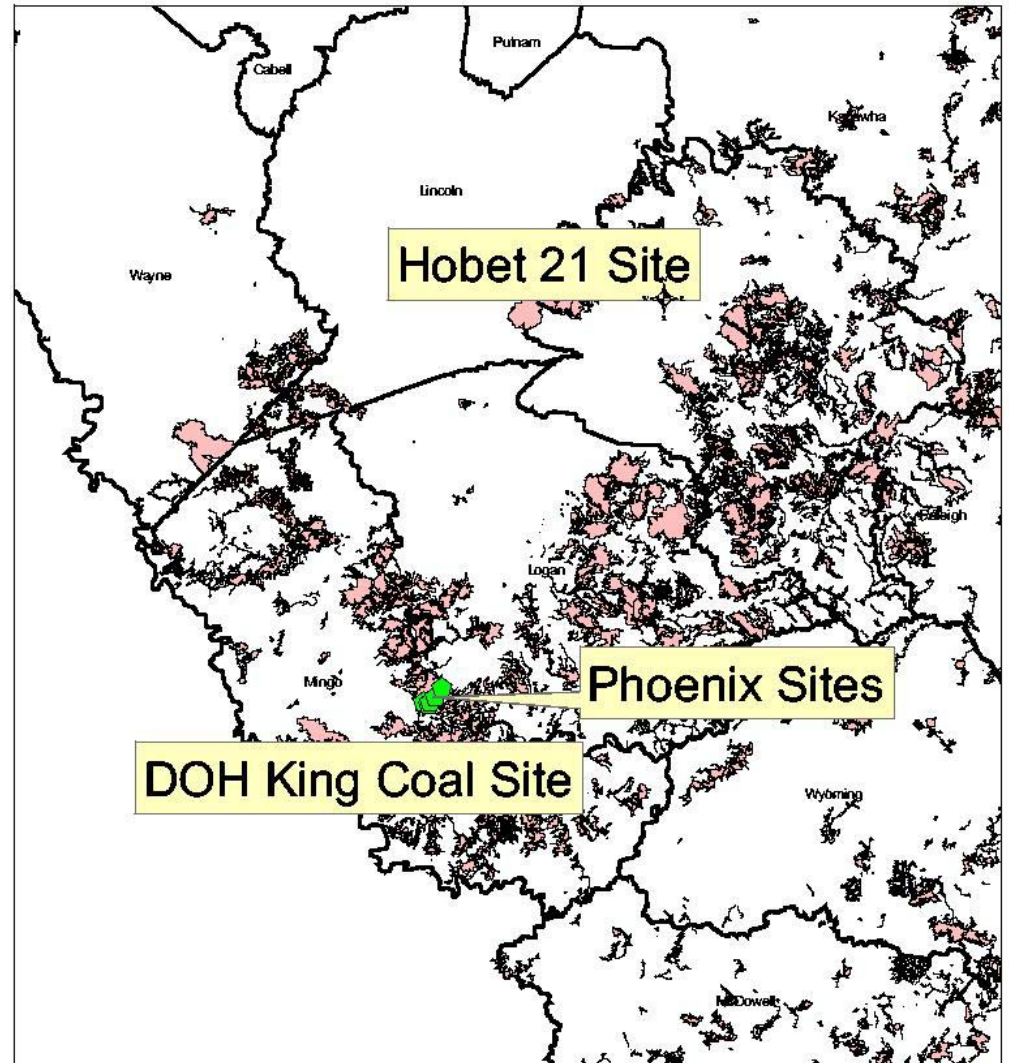


Selenium and materials handling

Nick Schaer
Program Development Geologist

Overburden Sites

Selenium Overburden Sites



Legend

-  Permits
-  County Outline

RESULTS FROM DRILLING IN LOGAN AND MINGO COUNTIES IN SOUTHERN WEST VIRGINIA

Where it was found



RECOMMENDED MATERIALS HANDLING PLAN

To scrape or not to scrape?

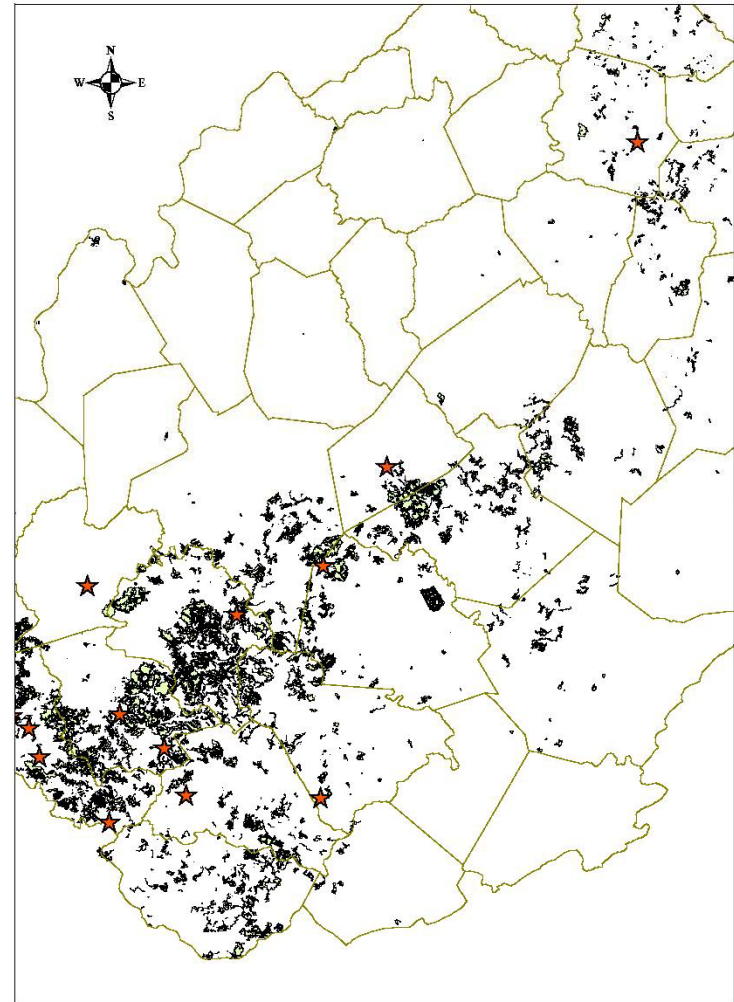
Instream Limits

- Numeric standards of Title 46
- The new fish tissue limits



Threshold Hits

Threshold Selenium Hits



Legend

- ★ Selenium Threshold Points
- County
- Permits

How to treat for selenium



It will be easier to handle than it
will be to treat.

