

Central Valley Water Board Sacramento Office

Introduction to Mine Waste Characterization

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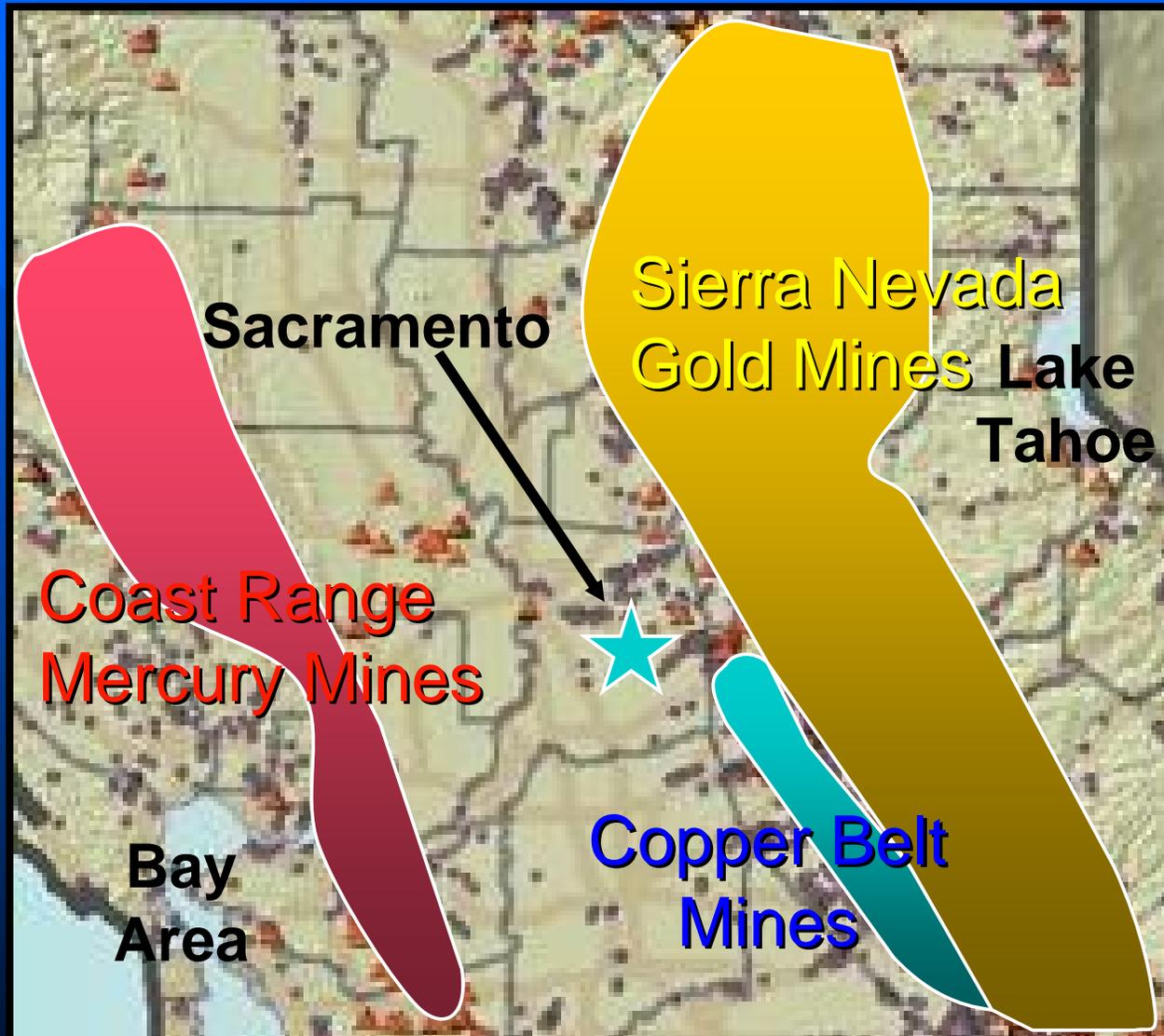


Mount Diablo

Mining Areas: Sacramento Office

- **Coast Range Mercury Mines**
(mercury, pH? salts and other metals)
- **Sierra Nevada Gold Mines**
(arsenic, mercury, pH?, salts and other metals)
- **Copper Belt – Lower Sierra Nevada Foothills**
(copper, pH, salts and other metals)

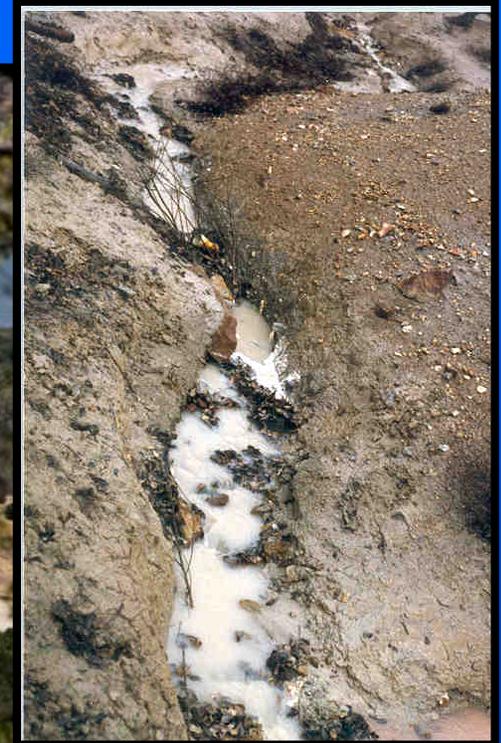
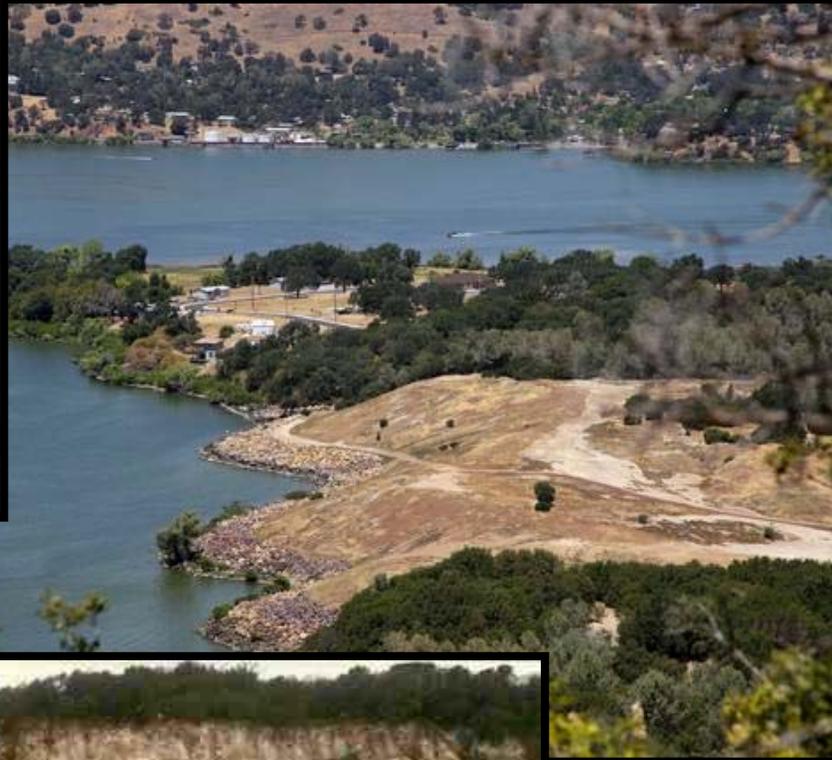
Mining Area Locations



Coast Range Mercury Mines



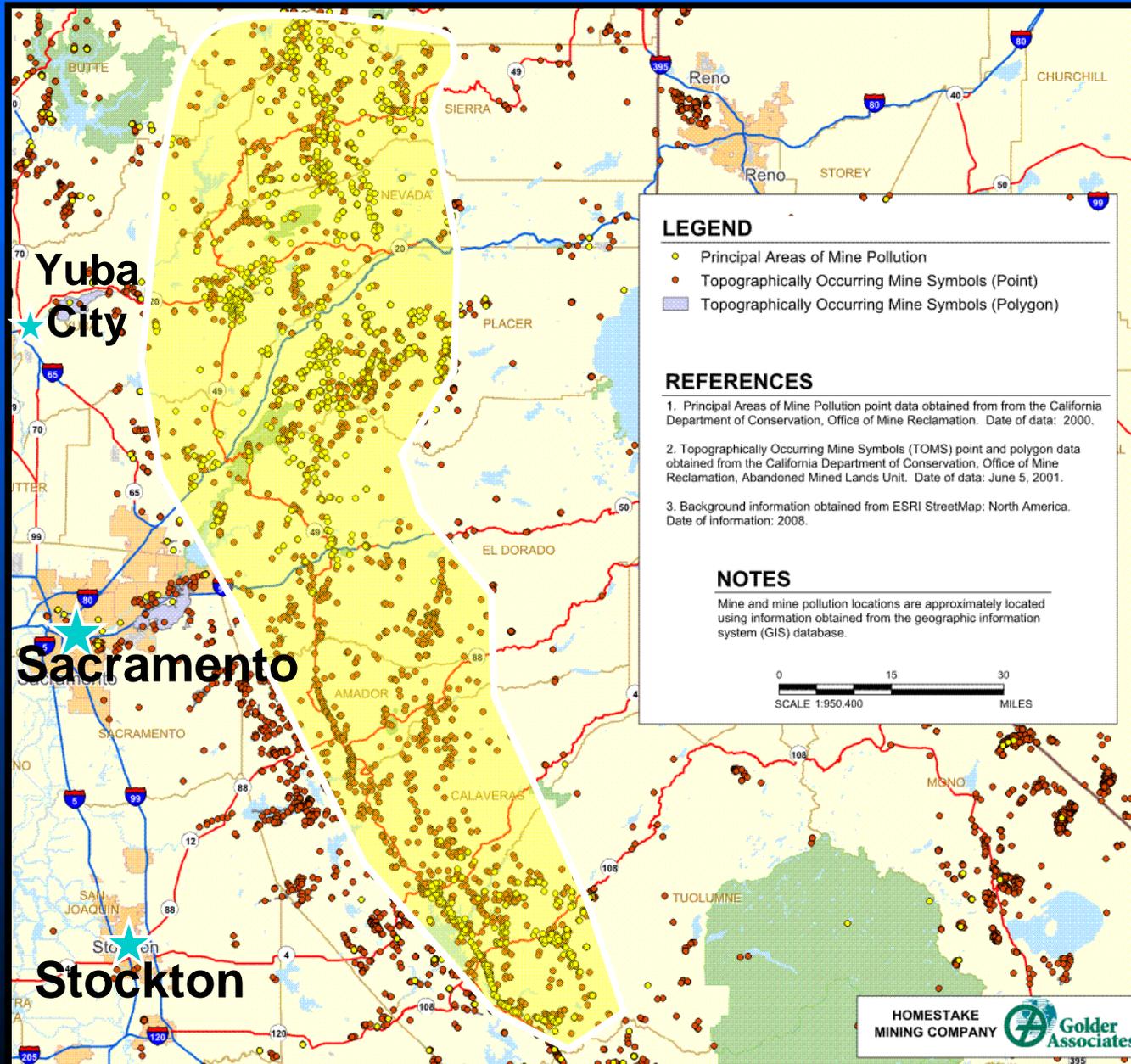
Sulphur Bank Mine



Elgin Quicksilver Mine



Sierra Nevada Gold Mines



Gardner Point



Jamestown Mine



Lower Brush Creek Mine



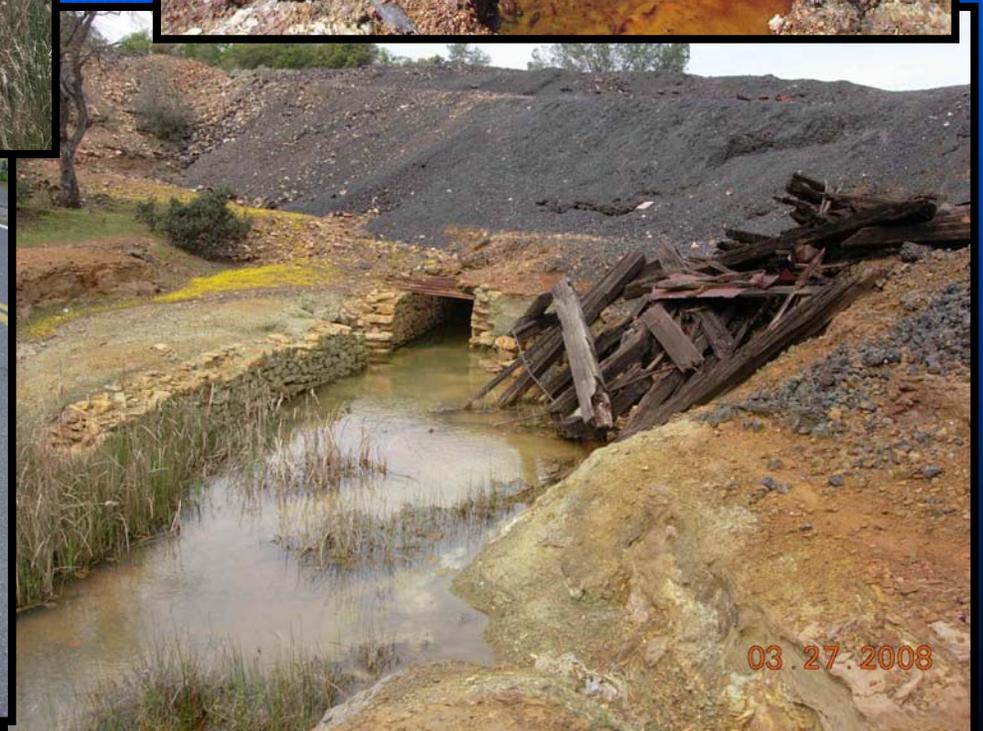
Copper Belt Mines



Copperopolis



Copperopolis



Newton Copper Mine



Potential Mining Impacts

- Coast Range Mercury Mines
(mercury, pH? **salts** and other metals)
- Sierra Nevada Gold Mines
(arsenic, mercury, pH?, **salts** and other metals)
- Copper Belt – Lower Sierra Nevada Foothills
(copper, pH, **salts** and other metals)

What is mining waste?

**Title 27 California Code of
Regulations**

**Mining Waste Management
Regulations §22470**

“Mining waste” (SWRCB) means all waste materials (solid, semi solid, and liquid) from the mining and processing of ores and minerals including soil, waste rock, and other forms of overburden as well as tailings, slag, and other processed mining wastes.

(a) Definition — Mining waste is waste from the mining and processing of ores and mineral commodities. Mining waste includes:

- (1) overburden;**
- (2) natural geologic material which have been removed or relocated but have not been processed (waste rock); and**
- (3) the solid residues, sludges, and liquids from the processing of ores and mineral commodities.**

Mining Waste Includes:

- Overburden
- Waste Rock
- Low grade ore
- Spent ore
- Unprocessed ore
- Backfilled waste
- Mill Tailings
- Process Water

Waste Characterization

California Water Code 13260

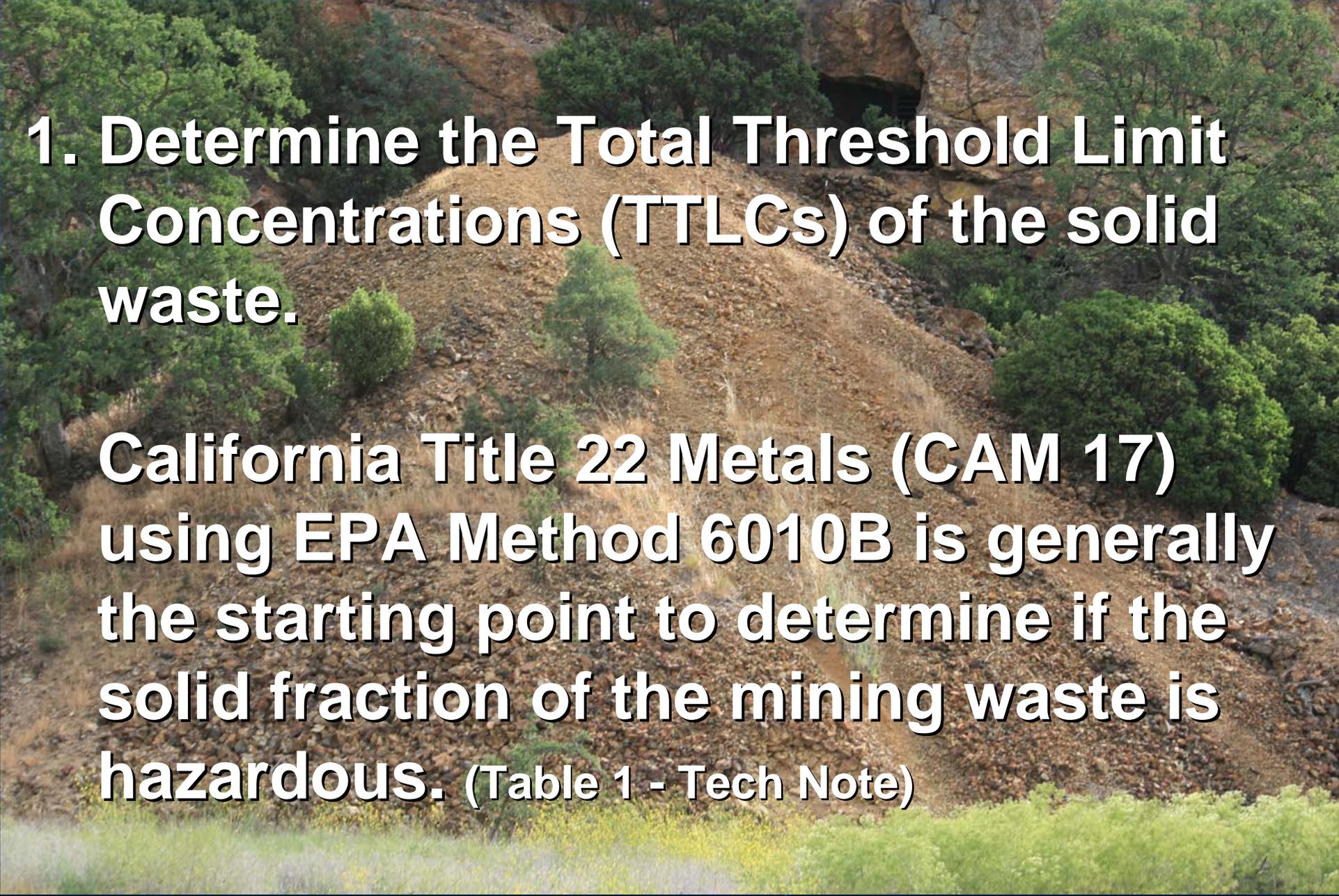
Before any person discharges mining waste, the person shall first submit both of the following to the regional board:

- **A report on the physical and chemical characteristics of the waste that could affect its potential to cause pollution or contamination.**
- **A report that evaluates the potential of the discharge of the mining waste to produce, over the long term, acid mine drainage, the discharge or leaching of heavy metals, or the release of other hazardous substances.**

**How do we get the information on
the physical and chemical makeup of
the waste?**

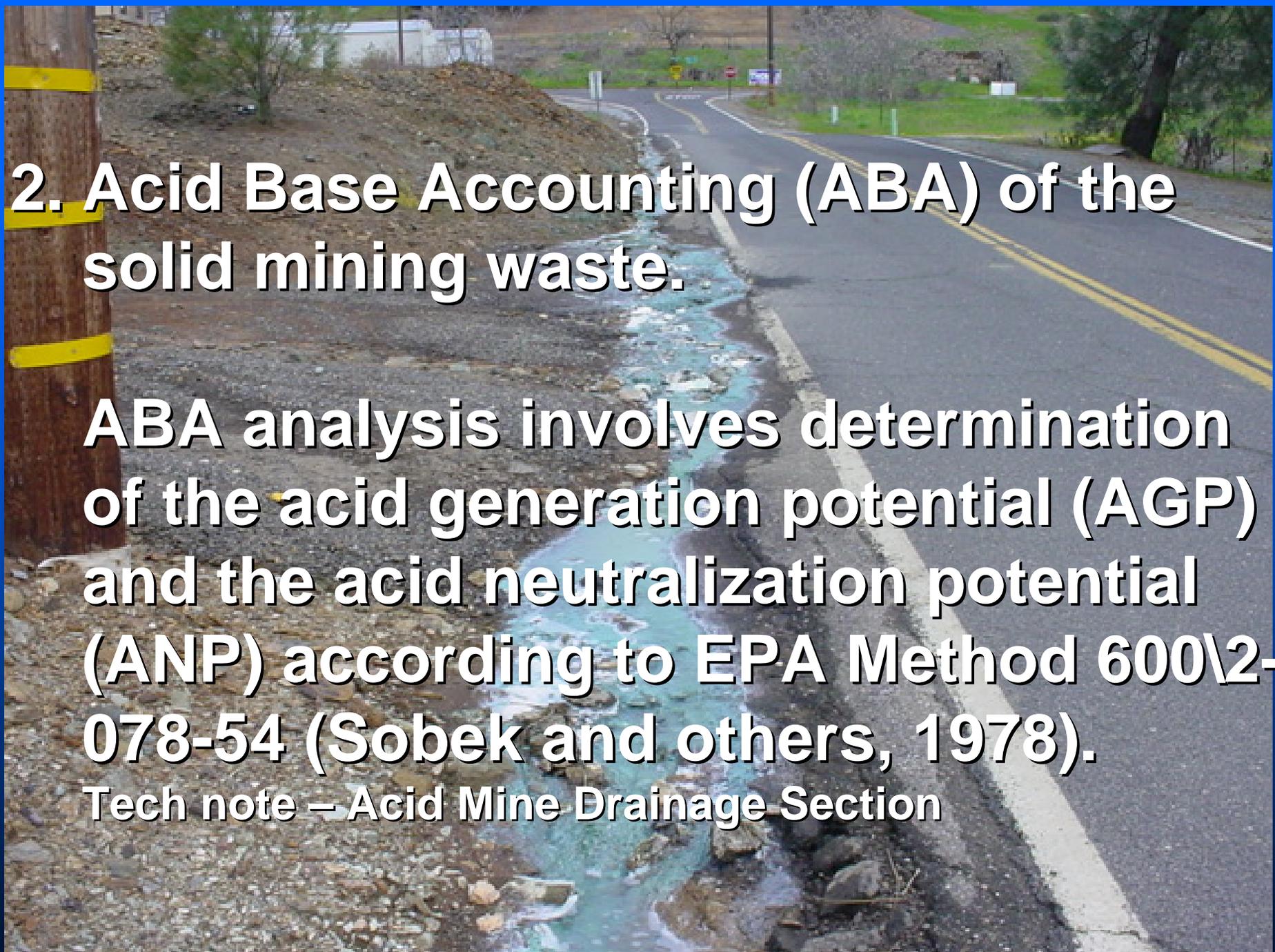
**Analytical testing of the mining
waste**

**Tech Note – Mine Waste
Characterization**



1. Determine the Total Threshold Limit Concentrations (TTLCs) of the solid waste.

California Title 22 Metals (CAM 17) using EPA Method 6010B is generally the starting point to determine if the solid fraction of the mining waste is hazardous. (Table 1 - Tech Note)



2. Acid Base Accounting (ABA) of the solid mining waste.

ABA analysis involves determination of the acid generation potential (AGP) and the acid neutralization potential (ANP) according to EPA Method 600/2-078-54 (Sobek and others, 1978).

Tech note – Acid Mine Drainage Section

3. Determine the Soluble Threshold Limit Concentrations (STLCs) of the mining waste (EPA Method 6010B).

The Waste Extraction Test (WET) procedure is used determine the soluble constituents of solid waste that could potentially migrate to waters of the State. Tech Note – Table 4

Table 4. Laboratory Constituent List for Surface Water and Groundwater Samples

Constituent	EPA Method	Target Method Detection Limit (mg/l)
Metals		
Calcium, dissolved	M200.7 ICP	0.2
Magnesium, dissolved	M200.7 ICP	0.2
Sodium, dissolved	M200.7 ICP	0.3
Potassium, dissolved	M200.7 ICP	0.3
Chloride, dissolved	M325.2	1
Bicarbonate, dissolved	M2320B-Titrametric	2
Carbonate, dissolved	M2320B-Titrametric	2
Total Alkalinity, dissolved	M2320B-Titrametric	2
Silica, dissolved	M200.7 ICP	0.2
Sulfate, dissolved	M300.0	10
Nitrate/Nitrite as N, dissolved	M353.2	0.02
Ammonia (as N)	M350.1	1.5

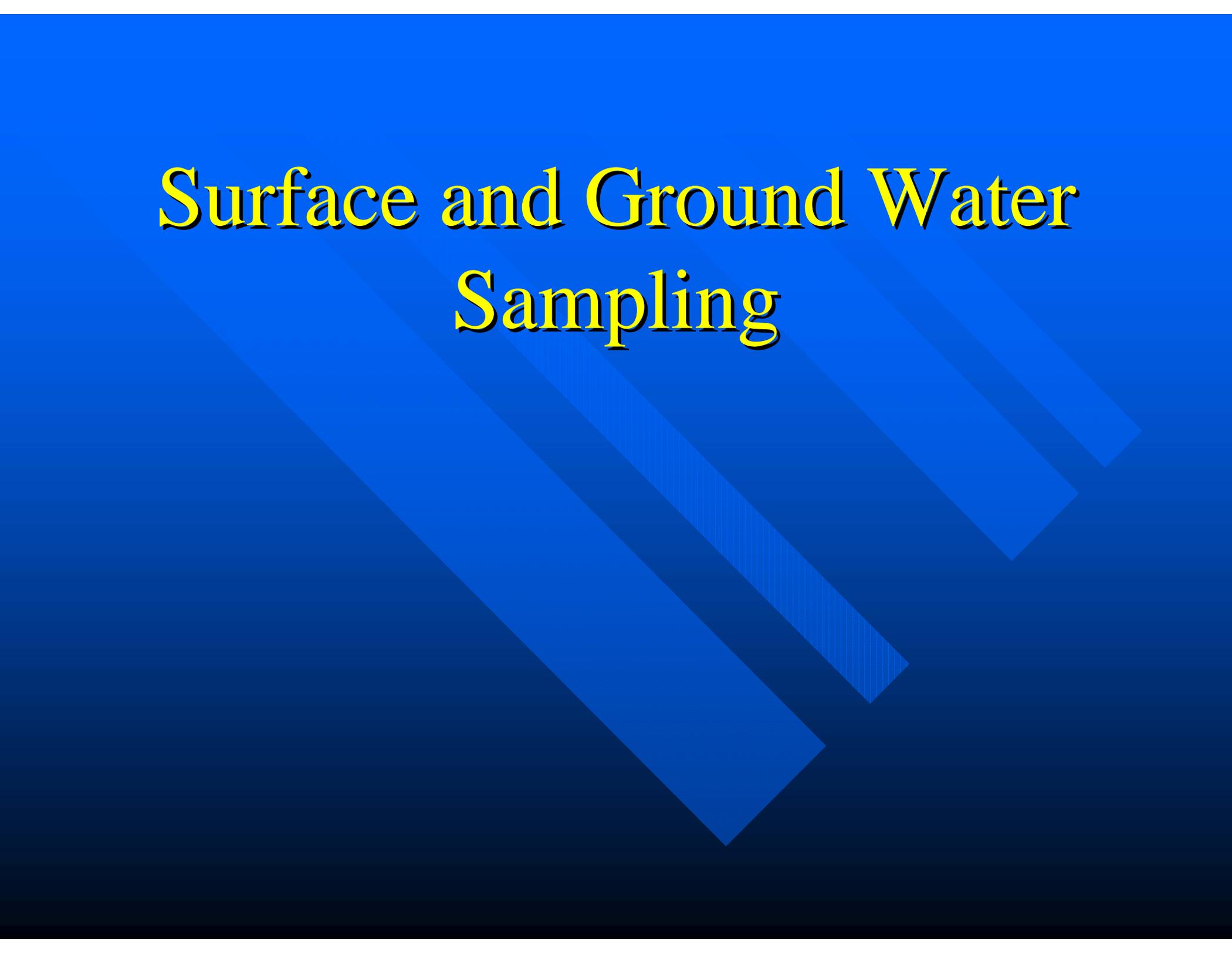
The analytical analysis determines if the mining waste contains constituents that are:

- **hazardous**
- **acid generating**
- **soluble**
- **above water quality objectives, or**
- **inert.**

What do I do with this data?

- If you are only classifying the waste you are done sampling and you should compare it to appropriate criteria.
- If you want to know if mining has impacted water quality, further surface and groundwater sampling is necessary.

Surface and Ground Water Sampling

The background of the slide is a dark blue gradient. Overlaid on this are several diagonal stripes of varying shades of blue, running from the top-left towards the bottom-right. The stripes vary in width and opacity, creating a layered, geometric effect.

Initial Sampling us Constituents on Table 4 from Tech Note – Mine Waste Characterization

- Calcium, Magnesium, Sodium, Chloride, Bicarbonate or alkalinity and Sulfate
- Reduce sampling after initial rounds of samples

USEPA Report

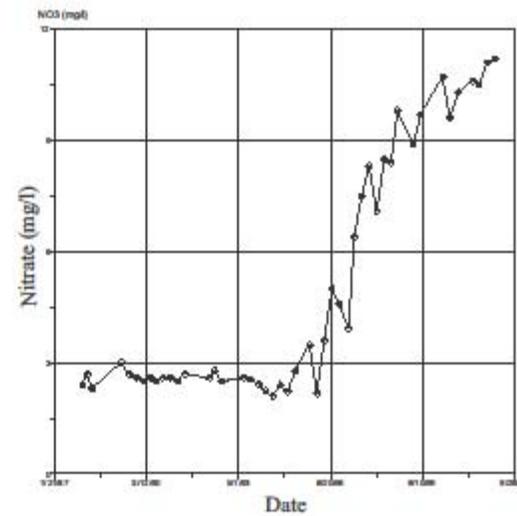
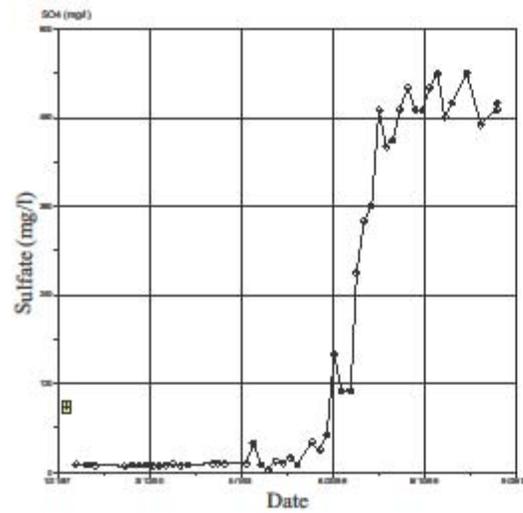
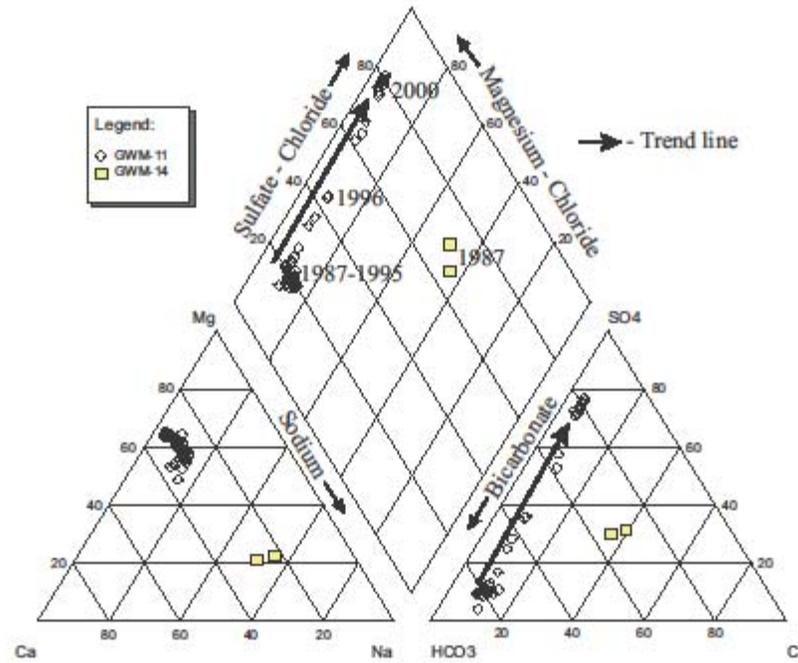
- **Characterization of Mine Leachates and the Development of a Ground-Water Monitoring Strategy for Mine Sites** EPA/600/SR-99/007 February 1999

Report Results

- Same geochemical parameters defined a consistent pattern
- Results reproducible at a site
- The geochemical fingerprint distinctly different than natural groundwater

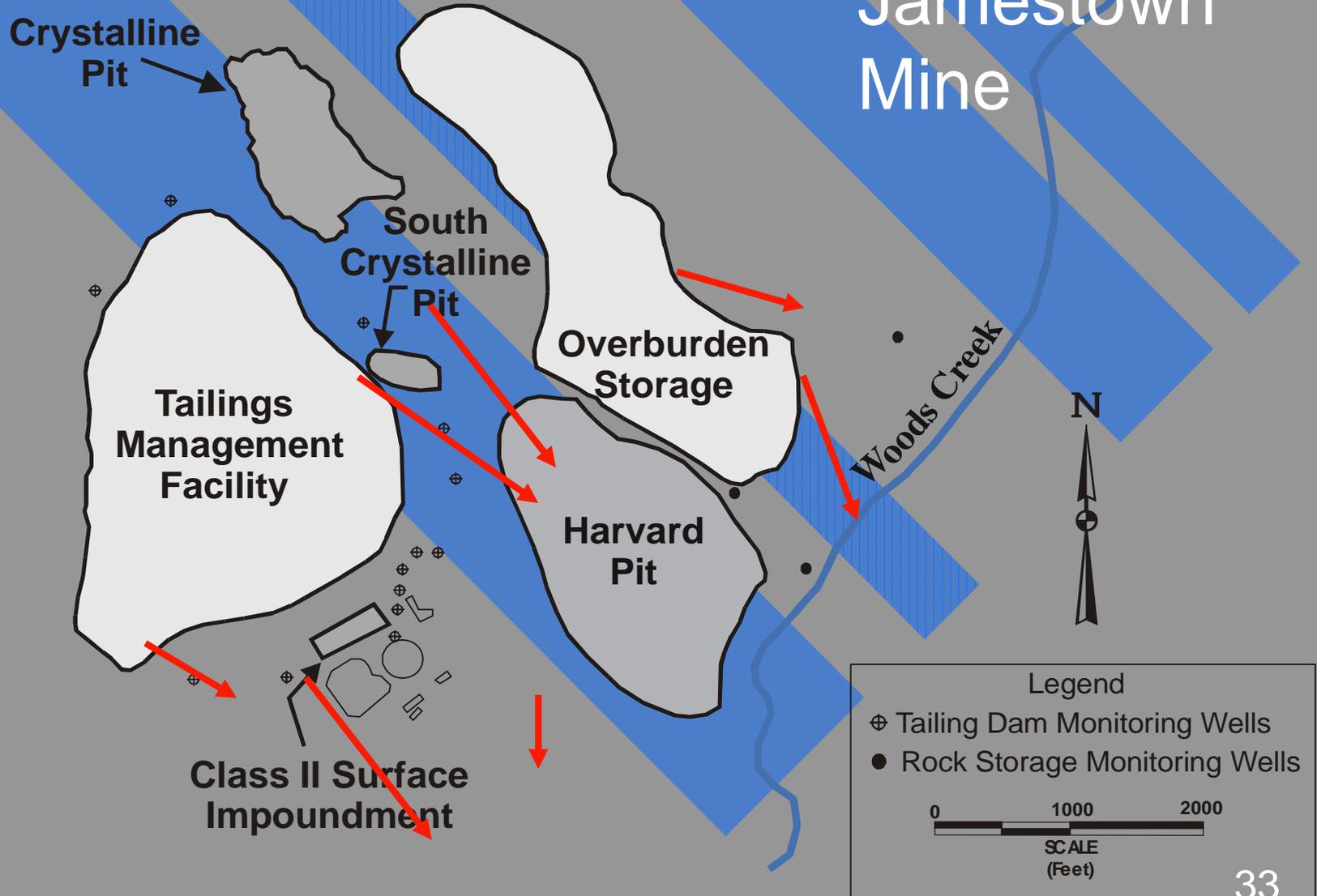
Figure 15

Gold Knoll ODS
GWM-11 & 14



Groundwater Sampling

Jamestown Mine



Groundwater Sampling

Rathburn-Petray



Do we do Groundwater Sampling?

Conclusion

Any questions?