"All the stones… each one has a language of its own… a song."-- Wallace Black Elk, LAKOTA

**Elder's Meditation**

- To believe stones can talk takes an open mind.
- Pick up a rock and listen to your thoughts.
- After a while, put that rock down and pick up another rock.
- Your thoughts will change.
- The Stone People are very old and very wise.

http://www.whitebison.org/index.php
Outline

• Mining on Tohono O’odham Tribal Lands
• Basic Mining Concepts
• Life Cycle of a Mine
• Positive and Negative Impacts From Mining
• Reclamation / Closure
• Protecting Tribal Lands
• Discussion
Mining on Tohono O’odham tribal lands
Mining Office
Department of Natural Resources
Tohono O’odham Nation
Sells, Arizona
The Mission of the Mineral Resources Program is to Protect and Develop the Mineral Resources of the Tohono O’odham Nation as directed by the Nation’s Leadership.

- Oversee hard rock mining operations
- Oversee sand, gravel, aggregate operations
- Monitor patented & unpatented claims
- Support assessments
- Develop mining related job opportunities
- Stay informed
- Provide mining education
- Help develop tribal mining policies & regulations
TOHONO O’ODHAM NATION

- Federally recognized sovereign Nation
- 11 districts
- > 30,000 members
- 2.8 million acres
- Southern Arizona
- ~75 miles on border
MINING NEAR & ON TOHONO O’ODHAM

- Cyprus Tohono Mine
- ASARCO Mission
- Sierrita Mine
- Proposed: Rosemont
- >100 patented
- ~10 unpatented
- >100 legacy mines
Cyprus Tohono Corporation Mine

- Alternative Superfund Copper Mine Site
- Impacted land and groundwater
CYPRUS TOHONO MINE: Reclamation Flats
CTC/ USEPA Remedial Investigation/Feasibility Study for Mitigation of Groundwater Contamination

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/BySite/Cyprus%20Tohono%20Mine
ASARCO Mission Copper Mine

2008

2015
$8 TRILLION ALTERNATIVE ENERGY BOOM IS A WIN FOR COPPER
ROSEMONT

To the Honorable Tom Vilsack,
Secretary
U.S. Department of Agriculture
1400 Independence Ave., S.W.
Washington, D.C. 20250
 ap_ANTQ82@egov

The Tohono O’odham Nation
August 26, 2013

Dear Secretary Vilsack:

We write to respectfully request that the repudiating of the Final Environmental Impact Statement and associated Record of Decision for the Rosemont Mine Project (“Project”) be stopped. The Tohono O’odham Nation recently learned that the Forest Service plans to issue a Record of Decision in this matter in the end of September. This deadline is entirely out of hand to the Nation, as no such date had been previously mentioned. The announcement came when the Forest Service distributed to the Cooperating Agencies the Final Draft Environmental Impact Statement. This arbitrary deadline has apparently been proposed to avoid new regulations that would otherwise apply to this Project, replacing the current administrative appeal process with an objection process.

First, with respect to the new deadline, the Nation takes issue with the inconsistencies of this arbitrary deadline. The new regulations became effective for the Hardrock Forest Resource Act project on March 27, 2013. 76 C.F.R. § 218.1(a). The Forest Service knew or should have known that the new regulations would apply to proposals such as the Project if no decision was rendered prior to September 27, 2013. Yet, the Forest Service did not inform the cooperating agencies that they were attempting to scrutinize the Project under the new regulations. Instead, cooperating agencies were informed on July 1, 2013, of this impending deadline. This sudden change is deeply problematic. The regulations provide that the Forest Service merely must notify interested and affected parties that the project will be subject to the new regulations if a decision will be issued after the September 27th deadline. Presenting the Project under the new regulations rather than rectifying a decision under the old regulations will ensure full

http://www.rosemontminetruth.com/
Sierrita Mine
Historical Site visit
"AGGREGATE MINERALS"
LEGACY ABANDONED MINES
“Quijotoa: Boom and Bust in the Arizona Desert”
Abandoned Mine Safety

WARNING! DANGER!
Abandoned mines are deadly! Don’t get trapped!

STAY OUT! STAY ALIVE!

Damaging or removing this sign is a felony pursuant to ARS 27-318D. Entry into these workings is criminal trespass.

Douglas K. Martin, Arizona State Mine Inspector
1700 W. Washington, Suite 400, Phoenix, Arizona 85007-2805
Basic mining concepts
2ND OLDEST PROFESSION

"IF IT ISN'T GROWN, IT MUST BE MINED"

- **Mining** is a part of human advancement
- **Oldest Mine**: 20,000-40,000 years ago Red Ochre
  - mined in Africa for use in rock paintings
- **Native Americans** mined copper 5000-1200 BC
  - *for knives, arrows, spear heads, and axes*
- **Copper** was mined 5000 years ago on Cyprus Island
- **Ancient Greek & Roman Copper Mining**
  - released trace metals discovered in Greenland ice cores
MINES ARE EVERYWHERE

- Mines are in every state
- 500,000 abandoned mines
- 14,000 active mines
WHY ARE THERE SO MANY MINES?

- Coal: 49.0%
- Natural Gas: 20.0%
- Petroleum: 19.4%
- Other Gases: 0.4%
- Nuclear: 1.6%
- Hydroelectric: 7.0%
- Other Renewables: 2.4%

Total = 4,065 Billion KWh
Electric Utility Plants = 61.1%
Independent Power Producers & Combined Heat and Power Plants = 38.9%
70% of all metal is used only once and then thrown away

Reduce  Reuse  Recycle

Every American Born Will Need...

- 33,193 lbs. Salt
- 11,427 lbs. Clays
- 539 lbs. Zinc
- 1.25 million lbs. Stone, Sand, & Gravel
- 985 lbs. Copper
- 1.59 Troy oz. Gold
- 16,651 lbs. Phosphate Rock
- 452,666 lbs. Coal
- 5,214 lbs. Bauxite (Aluminum)
- 26,010 lbs. Iron Ore
- 48,483 lbs. Cement
- 72,115 gallons Petroleum
- 905 lbs. Lead
- plus 56,016 lbs. Other Minerals & Metals
- 6.96 million cu. ft. Natural Gas

3.11 million pounds of minerals, metals, and fuels in their lifetime

©2015 Minerals Education Coalition
The Society for Mining, Metallurgy & Exploration Foundation
Learn more at www.MineralsEducationCoalition.org
Life cycle of a mine
DIFFERENT MINES
MINING: The process, industry, and occupation of extracting minerals from the earth’s crust (Hartman, 1992)

- **Mining is a business!**
- **PLAN!**
  - What kind of mine? Open pit? Underground?
  - MUST make Money from mining
  - Buy land, tools, labor, and reclamation
- **Safety is #1 priority**
- **Must Reclaim the site**
- **Do we have to leave any minerals in place?**
- **Closure**
• Prospecting: finding it
• Exploration: defining it
• Development: planning it
• Exploitation: mining it
• Closure/reclamation: cleaning it up
STAGES OF MINING

Preparation
Plan! Buy!

Excavation
Mine!

Reclamation
Rebuild!

Closure
Calculate! Compare!
PROSPECTING: FINDING IT

• 2-8 years including exploration
• Research
• Measure rock properties
  • Geophysics
  • Geochemistry
• Geologic mapping
• May or may not lead to valuable minerals discovery
**MINERALS VS ROCK**

**Mineral** – naturally occurring homogeneous solid with definite (but generally not fixed) chemical composition and an ordered atomic arrangement. It is usually formed by inorganic processes.

**Rock** – a naturally formed, stable aggregation of minerals.

Calcite is a mineral.
Limestone is a rock containing calcite.
EXPLORATION: DEFINING IT

• 2-8 years including prospecting stage

• Purchase lease

• Determine size of the mineral deposit

• Drill Cores & Evaluate
  • Is it valuable? How much will it cost? What are the risks?

• Feasibility report: “go or no go”?

Is the mineral deposit an ore deposit?
MINERAL DEPOSIT VS ORE DEPOSIT

**Mineral occurrence** –
anomalous concentration of minerals

**Mineral deposit** –
concentration has potential economic value

**Ore deposit** –
minerals extracted and processed at a profit
**Conceptual Relationship of Resources and Reserves**

**Mineral Resources**
- **Inferred**: Might be there but not sure
- **Indicated**: Has been sampled, but still an estimate
- **Measured**: Additional sampling: estimate is considered accurate

**Ore Reserves**
- **Possible**: A good chance there’s ore but has high risk
- **Probable**: There is ore where there is some risk
- **Proved**: Know there is ore; very low risk of failure

**Increasing Economic Favorability**

*Source: Adapted from Grimley (1987)*
World Copper Consumption (mt)

World Cu Consumption (lbs/person)
Just less than half the probable and possible project universe will be needed to meet demand in 2026.

Forecast copper mine production from existing operations & firm projects; potential production from probable & possible projects.
DEVELOPMENT: PLANNING IT

- 4-12 years

- Budget and Financing

- Report impact: Environment, community, safety

- Assess Permits, Technology, Roads, Disposal

- Construct facilities and excavate deposits

- *Millions of dollars of investment by this point*
INVESTMENT IN A MINE

- Costs:
  - Process permits and get approved
  - Environmental Impact Statement
  - Feasibility Studies

- To get from development to production
  - must consider certainty in land tenure, water rights security, and regulatory
NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PROCESS

Describes Baseline Conditions and Potential Impacts
MANY AGENCIES REGULATE MINING

Section 402 NPDES Water Discharge Permit
Air Quality Permit
Section 404 Dredge and Fill Permit
Section 106 Historical and Cultural Resources Protection
Marine Mammal Protection Act
Threatened and Endangered Species Act
Essential Fish Habitat
Fish and Wildlife Coordination Act
Bald Eagle Protection Act
Migratory Bird Protection
EXPLOITATION: MINING IT

• Usually lasts 5-30 years

  many mines are now 100+ years

  very dependent on commodity type

• Remove ore

  Conventional cycle = drill + blast + load + haul

• Maintain safety at all times
drill + blast + load + haul
COPPER
Uses of Copper in the United States During 2011

- Building Construction: 45%
- Electric and Electronic Products: 23%
- Transportation Equipment: 12%
- Consumer and General Products: 12%
- Industrial Machinery and Equipment: 8%
OXIDE ORE PROCESS

Heap Leaching

Sprinkler

Leachate

Collection ditch

Solvent Extraction

Electrowinning

Acid

Rubber lining

Ca $^{3+}$

Recirculation

Extraction

Stripping

EW
Sulfide Ore

Grinding

Flotation

Thickening

Smelting

Converting

Anode Furnace/Casting

Electrolytic
Positive and negative impacts from mining
✓ Minerals
✓ Economic development
✓ Infrastructure
  • roads, electricity, clean water, wastewater treatment
✓ Community development
  • education, schools, hospitals, and services
✓ Employment
  • >13 million employees worldwide in small scale mining
  • where mine employees spent their income
POSITIVE IMPACTS

- Infrastructure
- Services
- Employment
<table>
<thead>
<tr>
<th>Mining jobs</th>
<th>Casino jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>910</td>
<td>401</td>
</tr>
<tr>
<td>$20,000+ (241)</td>
<td>$20,000+ (241)</td>
</tr>
<tr>
<td>$40,000+ (370)</td>
<td>$40,000+ (102)</td>
</tr>
<tr>
<td>$60,000+ (252)</td>
<td>$60,000+ (30)</td>
</tr>
<tr>
<td>$80,000+ (162)</td>
<td>$80,000+ (17)</td>
</tr>
<tr>
<td>$100,000+ (85)</td>
<td>$100,000+ (11)</td>
</tr>
<tr>
<td>$120,000+ (41)</td>
<td></td>
</tr>
</tbody>
</table>
MINING ROYALTIES

ENVIRONMENTAL CONCERNS

• Erosion, Formation of Sinkholes
• Loss of Biodiversity
  Land use changes; land loss
• Contamination by Chemicals
  Air
  Soil
  Groundwater
  Water
• Blasting vibration damage to foundations, floors, yards, historical buildings and graveyards
AIR CONCERNS:

DUST AND CHEMICAL EMISSIONS

Sources:
- open pits
- waste rock piles
- ore crushing
- dry tailings
- roads
- equipment

Impacts:
- degrade air quality
- affect health of people
- contaminate soil, vegetation, water
AIR QUALITY IS AN ISSUE AT EVERY MINE

• Monitoring:

Baseline air quality and climatological data collected in the Proposed Mining Area for comparison to future data and to define potential impacts specific to respiratory health for both workers within the mine and at nearby hamlets/communities.

• Control:

Fugitive dust emissions are controlled through use of direct water application, chemical binders or wetting agents and revegetation of disturbed areas concurrent with operations.
WATER IMPACTS

- Control!
- Minimize contact between wastes and water
- Maximize water reuse
- Prevention!
LAND IMPACTS

Direct:
- Physical alteration
- Loss of habitat and vegetation
- Soil contamination

Indirect:
- Wildlife
- Subsistence users
SOIL AND LAND IMPACTS
PREVENTION AND CONTROL MEASURES:

- Minimize footprint
- Backfill tailings
- Backfill waste rock
- Consolidate wastes
- Reclaim / recontour
- Revegetate & Seed
Endangered Species

Sonoran Pronghorn

Desert Tortoise

Jaguar

Mountain lion

Pima Pineapple Cactus

Bald Eagle

Bighorn Sheep
INVASIVE SPECIES: example **BUFFLEGRASS**

- Native to Africa, Asia, and arid Europe
- Brought to Southwest in 1940s
- Thrives on 6 – 24 inches of rain
- Doubles every 2-7 years
- Fewer saguaros where buffelgrass >43% cover
- Promotes wildfire and re-sprouts readily
- Management: manual with chemical

EMERGENCY RESPONSE

When things go wrong – BE PREPARED!
Reclamation & Closure
CLOSURE / RECLAMATION: CLEANING IT UP

- 1-5 years (closure) / 35 years (reclamation)
- Four objectives:
  - Protect public health and safety
  - Alleviate or eliminate environmental damage
  - Achieve a productive use of the land, or a return to its original condition or an acceptable alternative, and
  - To the extent achievable, provide for sustainability of social and economic benefits resulting from mine development and operations

*Depends on age, location, type, and size of the mine*
GOALS:

- **Physical stability**
  Prevent potential failures, collapses, erosion

- **Chemical stability**
  Prevent run off, poor quality leachate, air and water quality issues

- **Biological stability**
  Vegetated cover

- **Land use**
  Safe and productive land
“An important component of mine planning is the consideration of how closure and reclamation will be funded…. ”
Mining disturbs land.
Modern mines reclaim during and after mining.
Reclaimed mine lands should be attractive to wildlife and human.
Closure planning is necessary at all stages of a mining operation.

Best practice dictates that mines should be ‘designed for closure’.

Closure planning should be routinely incorporated into feasibility studies, operating plans, and due diligence assessments.
Protecting tribal lands
HOW CAN TRIBES BE INVOLVED?

• Tribal Standards, Policies, Regulations
• Traditional Knowledge Surveys
• Government to Government Consultation
• Early & frequent contact with project components, lead agency & advocates
• Participate in Public Hearings & Meetings
• Site Tours
• Training and Education
A Traditional Environmental Knowledge-based Scenario

- Montane Resources
- Riparian Resources
- Wetlands Resources
- Desert Resources
- Air and Dust Inhalation
- Cultural Activities
- Processing
- Direct Soil Exposure
- Garden Produce
- Groundwater
- Aquatic Foods
- Surface Water Use
- Sediment Exposure
- Gathered Foods

Resources:
- Game
- Game Meat
- Irrigation
- Surface Water Use
- Aquatic Foods
- Sediment Exposure
- Gathered Foods

Activities:
- Cultural Activities
- Processing
- Direct Soil Exposure
- Garden Produce
- Groundwater
- Aquatic Foods
- Surface Water Use
- Sediment Exposure
- Gathered Foods
TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK)
MINING LAWS on TRIBAL LANDS

• General Mining Law of 1872

• Federal Land Policy and Management Act of 1976
  • “authorizing and permitting of mineral exploration, mining, and reclamation actions on the public lands administered by BLM.
  • (43 USC 1732[b] and 603[c]; 43 CFR 3802 and 43 CFR 3809)

• Surface Resources Act of 1955
  • (30 USC 611-615; 43 CFR 3715)
  • Holders of patented mining claims and sites located within (tribal) lands later withdrawn from mineral entry, must prove their right to continue to occupy and use the land for mining purposes.
INDIAN RESERVATIONS

- All Indian reservations are closed to location of mining claims under the general mining laws (“WITHDRAWN”).

- In general, Indian tribal lands may, with the approval of the Secretary of the Interior, be leased for mining purposes, by authority of the tribal council (25 U.S.C. § 396 (a); 25 C.F.R. Part 171, esp. § 171.10.)

- Application should be made directly to the Governor or Tribal Council
NEPA is:

- Not a permitting process
- Not a go/no-go decision
- Does not make decisions
- Not a technical or programmatic review
- Not an enforcement tool
NEPA ASSESSMENT CHECKLIST:

• Evaluate the significance of the effects of the proposal on the character, features and resources of the project area.

• Enter relevant data / verifiable documentation to support the finding.

• Enter the appropriate code to make a determination of impact.
  • Impact Codes:
    (1) - No impact anticipated
    (2) - Potentially beneficial
    (3) - Potentially adverse
    (4) - Requires mitigation
    (5) - Requires project modification. *Note mitigation required.*

• Evaluate Alternatives

• Summarize Findings and Conclusions

[Environmental Review; Ref. 40 CFR 1508.8 &1508.27]
Mining Education is Important

Tribal Consultation
- United Nations of the Rights of Indigenous Peoples

Free, Prior and Informed Consent
- International Labor Organization

Tribal Sovereignty
- Self-Governance
United Nations Declaration on the Rights of Indigenous Peoples:

“Free, Prior & Informed Consent refers to the rights of Indigenous communities to participate in decision making about issues that impact them”
PRACTICAL SOVEREIGNTY

putting

DECISION-MAKING POWER IN THE HANDS OF INDIAN NATIONS.
DEVELOP PARTNERSHIPS

- Superfund Research Program - UofA
- Tribal College - TOCC
- Jobs - TERO
- DEMD – Planning & Development
- Wildlife & Veg – USFWS
- Local Gov’t - Pima Co
- USEPA
- Brownfields – site investigations
AGENDA
Tohono O'dham Summer Youth Mining Education Day
Tuesday July 7, 2015 - San Xavier District
District Office Multi-Purpose Room  520-577-4280
Wednesday July 8, 2015 - Sif Odak District
District Office Conference Room  520-361-2340

8:30-9:30  Blessing & Opening

9:30-10:30  Minerals Discovery by AAIACO Mission Complex

10:30-12:00  Mining: It's in Everything by Pamela A.K. Wilkinson, Lowell Institute for Mineral Resources, U of A

12:00-1:00  Lunch

1:00-3:00  Mining: Impacts & Reclamation by US Bureau of Reclamation

3:30-5:30  Closing

Throughout the day  Mining Equipment Simulators: by Prospero Aha Mioke Inc

Primarily for Tribal Youth Ages 7 - 12 grade (adults who want to attend)

For more information: 520-361-2887 or 520-361-2200 or Tohono Mining Office 520-361-3031

Earth Day Events at TOHS

By Naimah Miguel and David Miguel, Opinion

On April 20, as we did in the past, faculty members, students, and parents from TOHS. There was a full day of events and activities throughout the day. Students were divided into groups. Students then had three hours to try on the equipment and explore the various aspects of mining. The students were taught by TOHS teachers. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources.

The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources.

Earth Day Events at TOHS

By Naimah Miguel and David Miguel, Opinion

On April 20, as we did in the past, faculty members, students, and parents from TOHS. There was a full day of events and activities throughout the day. Students were divided into groups. Students then had three hours to try on the equipment and explore the various aspects of mining. The students were taught by TOHS teachers. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources. The presentations included TOHS, the National Parks, the National Forest Service, and the National Resources.
Tribal Program Objectives:

- Provide funds to perform technical evaluations of tribal energy and mineral resource potential; geological, geophysical, engineering reports, and maps…

- Provide technical assistance to understand and plan

- Provide Tribes with an outreach vehicle to promote development of their lands and resources.
NATIONAL TRIBAL MINING WORKGROUP

Focus: Develop training and a 2016 symposium concerning tribal Mining Issues.

Network with other tribes
Discussion
HOW WOULD YOU DO THESE WITHOUT USING ANY ROCKS AND MINERALS?

- Housing
- Transportation
- Communication
- Lighting
- Heating/cooling
- Food
- Clothing
- Protection
- Health issues: medicines, diagnosis, etc.
White 101 Copper Mine Mock Site Fact Sheet

Purpose
The purpose of this summary is to provide an overview of information pertaining to the purely fictional White 101 Copper Mine, in order to create a mock Phase II Environmental Site Assessment proposal. All the information, photos, maps, data, and images were gathered from real sites to create a fictional site, solely for this training. The site created here is representative of copper mining anywhere and does not represent an actual mine. For the sake of our scenario, the site is up for sale.

Location
The False White 101 Copper Mine is located in the Upper Peninsula of Michigan and is categorized under “Historical Copper Mine.” It is located in Houghton County, Michigan along the shores of Lake Superior in a region known as the Upper Peninsula of Michigan. The Mock Site is located along the outskirts of Copper City, Michigan, which borders Baytown Tribal Nations trust lands on the east, and is 100 miles north of Milwaukee Wisconsin. GPS Location: Latitude N 47° 07' 40” Longitude W 88° 33' 47”

Climate and Setting: The Mine is situated about 1.5 miles south of the shore of Lake Superior. At Latitude North 47°, the climate is cold and wet in the winter and hot and wet in the summer. The growing season is short (June to October). There are seasonal winds, which are from the southwest in the winter and from the northeast in the summer. Annual precipitation is approximately 38 inches. The site is just north of and adjacent to the Copper Dumps River, which runs in a westerly direction.

Background
Michigan’s Copper Deposits and Mining: The presence of copper in the rocks of the Keweenaw Peninsula has been known for centuries. Copper artifacts show that long before Europeans arrived, Native Americans throughout the upper Midwest used the metal to make a variety of ornaments, tools, utensils, and weapons. Sometime in the remote past, they dug pits in the ground and separated copper from stone by hammering, using wedges, and, probably, by the use of heat. In 1841 a report by geologist Douglass Houghton drew favorable mining attention to the region, which subsequently...
Laurie Suter, Mineral Resources Administrator
Tohono O’odham Nation Dept. of Natural Resources Mining Office
P.O. Box 837, Sells AZ  85634
Telephone No. 520-383-3031
Laurie.suter@tonation-nsn.gov