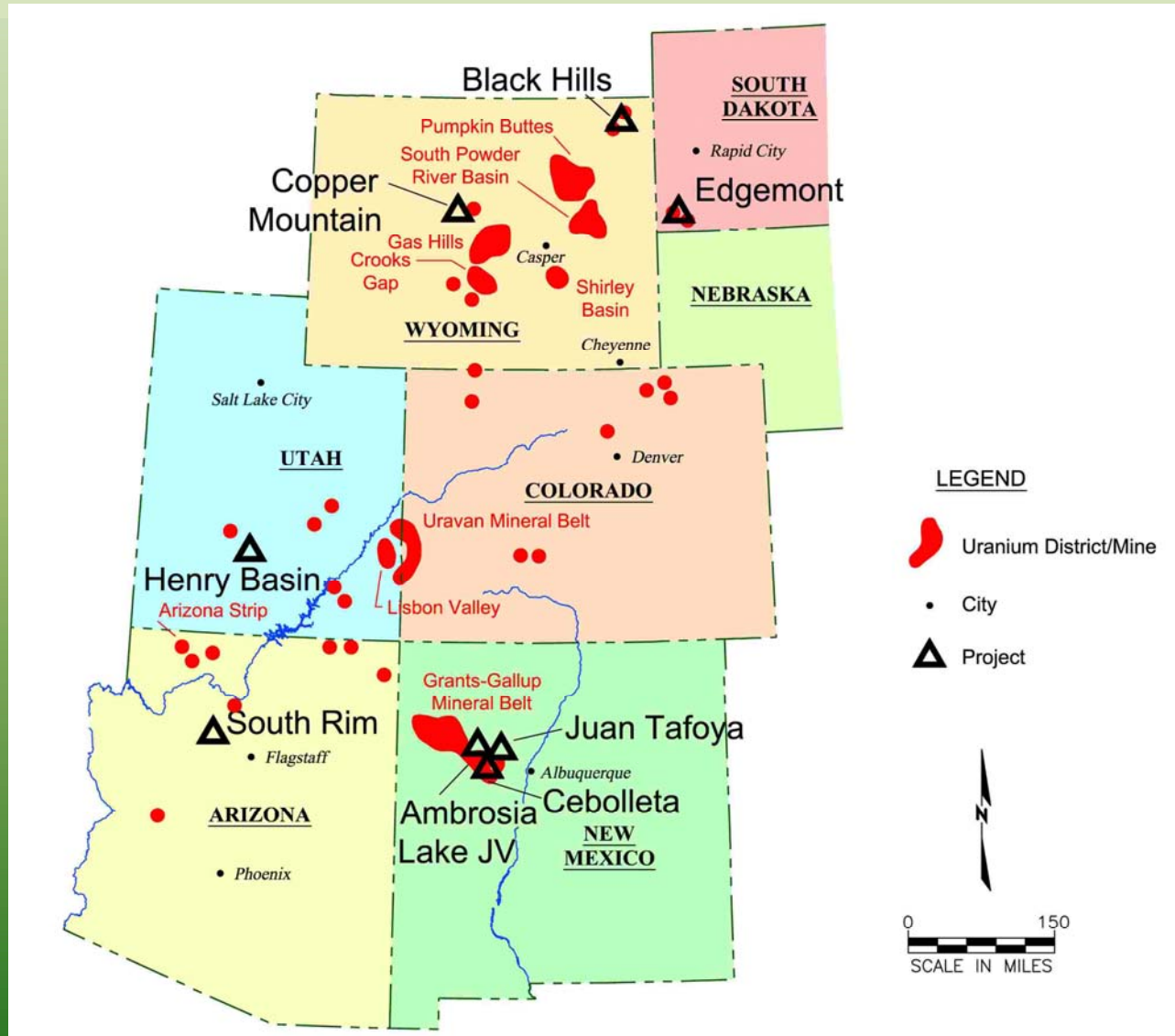


# Who is Neutron Energy?

- Privately owned, well-funded corporation formed in March 2005
- Headquartered in Denver, CO with offices in Albuquerque and Grants, NM, and Wyoming
- 21 full-time employees with 6-8 contract employees
- Over 200 years of collective Staff & Management experience with Uranium Project expertise in the areas of:
  - Geology and Hydrology
  - Environmental Planning and Permitting
  - Mine Development, Operation and Closure
- Corporate Commitment to:
  - Responsible Environmental Stewardship
  - Sustainable Project Development
  - Social Engagement

# PROJECT LOCATIONS



# Juan Tafoya Project Overview

- Located entirely on land owned by the Juan Tafoya Land Corporation about 20 miles as crow flies north of Laguna New Mexico

# Juan Tafoya Project Overview



Marquez Canyon  
Project Location Map

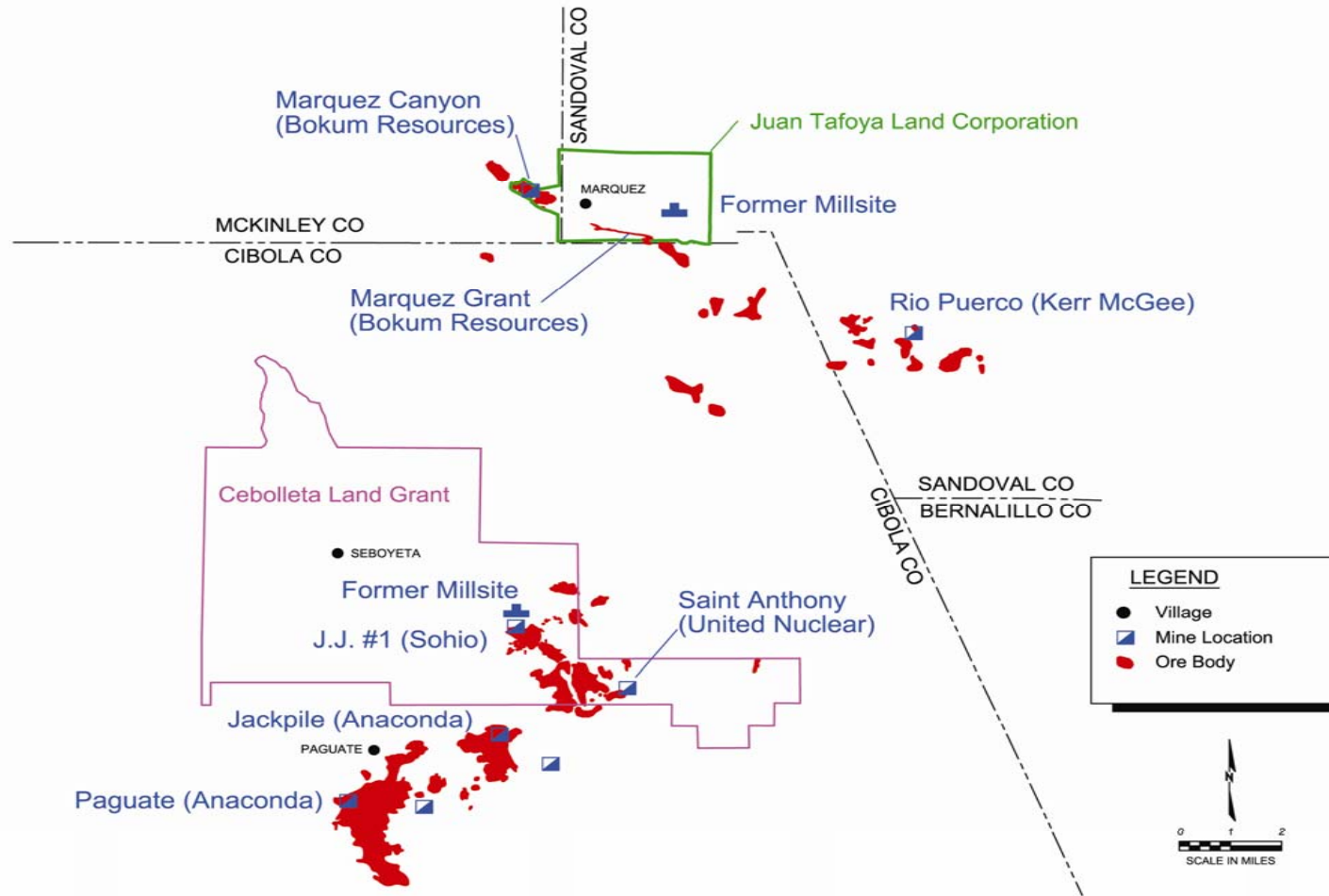




# Juan Tafoya Project Overview

- Juan Tafoya Land Grant (about 4300 acres) formerly part of the 200,000 acre Cebolleta Land Grant chartered in 1800
- 1848 Treaty of Guadalupe Hidalgo – Established US Government recognition of private ownership of Spanish and Mexican Land Grant lands in SW area
- Less than 100 people within a 10 mile radius of the Project Area
- Nearest downwind residence = about 2.5 miles
- Relatively near-by settlements include Village of Marquez, Seboyeta, Moquino , Bibo- all on the Cebolleta Land Grant, and Pagate on the Laguna Pueblo

# Juan Tafoya Project Overview



# Juan Tafoya Project

## Aerial View of the Village of Marquez



# Juan Tafoya Project Overview

- Unemployment rates among Land Grants very high; most residents forced to commute to Grants or Albuquerque for good jobs
- Population composed primarily of Hispanic Land Grant heirs and descendants and nearby Pueblo of Laguna
- 1900's Juan Tafoya group split off from Cebolleta Land Grant
- Approximately 200 members of Juan Tafoya Land Corporation formed in 1976, none of whom live full time in Marquez



# Site History

- Bokum Resources developed project in mid-late 1970's, drilling (and sealing) over 500 holes
- Historic resources greater than 15M lbs. uranium oxide
- 1977 Shaft Sinking Begins
- Sank shaft to about 1800 feet; (PHOTO) did not get to ore zone (Westwater Canyon ~2000 ft.)

# Marquez Canyon Mine Site Circa 1978



# Site History (Cont'd)

- Built new mill; 95% complete before work discontinued, dismantled in late 1990's



# Bokum Resources Mill Circa 1980





# Site History (Cont'd)

- Constructed diversion channel and dam for tailings basin; never operated

# Bokum Resources Tailings Basin Diversion Channel & Dam



# Site History (Cont'd)

- Planned 2000 TPD to accommodate production from Juan Tafoya and Cebolleta
- Infrastructure still in place
  - Haul road
  - Power
  - Water Rights
  - Mill site
- New Mexico Radioactive Materials License issued 1980; transferred to NRC in 1986 and terminated “without prejudice” in 1988



# Juan Tafoya Project View of Mill Site Looking SE to NW Circa 2008



# Current Project Status

- Moving forward with new site characterization work
- Reviewing mill design docs/plans
- Preparing RFP for mill design services
- Looking at alternatives
- Current thought is 2,000 TPD mill
- Moving into tails pre-feasibility design stage

# Environmental Work Plan Review

Current studies underway at the site include:

- Meteorology
- Air Quality
- Ecology
- Radiology
- Archaeology/Cultural Resources
- Socioeconomic studies
- Community Engagement
- Hydrology
- All Studies are being performed by local experts in their respective fields, under direct contract to NEI.



# Meteorology & Air Quality Monitoring Program

- Class One Technical Services designed & is managing Program
- Solar-powered meteorology tower , Instrumentation installed September 2007

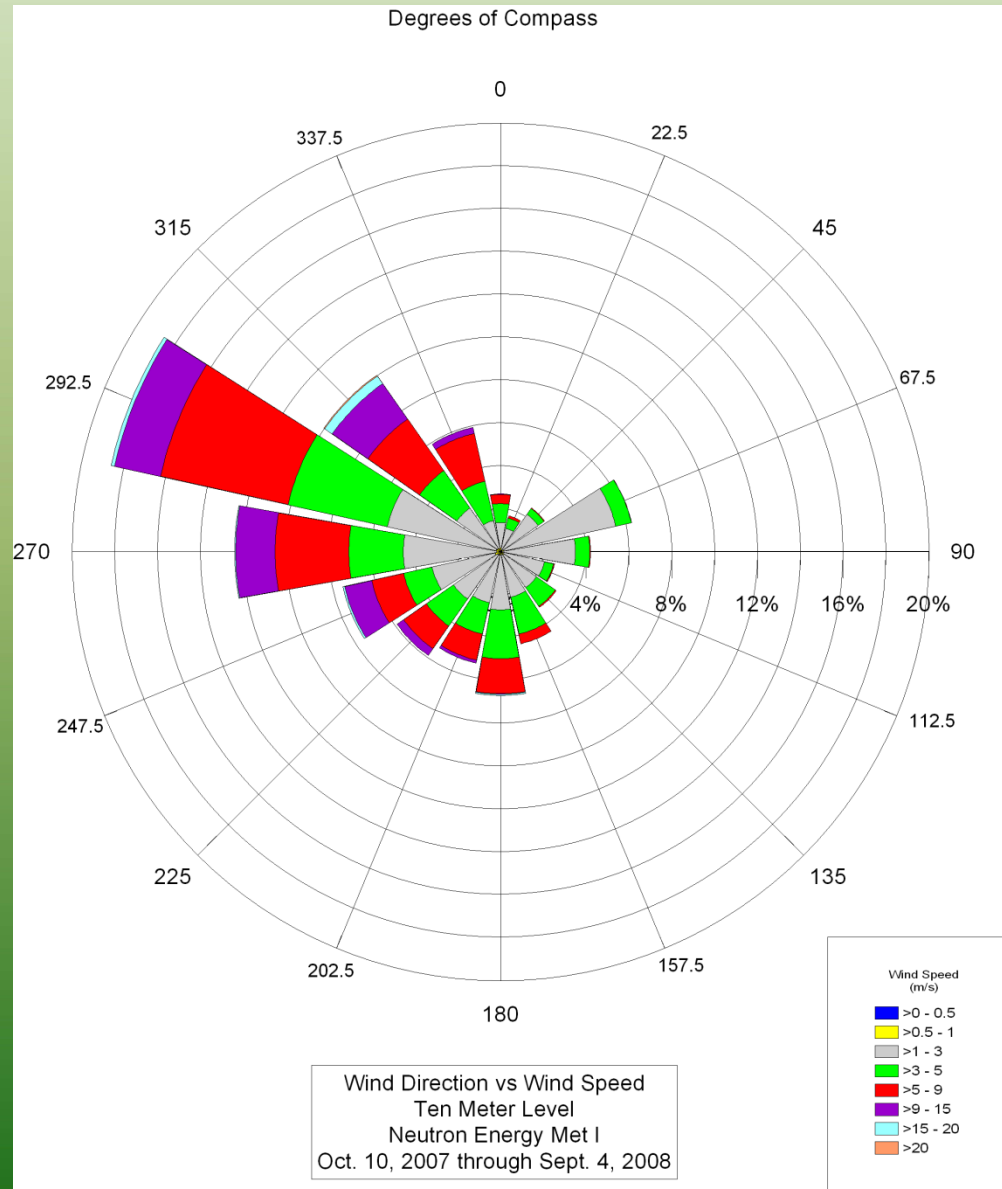


# Meteorology & Air Quality Monitoring Program

- Data collection includes continuous wind direction & speed, temperature, relative humidity, net radiation, barometric pressure, precipitation, and evaporation
- Data is downloaded into Campbell data logger and transmitted to nearby receiver accessible via land line to a modem.
- Year's worth of meteorological data shows prevailing wind direction from W-NW

# Meteorology & Air Quality Monitoring Program

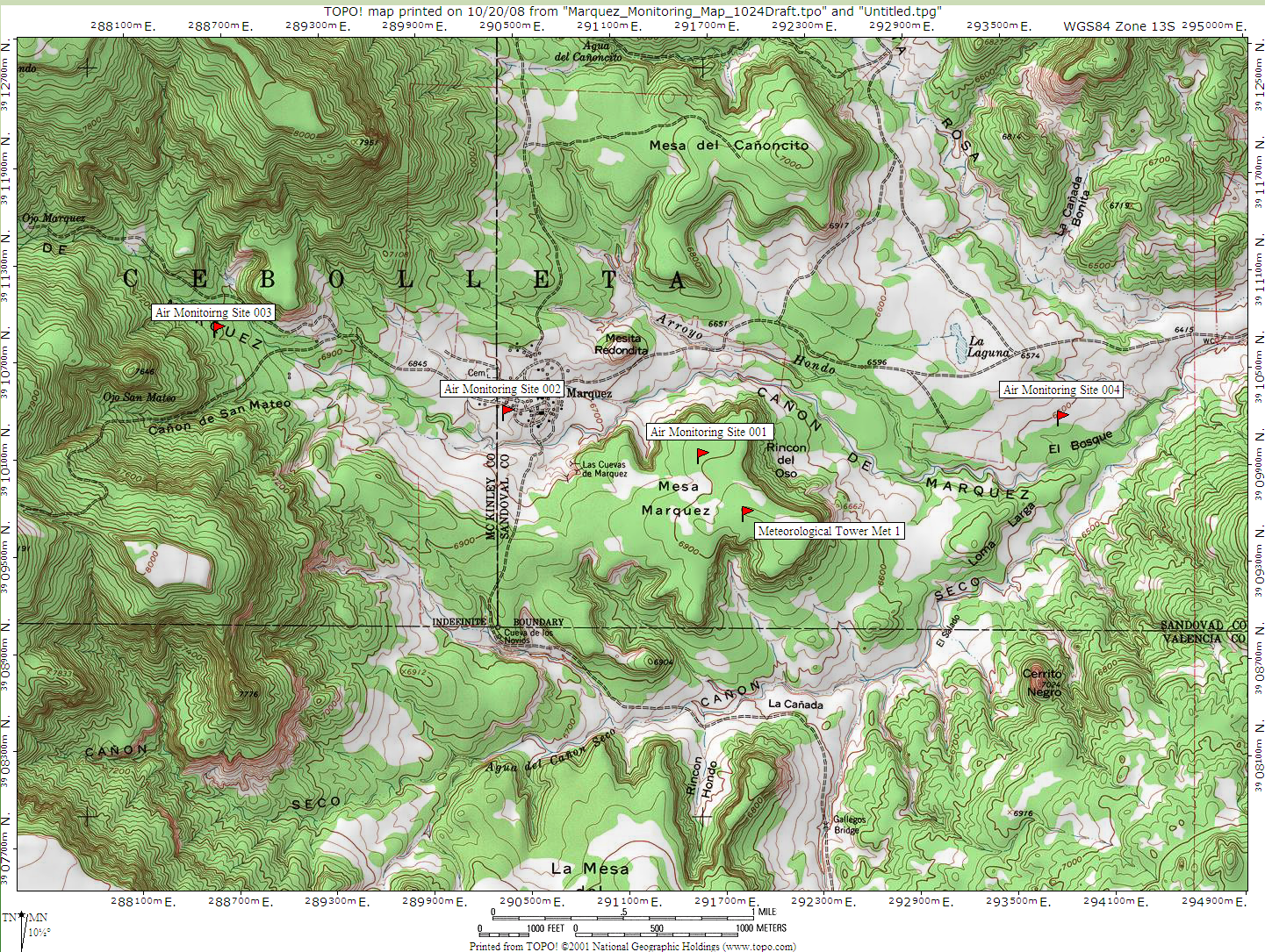
## Wind Rose





# Meteorology & Air Quality Monitoring Program

- Currently four air quality sampling sites (map) 3 of which include continuous radionuclides per RG 4.14 (Th-230, Ra-226, Pb-210, U nat with Hi-vol samplers) at upwind control, nearest residence (Marquez Village), mill site, and downwind of potential tails disposal area.
- Also sampling Rn 222 with AccuStar AT-100 Alpha Track Detectors at same location.
- TSP also being monitored using Lo-vols for PM-10 collection at upwind and downwind locations.





# Juan Tafoya Project Aerial View of Nearest Downwind Residence (L-Bar Ranch House)







# Biological Surveys

## Study Design-Hawks Aloft

- **Literature Review** of previous reports to facilitate vegetation sampling and mapping, and any significant vegetation change relative to prior studies
- **Biological Surveys** to document all evidence of wildlife, including threatened or endangered species, stick nests, and raptor activity
- **Vegetation Surveys** to document and map the vegetation present and compile a list of plant species present on site
- **Wetland Delineation** to determine the presence of jurisdictional wetlands using the standards established by the US Army Corps of Engineers
- **GIS Vegetation Maps** to document different vegetation communities located within the mill site boundaries
- **Reporting** to include literature review, biological surveys, wetlands delineations, and GIS vegetation maps. Comparison of current and historic data where possible. Reports will meet standard content and format requirements of the respective jurisdictional agencies

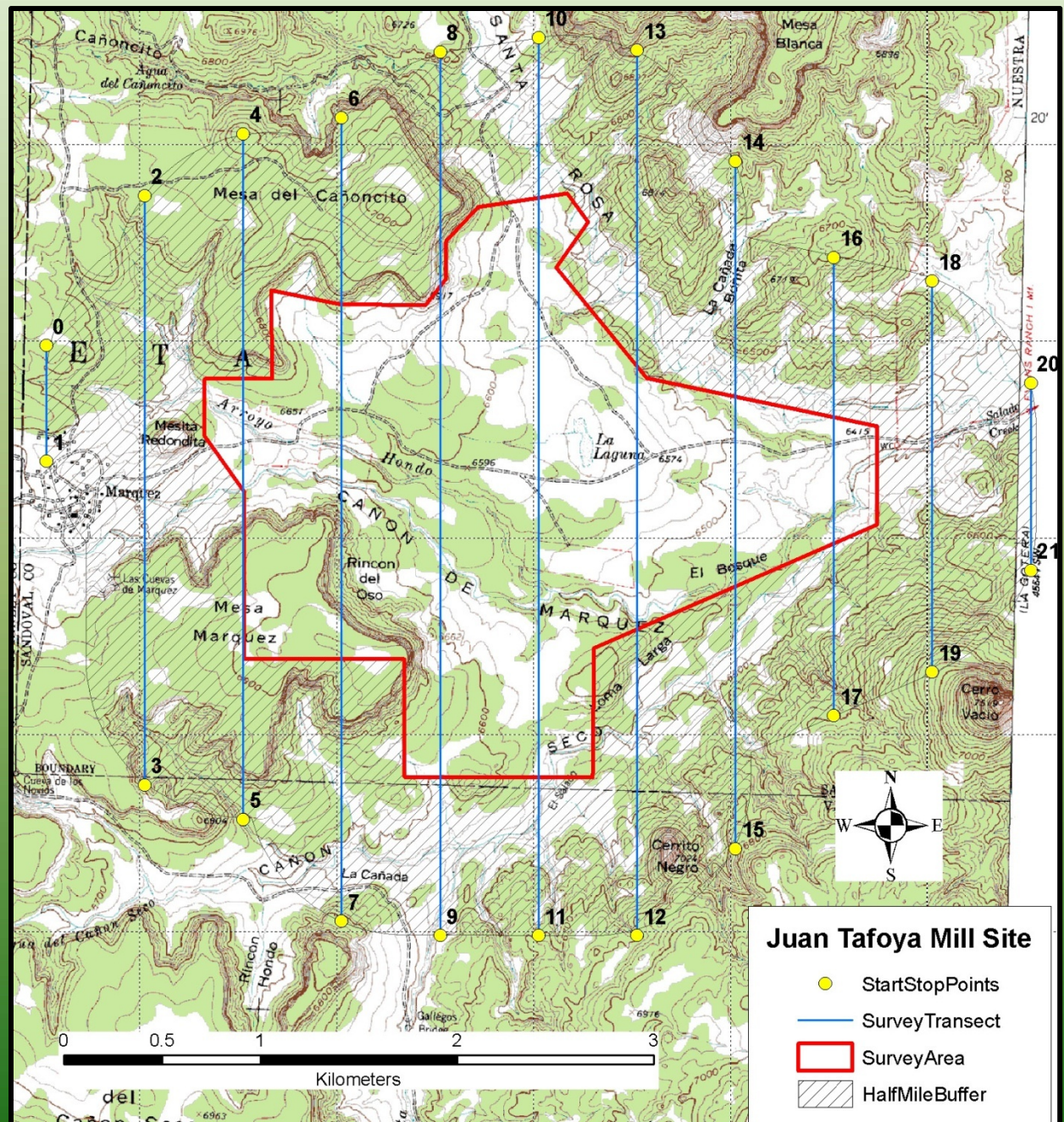


# Study Area

Vertical Blue lines illustrate avian and vegetation transect lines.

Red outlines shows study area boundary.

Light black dashed line shows extent of ½ mile buffer zone used for raptor, avian, and wildlife surveys.







# Typha Pond







# Threatened and Endangered Species



Gray Vireo – NM State Listed



Peregrine Falcon – NM State Listed



Black-footed Ferret – US Federally Listed



# Results: Avian Species

- No T & E species observed
- 54 species detected
- 13 species of conservation concern

## Species of Conservation Concern

Black-chinned Hummingbird

Black-throated Sparrow

Bullock's Oriole

Golden Eagle

Juniper Titmouse

Mountain Bluebird

Pinyon Jay

Plumbeous Vireo

Prairie Falcon

Vesper Sparrow

Western Bluebird

Western Scrub-jay

White-throated Swift



Black-throated Sparrow



# Results: Raptors

## Active Nest Sites

Cooper's Hawk

Golden Eagle

Red-tailed Hawk

## Other Species Observed

Prairie Falcon

American Kestrel

Turkey Vulture

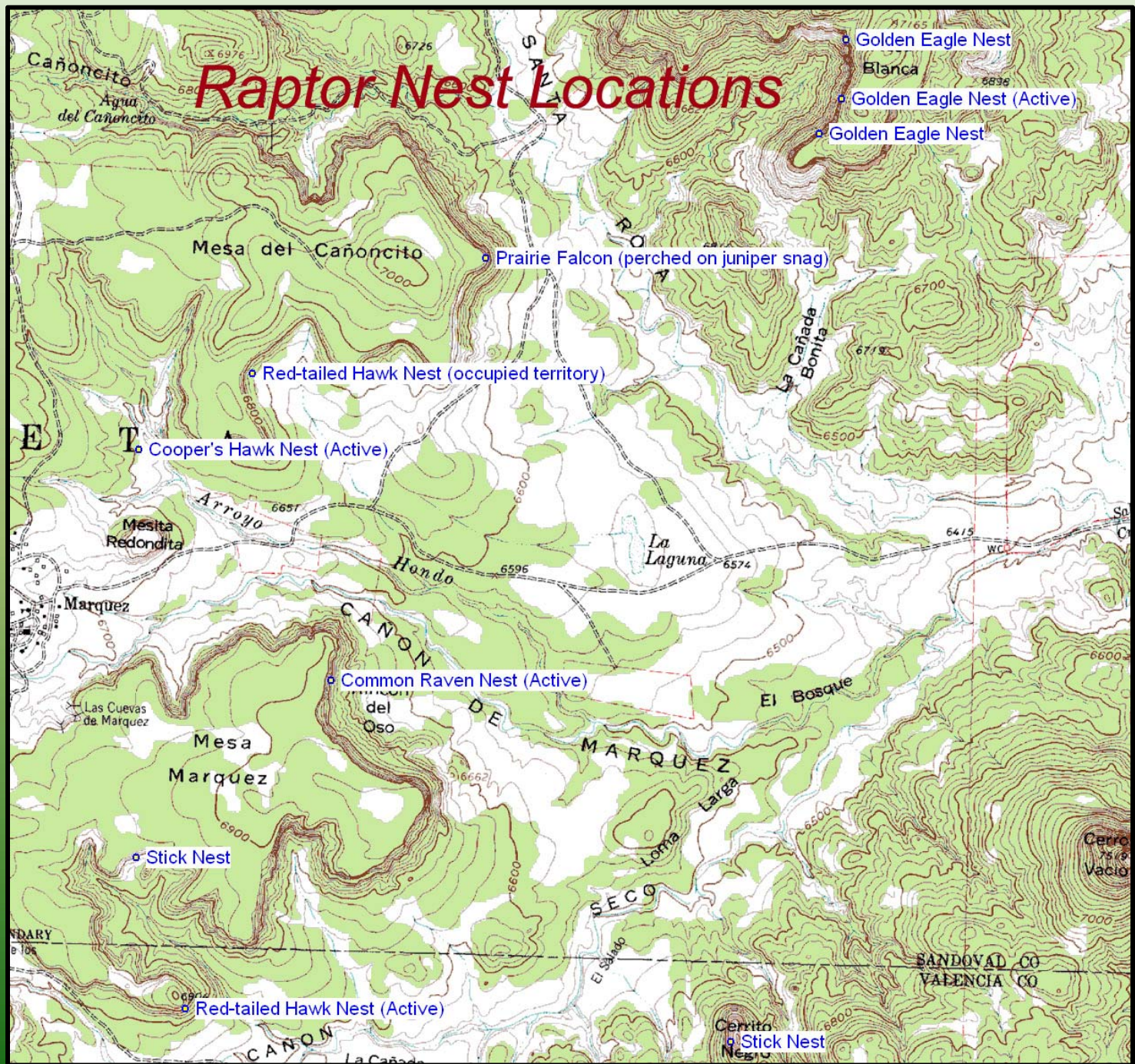


Cooper's Hawk nestling





# Raptor Nest Locations







# Active Golden Eagle Nest



- Nest located just beyond ½ mile buffer
- Future monitoring will be continued
- Determine effects of mill site on nest success



# Results: Mammal Species

- No T & E species observed
- 11 species detected

## Species Detected

**Coyote**

**Elk**

**Banner-tailed Kangaroo Rat**

**Black-tailed Jackrabbit**

**Wood Rat spp.**

**Mule Deer**

**Mountain Lion**

**Rock Squirrel**

**Desert Cottontail**

**Chipmunk**

**Gray Fox**



Mountain Lion





# Results: Reptile Species

- No T & E species
- 5 species detected

## Species Detected

**Western Diamondback  
Rattlesnake**

**Western Whiptail**

**Western Fence Lizard**

**Eastern Collared Lizard**

**Greater Short-horned Lizard**



Western Diamondback Rattlesnake



Greater Short-horned Lizard



# Results: Vegetation Surveys

- No T & E species observed
- 54 species detected



Annual Townsend's Daisy



Evening Primrose

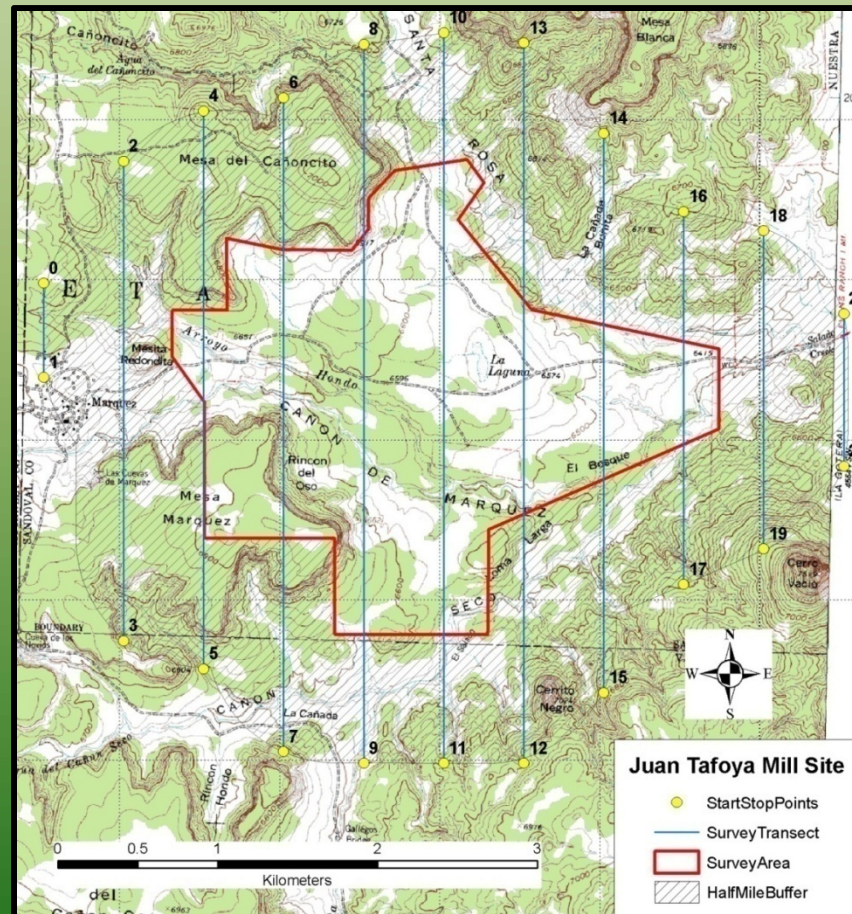


Pincushion Cactus



# Archeological & Cultural Resources

- Criterion Consulting did 100% pedestrian survey of mill and potential tailings sites in July-August this year





# Archeological & Cultural Resources

- Total of approximately 1350 acres covered
- Approximately 60 sites discovered within study area (much larger than actual APE)
- 34 sites tentatively considered eligible for listing (to National Register of Historic Places), 5 not considered eligible, and 21 Undetermined.
- Preliminary evaluation suggests all but maybe 8-10 sites can be easily avoided. Sites range from Archaic artifact scatters (tools, lithics) to historic hogans







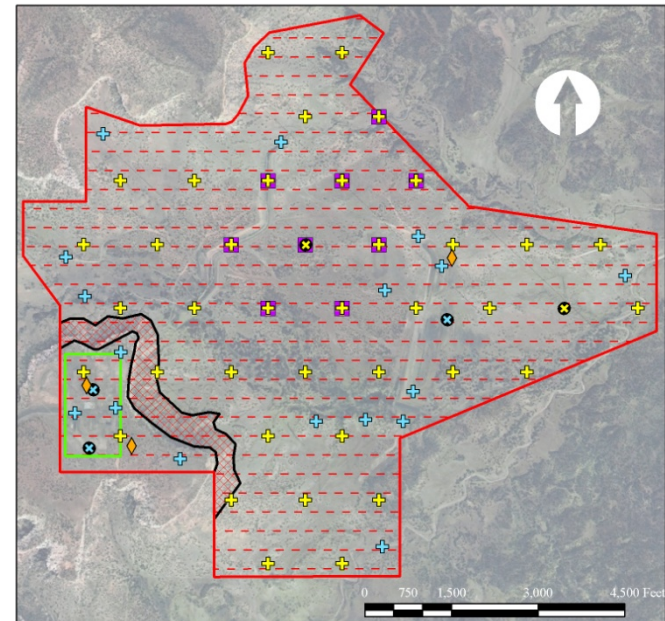


# Radiological Baseline Studies

- Generally Follows US Regulatory Guide 4.14 (RG 4.14)
  - Surface Soils (0-15 cm) and (0-5 cm)
  - Subsurface Soils (15 - 30 cm) and (30-100 cm)
  - Water
    - Ground water
    - Surface water
  - Air
    - Radon-222 (ambient concentration and flux)
    - Air particulate monitoring (4 stations)
  - Direct Radiation
  - Vegetation (crops and forage)
  - Meat (locally grazed cattle and game animals)
- Includes a gamma radiological survey not required by RG 4.14

# Radiological Baseline Studies

- Gamma Survey
  - GPS based
  - 100 meter transects
  - Bare 2x2 NaI detectors
  - Approximately 18 inches above ground surface
  - Approximately 1.5 m/s walking survey
  - Results correlated to Pressurized Ion Chamber (PIC) measurements to estimate exposure rate
  - Results correlated to laboratory determined Radium-226 soil concentrations



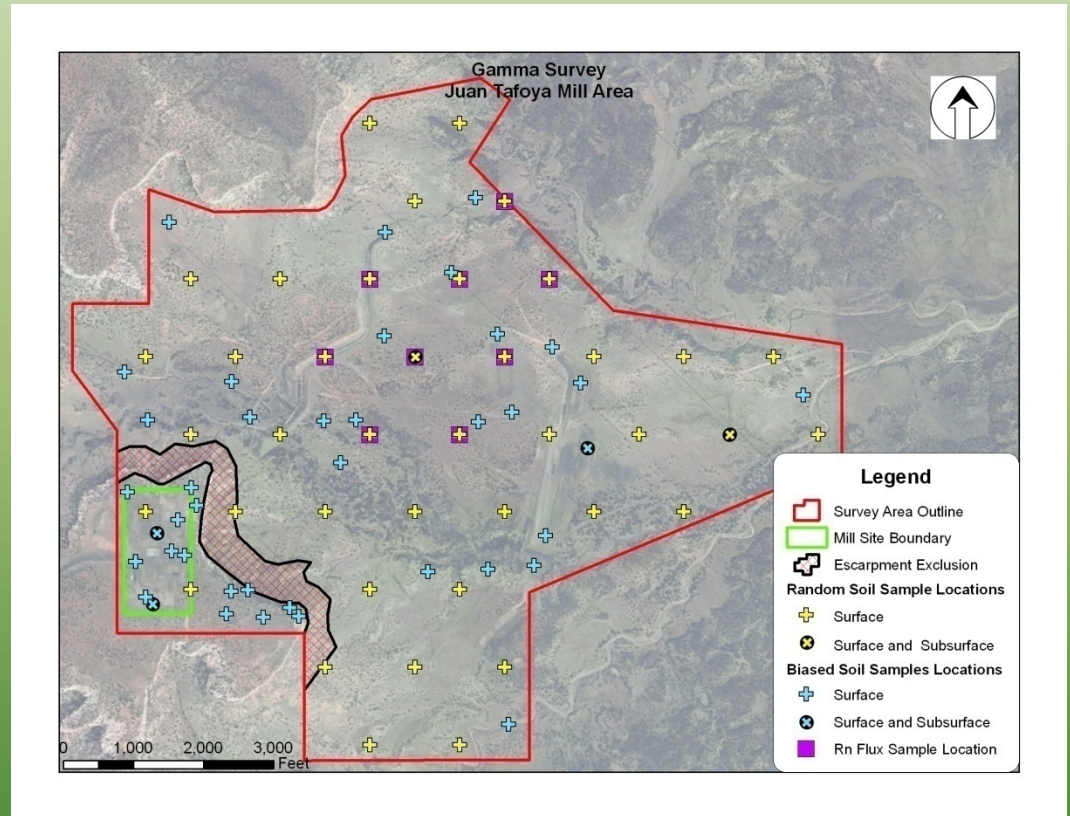
## Legend

- |                               |                                 |
|-------------------------------|---------------------------------|
| Random Soil Sample Locations  | Rn Flux Sample Location         |
| ✚ Surface                     | Survey Area Outline             |
| ✚ Surface and Subsurface      | Escarpment Exclusion            |
| Biased Soil Samples Locations | Mill Site Boundary              |
| ✚ Surface                     | Air Monitoring Station Location |
| ✚ Surface and Subsurface      | GPS Survey Transects (100m)     |



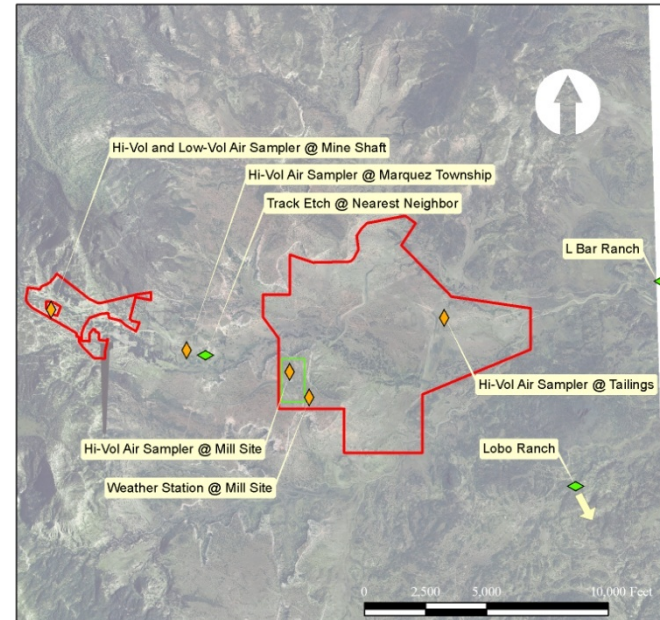
# Radiological Baseline Studies

- Soils
  - Sample location varies from RG 4.14 approach
  - 40 randomly located site (0-15 cm)
  - 40 biased locations (0-15 cm) based on topography, geological features, and results of GPS survey
  - Five biased subsurface locations (15-30 and 30-100 cm)
  - Samples (0-5 cm) collected at each air monitoring station
  - Radiological parameters consistent with RG 4.14



# Radiological Baseline Studies

- Air
  - Continuous air particulate monitoring at 4 monitoring stations
  - Ambient Rn-222 concentration at 4 air monitoring stations and 3 other potential off site receptors
  - Sample frequency and parameters consistent with RG 4.14



## Legend

- ♦ Air Monitoring Station Location
- ◆ Track Etch Only Location
- ▭ Survey Area Outline
- ▭ Mill Site Boundary

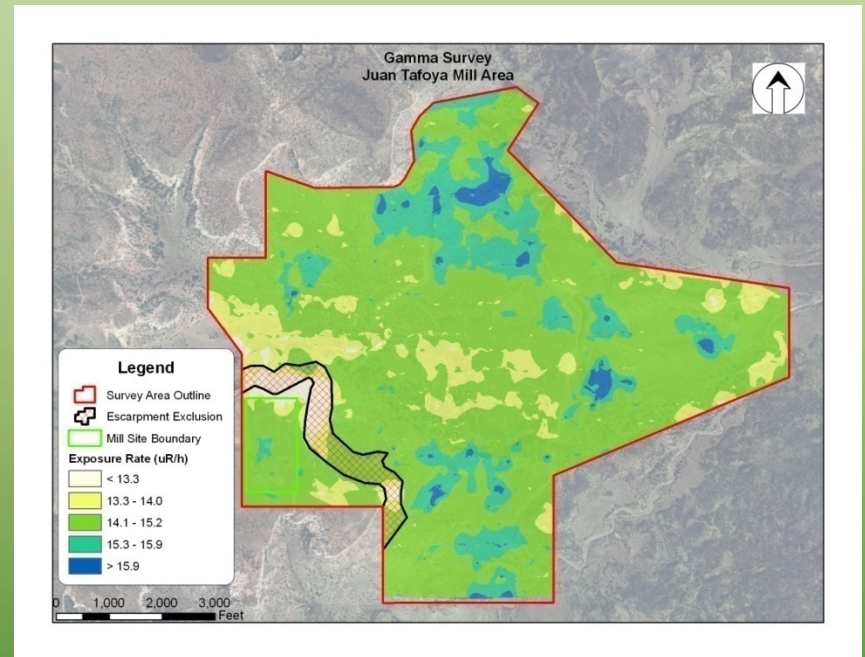


# Radiological Baseline Studies

- Vegetation and Crops
  - Sample frequency and radiological parameters consistent with RG 4.14
- Meat
  - Sample frequency and radiological parameters consistent with RG 4.14
- Direct Radiation
  - Environmental TLDs at each air monitoring station. Sample frequency quarterly for one year

# Radiological Baseline Studies

- Preliminary Results
  - Gamma survey
    - N = 61,177
    - Mean =  $14.6 \pm 0.6$   $\mu\text{R/hr}$
    - Minimum = 11.0  $\mu\text{R/hr}$
    - Maximum = 19.8  $\mu\text{R/hr}$
    - Median = 14.5  $\mu\text{R/hr}$
    - Typical of New Mexico and western U.S.



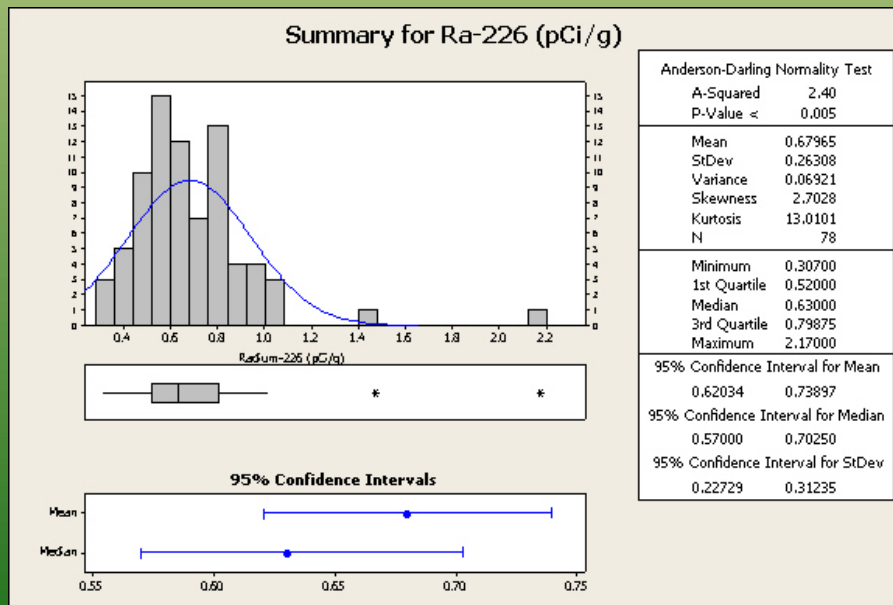
# Radiological Baseline Studies

- Preliminary Results
  - Surface Soils (0-15 cm)
    - Ra-226 Concentrations
      - Mean =  $0.68 \pm 0.26$  pCi/g
      - Median = 0.63 pCi/g
      - Minimum = 0.3 pCi/g
      - Maximum = 2.2 pCi/g
      - N = 78

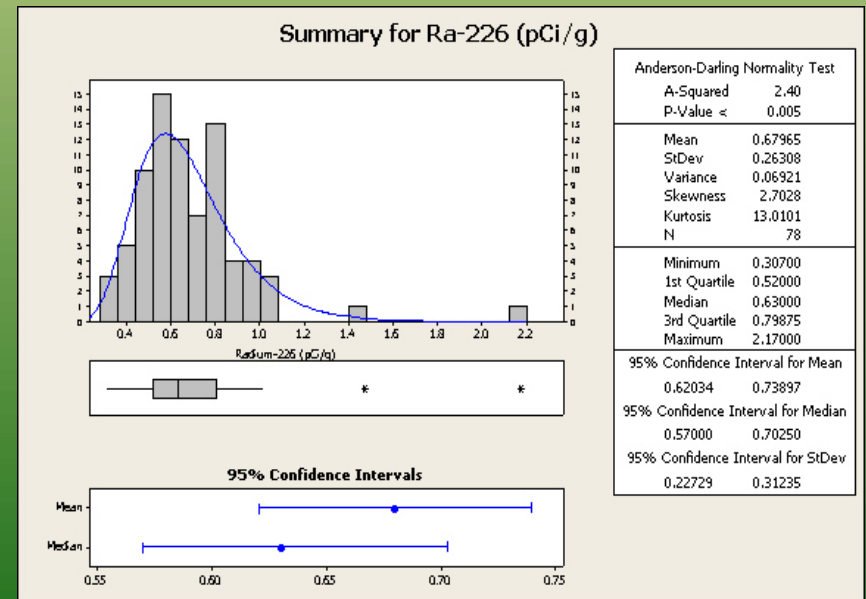
New Mexico ( from Myrick et al,1983)

- Mean =  $1.5 \pm 1.1$  pCi/g
- Geometric Mean =  $1.5 \pm 1.4$  pCi/g
- Minimum = 0.72
- Maximum = 2.7
- N = 13

## Normal Fit



## Lognormal Fit





# *Juan Tafoya Project*

*Stakeholder Engagement Program*

*Marquez Canyon*



# Plan Objectives

- Help build capacity among local stakeholders to become knowledgeable about the Juan Tafoya project and uranium mining
- Provide special outreach to possible environmental justice populations (This activity will happen in concert with the tribal consultations)
- Document the development of the mine and the development of relationships with the people and communities in the Study Area

# Open Houses

## ➤ Confirmation Drilling Permit Application Open Houses



**Grants - Saturday 15 November 2-4 pm**

**Seboyeta – Monday 17 November 6-8 pm**

## ➤ Information Available



# Tribal Consultations

At the recommendation of the New Mexico State Historic Preservation Office, the Mining & Minerals Division, with Neutron's cooperation, is continuing to consult with the following tribes:

- Hopi Tribes
- Pueblo of Acoma
- Pueblo of Zuni
- Navajo Nation
- Pueblo of Laguna



# Speakers' Kit

- PowerPoint Presentation
- Talking points
- Background information
- Posters
- Information sheets
- Other handouts



# **Develop a Presence in Sandoval, Cibola, and McKinley Counties**

- **Economic Development Corporations (EDCs)**
- **Other Community Organizations**
  - Fraternal organizations
  - Service clubs
  - Business organizations
  - Charitable organizations
- **Face-to-face Meetings**
  - Land corporations
  - Local government
  - Schools
- **Local Media Contacts**



# COMMUNITY DEVELOPMENT INITIATIVES



**Congratulations**  
**NEUTRON SCHOLARSHIP RECIPIENTS**

**2008-2009**  
**Juan Tafoya Land Grant**  
**Descendant Recipients**

- **Matthew Chavez** –  
*Wildlife Science*
- **Elizabeth Garcia** –  
*Psychiatry*
- **Desirae Harvey** –  
*Economics*
- **Bryan Johnston** –  
*Sports Medicine/  
Physical Therapy*
- **Amadeo Martinez** –  
*Geology*
- **James Martinez** –  
*Psychology*
- **Mario Martinez** –  
*Engineering*
- **Frank Sanchez** –  
*Range Science*

Scholarships are awarded annually to descendants of the Juan Tafoya Land Grant. If you feel you might qualify contact Mrs. Ruth Armijo in care of: Sanchez, Mowrer, & Desiderio, P.C., P.O. Box 1966, Albuquerque, NM 87103



- Juan Tafoya Land Corporation scholarships
- Buy locally whenever possible
- Develop budgets for community events
- Encourage employees to volunteer in the community

# Draft Baseline Phase I Hydrologic Characterization Work Plan for the Juan Tafoya Project

*Prepared for:*



Neutron Energy Inc.  
2511 Broadbent Parkway NE  
Suite A  
Albuquerque, NM 87107

*Prepared by:*



INTERA Incorporated  
6000 Uptown Boulevard, NE  
Suite 100  
Albuquerque, New Mexico 87110

**November 6, 2008**

# Groundwater Characterization

## Criterion 5 of Appendix A, 10 CFR Part 40

- A constituent becomes a hazardous constituent when it has been detected in the ground water in the *uppermost aquifer*.
  - An *aquifer* is a geologic formation, group of formations capable of yielding a significant amount of ground water to wells or springs
  - The *uppermost aquifer* is the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary





# Groundwater Characterization

## **Criterion 7 of Appendix A, 10 CFR Part 40**

- Establishing baseline water quality
  - Pre-operational – one year

## **Criterion 5 of Appendix A, 10 CFR Part 40**

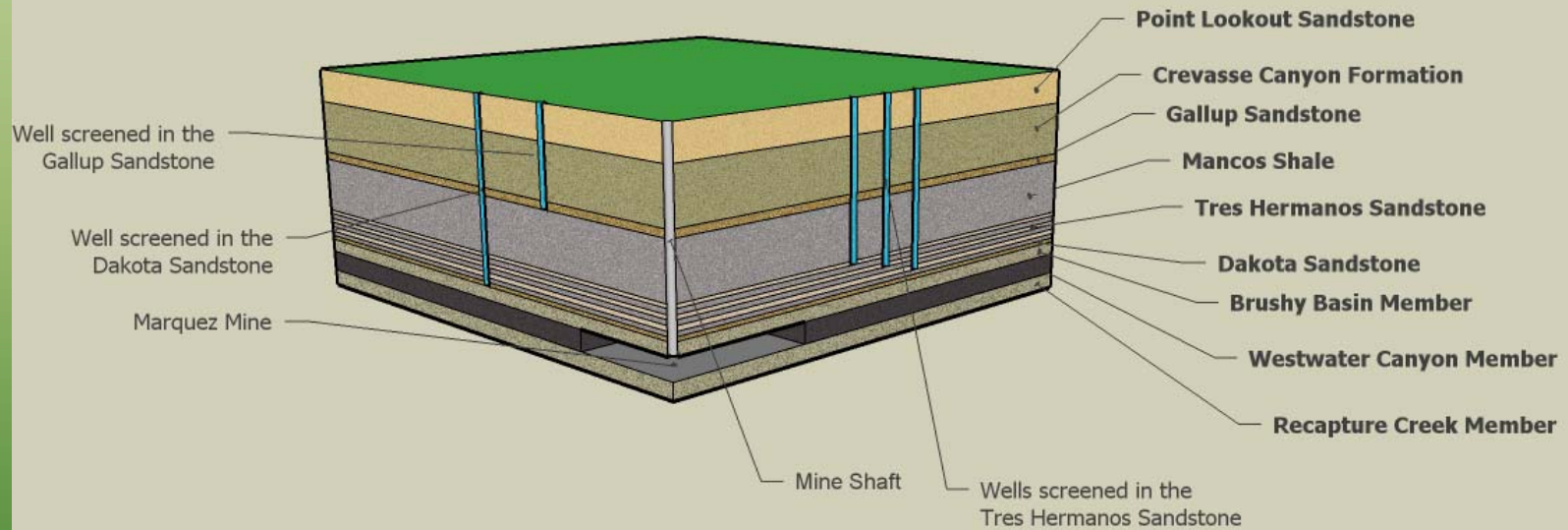
- Monitoring program
  - Operational monitoring program - ground water protection standards

## ***RG 4.14 – Regulatory Effluent and Environmental Monitoring at Uranium Mills***

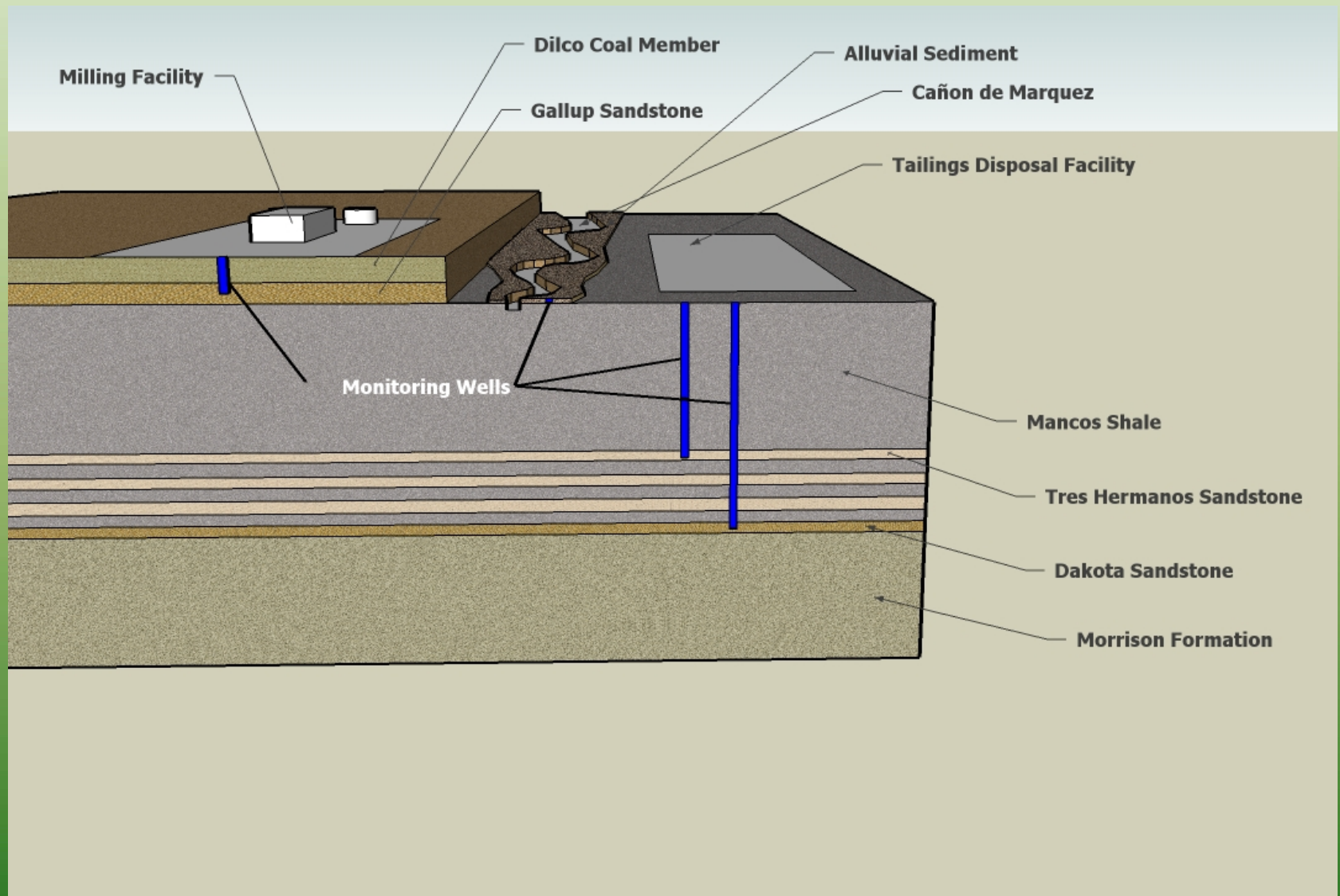
- 3 downgradient, 3 sidegradient, 1 upgradient - quarterly



# General Site Stratigraphy



# Mill Site Block Model





# Alluvial Wells

- Assumptions:
  - Alluvium is 0 to 50 feet thick
  - Ground water gradient is to the southeast
  - First water bearing unit in the area (not under tailings impoundment)
- 3 wells downgradient
- 3 wells on sides of facility
- 3 wells in major drainages



# Tres Hermanos Wells

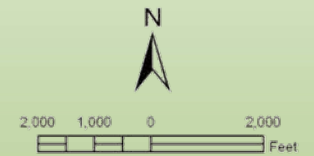
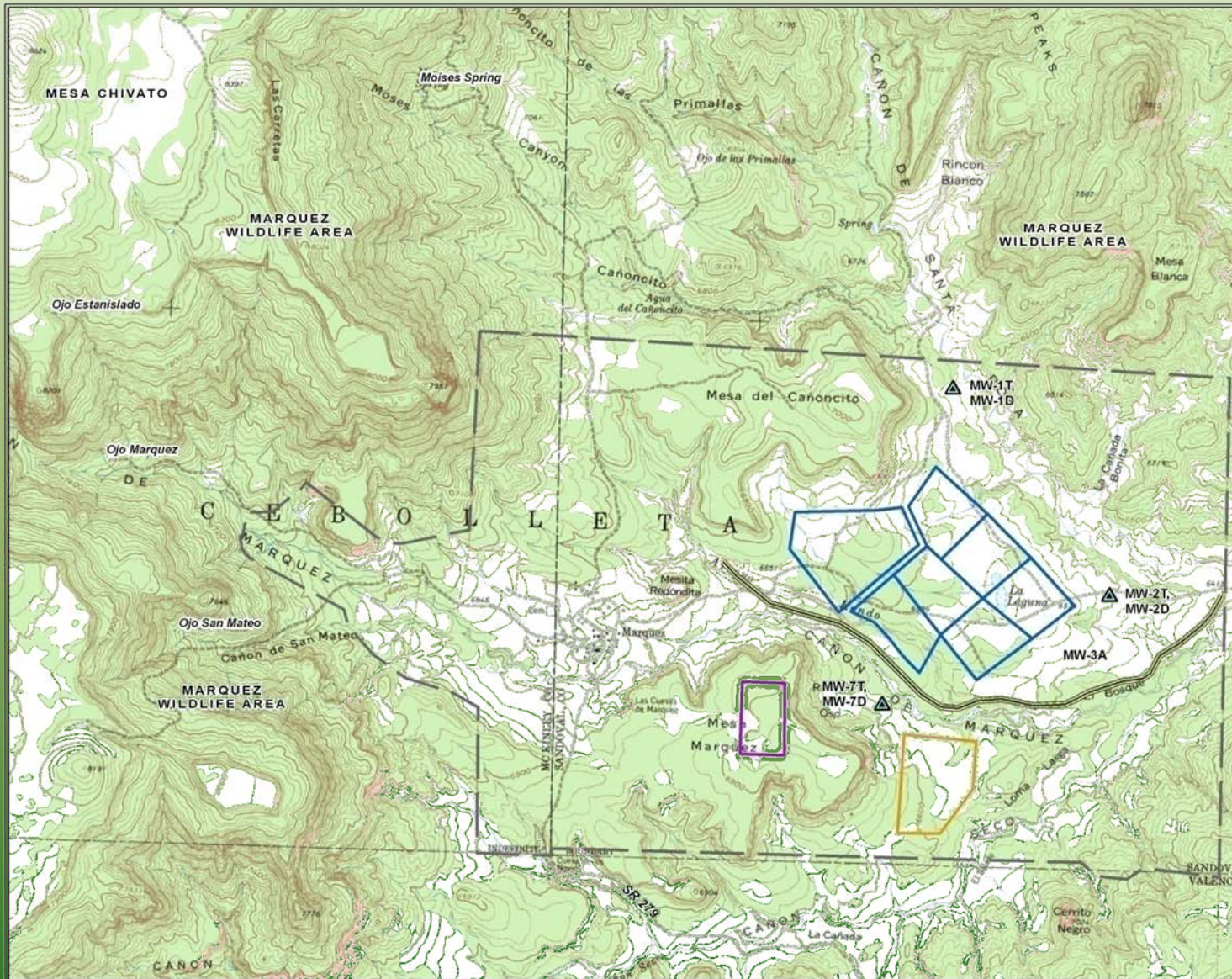
- Assumptions:
  - > 350 feet
  - Low yield
    - May not fit the NRC definition of an aquifer
- Chosen to establish the site-specific ground water gradient
- Where alluvium absent may be considered uppermost aquifer beneath the tailings area



# Dakota Sandstone Monitoring Wells

- Regionally important aquifer beneath the Mancos Shale
- Assumptions
  - > 600 feet
  - Fits the NRC definition of an aquifer
  - Gradient is to the southeast
- Well locations to establish the site-specific ground water gradient
- Wells are clustered with Tres Hermanos wells and alluvium wells





Sources(s): Topo – MapTech, Terrain Navigator Pro;  
Boundaries – Neutron Energy.

7.5 Minute USGS Topographic Map  
Marquez Quadrangle, 1961  
Contour Interval 20 Feet



Proposed Monitoring  
Well Locations

Juan Takyu Project

Figure 6



# Gallup Sandstone Monitoring Well

- The Gallup Sandstone is a local source of drinking water
- The Gallup Sandstone may not be water bearing beneath the mill area
- Well to confirm the absence of groundwater in the Gallup beneath the Mill







# Surface Water Characterization

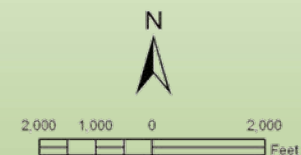
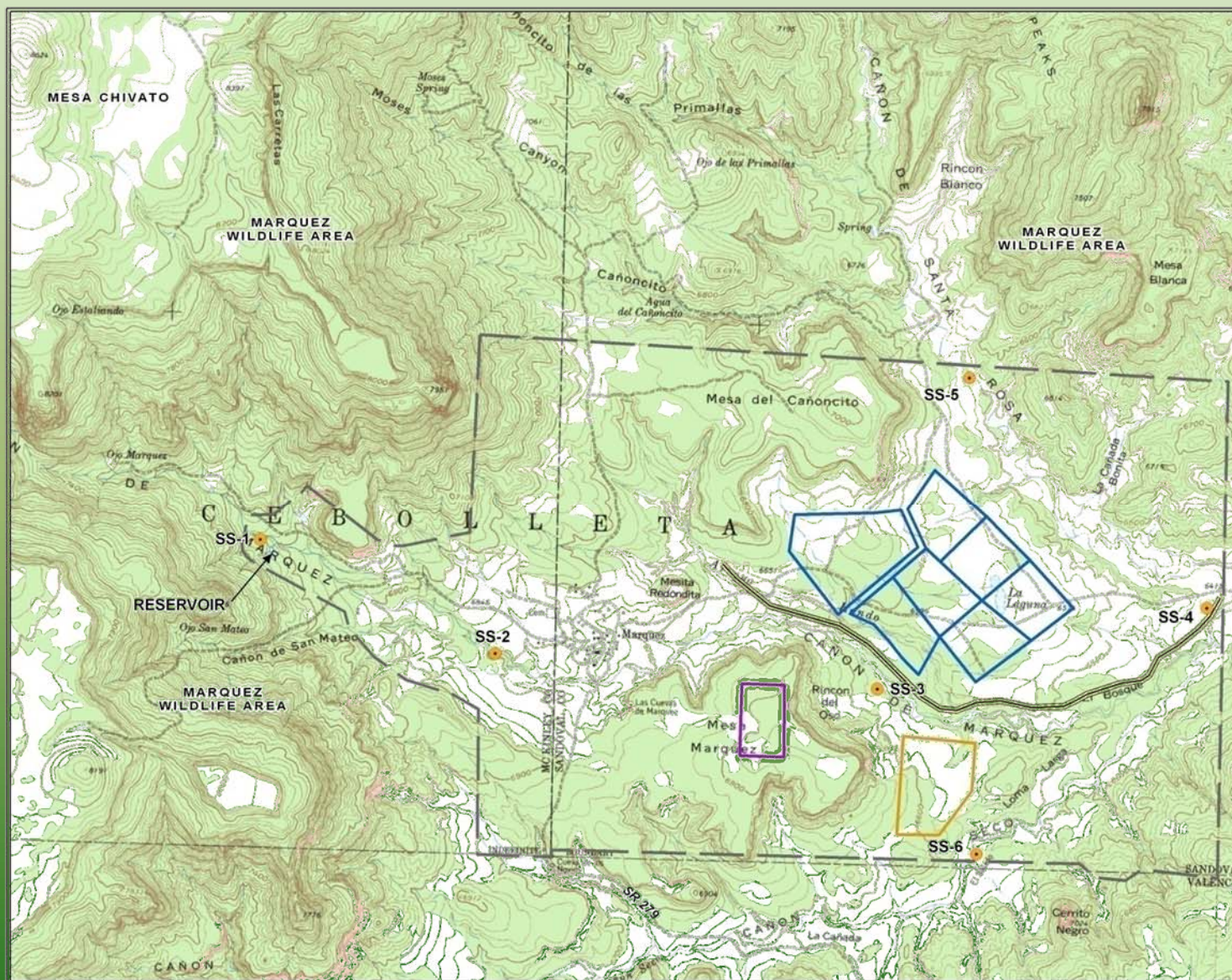
- RG 4.14 – Regulatory Effluent and Environmental Monitoring at Uranium Mills
  - Surface water samples for preoperational monitoring:
    - Collected quarterly onsite and offsite water impoundments
    - Samples should also be collected whenever water is flowing in ephemeral streams and rivers that cross the site boundary



# Surface Water Characterization

- SS-1 – spring area, inlet to irrigation impoundment
- Irrigation Impoundment
- 5 event-based samplers in major drainages
- Sediments at all surface sample locations





Source(s): Topo – MapTech, Terrain Navigator Pro;  
Project boundary – Neutron Energy.

7.5 Minute USGS Topographic Map:  
Marquez Quadrangle, 1961  
Contour Interval 20 Feet

Legend

-  Surface Water and Sediment Sampling Location
-  Project Boundary (approximate)
-  Armored Channel
-  Tailings Disposal Area
-  Evaporation Pond
-  Mill Facility



### Surface Water and Sediment Sampling Locations

## Juan Tafuya Project

# SUMMARY

- **Complete Ground Water Characterization**
  - 9 wells in the alluvium
  - 3 wells in the Tres Hermanos
  - 3 wells in the Dakota
  - Gallup test well
- **Complete Surface Water Characterization**
  - 6 surface water monitoring locations
  - Sampling of all surface water bodies and sediment at all surface water sampling locations
- **Conservative – exceeds minimum requirements of the regulations**



# Juan Tafoya Project

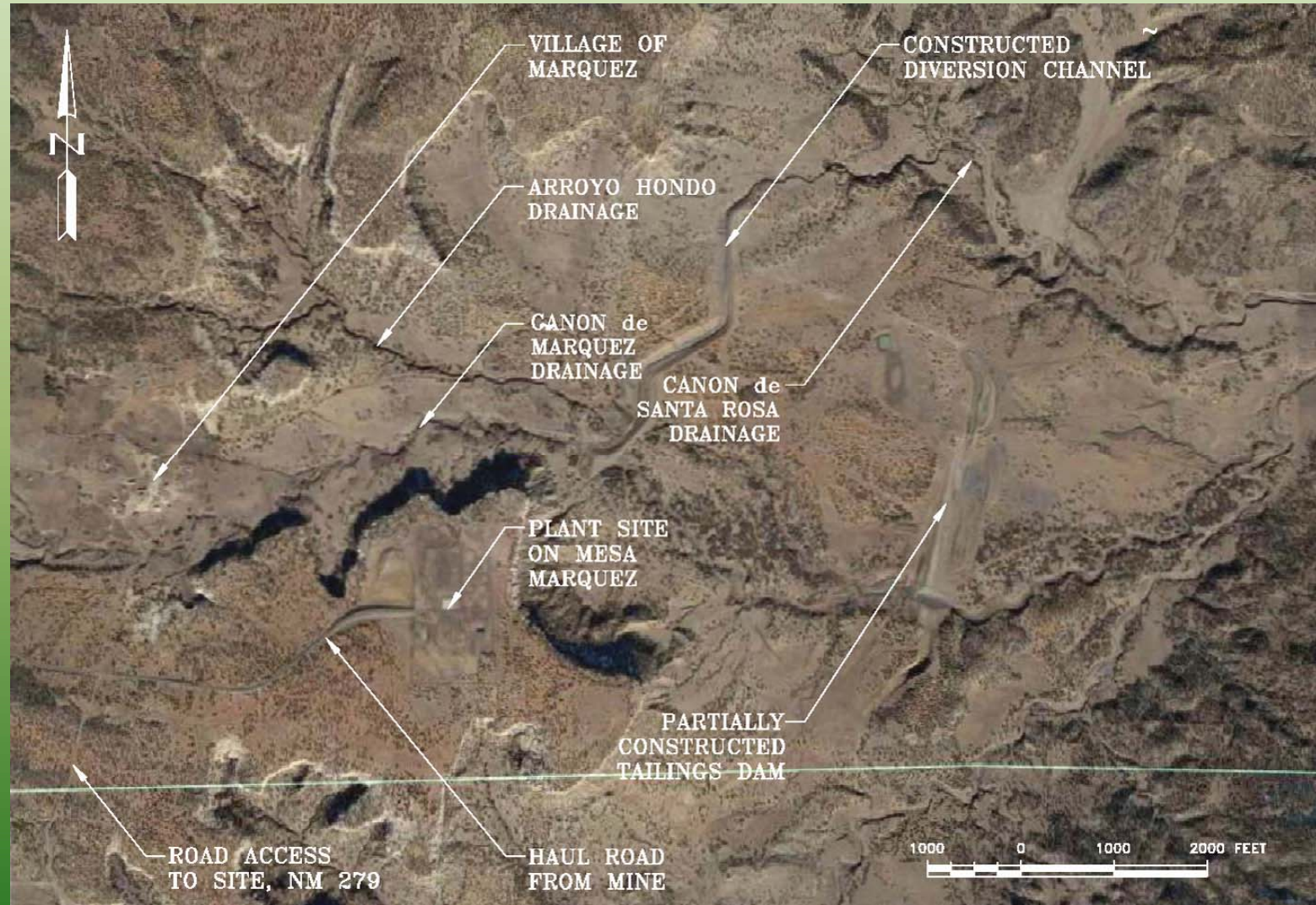
## Draft Concept Plans for Tailings Management

Presented to the USNRC on  
November 6, 2008



# Juan Tafoya Project

## Aerial Photo of Site for Tailings Facility





# Juan Tafoya Project

Photo of Site for Tailings Facility from Mesa Marquez



# Juan Tafoya Project

## Ground Conditions and Geology

- Undulating and hummocky eroded surface in Mancos Shale
- Mancos Shale is:
  - Marine calcareous sedimentary deposit
  - Thick (extends to approx. 300' below the Tailings Facility site)
  - Upper portion – weathered dense silty or sandy clay
  - Lower portion – claystone bedrock
  - Generally low permeability ( $k \approx 10^{-6}$  cm/s)
  - Good foundation and construction materials for soil liner, compacted fill and soil cover
- Surface drainage pattern is dendritic confirming Mancos Shale has low permeability and no significant structure



# Juan Tafoya Project

## Seismicity

- Low to moderate
- 2500 yr (2% chance of exceedence in 50 years) PGA = 0.16 g
- Need to complete an up to date seismic risk assessment including definition of:
  - potential local quaternary crustal faults and activity,
  - the maximum credible earthquake for the site

# Juan Tafoya Project

## Hydrology and Climate

- 3 principal drainages
  - Cañon de Marquez
  - Cañon de Santa Rosa
  - Cañon Seco
- Ephemeral flows – event driven with some small subsurface flow in alluvium
- Arid climate
  - Mean annual precipitation 8"
  - Mean annual evaporation 65"

# Juan Tafoya Project

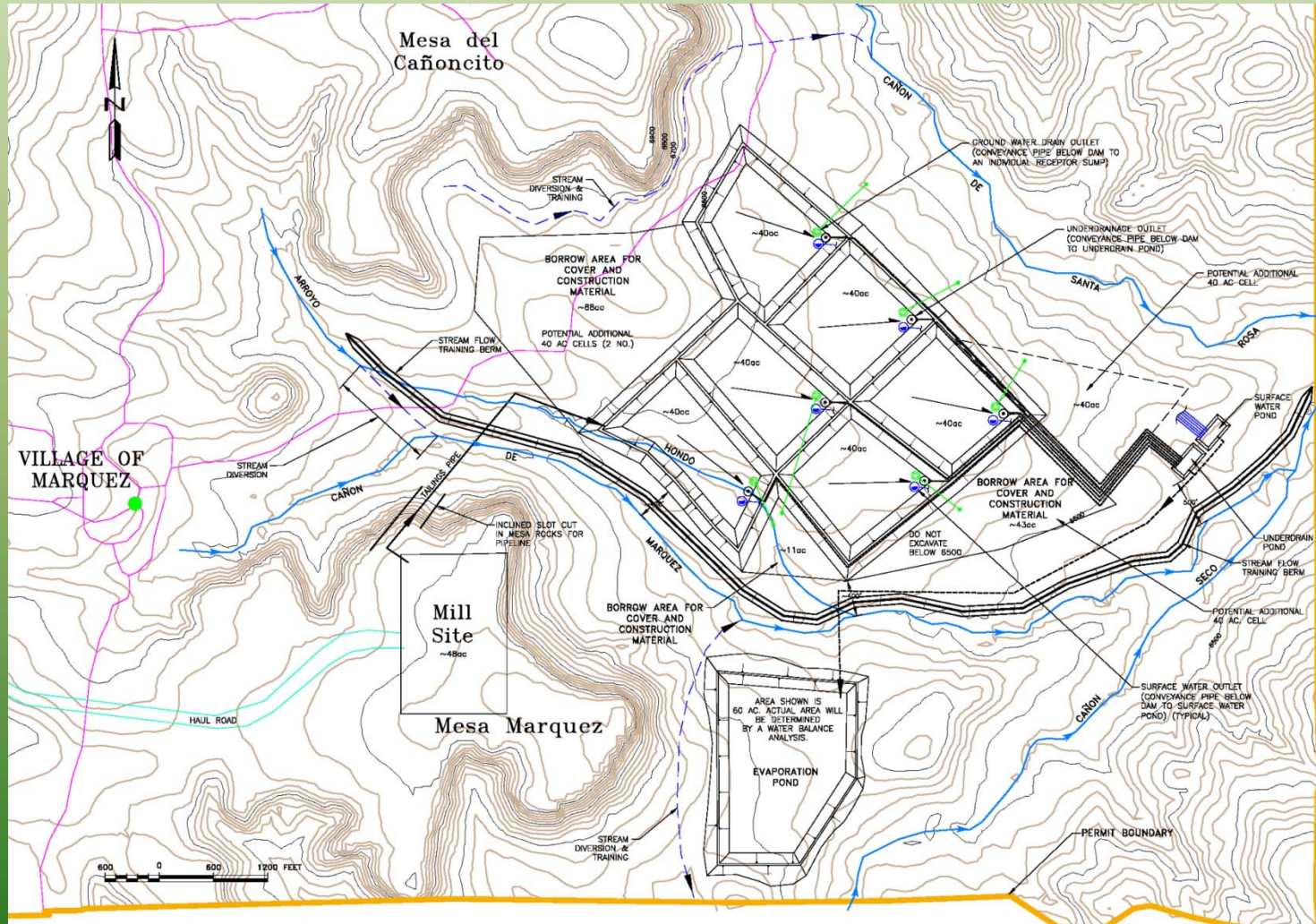
## Hydrogeology

- Small intermittent flows in alluvium in drainages
- Point Lookout Sandstone and Gallup Sandstone outcrop above and to the west of the Tailings Facility site
- Tres Hermanos and Dakota Sandstone underlie the 300' thick Mancos Shale



# Juan Tafoya Project

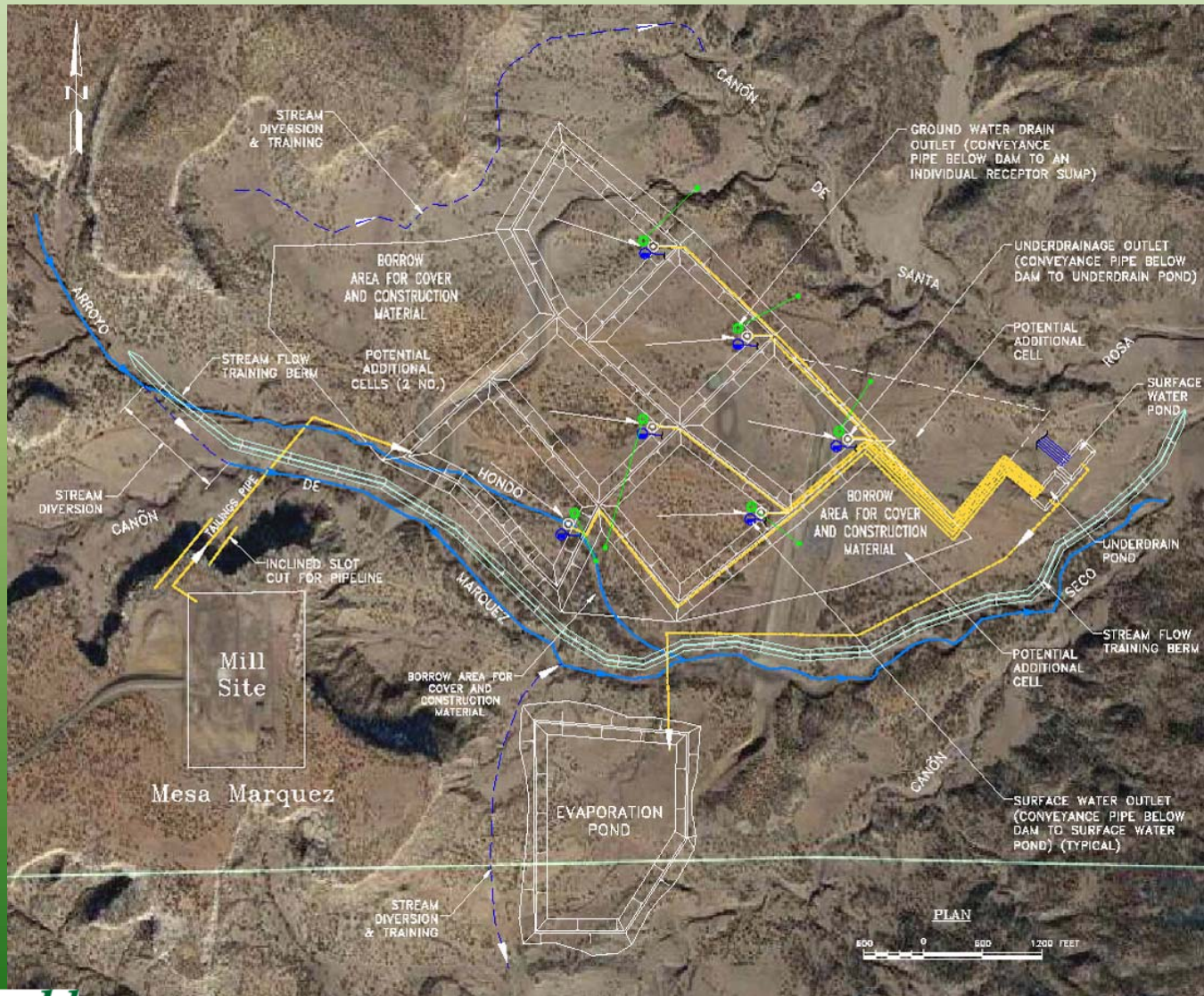
## Conceptual Plan of New Tailings Facility





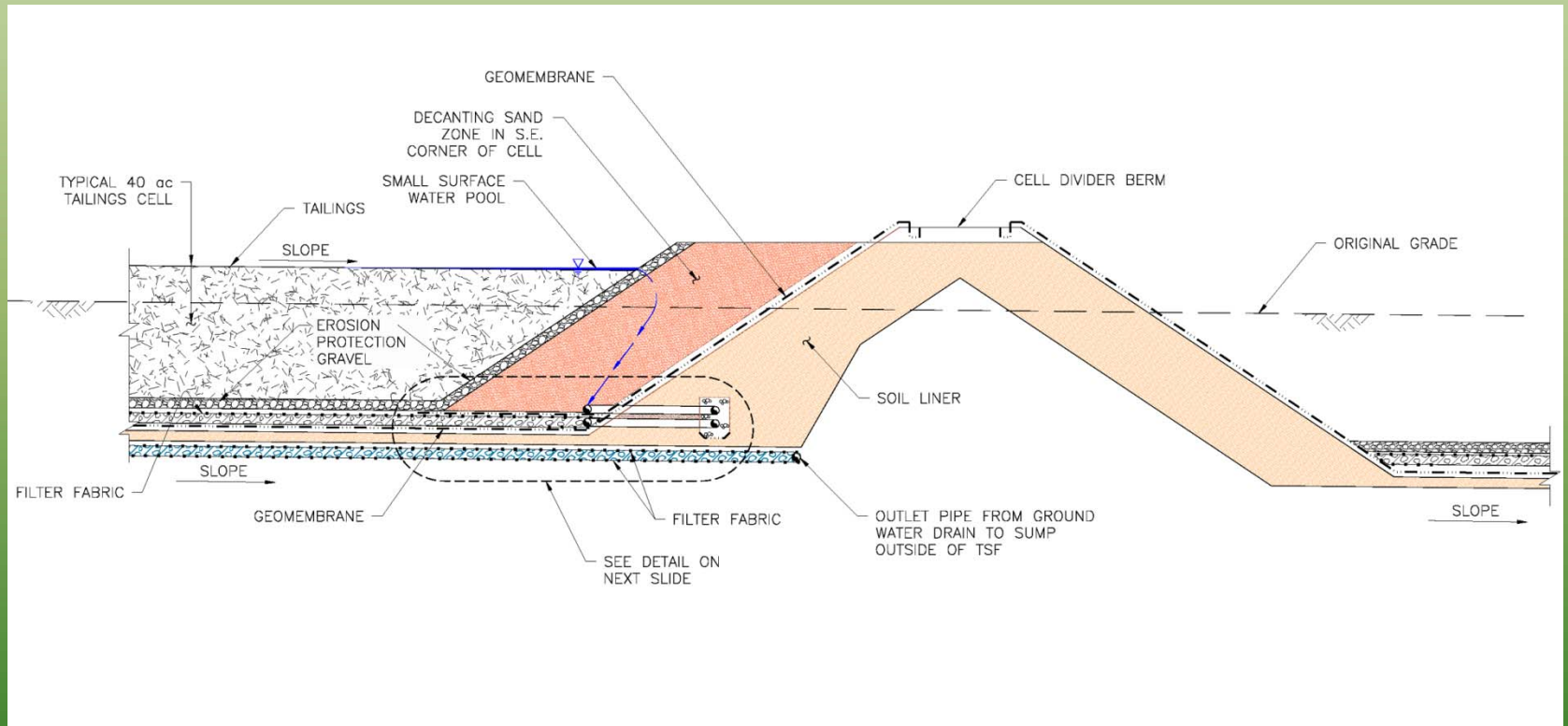
# Juan Tafoya Project

## Conceptual Plan of New Tailings Facility



# Juan Tafoya Project

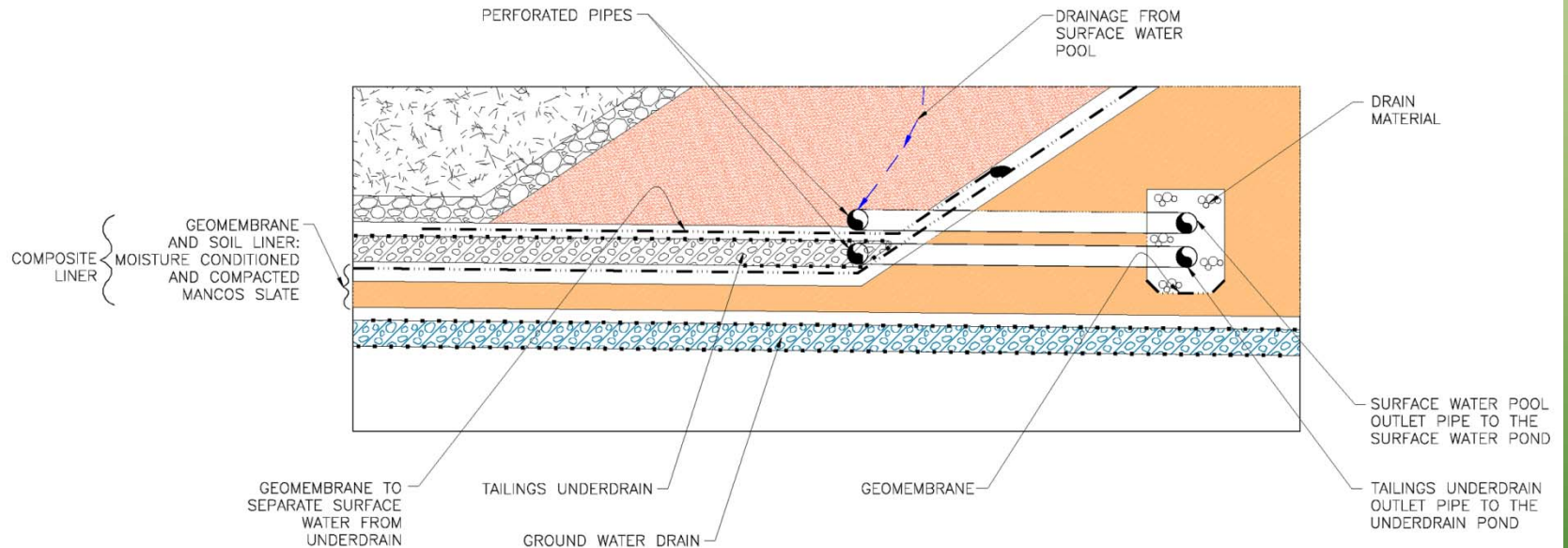
## Conceptual Section Between Cells in New Tailings Facility





# Juan Tafoya Project

## Conceptual Detail of Liners and Drains in New Tailings Facility



## Juan Tafoya Project

# Tailings Management Concept

- Located in the same general area as the site of the previously planned tailings facility in the 1970's and 1980's but above and well removed from Cañon de Marquez
- Significantly different concept
- Developed in accordance with:
  - USNRC Reg. 10 CFR Part 40 including Appendix A
  - Associated USEPA Standards under 40 CFR Parts 192 and 440
  - USNRC Regulatory Guide DG-3032

# Juan Tafoya Project

## Tailings Management Concept

- Six to ten 40 ac cells
- 20 M dry tons of tailings
- Cells would be up to 40' deep
- Likely scenario (to be determined) – cells partially excavated below surface – full excavation unlikely to provide any further long term security or erosion protection since little erosion potential from overland runoff and thick cover of Mancos Shale proposed



# Juan Tafoya Project

## Tailings Management Concept

- Cells stepped down from NW to SE
- Bottoms of cells sloped also from NW to SE
- Deposition of tailings into each cell from spigots along N and W sides
- Deposition by sub-aerial methods
- 2 cells in use at any time

## Juan Tafoya Project

# Tailings Management Concept

- Only a short diversion of Arroyo Hondo (small drainage) contemplated - no change in flow direction required
- No diversion required if SW cell removed

## Juan Tafoya Project

# Tailings Facility Closure

- Progressive as each cell is filled
- Cover will consist of (bottom to top):
  - Granular capillary break layer to restrict upward mobility of evaporites
  - Thick Mancos Shale placed in compacted layers to restrict emissions of radon gas and radionuclides
  - Vegetated or armored upper surface
- Recontoured side slopes also vegetated or armored



## Juan Tafoya Project

# Advantages Provided by the New Concept for Tailings Management

- Site is on a thick, low permeability foundation of Mancos Shale
- Phased construction, operation and closure in 40-ac lined cells
- Ground water drains below cells where necessary
- High quality soil/geomembrane composite liner
- Blanket under drain on the bottom of each cell to reduce head on the liner and to dewater and consolidate the tailings
- Deposition of tailings by sub-aerial methods (low velocity for enhanced liquids/solids separation and in thin layers) to dewater and consolidate the tailings

## Juan Tafoya Project

# Advantages Provided by the New Concept for Tailings Management

- Surface water drain or decant in each cell
- Separate systems to remove, monitor and manage flows from the groundwater drains, tailings under drains and surface water drains
- Facility located above and well removed from Cañon de Marquez and from Arroyo Hondo (small drainage) if the western cell not developed
- Short diversion with no bends on Arroyo Hondo if western cell is developed
- Compacted clay/soil cover placed over the tailings shortly after deposition is completed in each cell