# STRUCTURAL AND MINERALOGICAL FEATURES OF THE DEEP POST GOLD DEPOSIT, NORTHERN CARLIN TREND, NEVADA


BY:

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**PDAC, TORONTO**

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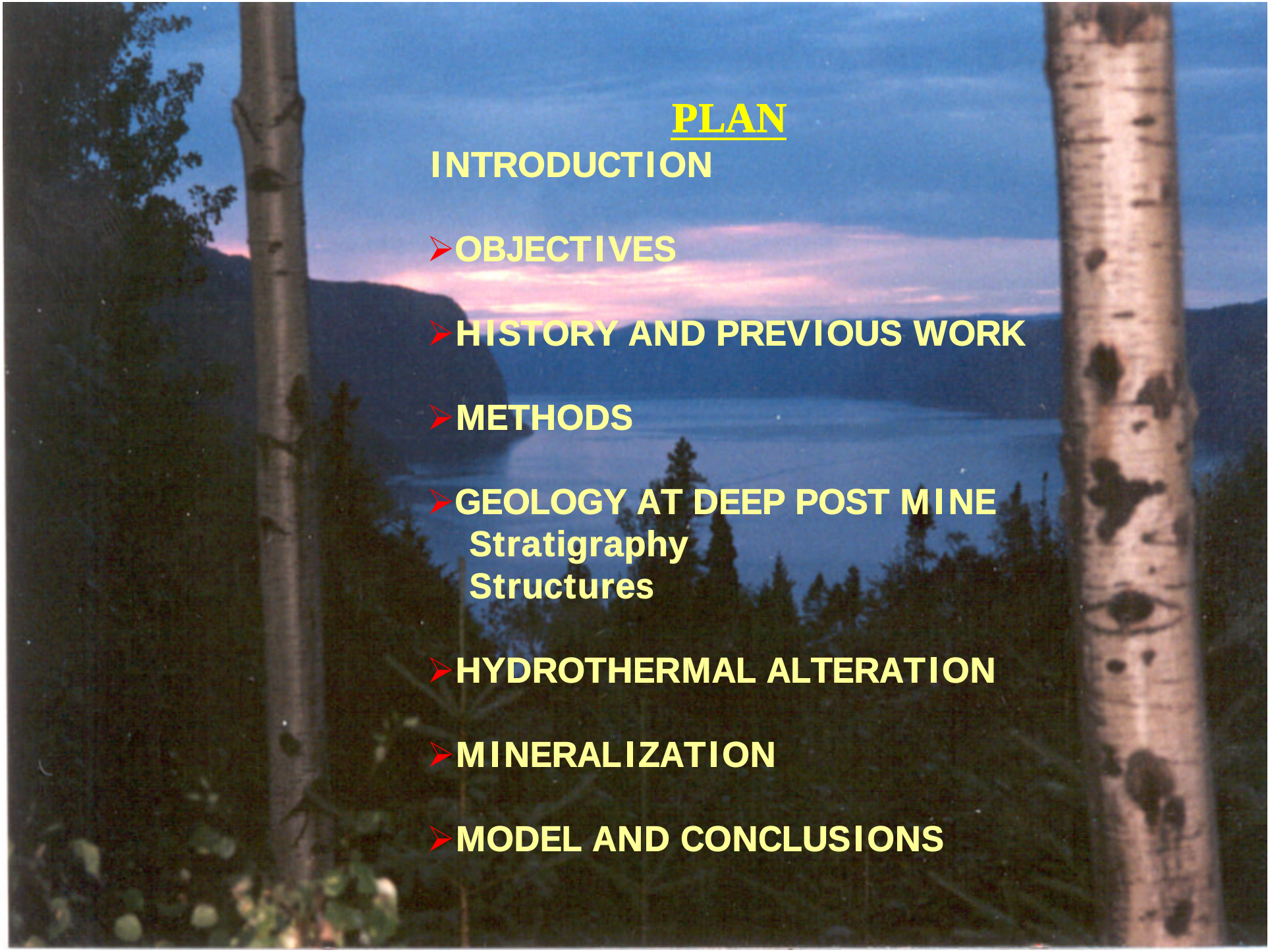
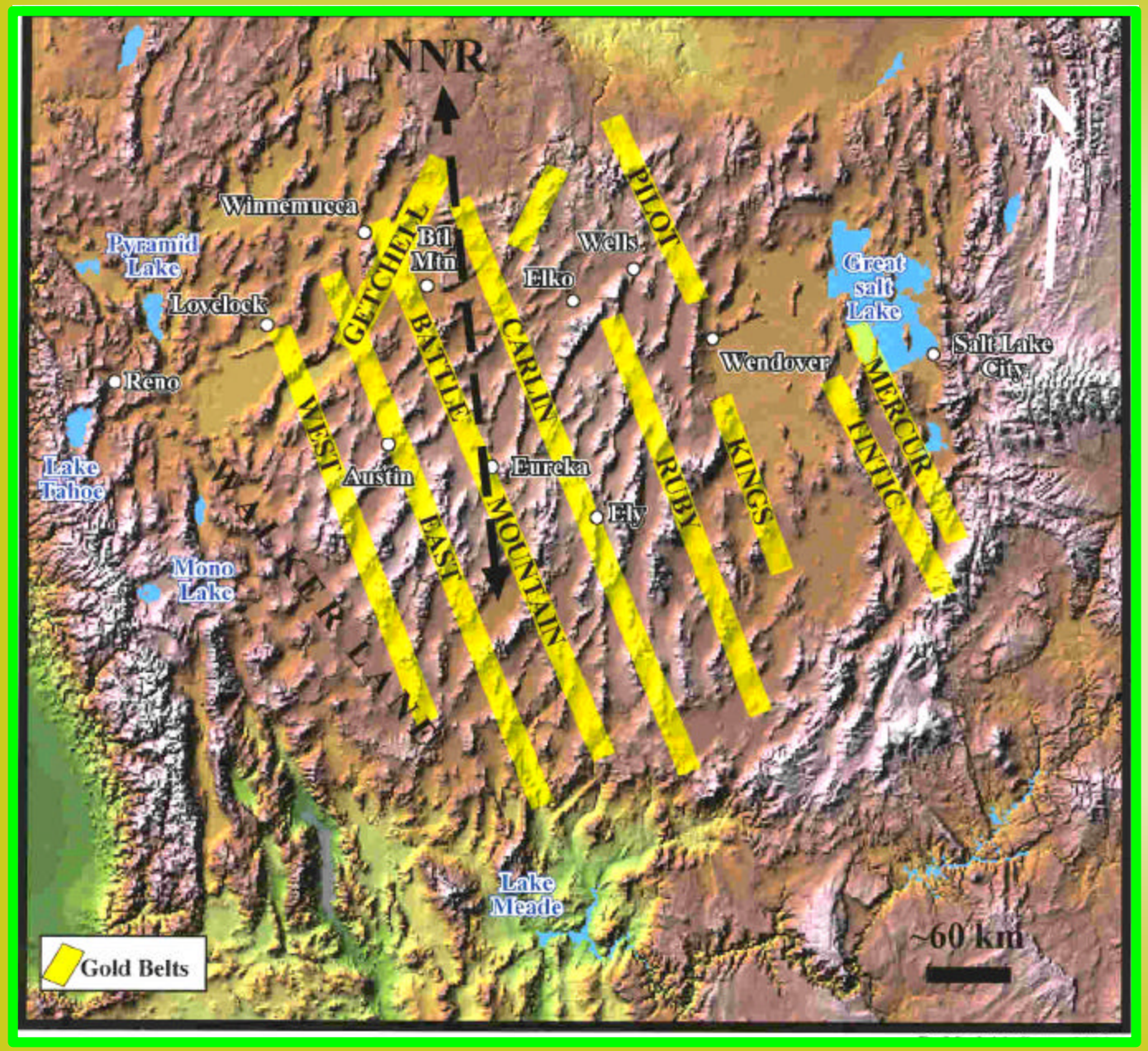


# PLAN

INTRODUCTION

- OBJECTIVES
- HISTORY AND PREVIOUS WORK
- METHODS
- GEOLOGY AT DEEP POST MINE
  - Stratigraphy
  - Structures
- HYDROTHERMAL ALTERATION
- MINERALIZATION
- MODEL AND CONCLUSIONS

# INTRODUCTION

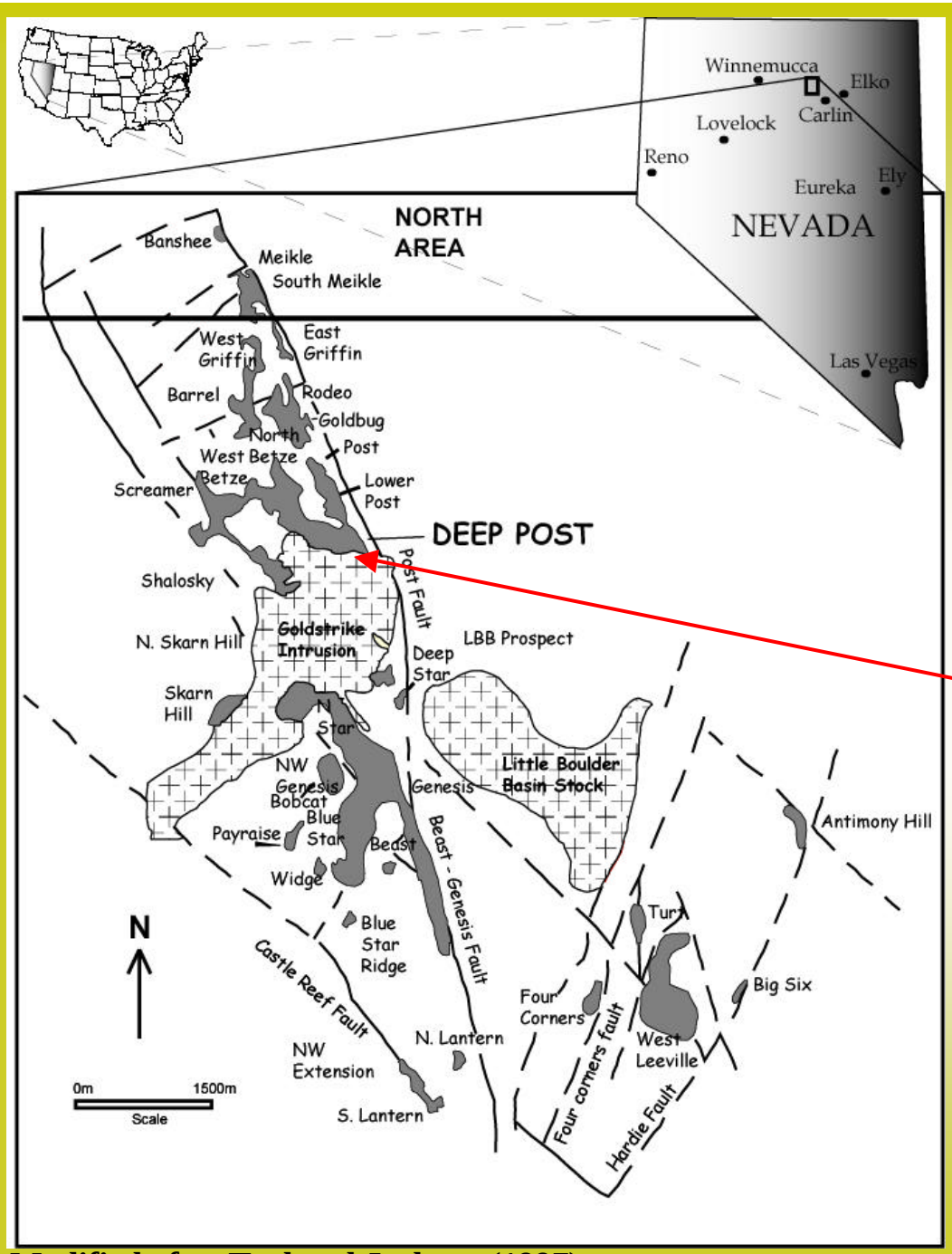



**LOCATION**

**Source: Madrid (2000)**

# 1. INTRODUCTION

## LOCATION




**DEEP POST GOLD DEPOSIT**

**Modified after Teal and Jackson (1997)**

# STATEMENT OF THE PROBLEM

✓**Understanding the significance of deep conduits in the Carlin-type gold deposits.**

**Convergence of major geological features**

✓**Which controls the mineralization:**

| | | |
|---|---|---|
| **Structures** | **vs.** | **Au grade** |
| **Structures** | **vs.** | **Hydrothermal alteration** |
| **Au grade** | **vs.** | **Hydrothermal alteration** |
| **Structures** | **vs.** | **Stratigraphy** |

✓**Study area**

# OBJECTIVES

- **Identify the relationship between hydrothermal alteration and the structural framework to ore zones and the geometry of the Deep Post gold deposit.**
- **Determine which fracture systems host gold ore.**
- **Determine if fracture density controls the distribution of ore grades.**
- **Identify and characterize the main styles of hydrothermal alterations in the orebody.**
- **Establish a paragenetic sequence of structures, hydrothermal alteration and ore minerals.**
- **Define gold mineralization styles.**
- **Develop a genetic model for gold mineralization at the Deep Post deposit.**

## ***MINING HISTORY***

1907: Lynn Creek placers; originating from Big Six

1946: Discovery of Au at Bootsrap

1959: Au found in turquoise workings at Blue Star

**1961: Discovery of Carlin.**

1962: Discovery of Au in discovery of Au in Goldstrike

1965: Carlin production commences (11 Mt at 0.32 opt)

1978: Goldstrike production commences (western area)

1982: Discovery of Post oxide

1984: Discovery of Genesis

**1986: Discovery of Deep Post**

## ***MINING HISTORY***

1988: Discovery of Deep Star, Rodeo, Goldbug & Meikle

1994: Discovery of West Leeville

1996: Underground production starts at Deep Star & Meikle

**1997: Deep Intercepts in Little Boulder Basin (>6000 feet)**

**1999: Underground production starts at Deep Post**

**2000: Deep intercepts at Ren**

**2001-2002: Deep Intercepts at Gold Margin Corridor**

**Gold production until year 2002: 50 Million Ounces**

# METHODS

## A. Field phase.

- ✓ **DATA COLLECTION**
- ✓ **INTERPRETIVE MAPS**

### - Faults, joints, and fractures

- **Width of damage zone**
- **Filling material**
- **Kinematic indicators**
- **Continuity**

### - Sense of motion

- **Dextral strike-slip displacement**
- **Sinistral strike-slip displacement**
- **Reverse displacement**

### - Fracture Intensity

**Number of fractures/ 1 meter or 1 foot**

### - Filling material

**Clay + sulfides**
**Clay gouge**
**Sulfides**
**Barite + realgar + orpiment**
**Quartz**
**Carbonates**
**Stibnite**

# METHODS

## ✓DATA COLLECTION

### -Timing and crosscutting relationships

Structural paragenesis

### - Lithology

- Biotite-feldspar porphyry
- Calc-silicate rocks
- Goldstrike Intrusion
- Popovich Formation
- Roberts Mountains Formation

### - Sample Collection

- Samples along structures
- Representative rock samples

### - Structural attitudes

- Strike/Dip of faults, joints & fractures
- Bedding
- Mesoscopic folds
- Parasitic folds
- East or west limb of the anticline
- Fracture Vs Compositional Layering

# METHODS

## B. Laboratory phase

Gold analysis (Newmont Lab)
XRD (University of Nevada)
ICP/mass spectrometry (Chemex)

## C. Petrographic phase

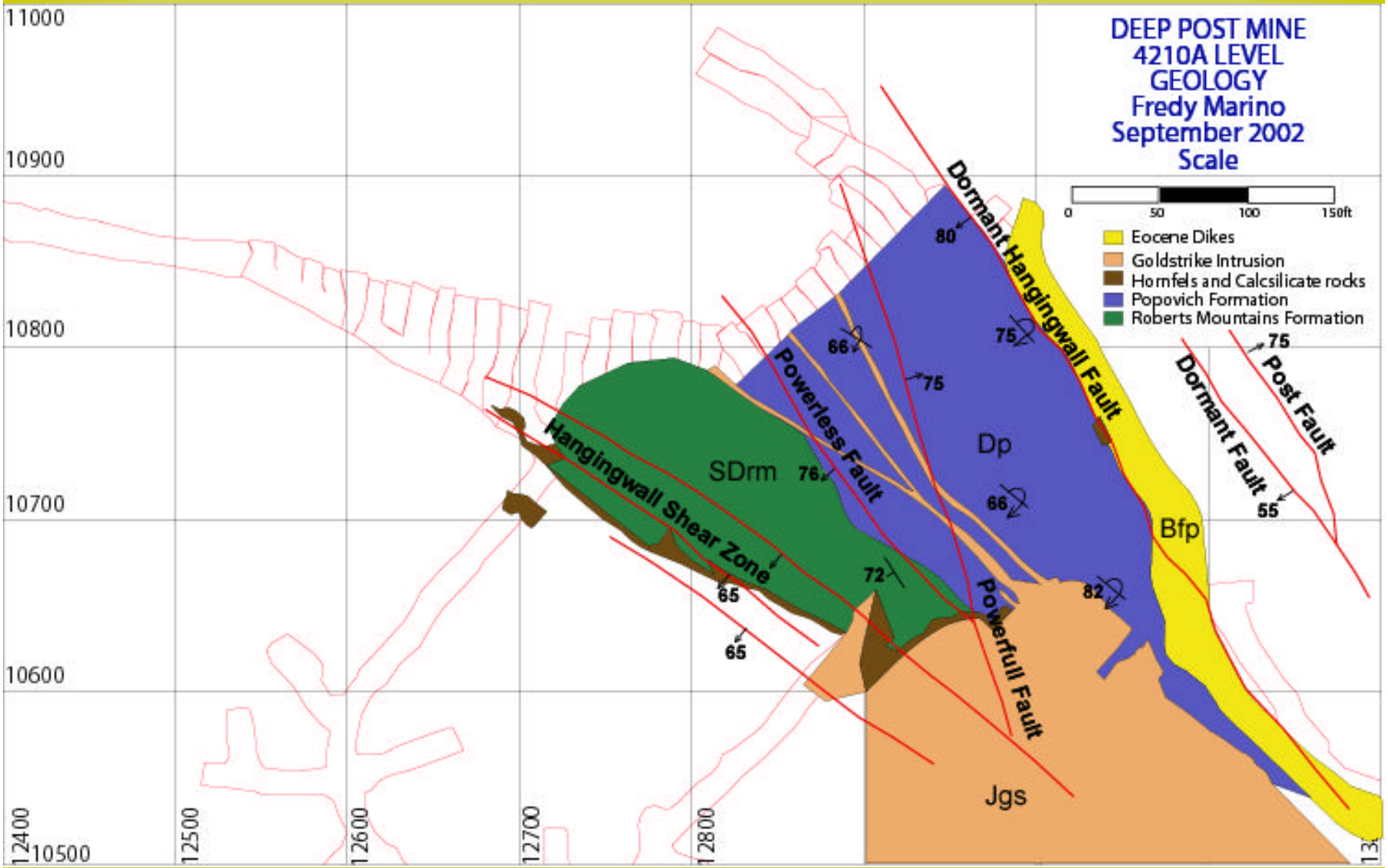
Thin-polished sections

Mineralogical paragenesis

## D. Data analysis and interpretation

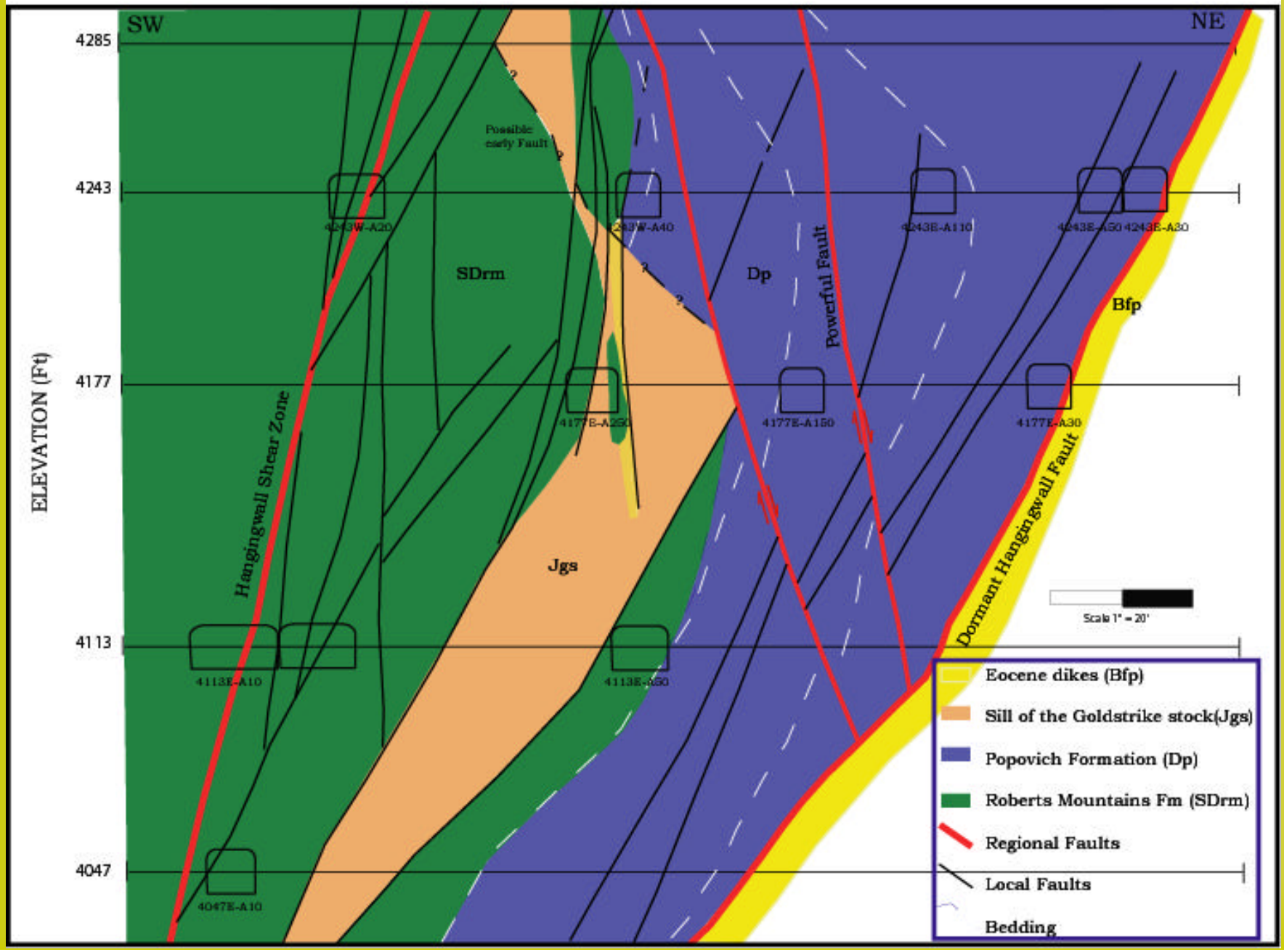
## E. Model development

# 2. GEOLOGY


DEEP POST MINE
4210A LEVEL
GEOLOGY
Fredy Marino
September 2002
Scale
0
50
100
150ft
Eocene Dikes
Goldstrike Intrusion
Hornfels and Calcsilicate rocks
Popovich Formation
Roberts Mountains Formation
Dormant Hangingwall Fault
Powerless Fault
Hangingwall Shear Zone
Powerfull Fault
Dormant Fault
Post Fault
SDrm
Dp
Bfp
Jgs
80
66
75
75
76
66
72
65
65
82
75
55
11000
10900
10800
10700
10600
10500
12400
12500
12600
12700
12800

# CROSS SECTION

# DEEP POST GOLD DEPOSIT



# STRUCTURES

## FAULTS

- Post Fault
- Dormant Hangingwall Fault
- Hangingwall Shear Fault
- Prodillon Fault

## FOLDS

- Post anticline
- Betze anticline

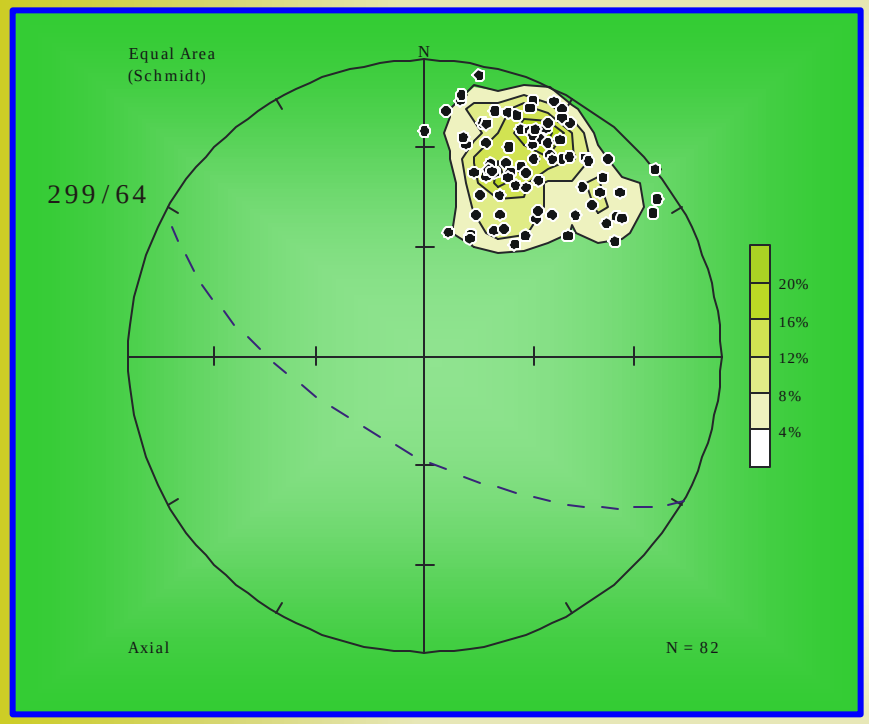
## BRECCIAS

- Debris Flow Breccia
- Dissolution-Collapse Breccia
- Fault Breccias
- Hydrothermal Breccias

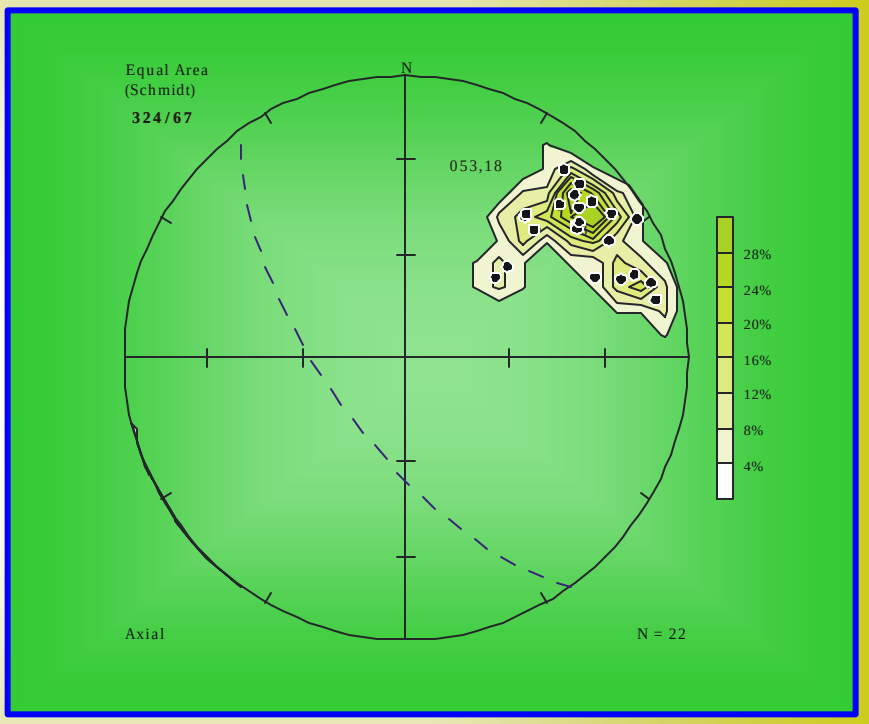
# STRUCTURES

## FAULTS

### 1. Hangingwall Shear Domain (WNW/SW)




### 2. Dormant Hangingwall Domain (NNW/SW)

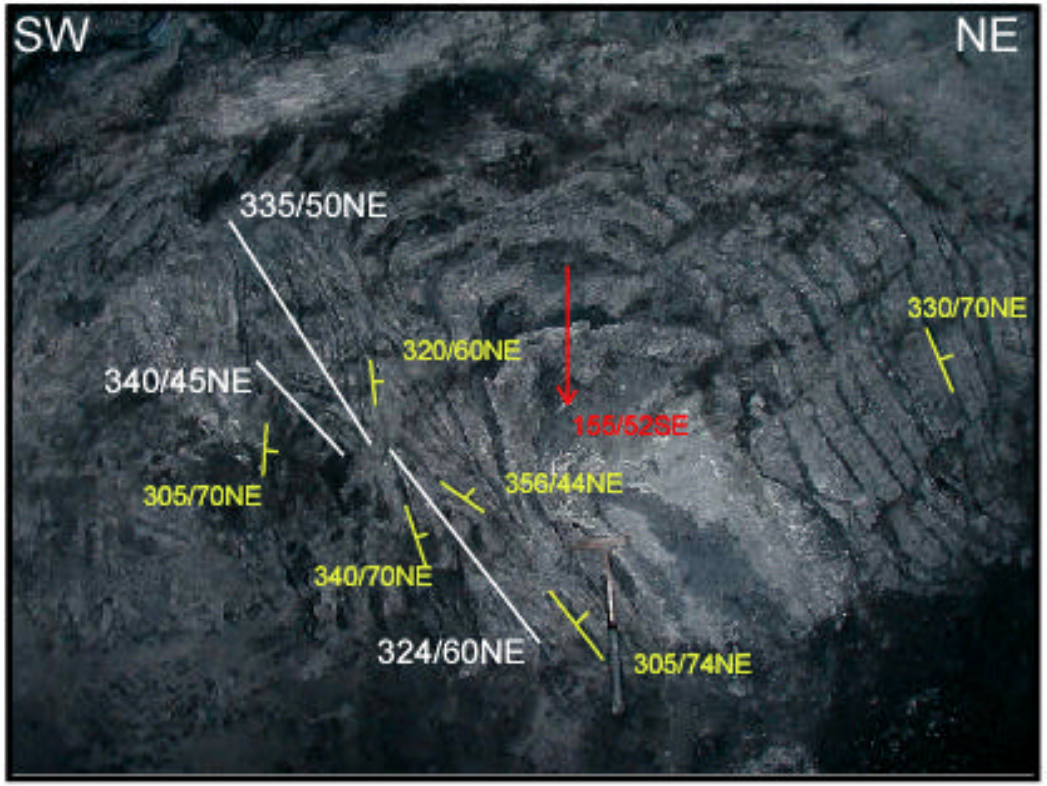



### 3. Prodillon Domain (NW/NE)

### 4. NE – NNE Domain (NE-NNE/NW-SE)

# STRUCTURES

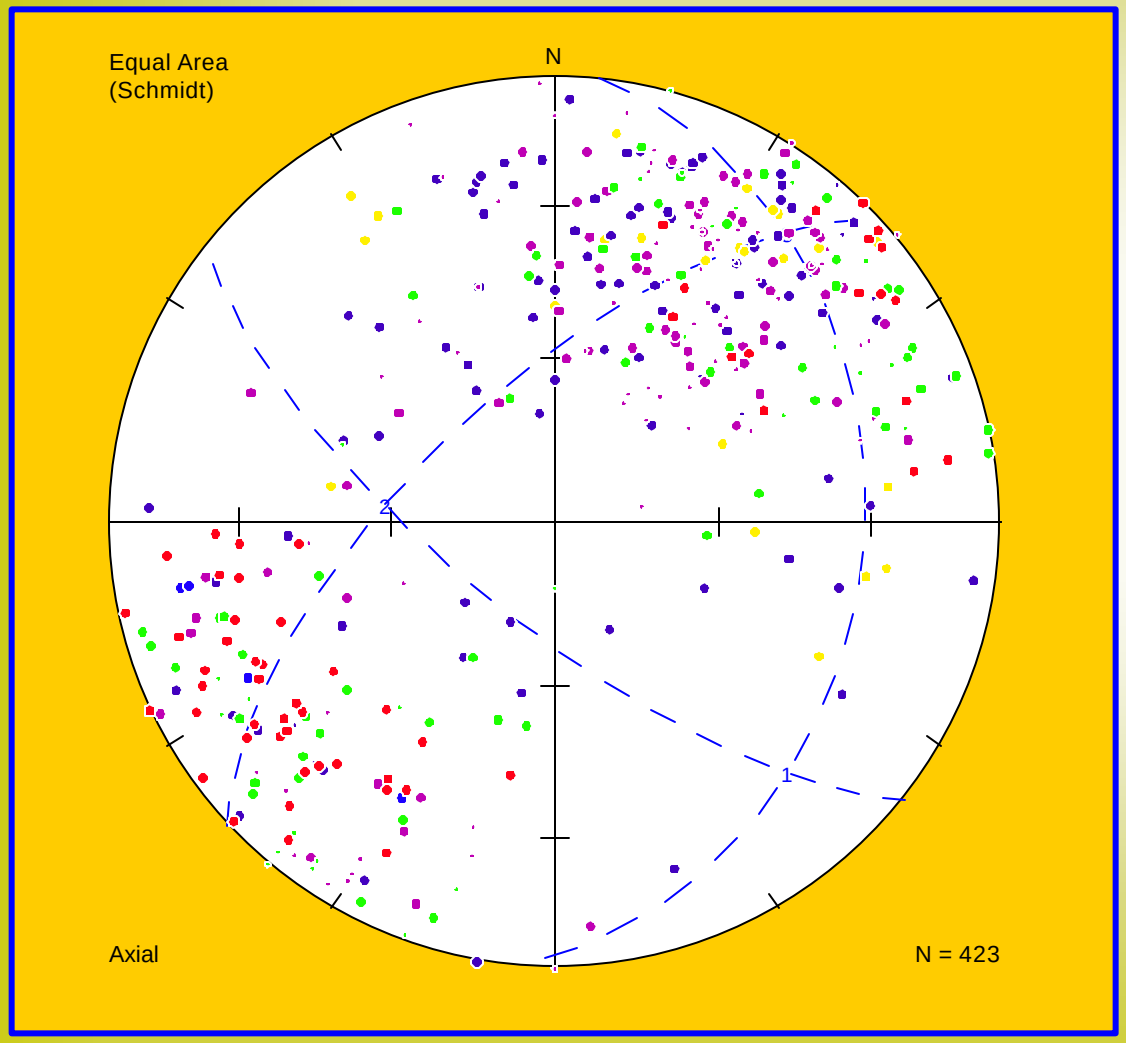
## FOLDS




**Small parasitic folds in the east limb of the Post anticline. 4150A-west level.**

# STRUCTURES

## BEDDING ATTITUDE

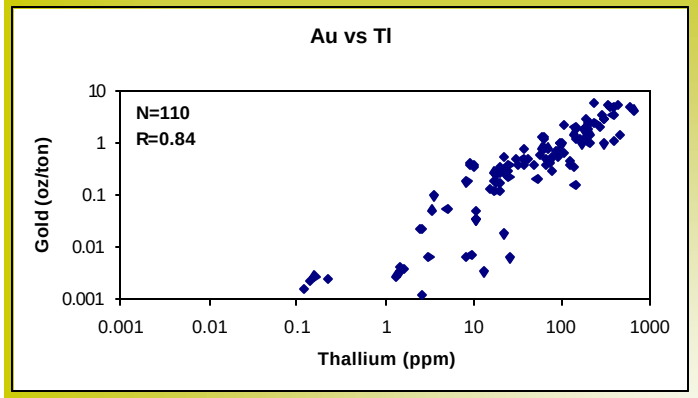


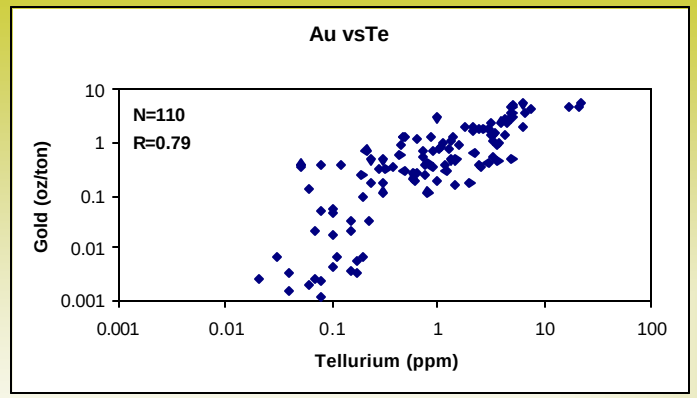

- **LEVELS:**
- 4270 Red
- 4210 Green
- 4150 Purple
- 4080 Blue
- 4020 Yellow

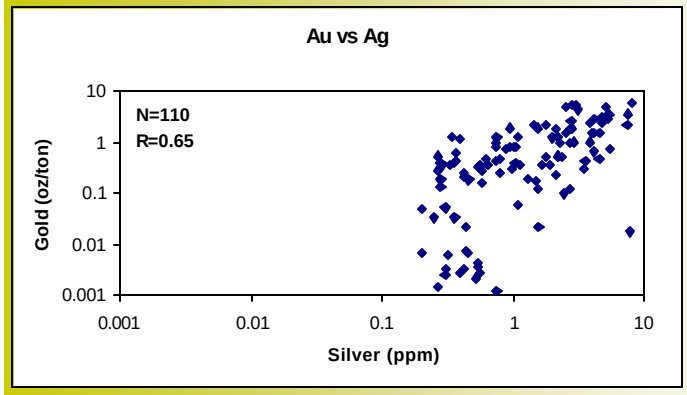
**Newmont data + this project data**

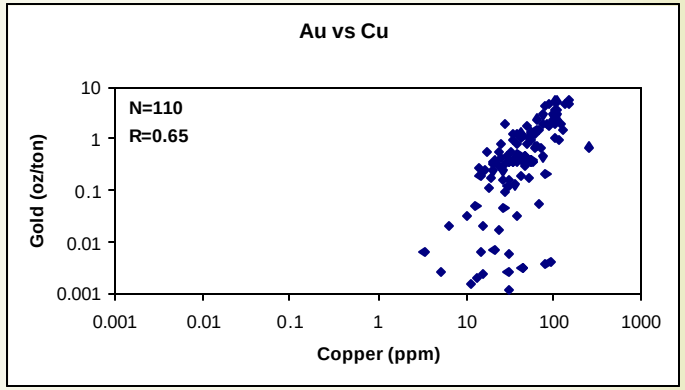
# BRECCIAS

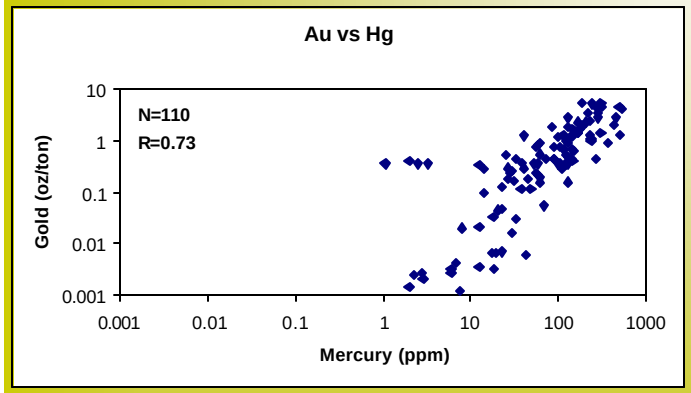
# 3. GEOCHEMISTRY

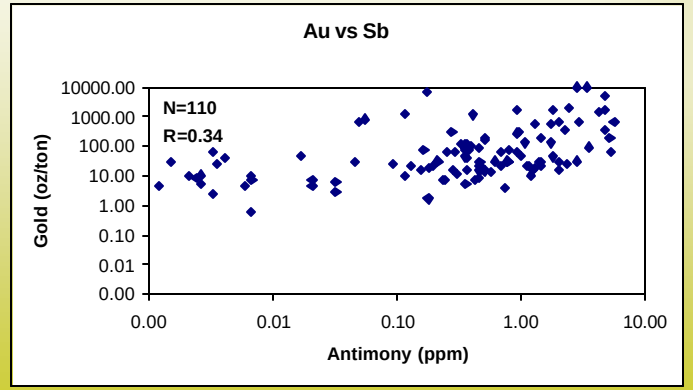


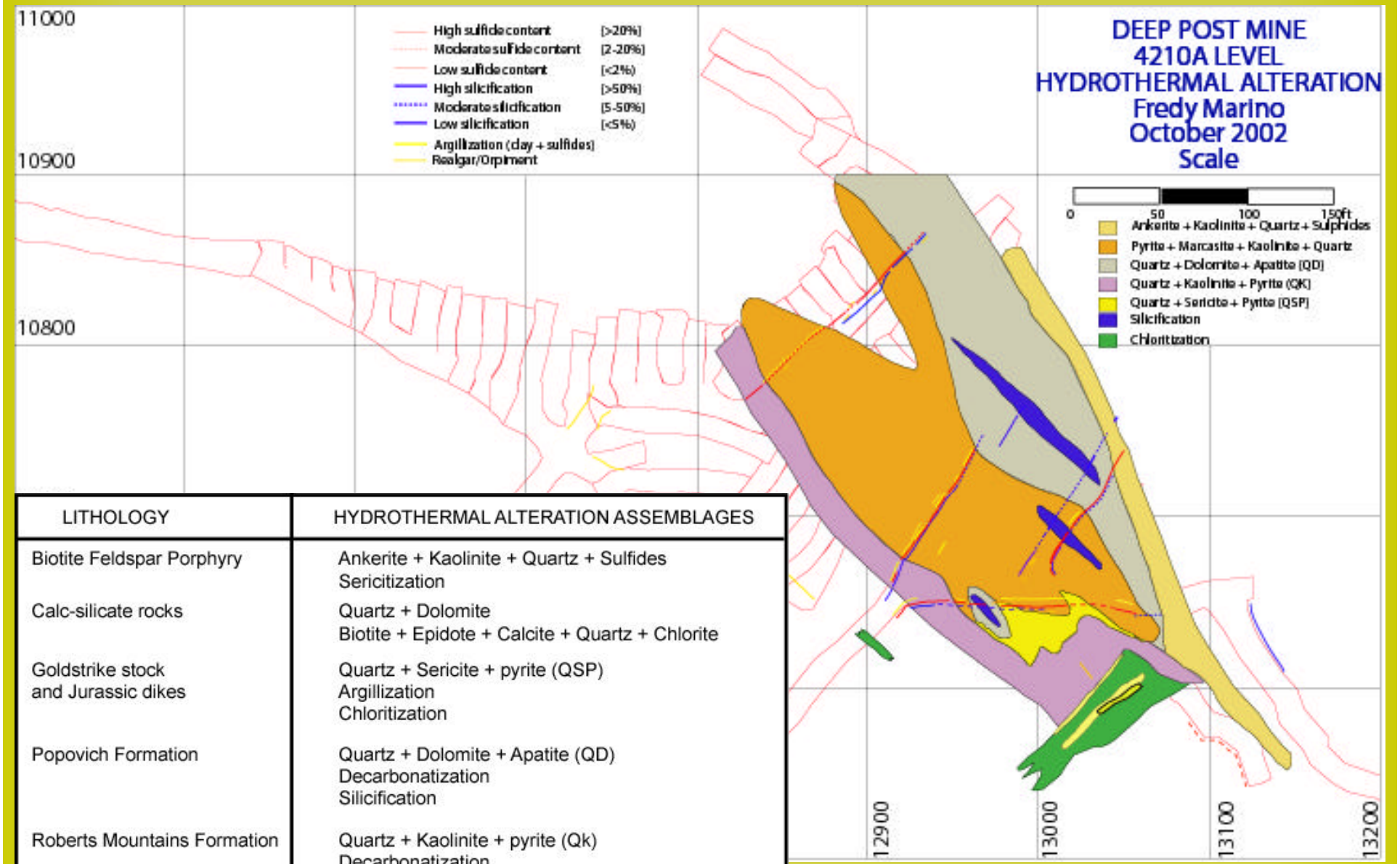



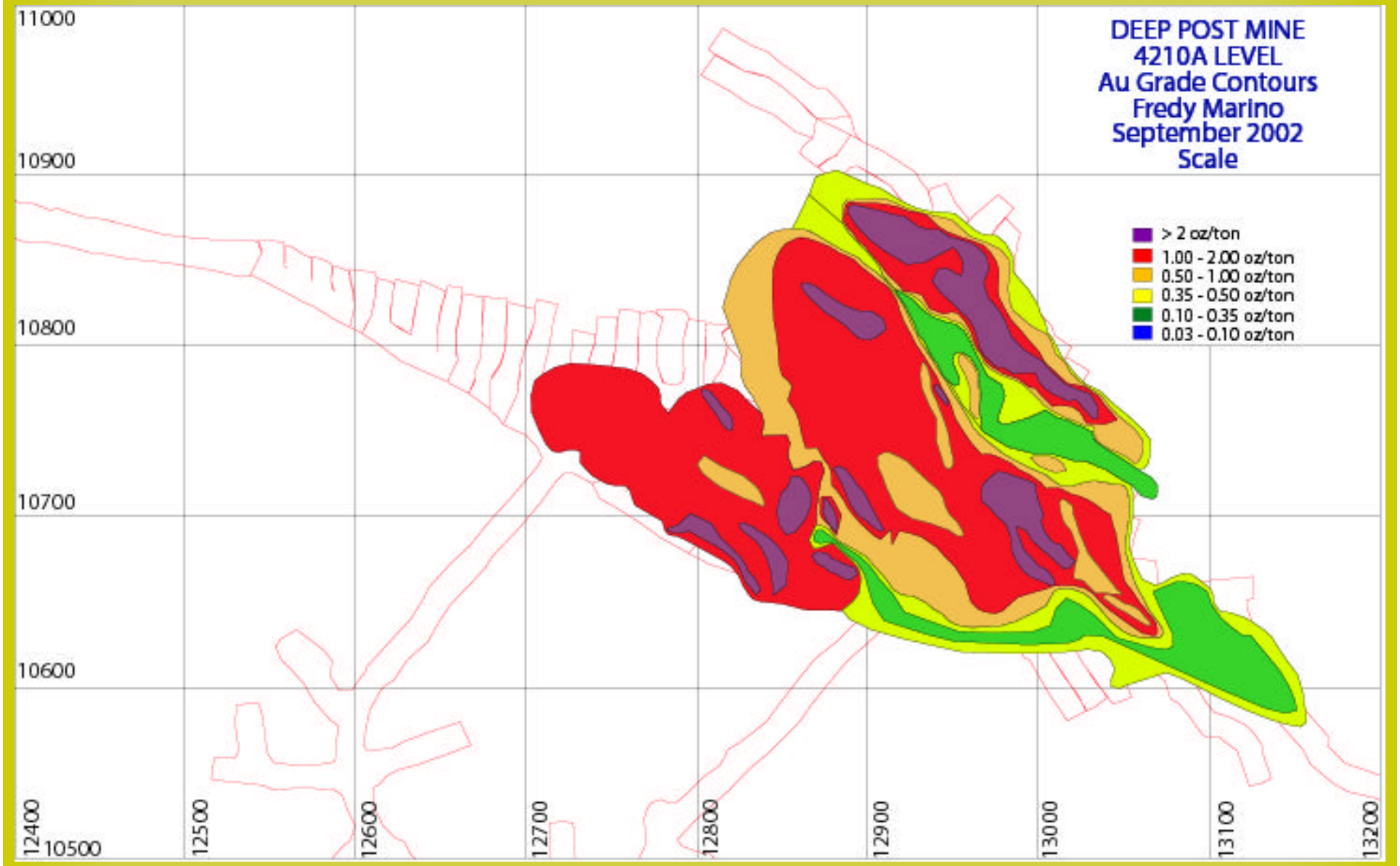

**Typical pathfinder elements Silver, Mercury, Thallium, Copper, Tellurium, and antimony show strong positive Correlation with gold.**

# 4. HYDROTHERMAL ALTERATION



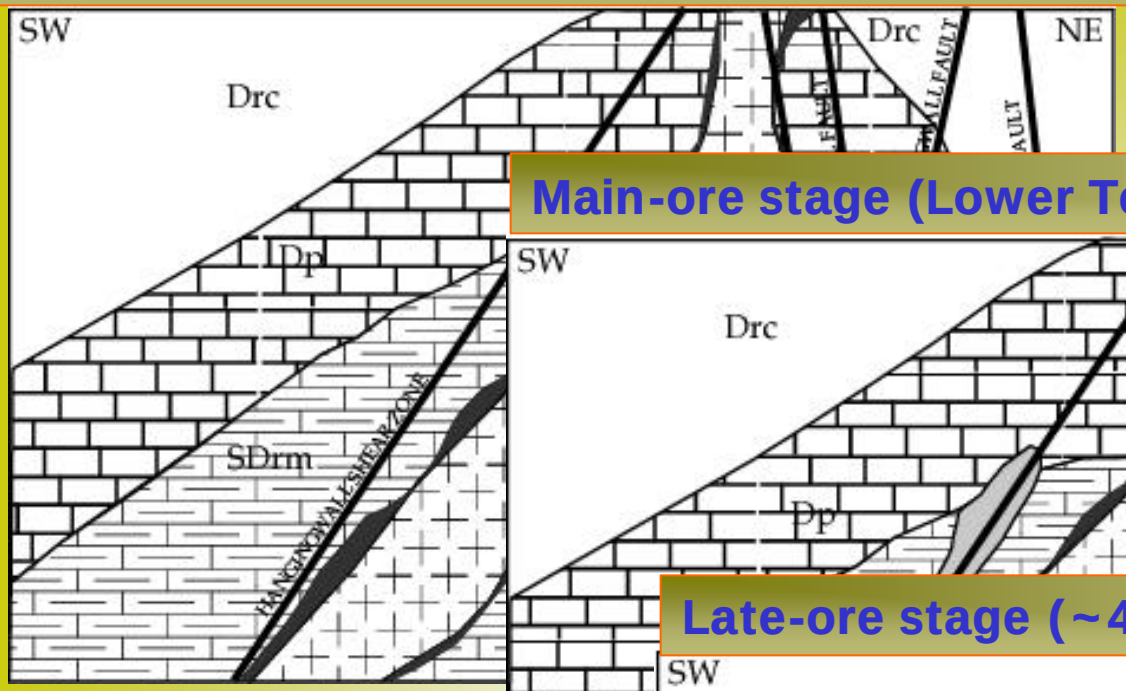

| LITHOLOGY | HYDROTHERMAL ALTERATION ASSEMBLAGES |
|---|---|
| Biotite Feldspar Porphyry | Ankerite + Kaolinite + Quartz + Sulfides<br>Sericitization |
| Calc-silicate rocks | Quartz + Dolomite<br>Biotite + Epidote + Calcite + Quartz + Chlorite |
| Goldstrike stock and Jurassic dikes | Quartz + Sericite + pyrite (QSP)<br>Argillization<br>Chloritization |
| Popovich Formation | Quartz + Dolomite + Apatite (QD)<br>Decarbonatization<br>Silicification |
| Roberts Mountains Formation | Quartz + Kaolinite + pyrite (Qk)<br>Decarbonatization<br>Silicification |
| Mineralization | PYRITE + MARCASITE + KAOLINITE + QUARTZ |

# 5. GOLD CONTENTS

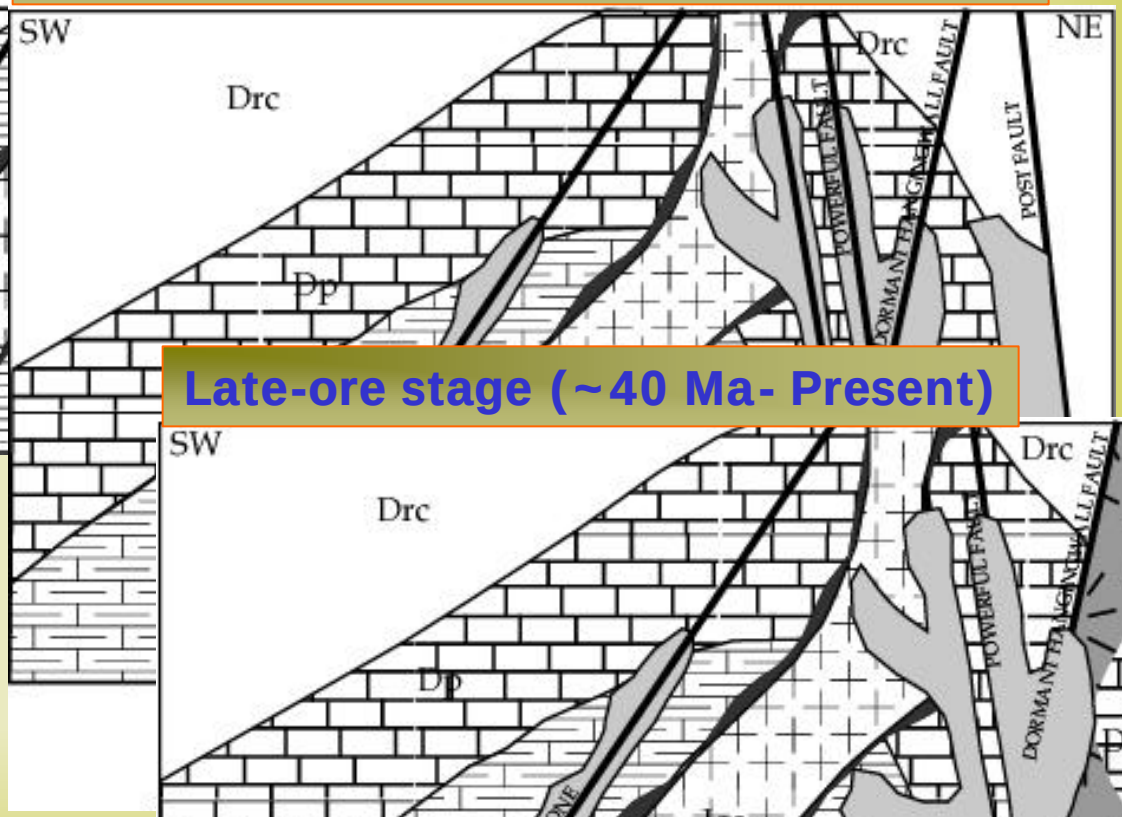


# 6. Schematic Model of The Deep Post Mine

## Pre-ore stage (Lower Paleozoic-Upper Mesozoic)




## Main-ore stage (Lower Tertiary- ~40 Ma)




## Late-ore stage (~40 Ma- Present)

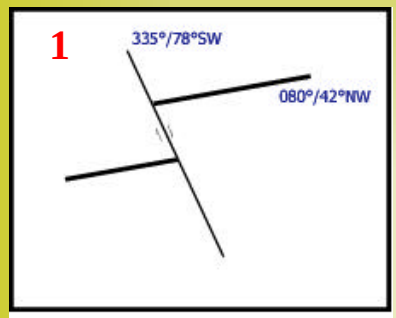



**EXPLANATION**

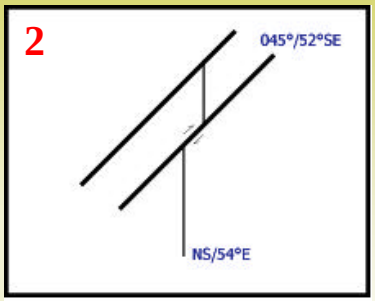
- Biotite feldspar porphyry (Bfp)
- Calc-silicate and hornfelsic rocks
- Sill of the Goldstrike stock (Jgs)
- Rodeo Creek Unit (Drc)
- Popovich Formation (Dp)
- Roberts Mountains Formation (Dsrm)

# 7. Conclusions

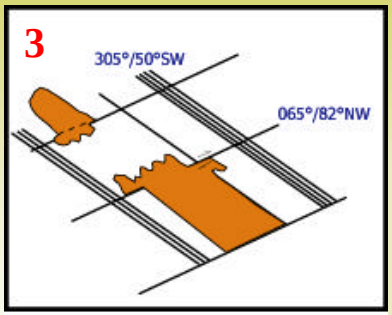
## A. CROSSCUTTING RELATIONSHIP



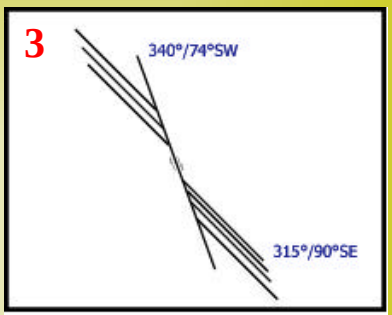
LOCATION: 4210E - A20L6



LOCATION: 4150W - A10L5



LOCATION: 4150E - A XCUT



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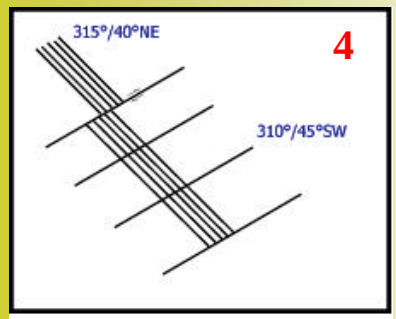

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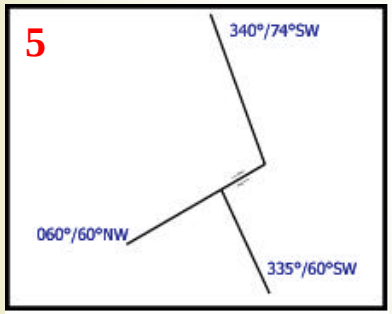

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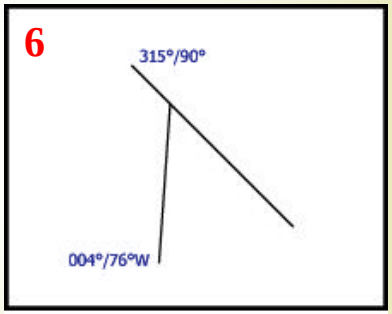
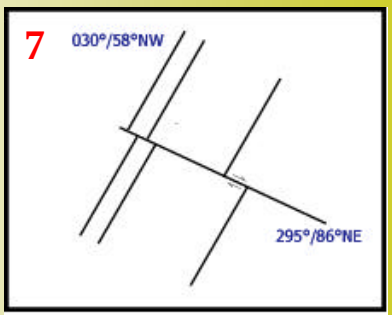
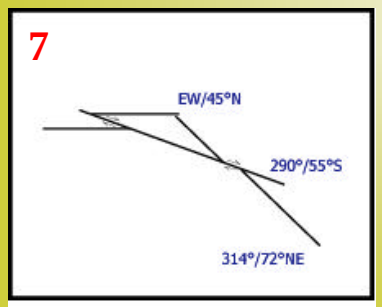


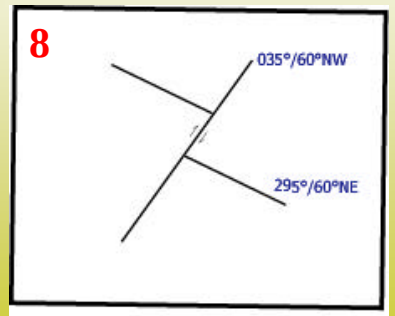
LOCATION: 4150E - A150



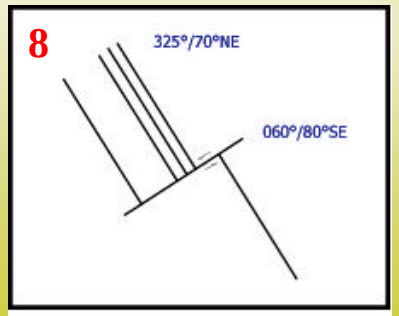
LOCATION: 4150W - A100



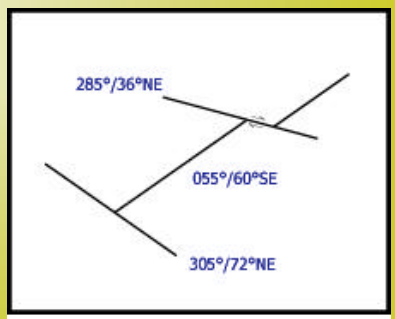
LOCATION: 4150W - A10L5



LOCATION: 4210E - A20R1



LOCATION: 4210E - A20L7



LOCATION: 4210E - A20L7

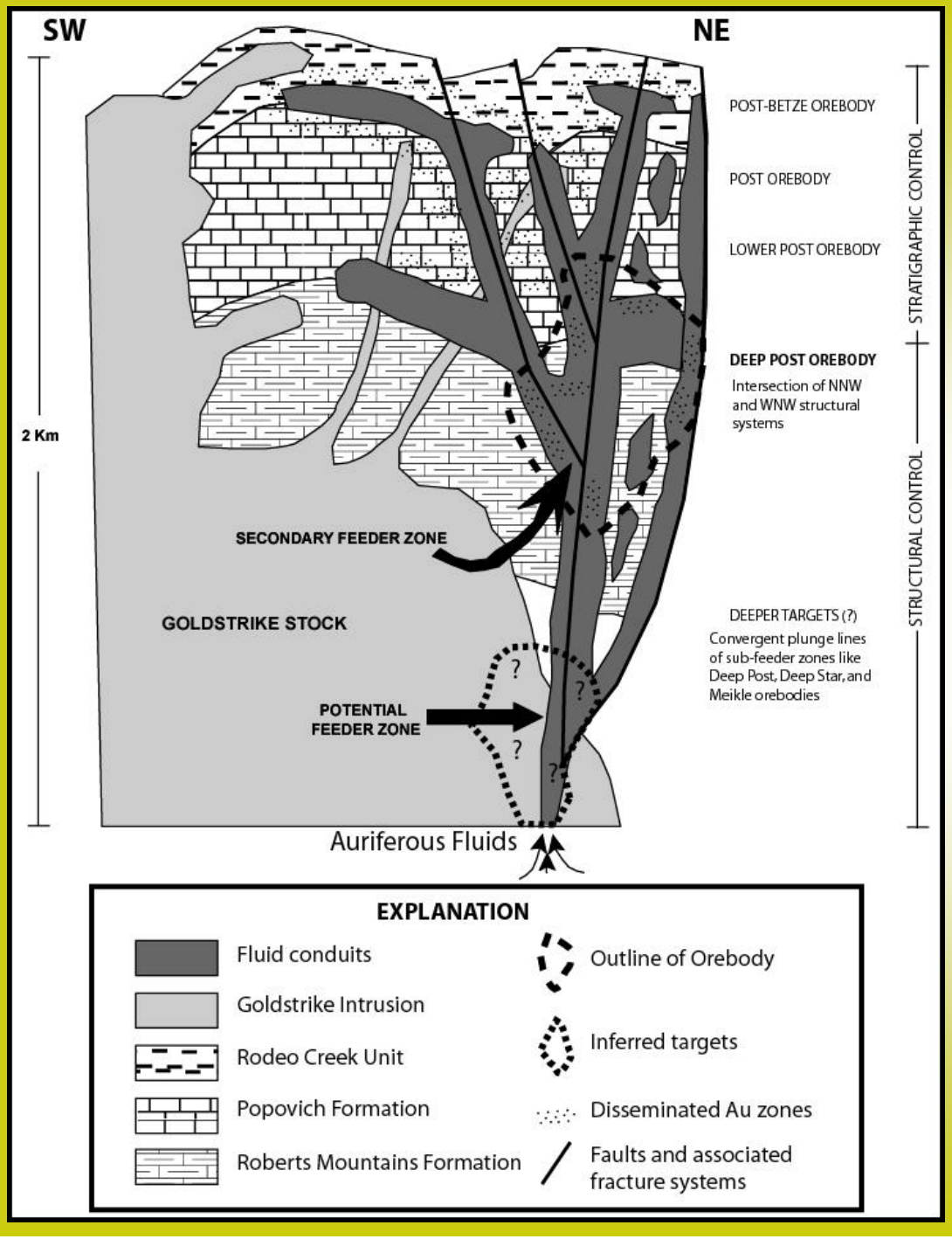
# Conclusions

## B. STRUCTURAL PARAGENESIS

| Time | Orientation | | Mineralogy | Temporal relation to Ore | Structural Domain |
|---|---|---|---|---|---|
| | STRIKE | DIP | | | |
| OLDEST | | | | | |
| 1 | ENE | NW | Sulfides+Qz | Pre-ore | |
| 2 | NS | W | Non mineralized; Clay gouge | Pre-ore | |
| 3 | NS | E | Sulfides+clay gouge; Rea+Qz; | Early ore event | |
| 4 | WNW | NE | Sulfides+clay gouge; Rea+Orp+Ba | Main ore stage | Hangingwall Shear Zone Domain |
| 5 | NW | SW | Sulfides+Clays; Rea+carbonates; Stb | Main ore stage | Dormant Domain |
| 6 | NW | NE | Sulfides+Clays; Rea+orp; Qz | Main ore stage | Prodillon and Powerful Domain |
| 7 | NNW | NE-SW | Sulfides+Clays | Main ore stage | Dormant Domain |
| 8 | NNE | NW-SE | Sulfides+Clay; Carbonates+Rea | Late | NNE Domain |
| 9 | NE | NW | Clay+Sulfides (oxides); Stb | Post-ore | NE Domain |
| 10 | EW | S | Non mineralized; Clay gouge | Post-ore | |
| YOUNGEST | | | | | |

# POTENTIAL SIGNIFICANCE

- ✓ A Better understanding of the structural controls for mineralization
- ✓ A Better understanding of the geometry of the secondary feeder zones
- ✓ A Better understanding of the relation between hydrothermal Alteration, structural geology and gold grade content.
- ✓ Exploration key for deeper Carlin-type gold deposits.




# 7. Conclusions

**Gold grade distribution at Deep Post shows stratigraphic and Structural controls.**

**Stratigraphic control is manifested In the location of the highest grade Ore within the upper unit of the Roberts Mountains Fm. and the Lower unit of the Popovich Fm.**

**Structural controls resulted in higher ore grades include anticline hinge Zones, and the presence of high-grade shoots along faults and fault intersections.**

# ACKNOWLEDGEMENTS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**Dr. Tommy Thompson**

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THANKS