

DISTRICT	Rosebud
DIST_NO	4010
COUNTY <small>If different from written on document</small>	Pershing
TITLE <small>If not obvious</small>	Rosebud general geology
AUTHOR	Muerhoff C ; Dixon R; Brady M.
DATE OF DOC(S)	1996
MULTI_DIST Y / <u>N?</u> <small>Additional Dist_Nos:</small>	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME <small>(mine, claim & company names)</small>	Rosebud Mine; Rosebud Project; Hecla Mining Co. South Zone
COMMODITY <small>If not obvious</small>	gold; silver
NOTES	Project summary; correspondence; geology; handwritten notes; resource; geologic map; cross sections 9p.

Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
the amount of pages by ~25)

SS:	DP	9/11/08
	Initials	Date
DB:		
	Initials	Date
SCANNED:		
	Initials	Date

ROSEBUD

GEOLOGY

GENERAL

60001953

4010

11-05



ROSEBUD PROJECT
501 S. Bridge
Winnemucca, NV 89445
Phone: 702-623-6912
Fax: 702-623-6967



Facsimile Cover Sheet

Date: 9/18/96

To: GREAT BASIN AERIAL SURV.
ATTN DEBBIE

From: Charlie Muerhoff
Rosebud Chief Geologist

No. of Pages including cover: _____

Message: DEAR SIRs: Please release data pertaining to
the Rosebud property Pershing Co NV to
Santa Fe Pacific Gold pursuant to our joint venture
agreement.

Charles V. Muerhoff

P.S. DEBBIE I WOULD LIKE 2 COPIES OF 7-19-88 370002 4-5
enlarged to 1"=500' Thanks CPK (mail bill to
our SFPG Reno address)

If you do not receive legible copies of all pages, please call back as soon as possible.

✓ CPK

TO: RICHARD DIXON
FM: MIKE BRADY
SUBJECT: ROSEBUD MINE, NEVADA
DATE: September 12, 1996

To date my experience at the Rosebud Project has been to complete a district scale geologic map, compile a summary of the known exploration targets on the property and then supervise a reverse circulation drill program. My total involvement has aggregated approximately 4-5 months for Hecla.

Santa Fe has now invited my participation in the further exploration of the property. As an initial step I was requested to outline some exploration ideas as well as to offer some areas that I believe justify additional study. In summary the following comments are therefore presented.

General

Reconnaissance district scale mapping has broadly established geologic relationships in the general vicinity. Considerable improvement is still possible regarding the age of the Dozer Tuff, relative ages of the Rosebud Shear and South Ridge Fault, origin of the Badger Formation, a confirmation of the various rhyolite intrusives depicted in the district and various other geologic relationships. When a compilation of the known target areas on the property was completed it was obvious that alteration is widespread and that past exploration (including sampling, geophysics and drilling) has been extensive but largely unsuccessful.

The total data base of past exploration work at Rosebud is nearly overwhelming at first impression. I believe that all of this information is of value but I would recommend that studies now should be focused on the details of the Rosebud orebody and not the exploration potential of the district. Specifically I believe that the following questions remain to be answered:

1) What exactly is the Rosebud orebody? Is it a replacement zone in the volcanic sediments, a fluid breccia chimney, a vein or deposition at a structural intersection?

2) What are the mineral zonations within the orebody? Do the gangue and ore mineral suites vary from top to bottom within the deposit in a fashion that would aid in understanding its genesis?

3) What are the alteration zonation patterns outside of the orebody? I believe that this becomes very important to determine if blind drilling of a +1,500 feet target is contemplated.

4) What are the controls for mineralization? I presently assume a combination of favorable host, proximity to east-west trending structure and along the margins of a rhyolite intrusive are important criteria but these are assumed variables that should more closely be examined.

5) How do the other known zones of mineralization (North and East Orebodies and the mineralization intersected in hole 96-356) relate to each other? Could they be faulted pieces of originally one zone of mineralization or do they represent separate depositional sites?

My suggestion is in summary to focus initially on the deposit details and not the over all exploration potential of the district.

Work Programs

Some of the activities that could be completed now include:

1) review all of the underground mapping for accuracy and completeness. Additional work may be required.

2) re-log the core holes that penetrate the area of the main orebody using a uniform stratigraphic terminology. This step will require that all of the core first be located and organized into permanent storage.

3) complete an alteration and mineral zonation study of the main orebody and surrounding periphery. Samples could be obtained from both the underground workings and the core holes.

4) using a computer, compile all of the geologic, alteration and assay data for a block of 500 ft x 500 ft x 500 ft that surrounds the main orebody. Use this data base to plot out features of potential interest.

5) continue the same procedure above for the other known zones of mineralization in the general vicinity.

6) locate and assemble in a permanent storage all of the chip trays for the completed reverse circulation holes on the property. A re-logging effort can then continue for those holes located north, south and east of Dozer Hill as a first priority.

Although these work programs are considered important, they are mainly time consuming and not that expensive. If major expenditures are required as a result of the terms of the joint-venture agreement, the following might be considered:

1) contact Hecla's consulting geophysicist, Joe Anzman in Denver (1-303-741-5433) regarding the availability of airborne magnetics over the district. If it is not available at suitable detail and coverage, conduct a separate survey. (est. \$20,000)

2) assemble all of the completed IP data for a detailed re-interpretation. I know of 4 IP anomalies on the Rosebud Property (Dozer Hill, Valley, North Equinox and Dreamland). The Dozer Hill anomaly is possibly related to the main Rosebud Deposit but a detailed interpretation might yield a more specific signature. If the detailed IP data is not available, consider reproducing it with additional lines in the field. (est. maximum \$20,000-40,000)

3) drill a vertical core hole at 480,500E; 2,205,000N approximately 1,800 feet northwest of the top of Dozer Hill. The northwest flank of a sub-cropping rhyolite intrusive, the basal base surge sequence and an east-west trending mineralized vein all project into the area creating an interesting exploration target. No core holes are present in the area (only a few reverse circulation holes) and the stratigraphic information that would be gained from a core hole at this site would be helpful. The total depth of the proposed hole would be roughly 1,700 feet. (est. \$75,000-80,000)

4) from the underground workings drill a series of horizontal core holes (possibly 3, spaced at 300 foot intervals) on a northwest bearing to intersect the footwall of the Rosebud Shear. This is highly prospective ground that essentially remains untested by the surface drilling. (est. \$100,000-150,000).

Project Summary Data Sheet

PROJECT NAME: ROSEBUD JV

LOCATION: Pershing and Humboldt Counties, Nevada

Country: USA

Office: Reno

Exploration Project Management Team: Jenkins / Dixon

EXPLORATION CONCEPT / MODEL: Epithermal gold-silver

Target Type: Volcanic-hosted structurally controlled high-grade gold-silver mineralization. Underground targets.

Potential size: 500,000 to 1.0 million troy ounces Au, plus substantial Ag content.

Potential shape, tons/grade: Proven South Zone at Rosebud is an elongate orebody at structural intersection. Approximate dimensions are 200' X 1350' X 50' with 1 million tons grading 0.50 oz./ton Au and 7.0 oz./ton Ag. Other blind orebodies occurring in the area are the North, East, and Far East.

Anticipated Metallurgical Process: Sulfide ore to be trucked to Twin Creeks, milled and run through CIL circuit, carbon stripped, and dore produced.

Anticipated Engineering/Mine Process: Rosebud will be an underground cut-and-fill mine using waste rock to backfill stopes.

FEATURES OF EXPLORATION SIGNIFICANCE: Tertiary volcano-tectonic trough with caldera development and gold-silver mineralization associated with ring fracture system, numerous structural intersections with mineralized breccias, locally strong sericitic and argillic alteration, associated pathfinder element geochemical anomalies. Rosebud is a zone of "blind" high-grade gold-silver orebodies.

Geology: Extensive geologic mapping in the district from 1981 to 1995. Mapping at scales from 1 inch = 1 mile down to 1 inch = 100 feet. Most recently mapped at scale of 1 inch = 500 feet (1995).

Geochemistry: Widespread soil surveys for Au, Ag, As, Sb, and Se. Recent multi-element geochemical study of underground drill holes on edges of South Zone to develop vectoring tool for finding more ore. Select surface rock-chip geochemistry.

Project Summary Data Sheet : Rosebud JV continued-

Geophysics: Detailed ground magnetics, IP, and resistivity surveys, contracted by Lac Minerals.

Drilling: Approximately 370 drill holes property-wide but locally very focused surface drilling. For example, the Rosebud Soth Zone orebody has 143 surface drill holes followed by 131 underground drill holes on 25-foot centers.

Lithology: Kamma Mountain volcanics of Miocene age are the hosts for gold-silver mineralization and consist of flows, pyroclastics, and epiclastic rocks of quartz latitic to rhyolitic composition. The LBT unit, a fine-grained water lain and air fall tuff, hosts most of the South Zone orebody. Other orebodies are hosted by the underlying Dozer Rhyolite, which is a fine-grained, siliceous ash flow tuff showing weak banding.

Structure: Regionally Rosebud lies along the north ring fracture of a 3 - 4 mile diameter resurgent dome of Tertiary age. More local structural controls for Rosebud-type deposits appear to be the intersections of east-west trending listric faults with north-striking and east-dipping volcanic beds. Other structural elements are thought to have influenced ore emplacement, including high-angle faults with northwest and northeast orientations.

Alteration and Mineralization: Locally intense sericitic and argillic alteration can hamper identification of wallrock lithologies. Gold and silver mineralization occurs with silica flooding, as discrete veins, vein stockworks, and as tectonic and hydrothermal breccias. This gold-silver mineralization is the quartz-sericite-adularia type and generally has low total sulfide content ($\pm 4\%$).

PROJECT STAGE: Discovery and discovery follow-up.

LAND OWNERSHIP:

Size: 772 unpatented lode mining claims on BLM land. 15,440 acres, or about 24.1 square miles. 95 claims being capitalized against the Rosebud operation, leaving 677 claims for exploration (note: \$67,700 in annual fees to BLM).

Commitments: SFPG will fund \$12.5 million in project development costs. SFPG will fund first \$1 million of exploration, thereafter will be responsible for 2/3 of all exploration expenditures. Exploration and development costs will be \$1 million annually, unless decided otherwise by JV Management Committee. SFPG will contribute the Scossa area to the JV. See terms outlined in Letter of Intent, dated May 24, 1996.

SFPG Ownership %: -0-, earning in to 50%

**Project Summary Data Sheet: Rosebud JV continued-
ASSESSMENT OF OTHER CRITICAL FACTORS:**

Social/Political:	Addressed in 1995 BLM Environmental Assessment*			
Cultural**:	"	"	"	"
Environmental:	"	"	"	"
Health and Safety:	"	"	"	"

Financial: See above SFPG commitments to earn 50%.

Notes: *1995 Environmental Assessment will have to be amended because of decision not to mill ore on-site. **More cultural surveys needed with expanded Plan of Operations.

PROPOSED 1997 EXPLORATION PROGRAM:

Work Planned Jan. 1 - July 24, 1997: Drill test 5 - 7 targets with 22 RC holes and 2 core holes, totaling 19,200 feet. Very selective geophysical and geochemical surveys.

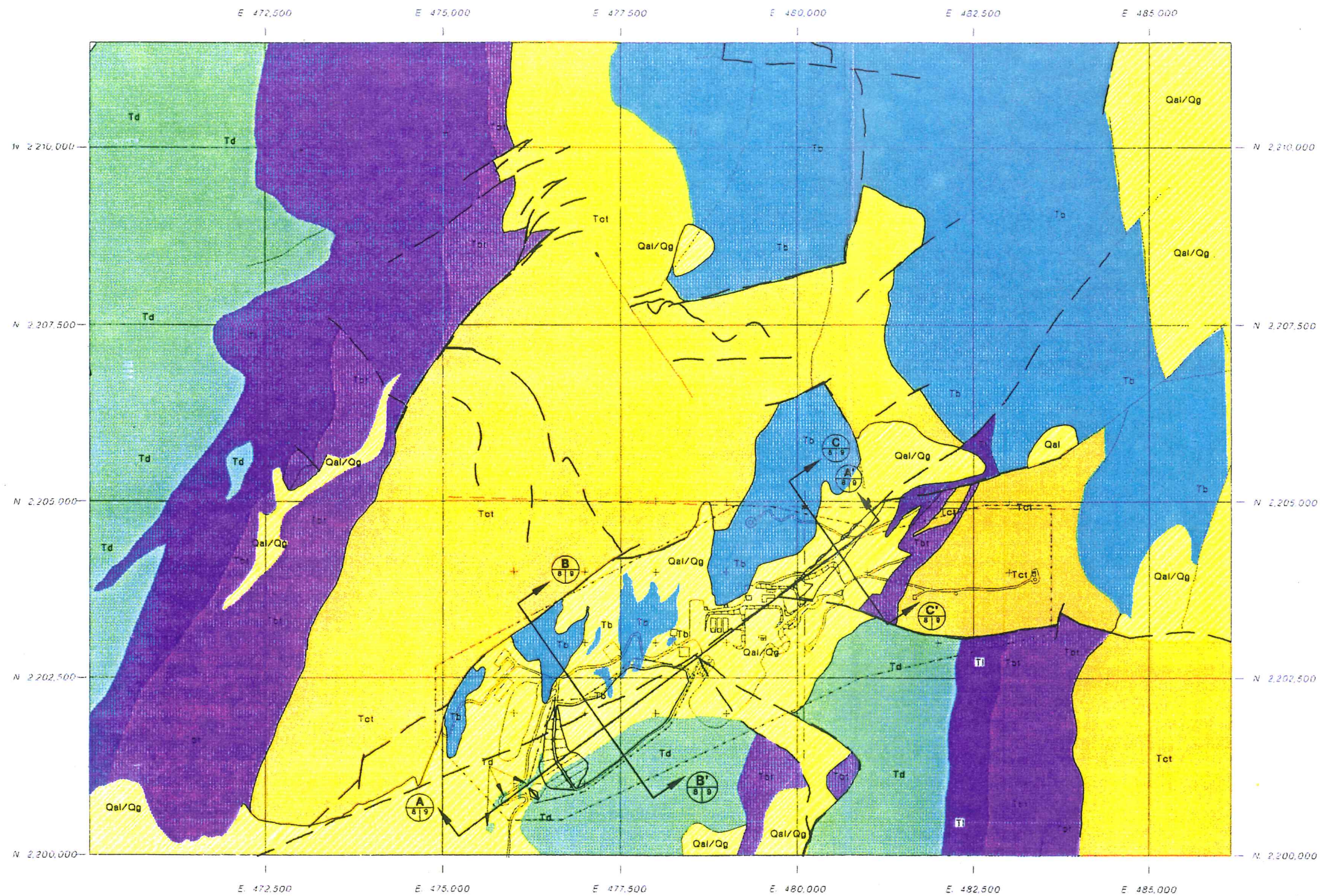
Budget:\$655,000

<i>Manpower:</i>	\$164,700
6.5 man-months/2 SFPG geol...	\$117,400
6.0 man-months/contract geol...	<u>47,300</u>
	\$164,700
<i>Drilling: (22 RC DH's and 2 Core DH's).....</i>	\$384,000
including drilling contract, analyses, downhole surveys, permitting, site prep., and reclamation.	
<i>Geophysics and Geochemistry:</i>	35,000
<i>Services: Cultural surv., control surv., drafting...</i>	38,800
<i>Contingency:</i>	<u>32,500</u>
	\$655,000

Work Planned July 25 - Dec. 31, 1997: Discovery follow-up drilling on 2 - 3 discoveries with estimated 42 RC holes and 4 core holes, totaling 36,800 feet. Limited geophysical and geochemical surveys and modeling over discoveries.

Budget:\$1,000,000

<i>Manpower:</i>	\$133,900
5.0 man-months/2 SFPG geol..	\$101,640
3.5 man-months/contract geol..	<u>32,250</u>
	\$133,900
<i>Drilling: (42 RC DH's and 4 Core DH's).....</i>	\$739,000
including drilling contract, analyses, downhole surveys, permitting, site prep., and reclamation.	
<i>Geophysics and Geochemistry:</i>	35,000
<i>Services: Control surv., drafting, and copy exp..</i>	8,900
<i>Contingency:</i>	15,500
<i>Land Cost: \$67,700 due BLM before Sept. 1, 1997</i>	<u>67,700</u>
July 25 - Dec. 31, 1997 Grand Total	\$1,000,000
Shared 2/3-1/3 with Hecla, SFPG's share=	667,000
SFPG's Total Expenditure 1997 = \$655,000+667,000=	\$1,322,000

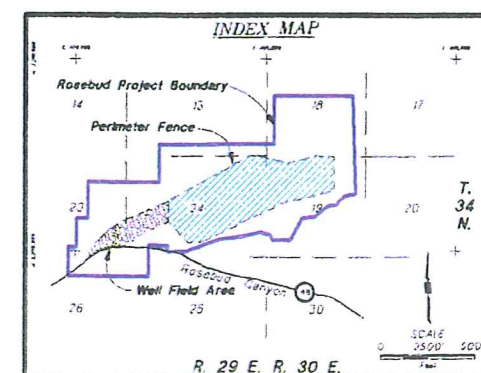
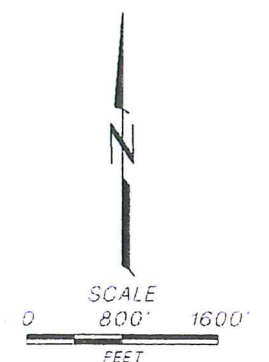


EXPLANATION

- Qal/Qg **QUATERNARY ALLUVIUM/GRAVELS**
- Tb **BADGER FORMATION**
Volcaniclastic sediments including debris flows, laharic breccias, and epiclastic sediments.
- Tct **CHOCOLATE TUFF**
Interbedded quartz-latite to alkaline rhyolite flows and pyroclastics.
- Tbt **BUD TUFF**
Interbedded tuffs, pyroclastic breccias and fine-grained rhyolite flows.
- Tl **LBT**
Interbedded flows, tuffs, and pyroclastic breccias (the main ore host).
- Td **DOZER TUFF**
Fine-grained, often densely-welded, tuff (possibly portion of a rhyolitic flow-dome complex).
- CONTACT**
- INTERPRETED FAULT**
- FAULT**
- CROSS-SECTION LOCATION**

A
10/12
 PLATE No. WHERE
DETAIL/SECTION
IS REFERENCED

PLATE No. WHERE
DETAIL/SECTION
IS SHOWN

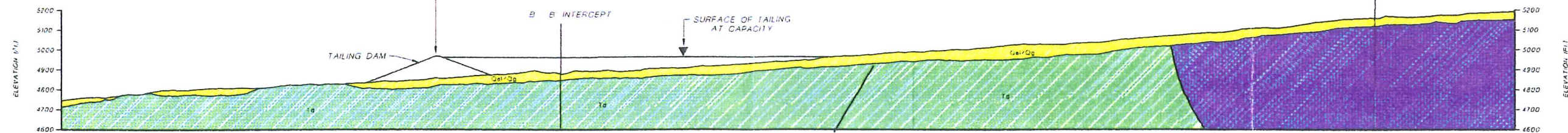


ROSEBUD MINE

GEOLOGY MAP

SOUTHWEST

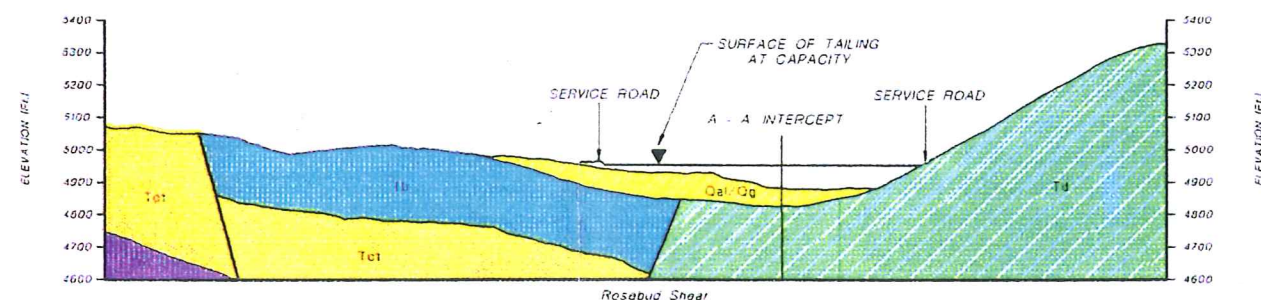
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A CROSS SECTION
HORIZONTAL SCALE 1"=600'
VERTICAL SCALE 1"=600'

NORTHWEST

B



B CROSS SECTION
HORIZONTAL SCALE 1"=600'
VERTICAL SCALE 1"=600'

SOUTHEAST

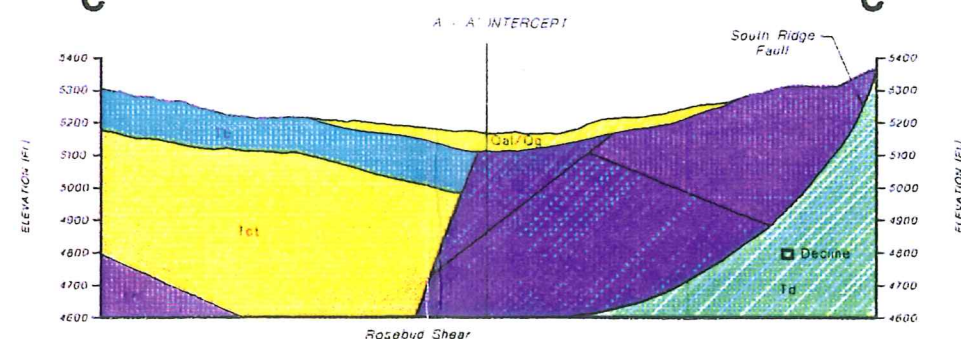
B'

EXPLANATION

- | | | |
|--|--------|---|
| | Qal/Og | QUATERNARY ALLUVIUM/GRAVELS |
| | Tb | BADGER FORMATION - volcaniclastic sediments including debris flows, lahatic breccias, and epiclastic sediments. |
| | Tct | CHOCOLATE TUFF - interbedded quartz-lalite to alkaline rhyolite flows and pyroclastics. |
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| | Tl | LBT - interbedded flows, tuffs, and pyroclastic breccias (the main ore host). |
| | Td | DOZER TUFF - fine-grained, often densely-welded, tuff (possibly portion of a rhyolitic flow-dome complex). |
| | | FAULT |

NORTHWEST

C



C CROSS SECTION
HORIZONTAL SCALE 1"=600'
VERTICAL SCALE 1"=600'

SOUTHEAST

C'

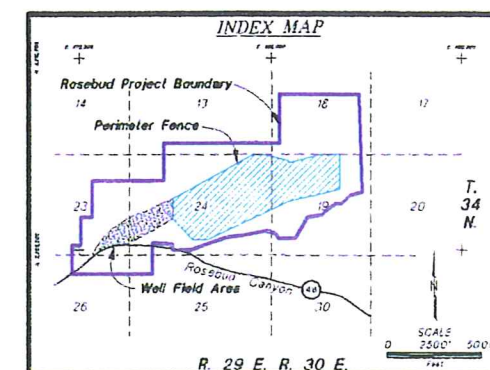


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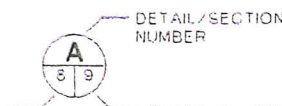


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DETAIL/SECTION
IS SHOWN

ROSEBUD MINE

GEOLOGIC CROSS SECTIONS