60001689

Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Geology and Mineralization of the Rosebud Deposit
AUTHOR	K. Allen; M. Dexter
DATE OF DOC(S)	2000
MULTI_DIST Y / N? Additional Dist_Nos:	
QUAD_NAME	Sulphur 7.5'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine; Rosebud Project; Hecla Mining Co.; Rosebud Mining Co. LLC; Newmont Gold Co. ASARCO; Freeport McMoRan Exploration; St. Joe Minerals; USMX; Homestake; Lac Minerals (USA); Equinox Resources; South Zone; East Zone; North Zone NOTE: add names from p8
COMMODITY If not obvious	gold; silver
NOTES	overhead presentation; reserves; resources; production; geology; stratigraphy; cross-sections ~~30~~ p. 32

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: DD 6/5/08 (Initials Date)
DB: [illegible] 7/08 (Initials Date)
SCANNED: N Blue (Initials Date)

Revised: 1/22/08

Rosebud Deposit Presentation

6000 1690 4010

6000 1689

Geology and Mineralization of the Rosebud Deposit

Rosebud Mining Co. LLC

Hecla Mining Company - Operator and Manager of Exploration

Newmont Gold Company - Manager Milling

History of the Rosebud District

- 1906: Discovery of gold and silver on the southern flanks of Rosebud Peak.
- 1908-1947: Several small mines in the district produced minor amounts of gold and silver, with some copper and lead credits. Total reported production from the district included:
  - 3,775 ounces gold
  - 116,300 ounces silver
  - 18,700 pounds copper
  - 4,600 pounds lead
- 1975-1985: ASARCO, Freeport McMoRan Exploration, St. Joe Minerals, USMX, Homestake:
  - surface exploration
  - limited drilling

Rosebud Deposit Discovery & Delineation

- 1985-1993: LAC Minerals (USA), Equinox Resources
  - consolidated district claim group, began surface exploration and drilling
  - 204,000 feet reverse-circulation and core drilling
  - Rosebud Deposit discovered in 1989
- 1994: Hecla Mining Company
  - excavated 3,000-foot decline below the South ore zone
  - excavated 240-foot cross-cut into the South ore zone (approx. 400 tons @0.92 Au oz/ton)
  - 25,000 feet of underground core drilling in South ore zone along 50-ft. spaced drill fans
  - 32,000 feet of surface core drilling in the South, East, and North ore zones
- 1995: Hecla Mining Company
  - completed an additional 7,100 feet of underground core drilling along 25-ft. spaced drill fans in the South ore zone "chimney" area and portions of the stratabound area.
- 1996: Hecla -Santa Fe Joint Venture Formed September 1996
  - Construction - October 1996
  - Production - Began mining in February 1997 ramping up to full production in April 1997.
  - Santa Fe - Newmont Gold merger - May 1997

Rosebud Reserves & Resources 1997 @ 0.140 Au oz/ton cutoff

Proven & Probable Reserve					
Zone	Tonnage	Au Grade (oz/t)	Ag Grade (oz/t)	Au Ounces	Ag Ounces
South	720,262	0.443	3.36	318,897	2,423,617
North	176,371	0.323	1.16	56,959	204,667
East	380,000	0.326	2.10	124,028	799,606
Total	1,276,634	0.392	2.69	499,884	3,427,890

Rosebud Reserves & Resources 2000 @ 0.180 Au oz/ton cutoff

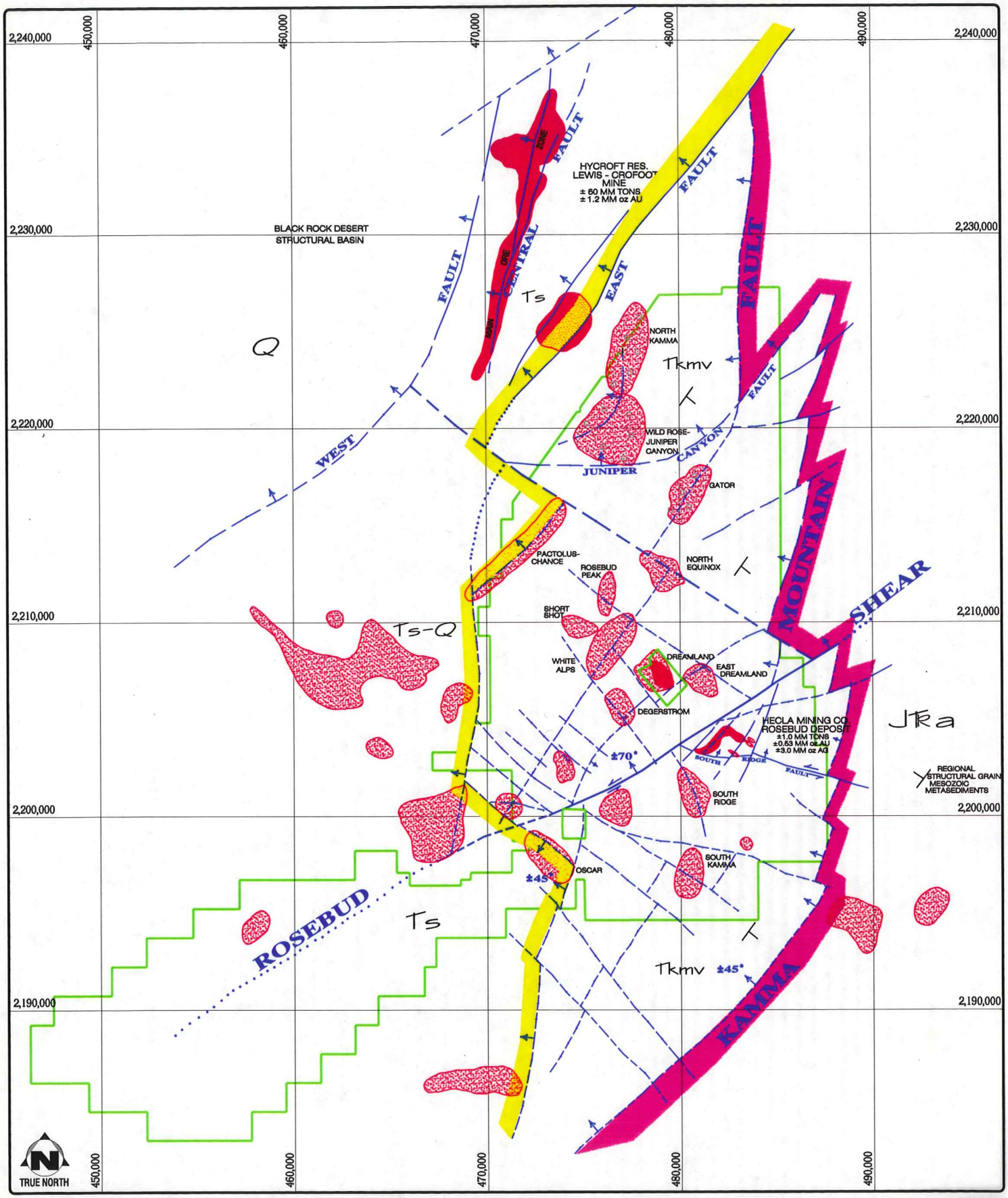
Proven & Probable Reserve					
Zone	Tonnage	Au Grade (oz/t)	Ag Grade (oz/t)	Au Ounces	Ag Ounces
South	8,019	0.356	4.28	2,854	34,303
North	158,765	0.295	1.08	46,907	171,667
East	48,889	0.408	1.20	19,952	58,462
Total	215,673	0.323	1.23	69,713	264,432

ROSEBUD PRODUCTION 1997 - 1999

YEAR	TONS	Au OZ/TON	Ag OZ/TON	Au OUNCES	Ag OUNCES
1997	197,951	0.485	3.08	95,991	610,501
1998	316,825	0.423	3.43	134,026	1,085,961
1999	274,468	0.433	1.54	118,881	421,495
TOTAL	789,244	0.442	2.68	348,898	2,117,957

Rosebud Deposit Stratigraphy

- Rosebud deposit is situated in Northwest Nevada, within the Basin and Range physiographic province.
- The deposit is hosted by Tertiary (late Oligocene-age) Kamma Mountain igneous rocks consisting of rhyolitic to andesitic volcanics, volcaniclastics, and epiclastics.



DATE: APRIL 16, 1998

DATA BY: C.B. Winteer

DRAWN BY: M. Sheen

CONTOUR INTERVAL 50'

SCALE: 1"=2000' 1:24000

DISTRICT GEOLOGY AND SURFACE TARGETS

Modified From
Masingil (88), Brewer (90), Walck (92), Moore (91)

ROSEBUD PROJECT
1997 ANNUAL REPORT
FIGURE 1

Hecla MINING COMPANY

ROSEBUD STRATIGRAPHY

Kamma Mountain Volcanics (Tertiary)

- **Tb – Badger Formation**
  - ✓ Conglomerates, fanglomerates, and possibly lahars derived in part from mass wasting.
  - ✓ Clasts are volcanic and are supported in hematitic mud to silt matrix.

- **Tc – Chocolate Formation**
  - ✓ Quartz latitic dikes, sills, and flows.
  - ✓ Rhyolitic to trachytic flows, sills, and volcanic breccias.
  - ✓ Interbedded epiclastics.

- **Tbud – Bud Formation**
  - ✓ Ubud – Epiclastics with thin interbedded ash flow tuffs.
  - ✓ Pabx – Rhyolitic porphyritic auto-brecciated flow/sill.
  - ✓ Mbud – Epiclastics with thin interbedded ash flow tuffs.
  - ✓ Bmb – Bud marker rhyolitic porphyry dike and sill.
  - ✓ Lbud – Epiclastics with thin interbedded ash flow tuffs.

- **Lbt – LBT Formation**
  - ✓ Plat – Fine-grained, rhyolitic, planar laminated to massive (Mass) flow.
  - ✓ Lst – Vesicular flow, "leopard skin tuff".
  - ✓ Plat – Fine-grained, rhyolitic, planar laminated to massive (Mass) flow.
  - ✓ Upmbx – Rhyolitic block and ash flow tuff.
  - ✓ Plat – Fine-grained, rhyolitic, planar laminated to massive (Mass) flow.
  - ✓ Lpmbx – Rhyolitic, basal flow breccia.

- **Tos – Oscar Sediments**
  - ✓ Epiclastics commonly with clasts of Auld Lang Syne Formation graphitic phyllite.

- **Td – Dozer Formation**
  - ✓ Flow banded, locally vesicular, rhyolitic flow dome(s).

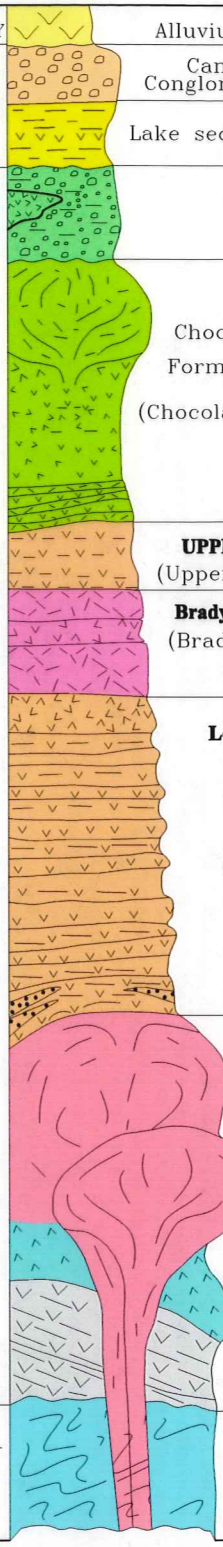
- **Tcs – Carbonaceous Sediment Sequence]**
  - ✓ Carbonaceous sandstones and siltstones.

- **Toa – Oscar Andesite**
  - ✓ Andesitic flows and fine-grained flow breccias,

- **Als – Auld Lang Syne Formation**
  - ✓ Metasediments including graphitic slates, phyllites, quartzites, and hornfels.

ROSEBUD CANYON STRATIGRAPHIC SECTION
1997 ANNUAL REPORT
FIGURE 4

S.J. Turner, 1997

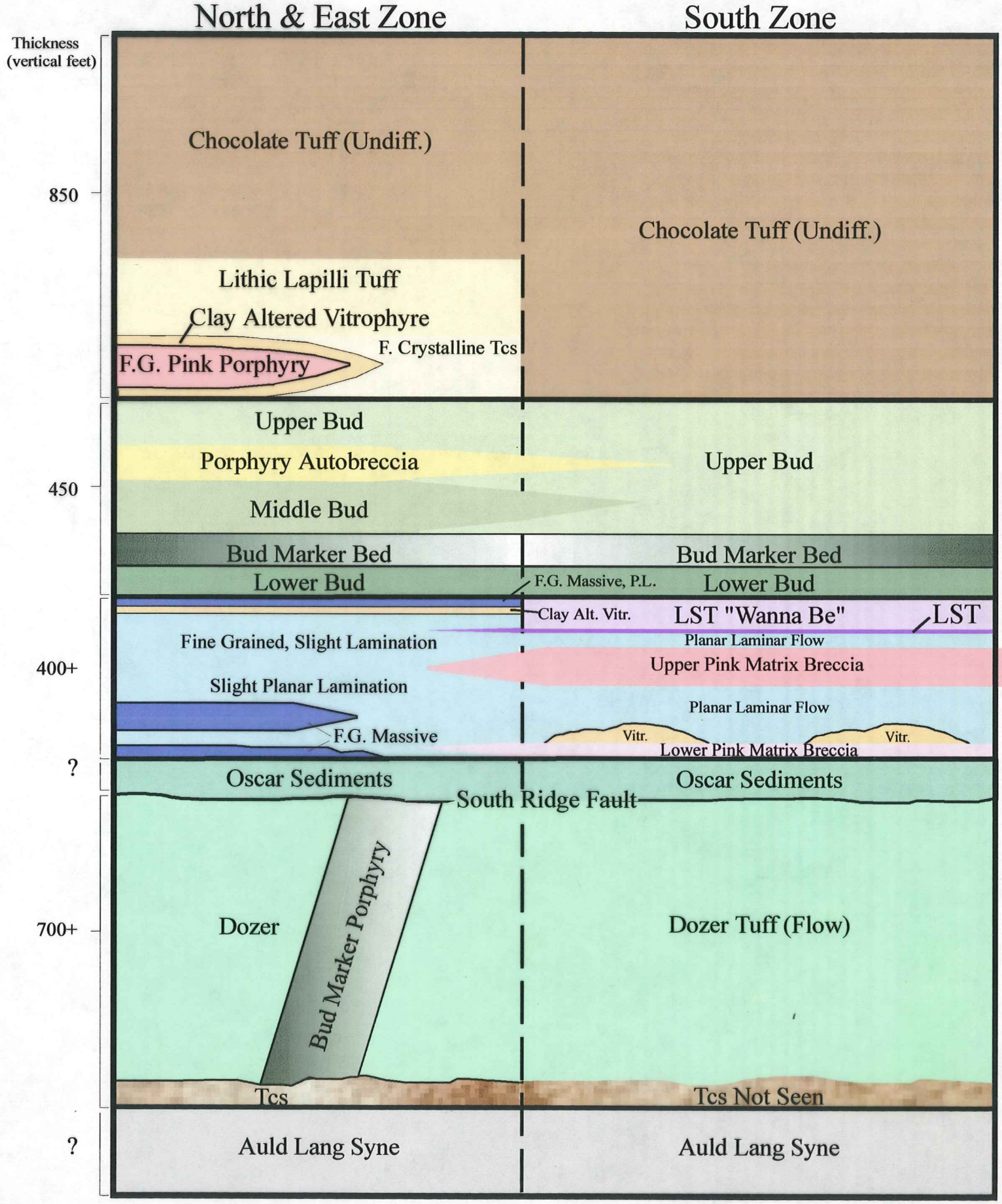


			SYMBOLS	SCALE 1" 500'
QUATERNARY	Alluvium, Colluvium		Qal	Alluvial gravels with placer Au
TERTIARY (MIOCENE) — KAMMA MOUNTAIN VOLCANIC GROUP	Camel Conglomerate	Sulfur Group	Tsc	Conglomerate and scree breccia. 40 to +250'
	Lake sediments		Ts	Volcanic ash and lacustrine sediments. 2,000'
	Badger formation (Gator)		Tb	Hematitic volcaniclastic and conglomeratic breccias–red silty matrix. 900–1000'
	Chocolate Formation (Chocolate tuff)	Chocolate Flow	Tc	Flow banded, sparsely porphyritic latitic flow, local eruptive center. +300'
		Chocolate Tuff		Non–welded lithic tuffs. +300'
		Marker porphyries		Glomeroporphyritic flows or sills. +125'
	UPPER BUD SEQUENCE (Upper Bud Tuff,Upper Surge)		Tbs_2	Well – bedded lithic tuff– breccias with graded bedding. +300
	Brady Sequence (Brady Andesite)	See Mine Host Sequence	Ta	Fine–grained flow, planar flow 90' laminations – intervening lithic 26' tuff – breccia 185'
	Lower Bud Sequence (Lower Bud Tuff; Lower Surge; Oscar Sediments; Wild Rose)		Tbs_1	Heterolithic, well–bedded lithic tuff breccias and volcaniclastic units with reverse and normal grading –includes fragments of the Auld Lang Syne Group and clasts of Dozer towards the base. +1000'
	Dozer Rhyolite Dozer Formation (Equivalent to 'Brown Flow' or Wild Rose Flow Domes)		Td	Flow banded, locally vesicular probable exogenous rhyolite flow dome(s) with significant relief on its upper surface. –Upper flow laminated zone 250–1800'
	Oscar Sequence	Oscar Andesite	Tos	Andesitic flows, generally fine grained with flow breccias and tuffs. (?)
		Basal Tertiary Sediments	Tcs	Carbonaceous sandstone, siltstone and pebble conglomerate. 0–100'
Jurassic–Triassic	Auld Lang Syne Group		JŦa	Deformed, dark gray metasediments: graphitic slate, phyllite, quartzite, hornfels.

NOTES:

1. Selected compilation of previous descriptions with alternate unit names shown in brackets; Recommended new terminology in **bold.**
2. Thicknesses for the upper Dozer to the Chocolate Formation are from a measured section on South Ridge; other thicknesses are schematic only.

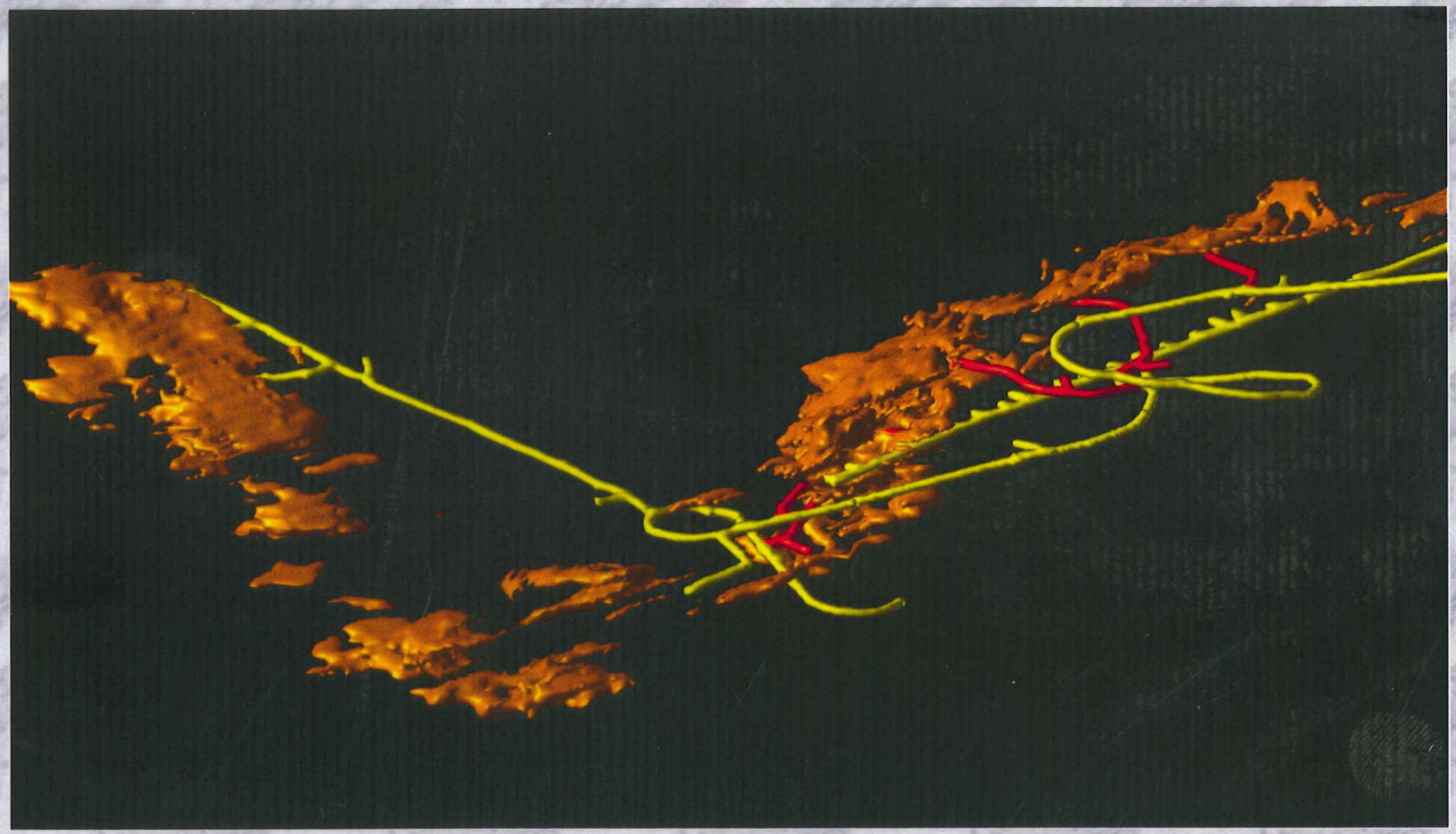
ROSEBUD MINE STRATIGRAPHY



Mineralization and Alteration

- Rosebud deposit is a volcanic hosted, epithermal, low-sulfidation, precious metal deposit. It is hosted primarily by late Oligocene volcanic rocks.
- Gold occurs in two dominant grain-size populations of ±10 microns and ±350 microns, with some grains exceeding 700 microns in diameter.
- Overall silver-to-gold ratio of the deposit is 9.5:1; Ore grade silver-to-gold ratio is 6.2:1.
- Rosebud deposit has been divided into three separate ore zones (South, East, and North) based upon spatial location and differing styles of mineralization.
- The age of mineralization is currently unknown but was estimated at ± 16 MY.

Development and Mineralized Zones

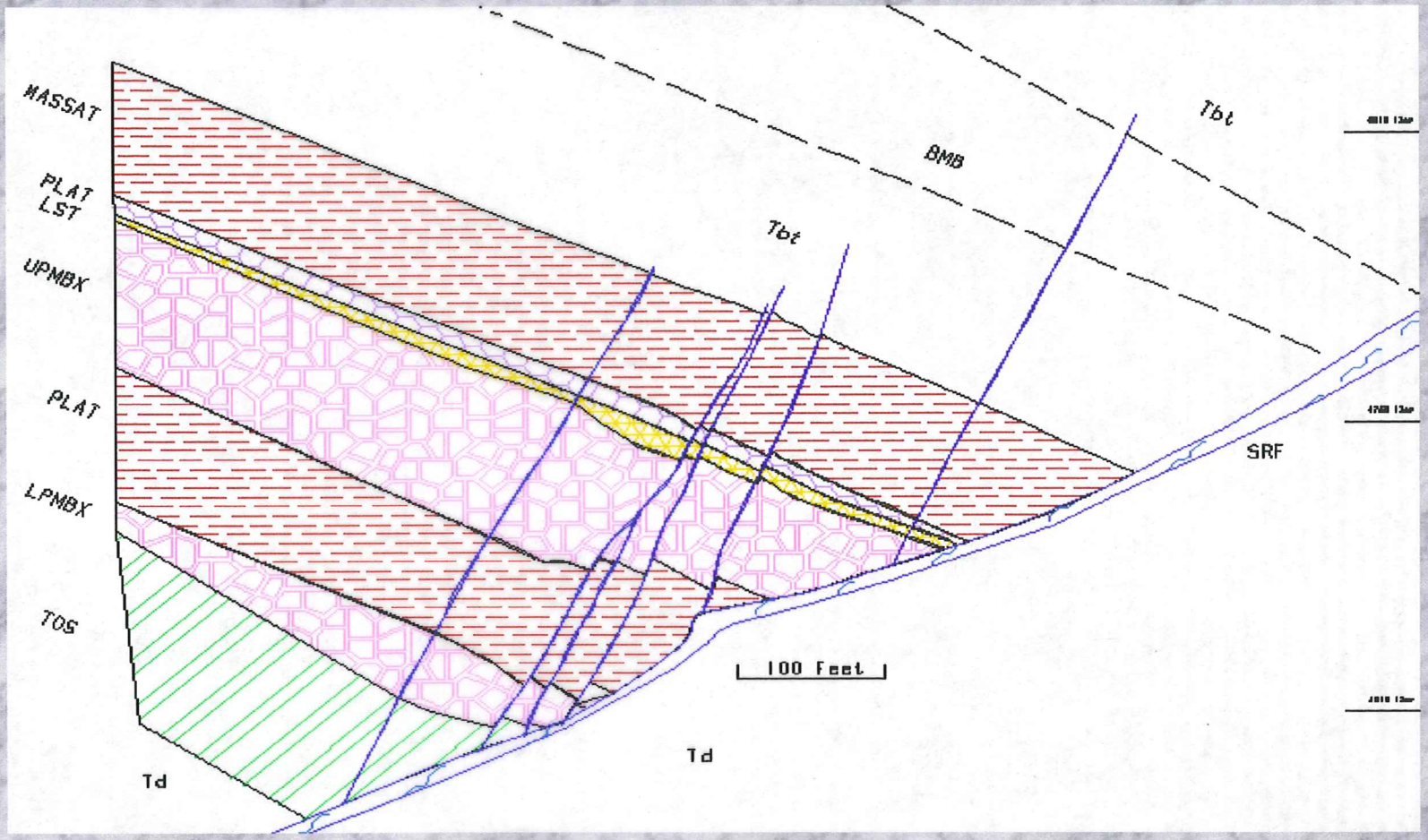


SOUTH ORE ZONE MINERALIZATION AND ORE CONTROLS

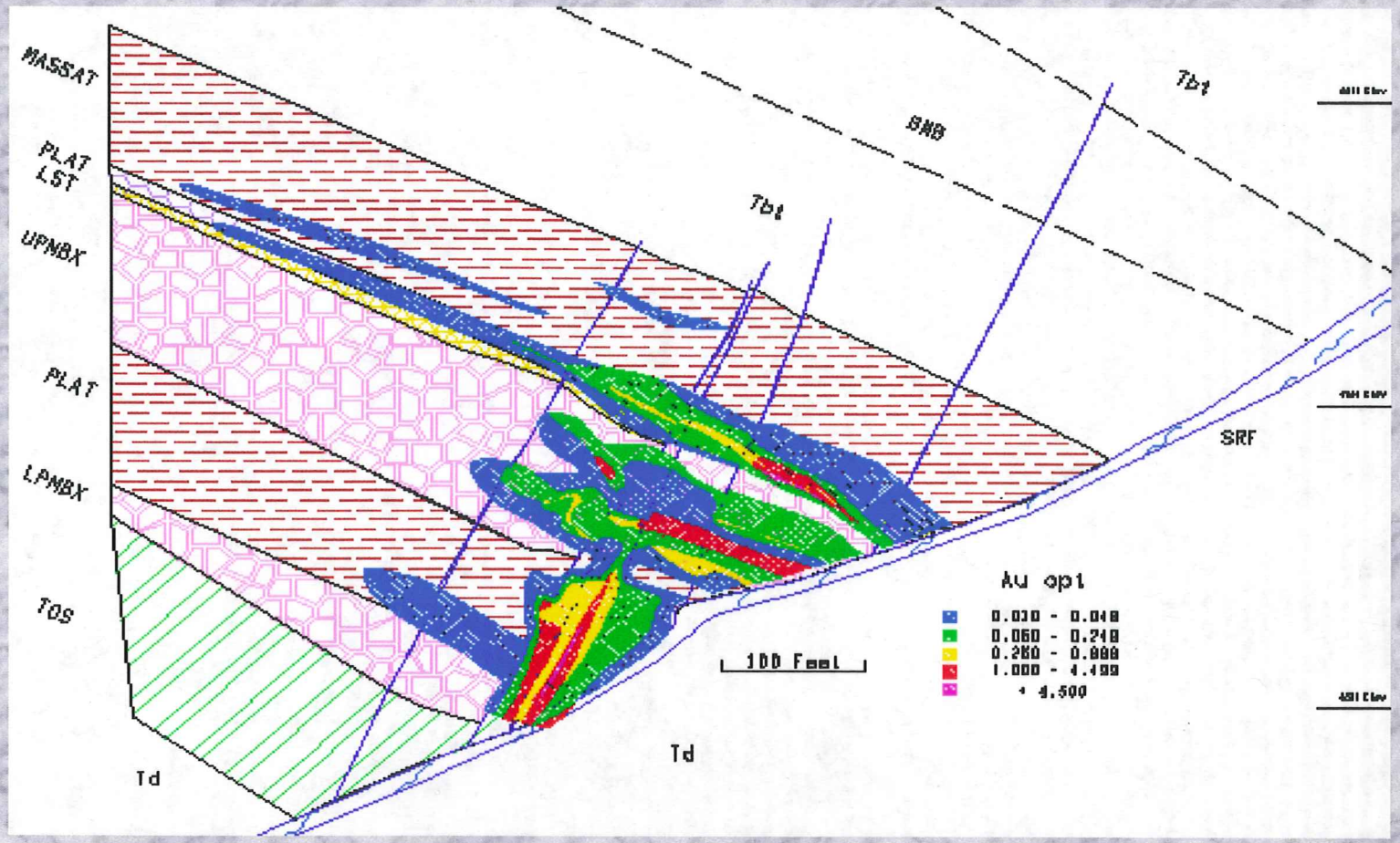
- South Ore Zone Mineralization:
  - Episodes of mineralization:
    - Early stockwork and dissemination of quartz + pyrite + marcasite +/- chalcopyrite +/- electrum +/- Ag-sulfosalts.
    - Middle stockowork and dissemination of mg-rich calcite + pyrite + marcasite + Ag-sulfosalts +/- Ag-selenides + Ag-sulfides + native silver + electrum.
    - Late kaolinite +/- dickite/nacrite +/- barite +/- marcasite.

- South Ore Zone Controls:
  - Geometry of the South ore zone is controlled by the intersection between LBT stratigraphy and the South Ridge fault, a moderate- to low-angle fault with early sinistral normal movement with minor (late) reverse dextral movement.
  - Northeast trending extension fractures related to the sinistral normal movement along the South Ridge fault.
  - Volcanic stratigraphy.

South Ore Zone Geology



South Ore Zone Geology/Gold Domains



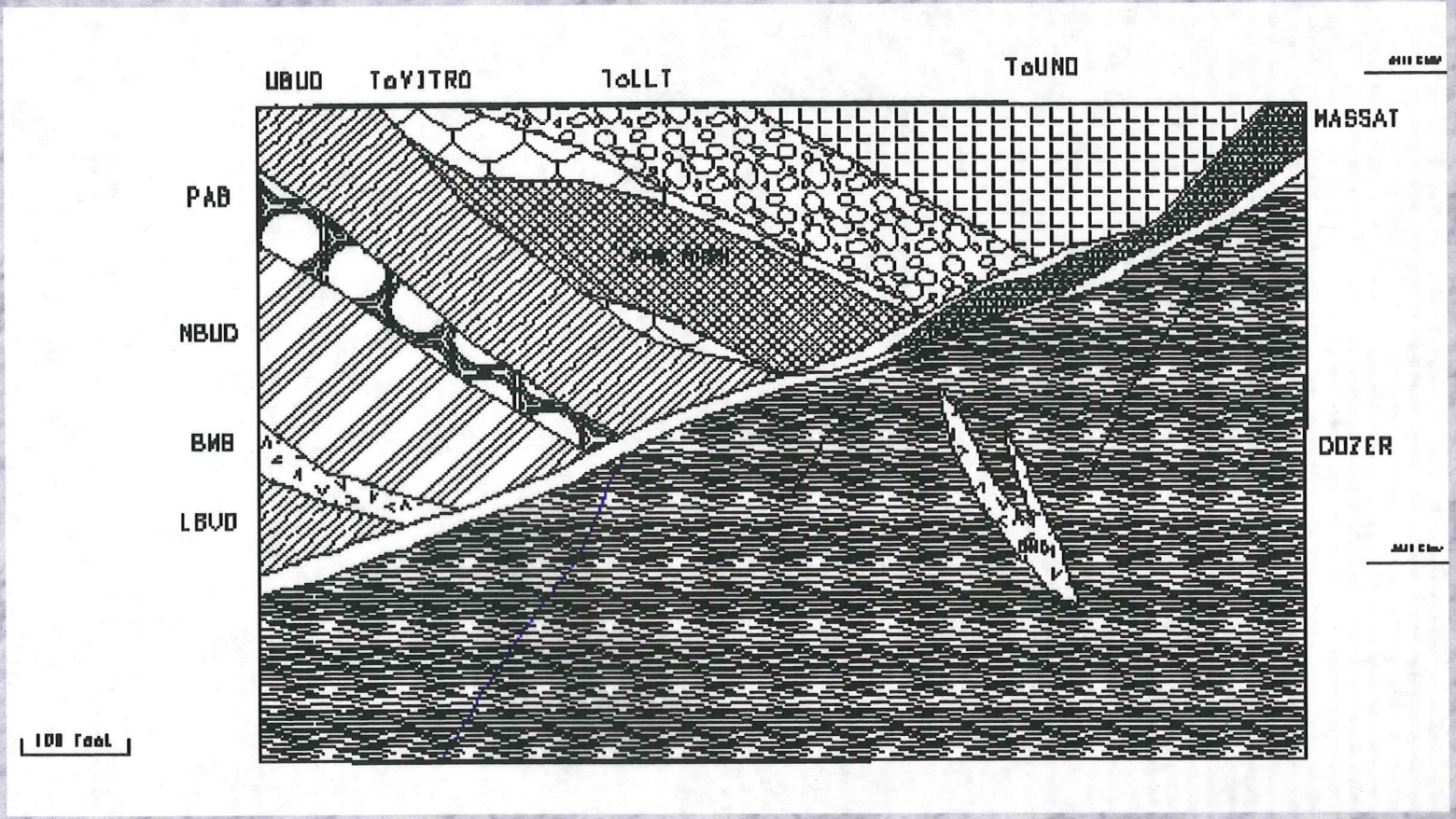
East Zone Mineralization and Ore Controls

- The Rosebud East Zone, hosted within the Dozer Formation and BMB-type porphyry, is situated within the footwall of the South Ridge fault. It is characterized by pervasive silica replacement and/or silica stockwork. The majority of the high gold grades (>0.500 opt) occur on the 10 to 40 foot thick footwall of the fault.

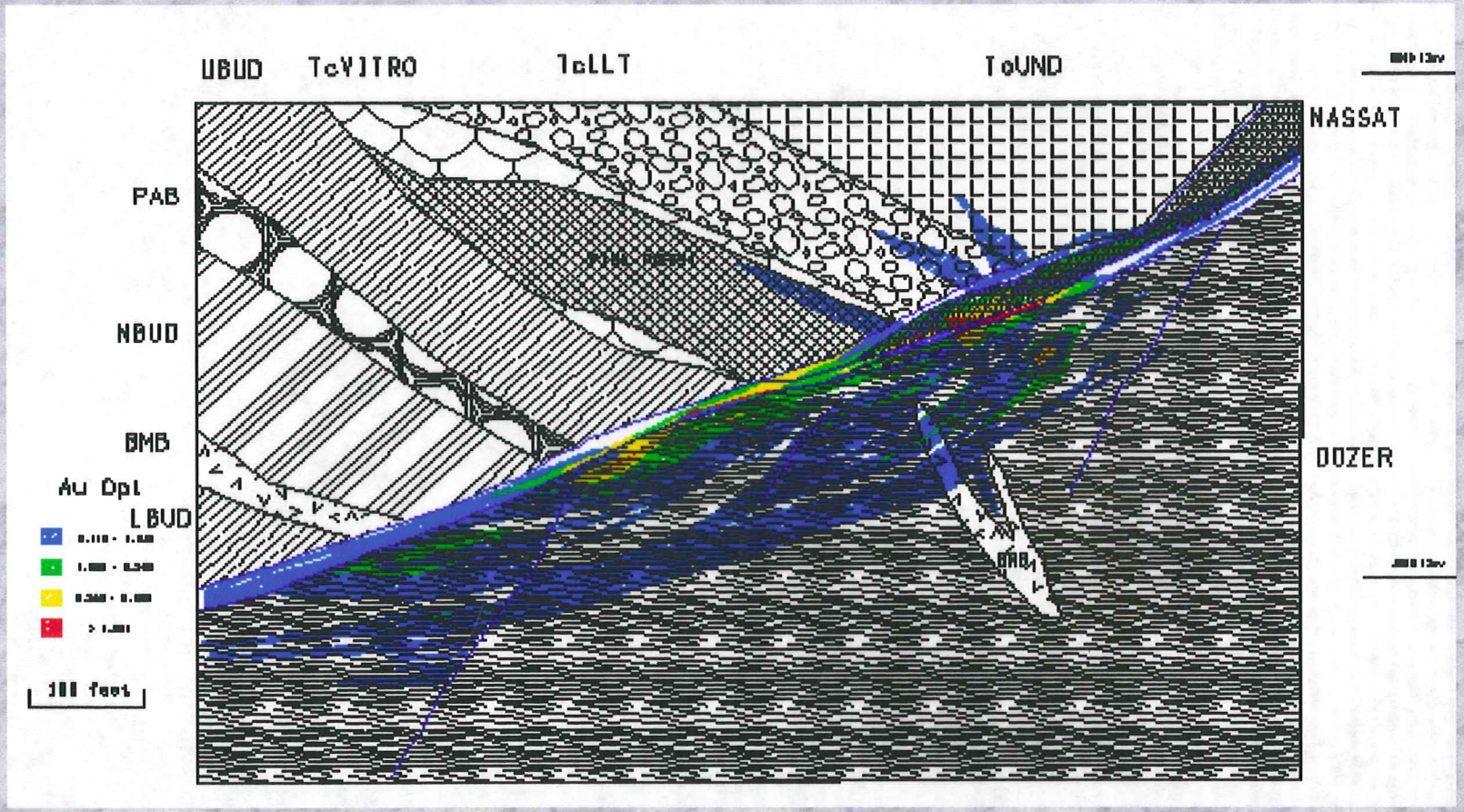
EAST ORE ZONE MINERALIZATION AND ORE CONTROLS

- East Ore Zone Mineralization:
  - Episodes of mineralization:
    - Early quartz veining and silica replacement + electrum + silver sulfosalts + pyrite + marcasite +/- chalcopyrite.
    - Late dickite/nacrite +/- illite +/- illite/smectite +/- silver sulfosalts (pyrargyrite) +/- barite +/- marcasite.
- East Ore Zone Controls:
  - High permeability zone in the footwall of the South Ridge fault created by transpressional compression and local hydro fracturing across an inflection of the South Ridge fault.
  - Northeast striking extension fractures associated with the sinistral normal movement along the South Ridge fault.

East Ore Zone Geology



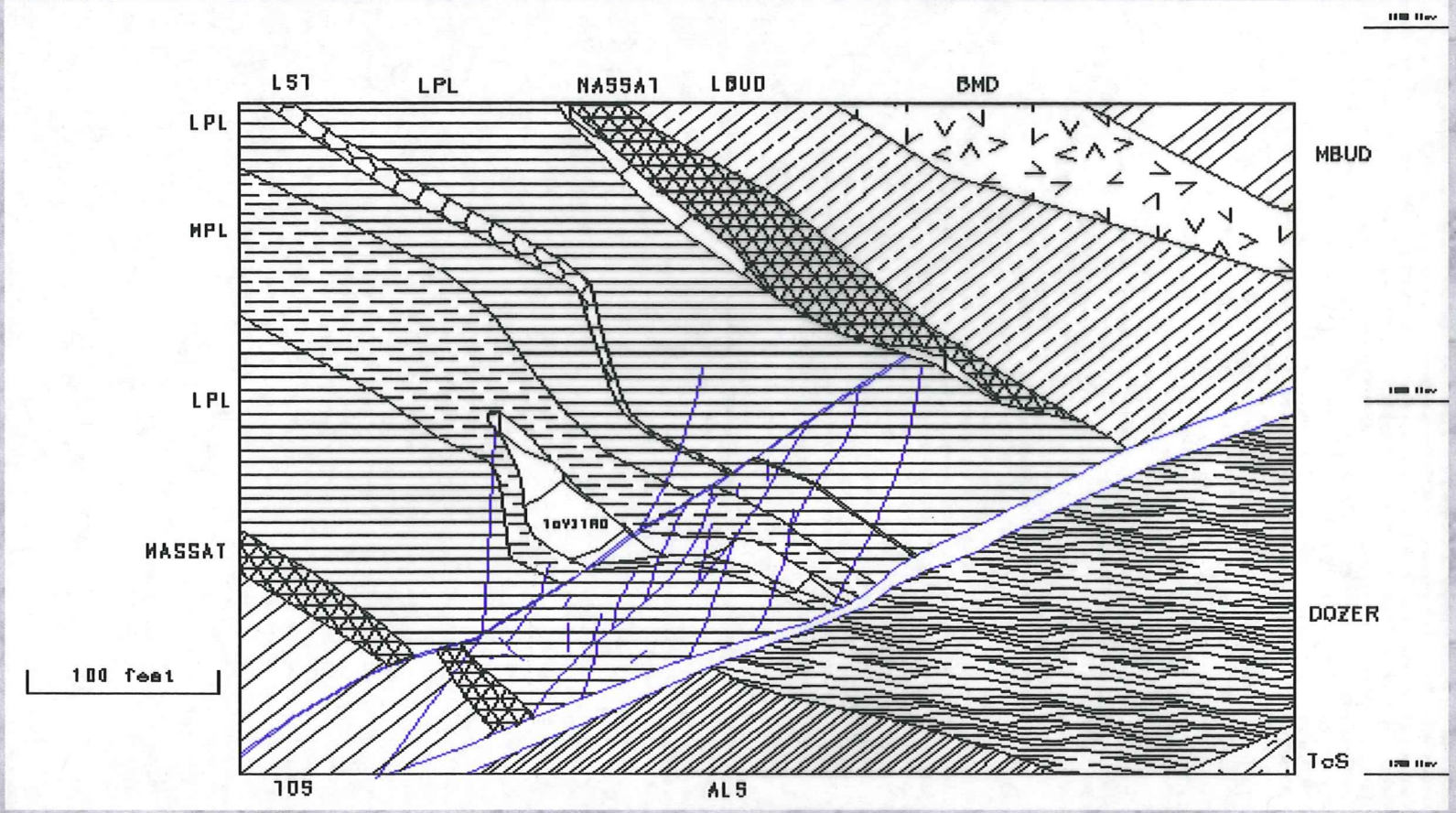
East Ore Zone Geology/Gold Domains



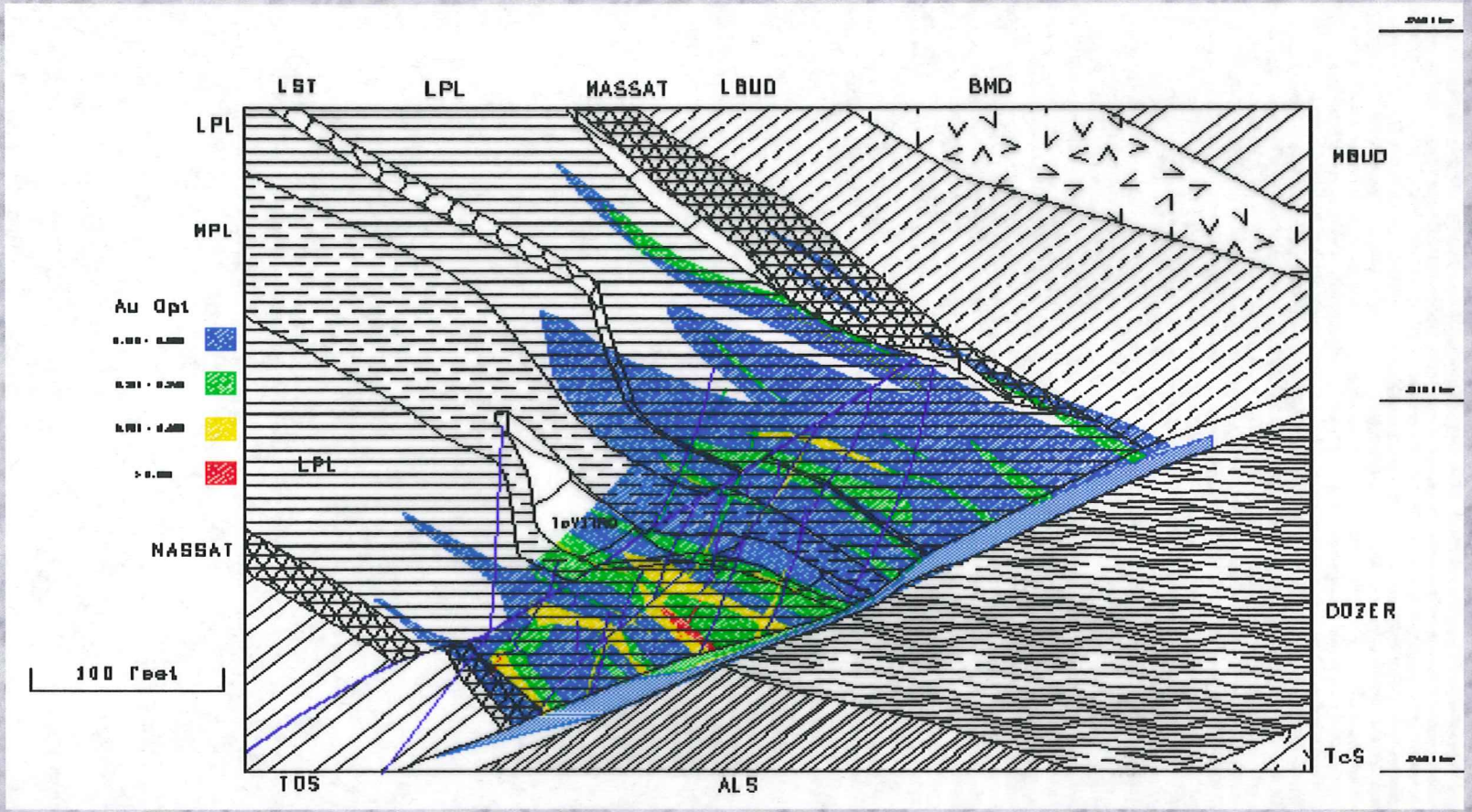
NORTH ORE ZONE MINERALIZATION AND ORE CONTROLS

- North Ore Zone Mineralization:
  - A combination between the South ore zone and East ore zone mineralization.
- North Ore Zone Ore Controls:
  - A combination between the South ore zone and East ore zone controls.

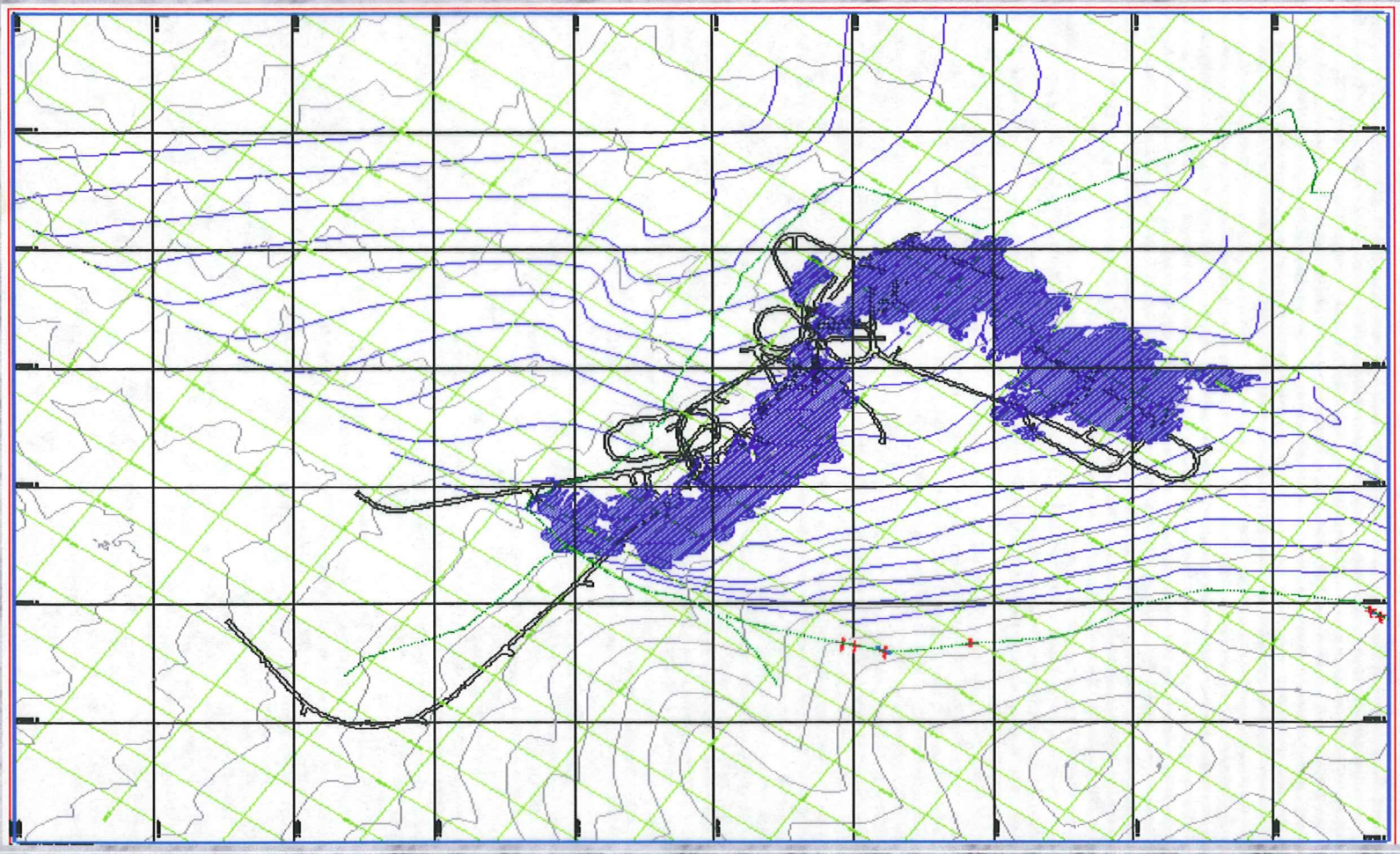
North Ore Zone Geology



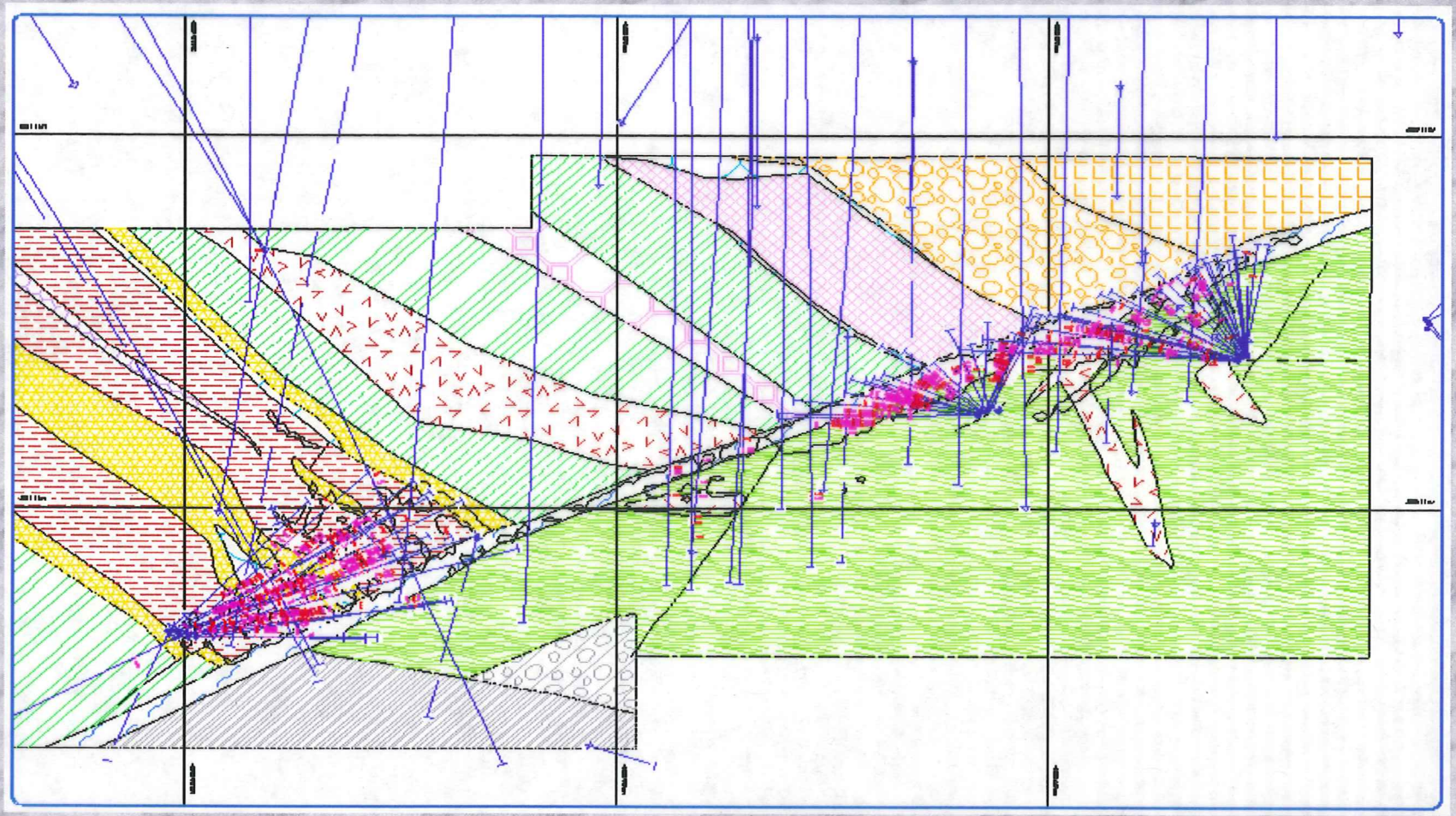
North Ore Zone Geology/Gold Domains



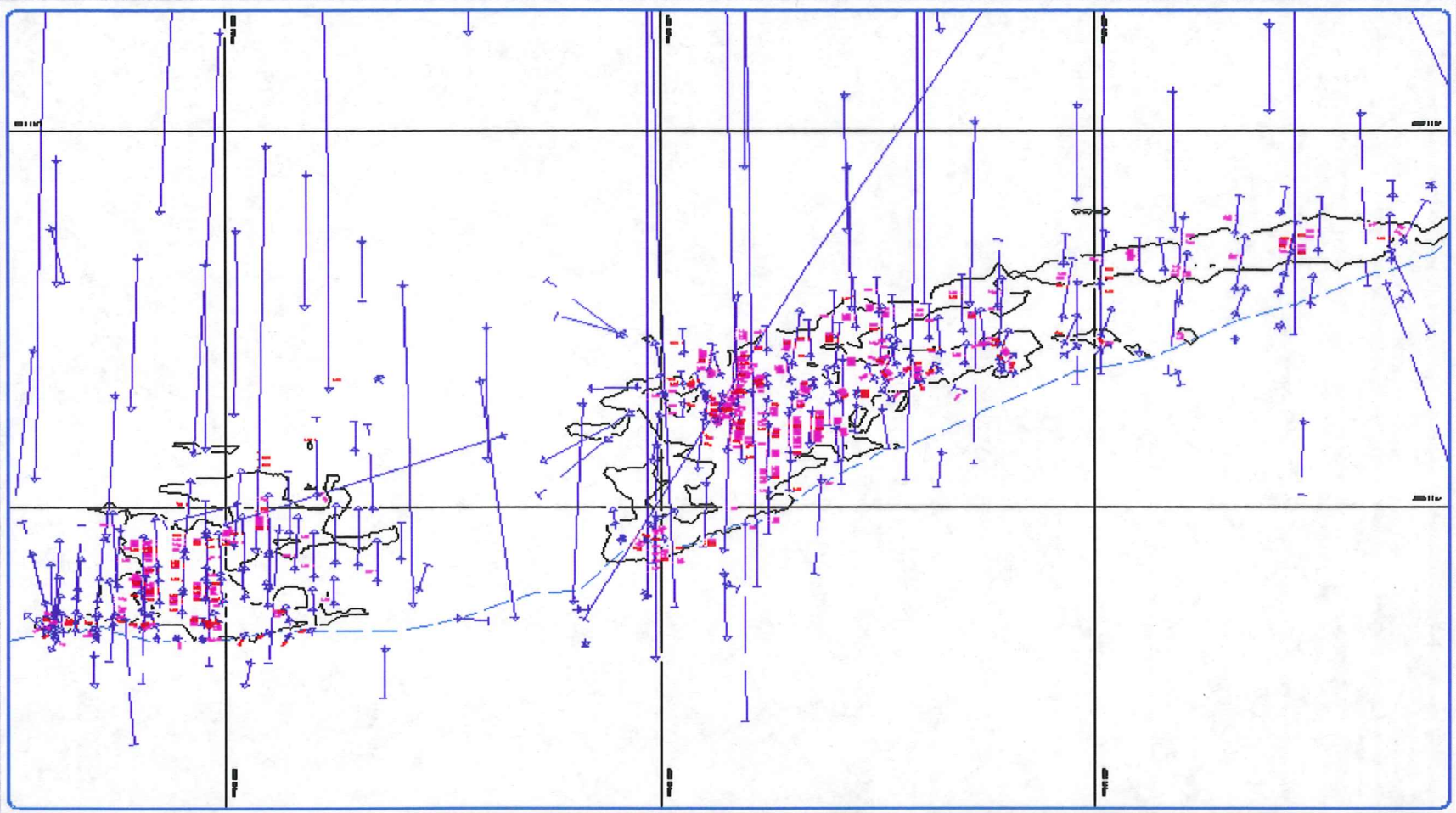
SRF Structural Contours



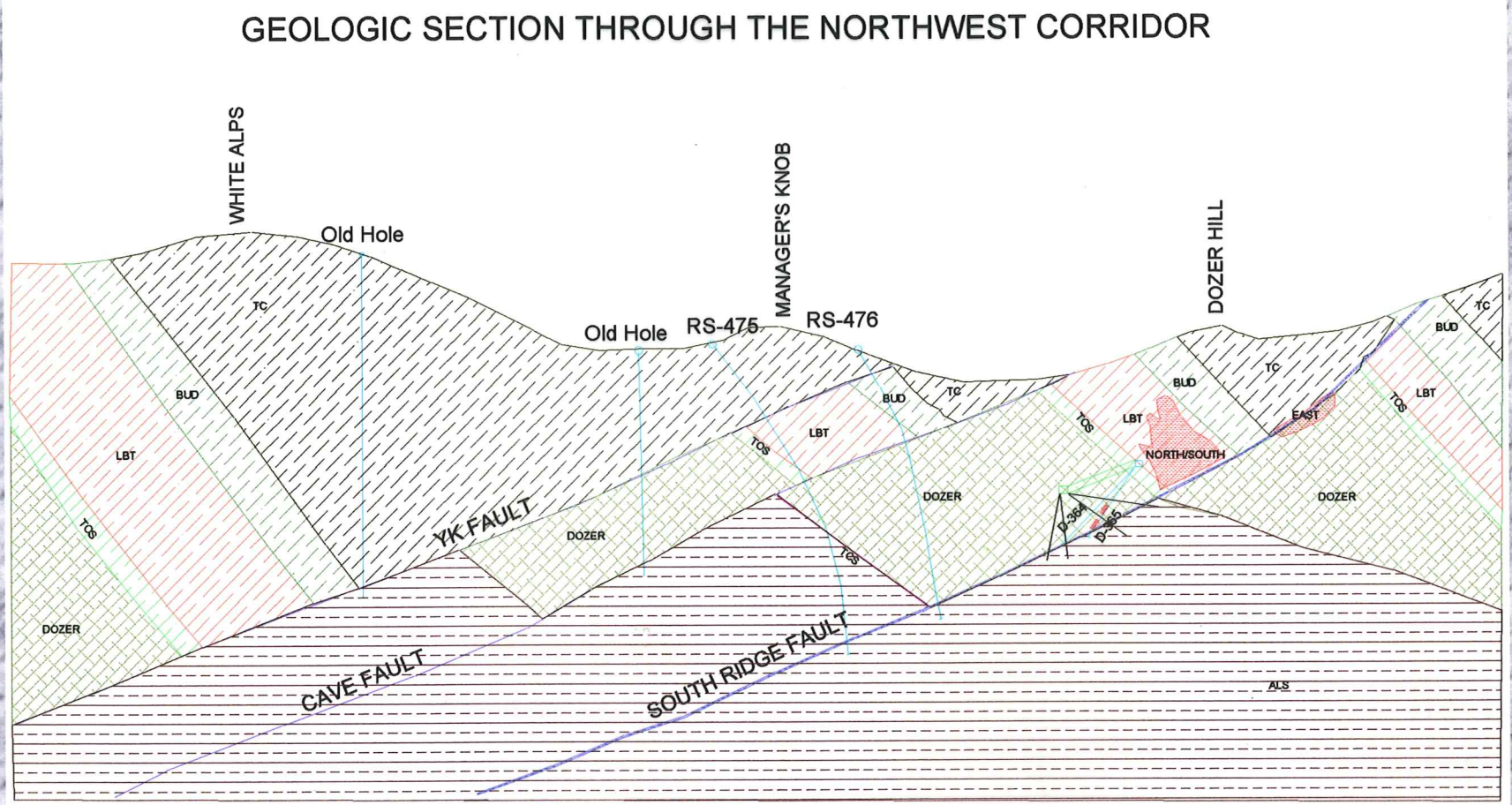
NE Cross-Section Through North and East Ore Zones



Section Through South/North



Northwest Corridor



Rosebud Mining Company, LLC
Hecla Mining Company, Operator

Memorandum

TO: Mike Dexter

FROM: Kurt D. Allen

DATE: August 2, 2000

SUBJECT: July 2000 Exploration Monthly Report

Drilling

Exploration drilling was completed during the month. Surface drilling year to date totals 28 holes totaling 39,345 feet of reverse circulation drilling and 3,056 feet of HQ core drilling. Reverse circulation drilling during July totaled 6,410 feet in five holes. Underground drilling year to date totals 17 HQ core holes totaling 10,296 feet.

Exploration Surface Drilling 2000.

TARGET AREA		RVC FOOTAGE	CORE FOOTAGE	TOTAL FOOTAGE
Wildrose	7 holes	9,530	0	9,530
East Wildrose	6 holes	8,360	0	8,360
South Wildrose	6 holes	9,205	1,496	10,701
NWC-Degerstrom	1 hole	1,140	1,560	2,700
NWC-Dreamland	3 holes	6,285	0	6,285
NWC-Mother Load	3 holes	1,835	0	1,835
South Ridge	2 holes	2,990	0	2,990
TOTAL	28 holes	39,345	3,056	42,401

Exploration Underground Drilling 2000.

TARGET AREA		CORE FOOTAGE	TOTAL FOOTAGE
NWC-Underground 96-356	9 holes	5688	5,688
NWC-Underground D-365-99	8 holes	4608	4,608
TOTAL	17 holes	10,296	10,296

St. LOUIS EXPLORATION DRILLING ASSAY RESULTS
SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-D355-99	NO SIGNIFICANT INTERCEPTS				
RS-D364-99	NO SIGNIFICANT INTERCEPTS				
RS-D365-99	567'	573.1'	6.1'	0.262	0.17
	601'	617'	16'	0.446	1.32
	658'	667'	9'	0.245	1.11
RS-D366-99	593.2'	593.6'	0.4'	0.284	0.30
RS-D367-99	713'	717'	4'	0.716	0.82
SLD-390-00	NO SIGNIFICANT INTERCEPTS				
SLD-391-00	NO SIGNIFICANT INTERCEPTS				
SLD-392-00	NO SIGNIFICANT INTERCEPTS				
SLD-394-00	403.2'	405'	1.8'	0.279	0.54
	422'	427'	5'	0.374	0.40
SLD-395-00	NO SIGNIFICANT INTERCEPTS				
SLD-396-00	NO SIGNIFICANT INTERCEPTS				
SLD-397-00	NO SIGNIFICANT INTERCEPTS				
SLD-398-00	NO SIGNIFICANT INTERCEPTS				
SLD-399-00	NO SIGNIFICANT INTERCEPTS				
SLD-400-00	NO SIGNIFICANT INTERCEPTS				
SLD-401-00	NO SIGNIFICANT INTERCEPTS				
SLD-402-00	456.1'	465.2'	9.1'	0.176	0.26
	508'	513'	5'	0.283	0.19
SLD-403-00	NO SIGNIFICANT INTERCEPTS				
SLD-404-00	NO SIGNIFICANT INTERCEPTS				
SLD-405-00	NO SIGNIFICANT INTERCEPTS				
SLD-406-00	NO SIGNIFICANT INTERCEPTS				

WILDROSE EXPLORATION DRILLING ASSAY RESULTS
SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-479	NO SIGNIFICANT INTERCEPTS				
RS-480	NO SIGNIFICANT INTERCEPTS				
RS-481	NO SIGNIFICANT INTERCEPTS				
RS-482	NO SIGNIFICANT INTERCEPTS				
RS-483	NO SIGNIFICANT INTERCEPTS				
RS-484	NO SIGNIFICANT INTERCEPTS				
RS-485	NO SIGNIFICANT INTERCEPTS				

WILDROSE SOUTH EXPLORATION DRILLING ASSAY RESULTS
SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-489	1495'	1515'	20'	0.004	14.93
	(Includes 1495'	1500	5'	0.009	54.20)
RS-490	NO SIGNIFICANT INTERCEPTS				
RS-491	NO SIGNIFICANT INTERCEPTS				
RS-492	NO SIGNIFICANT INTERCEPTS				
RS-495	NO SIGNIFICANT INTERCEPTS				
RS-496	NO SIGNIFICANT INTERCEPTS				

WILDROSE EAST EXPLORATION DRILLING ASSAY RESULTS
SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-494	NO SIGNIFICANT INTERCEPTS				
RS-497	NO SIGNIFICANT INTERCEPTS				
RS-498	1605'	1640'	35'	0.002	6.63
	(Includes 1615'	1620'	5'	0.006	32.41)
RS-499	NO SIGNIFICANT INTERCEPTS				
RS-500	NO SIGNIFICANT INTERCEPTS				
RS-506	**PENDING**				

NORTHWEST CORRIDOR, DEGERSTROM AREA EXPLORATION DRILLING ASSAY SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-493	NO SIGNIFICANT INTERCEPTS				

NORTHWEST CORRIDOR, MOTHER LOAD AREA EXPLORATION DRILLING ASSAY SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-486	NO SIGNIFICANT INTERCEPTS				
RS-487	NO SIGNIFICANT INTERCEPTS				
RS-488	NO SIGNIFICANT INTERCEPTS				

DREAMLAND AREA EXPLORATION DRILLING ASSAY SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-501	NO SIGNIFICANT INTERCEPTS				
RS-502	NO SIGNIFICANT INTERCEPTS				
RS-503	**PENDING**				

SOUTH RIDGE AREA EXPLORATION DRILLING ASSAY SIGNIFICANT INTERCEPTS

Hole#	From	To	Interval	Oz/ton Gold	Oz/ton Silver
RS-504	**PENDING**				
RS-505	**PENDING**				