60001688

Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Rosebud Drill Hole File - NW Target
AUTHOR	M. Dexter; K. Allen; J. Clark
DATE OF DOC(S)	1998-200
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; Wildrose; East Wildrose; South Wildrose; NWC-Degerstrom; NWC-Dreamland; NWC-Mother Lode; South Ridge; Newmont Mining Co NOTE: add names from Project Map.
COMMODITY If not obvious	gold; silver
NOTES	Correspondence; target summary; location map; stereonet diagrams; handwritten notes; geology; production; reserves; resources; cross-section; petrographic report ~~28~~ p. 30

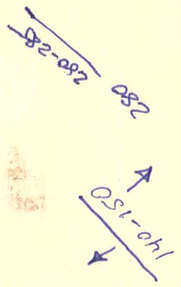
Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
the amount of pages by ~25)

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

Revised: 1/22/08

NW TARGET

60001688 4010



6000 1688

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

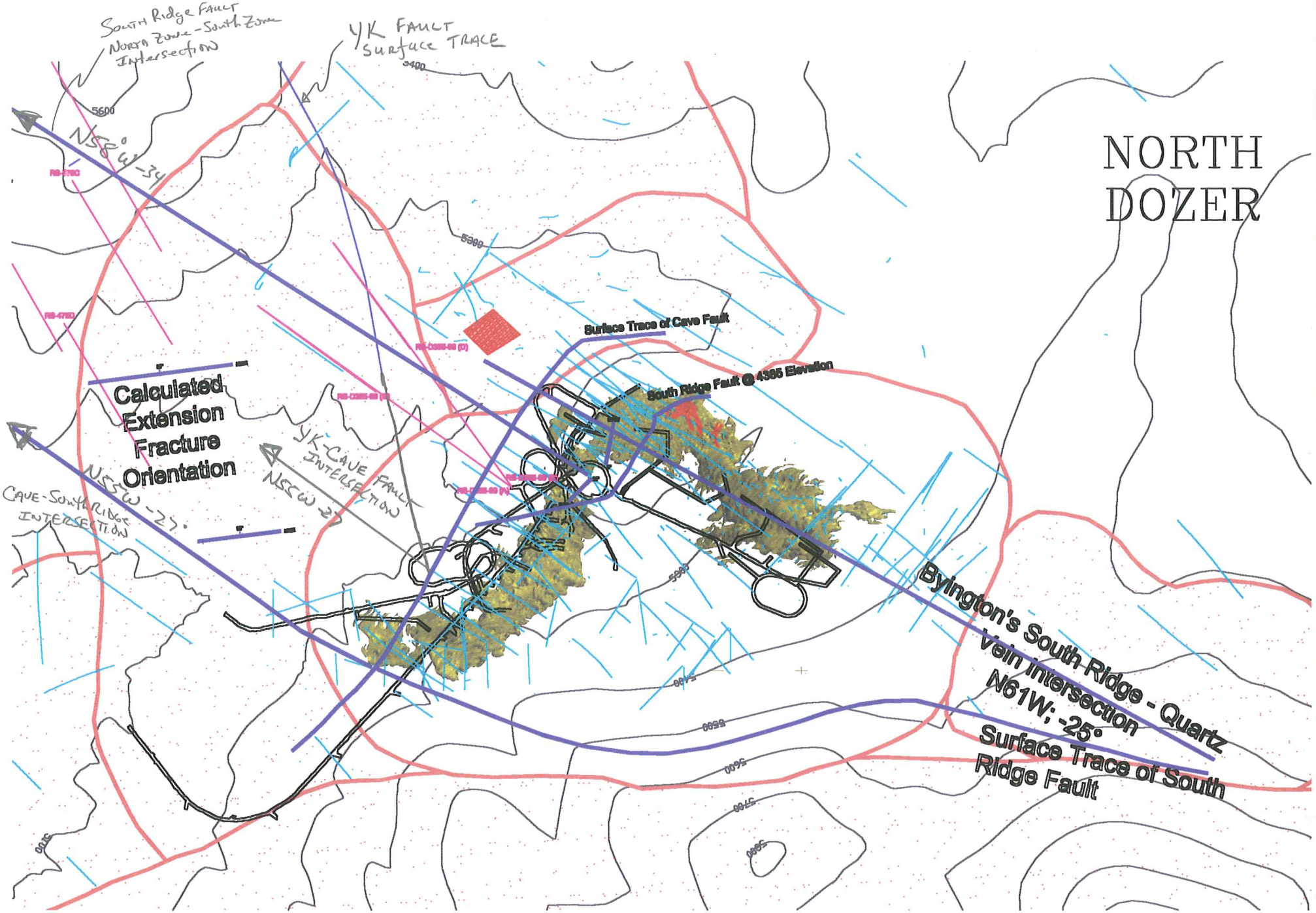
Exploration drilling was completed during the month. Surface drilling year to date totals 28 holes totaling 39,345 feet of reverse circulation drilling and 3,056 feet of HQ core drilling. Reverse circulation drilling during July totaled 6,410 feet in five holes. Underground drilling year to date totals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

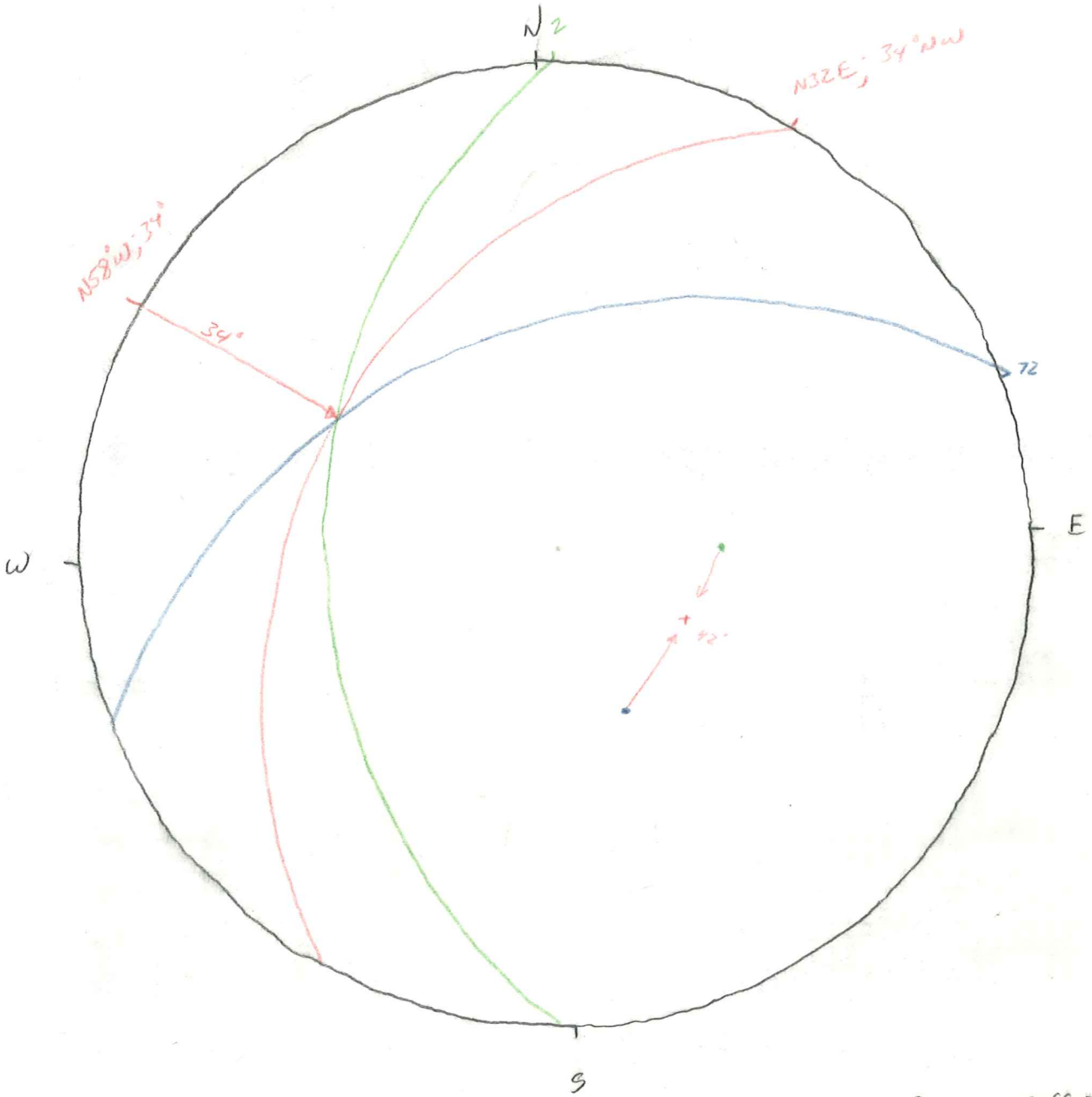
Exploration Surface Drilling 2000.

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.

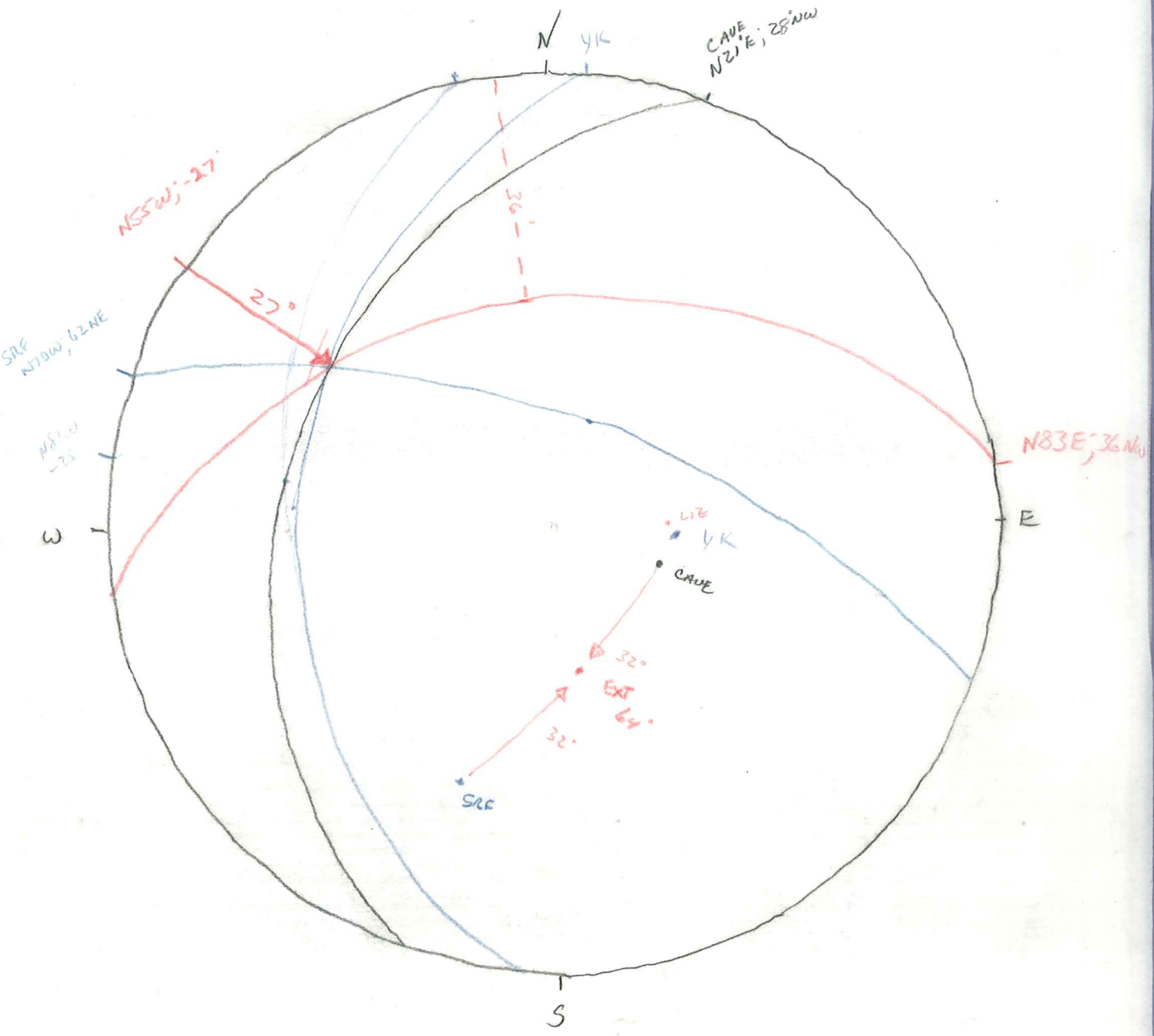
TARGET AREA		CORE FOOTAGE	TOTAL FOOTAGE
NWC-Underground 96-356	9 holes	5688	5,688
NWC-Underground D-365-99	8 holes	4608	4,608
TOTAL	17 holes	10,296	10,296


South Ridge Fault
North Zone - South Zone
Intersection
YK Fault
Surface Trace
5600
3400
N58°W -34°
5000
NORTH
DOZER
Surface Trace of Cave Fault
South Ridge Fault @ 4365 Elevation
Calculated
Extension
Fracture
Orientation
YK-Cave Fault
Intersection
N55W -27°
Cave-South Ridge
Intersection
Byington's South Ridge - Quartz
Vein Intersection
N61W; -25°
Surface Trace of South
Ridge Fault



South Ridge Fault North - South Ridge Fault South intersection

- South Ridge - North - N2E; 38°NW
- South Ridge - South - N72E, 40°NW
- Intersection Between S & N = N58°W; -34°



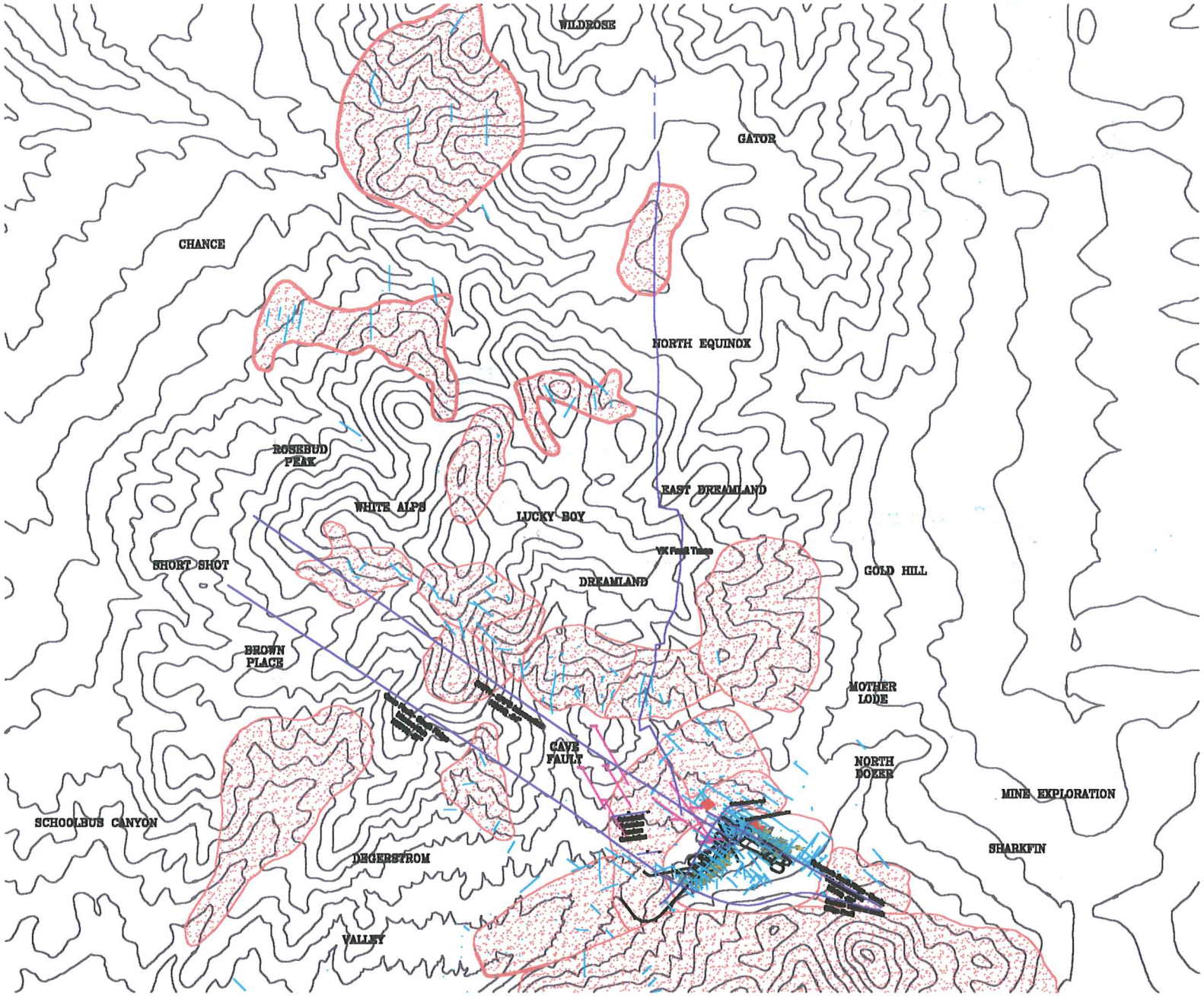
CAVE FAULT - SOUTH RIDGE INTERSECTION

— CAVE FAULT - N21°E; 28°NW

— SOUTH RIDGE - N70W; 62NE

— INTERSECTION - N55W; 27°

— EXTENSION FRACTURES - N83E; 36°NW


WILDROSE
GATOR
CHANCE
NORTH EQUINOX
ROSEBUD PEAK
EAST DREAMLAND
WHITE ALPS
LUCKY BOY
SHORT SHOT
DREAMLAND
GOLD HILL
BROWN PLACE
MOTHER LODE
CAVE FAULT
NORTH BOXER
MINE EXPLORATION
SCHOOLBUS CANYON
SHARKFIN
DEGERSTROM
VALLEY

ROSEBUD DEPOSIT

1999 PROVEN & PROBABLE RESERVE						1999 INFERRED RESOURCE				
ZONE	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES
South	170,054	0.449	3.37	76,398	572,383	13,734	0.566	3.47	7,775	47,640
North	141,219	0.369	1.15	52,170	162,179	85,410	0.386	1.50	32,932	128,481
East	172,580	0.354	0.80	61,047	137,941	3,152	0.267	1.99	842	6,271
Total	483,853	0.392	1.80	189,615	872,503	102,296	0.406	1.78	41,549	182,392

1998 PROVEN & PROBABLE RESERVE						1998 INFERRED RESOURCE				
ZONE	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES
South	427,727	0.514	4.31	219,867	1,842,428	15,561	1.075	6.13	16,734	95,458
North	168,078	0.333	1.18	55,907	198,593	98,874	0.355	1.42	35,127	140,038
East	347,237	0.345	2.16	119,860	750,923	21,370	0.599	2.63	12,793	56,162
Total	943,042	0.420	2.96	395,634	2,791,944	135,805	0.476	2.15	64,654	291,658

1997 PROVEN & PROBABLE RESERVE						1997 INFERRED RESOURCE				
ZONE	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES	TONNAGE	GOLD GRADE OZ/TON	SILVER GRADE OZ/TON	GOLD OUNCES	SILVER OUNCES
South	720,262	0.443	3.36	318,897	2,423,617	17,185	1.171	6.68	20,125	114,860
North	176,371	0.323	1.16	56,959	204,667	103,102	0.347	1.39	35,739	143,268
East	380,000	0.326	2.10	124,028	799,606	23,155	0.564	2.56	13,048	59,304
Total	1,276,633	0.392	2.69	499,884	3,427,890	143,442	0.480	2.21	68,912	317,432

1998 ROSEBUD PRODUCTION

TOTAL PRODUCTION	Material Type	Grade Class	Tons	Au Grade	Ag Grade	AuOz	AgOz	Percentage Tons	Percentage AuOz	Percentage AgOz
	ORE STOCK PILE	Waste	30,276	0.043	0.57	1,298	17,386	9.56%	0.97%	1.60%
		Subgrade	49,609	0.103	1.51	5,096	74,932	15.66%	3.80%	6.90%
		Ore	236,939	0.539	4.19	127,632	993,642	74.79%	95.23%	91.50%
	SUB-TOTAL	**All**	**316,825**	**0.423**	**3.43**	**134,026**	**1,085,961**	**100%**	**100%**	**100%**
	WASTE PILE	All	56,262	0.067	0.75	3,748	42,185	100%	100%	100%
	TOTAL	**All**	**373,087**	**0.369**	**3.02**	**137,774**	**1,128,146**	**100%**	**100%**	**100%**

TOTAL ORE PRODUCTION	Zone	Grade Class	Tons	Au Grade	Ag Grade	AuOz	AgOz	Percentage Tons	Percentage AuOz	Percentage AgOz
	South	Waste	29,812	0.043	0.53	1,283	15,655	9.41%	0.96%	1.44%
		Subgrade	48,813	0.103	1.51	5,011	73,553	15.41%	3.74%	6.77%
		Ore	235,294	0.540	4.21	127,042	991,737	74.27%	94.79%	91.32%
	East	Waste	465	0.032	3.73	15	1,731	0.15%	0.01%	0.16%
		Subgrade	797	0.107	1.73	85	1,379	0.25%	0.06%	0.13%
		Ore	1,646	0.359	1.16	590	1,905	0.52%	0.44%	0.18%
	TOTAL	**All**	**316,825**	**0.423**	**3.43**	**134,026**	**1,085,961**	**100.00%**	**100.00%**	**100.00%**

		Tons	Au Grade	Ag Grade	AuOz	AgOz
ORE	Mill Reported	336,570	0.398	3.23	134,026	1,085,961
	Mine Estimated	316,825	0.471	4.14	149,165	1,311,242
	Monthly Survey/Model	334,767	0.396		132,436	
WASTE	Mine Estimated	56,262	0.067	0.75	3,748	42,185
	Monthly Survey/Model	61,802	0.173		10,714	
TOTAL	Mine Estimated	373,087	0.410	3.63	152,913	1,353,427
	Monthly Survey/Model	396,569	0.361		143,150	
YEAR END	Year End Survey Solid	370,512				

ASSAYS $2/foot
Logging me Day Rate/200'/Day
ROAD Building $2-3/Lineal foot.

+ UG Drilling.

HECLA MINING COMPANY
COEUR D'ALENE, IDAHO 83815

BY	DATE	JOB TITLE	JOB NO.
CHK.	DATE		DIVISION
DWG. NO.			SHEET OF

RANDY's Cost Estimate
UG - $31.00/foot ⇒ YEAR to DATE [INCLUDES ASSAY, DON MACKROW, Mud]

Surface - CORE TAIL
$33.00/foot DRILLING only } vertical Holes
RUC - 15-16.00/ft INCLUDES CASEING }

Surface all 4 holes { 200,000 short CORE tails
220,000 long Core tails

A = RS-475 RANDY SAIS - from Surface (1600' Pre collar - 600' CORE TAIL) ⇒ $14,000 1200' core tail 42,000
1000' " 1200' " " } ⇒ 600' 21,000

Short A - 600
B - 600
C - 300
D - 300

UG 5,580' @ 31.00/ft = $172,980.00

Long A 1200
B 600
C 600
D 600
} 220,000

$372,980 ⇒ $392,980

Surface $275,000.00 w/ long CORE tails
173,000.00
$448,000.00 all 8 holes - 4 surface
4 UG

Surface A = RS-475 - 50,000.00
UG - : RS 355 - 55,800.00
105,800.00

Short for AN Eight Hole Program.
$ - 342,200.00

1) Take out Holes in Deposit
2) Take off Drafting
3) Take off Targets
4) Add Red spot for New interest.

1) Take out Srf Projected
2) Add New Surface & UG holes
3) Show location of new intercept
4)

1999 MINE TO MILL RECONCILIATION - June Through September

Lot Number	Mine Tons	Mine Au Grade	Mine Ag Grade	Mine Au Ounces	Mine Ag Ounces	Mill Tons	Mill Au Grade	Mill Ag Grade	Mill Au Ounces	Mill Ag Ounces	Difference Mine - Mill Tons	Difference Mine - Mill Au Grade	Difference Mine - Mill Ag Grade	Difference Mine - Mill Au Ounces	Difference Mine - Mill Ag Ounces
99007	25,355	0.379	1.42	9,606	36,019	25,853	0.339	0.93	8,757	23,990	-498	-1.705	-24.15	849	12,029
99008	23,534	0.379	1.29	8,914	30,340	23,694	0.325	1.03	7,698	24,461	-160	-7.600	-36.74	1,216	5,879
99009	24,608	0.270	1.05	6,654	25,940	25,568	0.348	0.77	8,910	19,805	-960	2.350	-6.39	-2,256	6,135
99010	20,280	0.344	1.44	6,981	29,266	21,003	---	---	---	---	-723	---	---	---	---
TOTAL	**73,497**	**0.343**	**1.26**	**25,174**	**92,299**	**75,115**	**0.338**	**0.91**	**25,365**	**68,256**	**-1,618**	**0.118**	**-14.86**	**-191**	**24,043**

Lot Number	Mine Tons	Mine Au Grade	Mine Ag Grade	Mine Au Ounces	Mine Ag Ounces	Survey/Model Tons	Survey/Model Au Grade	Survey/Model Ag Grade	Survey/Model Au Ounces	Survey/Model Ag Ounces	Difference Mine - Survey/Model Tons	Difference Mine - Survey/Model Au Grade	Difference Mine - Survey/Model Ag Grade	Difference Mine - Survey/Model Au Ounces	Difference Mine - Survey/Model Ag Ounces
99007	25,355	0.379	1.42	9,606	36,019	25,135	0.373		9,379		220	1.032		227	
99008	23,534	0.379	1.29	8,914	30,340	24,162	0.321		7,755		-628	-1.846		1,159	
99009	24,608	0.270	1.05	6,654	25,940	24,277	0.233		5,666		331	2.985		988	
99010	20,280	0.344	1.44	6,981	29,266	19,851	0.255		5,070		429	4.455		1,911	
TOTAL	**93,777**	**0.343**	**1.30**	**32,155**	**121,565**	**93,425**	**0.298**		**27,870**		**352**	**12.173**		**4,285**	

Lot Number	Survey/Model Tons	Survey/Model Au Grade	Survey/Model Ag Grade	Survey/Model Au Ounces	Survey/Model Ag Ounces	Mill Tons	Mill Au Grade	Mill Ag Grade	Mill Au Ounces	Mill Ag Ounces	Difference Survey/Model - Mill Tons	Difference Survey/Model - Mill Au Grade	Difference Survey/Model - Mill Ag Grade	Difference Survey/Model - Mill Au Ounces	Difference Survey/Model - Mill Ag Ounces
99007	25,135	0.373		9,379		25,853	0.339	0.93	8,757	23,990	-718	-0.866	---	622	---
99008	24,162	0.321		7,755		23,694	0.325	1.03	7,698	24,461	468	0.122	---	57	---
99009	24,277	0.233		5,666		25,568	0.348	0.77	8,910	19,805	-1,291	2.513	---	-3,244	---
99010	19,851	0.255		5,070		21,003	---	---	---	---	-1,152	---	---	---	---
TOTAL	**73,574**	**0.310**		**22,800**		**75,115**	**0.338**	**0.91**	**25,365**	**68,256**	**-1,541**	**1.665**	**---**	**-2,565**	**---**

NOTE: Mill tonnage reported includes backfill and other mis-classified material.
Mine estimated tonnage is from geology measurements and includes backfill dilution.
Survey estimated tonnage from survey of production openings and includes backfill dilution.
Comparisons to Mill through campaign 99009 only.

1999 RECONCILIATION - JUNE THROUGH SEPTEMBER

MINE VS MODEL - TOTAL ORE PRODUCTION

ZONE	MINE					SURVEY/MODEL					MINE/MODEL DIFFERENCE							
	Tons	Au (opt)	Ag (opt)	Au Oz	Ag Oz	Tons	Au (opt)	Ag (opt)	Au Oz	Ag Oz	Tons	Au Oz	Ag Oz	%Tons	% Au Grade	%Au Oz	%Ag Grade	%Ag Oz
South	7,389	0.732	3.46	5,411	25,553	7,669	0.932	---	7,144	---	-280	-1,733	---	-3.7%	-21.4%	-24.3%	---	---
North	39,914	0.278	0.60	11,078	23,920	37,545	0.209	---	7,848	---	2,369	3,230	---	6.3%	32.8%	41.2%	---	---
East	42,911	0.365	1.68	15,665	72,093	42,055	0.306	0.55	12,876	23,202	856	2,789	48,891	2.0%	19.2%	21.7%	21.7%	4813.0%
TOTAL	**90,214**	**0.356**	**1.35**	**32,154**	**121,566**	**87,269**	**0.319**	**0.55**	**27,868**	**23,202**	**2,945**	**4,286**	**48,891**	**3.4%**	**11.6%**	**15.4%**	**144.2%**	**423.9%**

NOTE: Mine estimated tonnage is from geology measurements but does not include backfill dilution.
Survey/Model estimated tonnage is from survey of production openings but does not include backfill dilution.
Comparison of silver is for East Zone only.

HECLA MINING COMPANY

COEUR D'ALENE, IDAHO 83815

BY	DATE	JOB TITLE	JOB NO.
CHK.	DATE		DIVISION
DWG. NO.		South Ridge Not intersected	SHEET OF

RS-407
RS-421C
RS-423C
RS-406C
RS-425C
RS-446

RS-D355-99 97-401 RL-262C 96-372
96-357

D-345-99

HECLA MINING COMPANY

COEUR D'ALENE, IDAHO 83815

BY	DATE	JOB TITLE	JOB NO.
CHK.	DATE	Holes that intersected SRF	DIVISION
DWG. NO.			SHEET OF

RS-411C ✓ RS-442C ✓ RS-427C ✓ RS-415C ✓ RS-431C ✓ RS-409C ✓ RS-441C ✓ RS-429C ✓ RS-428C ✓
RS-436C ✓ RS-434C ✓ RS-414C ✓ RS-412C ✓ RS-435C ✓ RS-438C ✓ RS-416C ✓ RS-410C ✓
RS-439C ✓ RBW-13 ✓ RS-475 ✓ 96-370C ✓ 97-386 ✓
RBW-14 ✓ RS-476 ✓ RS-Δ364-99 96-358 ✓ 97-398C ✓ 94-295C ✓
RS-430C ✓ RBW-18 ✓ 97-383 ✓
RS-418C ✓ RBW-15 ✓ RS-477 ✓ RS-Δ365-99 95-342C ✓ 97-397 ✓ 94-296C ✓
96-362 ✓
RS-417C ✓ RL-120C ✓ RS-478 ✓ 96-365 ✓ 97-380 ✓ 94-300C ✓
97-384 ✓
RS-413C ✓ RL-105C ✓ RL-208C ✓ RL-269 ✓ 96-367 ✓ 97-403C ✓ 94-341C ✓
96-364 ✓
RL-144 ✓ RL-192C ✓ RL-289C ✓ 96-368 ✓ 97-385C ✓ 94-306C ✓
RS-411C ✓ 96-371 ✓ 97-381C ✓
RL-241C ✓ RL-126C ✓ RL-90C ✓ 96-373C ✓ 97-382 ✓ 94-308C ✓
RS-448 ✓ RL-129C ✓ RL-8 ✓ RL-70C ✓ 96-369C ✓ 95-348C ✓ 94-309C ✓
RL-24 ✓ RL-272 ✓ RL-17C ✓ 96-356 ✓ 95-348C ✓ 94-310C ✓
RS-457 ✓ RL-29 ✓ RL-283 ✓ RL-178 ✓ KM-1 ✓ 95-350C ✓ 94-314C ✓
RS-452 ✓ RL-25 ✓ RL-268 ✓ RL-61 ✓ RL-215 ✓ 95-345C ✓ 94-315C ✓
RS-458 ✓ RL-5 ✓ RL-257 ✓ RL-182 ✓ RL-97C ✓ 95-346C ✓ 94-316C ✓
RS-424C ✓ RL-40C ✓ RL-88C ✓ RL-163 ✓ RL-112C ✓ 95-347C ✓ 94-319 ✓
RS-449 ✓ RL-28 ✓ RL-124C ✓ KM3 ✓ RL-109C ✓ 95-352C ✓ 94-320C ✓
RS-451 ✓ RS-420 ✓ RL-1 ✓ RL-57 ✓ RL-75C ✓ RL-206 ✓ 95-353C ✓ 94-321C ✓
RL-196C ✓ RL-123C ✓ RL-165C ✓ RL-186 ✓ 94-324C ✓
RL-23 ✓ RL-130C ✓ RL-179 ✓ RL-170 ✓ 94-325C ✓
RL-210C ✓ RL-158C ✓ RL-212 ✓ RL-168 ✓ 94-328C ✓
RL-247 ✓ RL-256 ✓ RL-261C ✓ RL-264C ✓ RL-220 ✓ RL-95C ✓ 94-329 ✓
RL-62 ✓ RL-105C ✓ RL-199 ✓ RL-183 ✓ RL-253 ✓ RL-141 ✓ 94-330C ✓
RL-65 ✓ RL-82C ✓ RL-211 ✓ RL-146 ✓ RL-101C ✓ RL-213 ✓ 94-331C ✓
RL-271 ✓ RL-203C ✓ RL-91C ✓ RL-254 ✓ RL-204C ✓ RL-256C ✓ 94-332C ✓
RL-6 ✓ RL-171 ✓ RL-207C ✓ RL-248 ✓ RL-200C ✓ RL-96C ✓ 94-333C ✓
RL-127C ✓ RL-193C ✓ RL-131C ✓ RL-100C ✓ RL-286 ✓ RL-184 ✓ 94-334C ✓
RL-41C ✓ RL-202C ✓ RL-169 ✓ RL-109C ✓ RL-255 ✓ RL-288C ✓ 94-335 ✓
RL-128C ✓ RL-68 ✓ RL-180 ✓ RL-94C ✓ RL-243C ✓ RL-219 ✓ 94-336C ✓
RL-162 ✓ RL-282 ✓ RL-205C ✓ RL-264C ✓ RL-285 ✓ RL-110C ✓ 94-337C ✓
RL-36 ✓ RL-67 ✓ RL-189 ✓ RL-242C ✓ RL-259 ✓ 94-338C ✓
RL-58 ✓ RL-54 ✓ RL-99C ✓ RL-273 ✓ RL-266 ✓ 94-339 ✓
RL-60 ✓ RL-149 ✓ RL-199C ✓ RL-106C ✓ RL-142 ✓ 94-340C ✓
RL-209 ✓ RL-102 ✓ RL-93C ✓ RL-185 ✓ RL-98C ✓
RL-7 ✓ MW-7 ✓ RL-69A ✓ RL-204C ✓ RL-218 ✓
RL-284 ✓ RL-195C ✓ RL-221 ✓ RL-191C ✓ RL-222 ✓
RL-126C ✓ RL-194C ✓ RL-201C ✓ RL-200C ✓ RL-181 ✓
RL-55C ✓ RL-263C ✓ RL-198C ✓ RL-214 ✓ RL-258 ✓
RL-125C ✓ RL-10 ✓ RL-187 ✓ RL-270C ✓ RL-217 ✓
RL-37 ✓ RL-216 ✓ RL-188 ✓ RL-273 ✓ RL-245 ✓

PETROGRAPHY OF A VEIN SAMPLE FROM THE ROSEBUD MINE AREA, NEVADA (SAMPLE RS-475-99, 2887.8')

By

James G. Clark, Ph.D.

APPLIED PETROGRAPHICS
Tucson, Arizona

27 September 1999

A Confidential Report Prepared For:

Kurt D. Allen
Rosebud Mining Company, LLC
Winnemucca, Nevada

INTRODUCTION

Sample RS-475-99, 2887.8' is a quartz vein intersected in an exploration drill hole from the vicinity of the Rosebud mine. Core logging and hand specimen examination identified tentatively the presence of pyrite

accompanied by arsenopyrite, sphalerite, and galena in the vein sample. Applied Petrographics was requested to undertake a petrographic examination of the sample in order to characterize the vein type and mineralogy, and the possible relationship to the Rosebud epithermal vein system.

METHODOLOGY

A polished thin section of sample RS-475-99, 2887.8' was prepared by Quality Thin Sections of Tucson, Arizona. The section was examined subsequently in transmitted and reflected light using an Olympus BX60 polarizing microscope, and under cathodoluminescence using a Relion Industries Reliotron cathodoluminescence instrument mounted on an Olympus SZ60 stereo microscope with polarizing capability. Results were documented on photomicrographs taken with Nikon N2000 and Olympus OM-2 photographic systems.

TRANSMITTED LIGHT

Sample RS-475-99, 2887.8' is a quartz vein that has been sheared and somewhat granulated. The quartz exhibits considerable variation in grain size, with a range from <0.05mm to nearly 6mm in length/diameter. The dominant quartz texture is xenomorphic-granular and polycrystalline. Pods of coarser-grained quartz that exhibit internal shear and annealing are encompassed by finer-grained granular quartz. Fragments of wall rock may also be entrained in the vein. This interpretation is supported by the local presence of granulated plagioclase crystals, commonly proximal to, or in association with the zones of coarse quartz. "Ghost" wall rock fragments can be inferred by small, plagioclase-quartz-bearing areas crudely outlined by fine-grained opaque phases. An alternate possibility is that the "plagioclase" with polysynthetic twinning may be cordierite, which, in its unaltered state is difficult to distinguish from plagioclase. If this phase is cordierite, then the wall rocks were probably argillaceous sedimentary rocks. All of the quartz exhibits some degree of strain shadowing, but this feature is more strongly developed in the coarser quartz. Several crystals have a peculiar feathery strain shadowing. Some quartz crystal boundaries appear to be granulated and subsequently annealed by recrystallization. The quartz vein is characterized by narrow sinusoidal stringers of carbonate, chlorite, sericite, and opaque minerals. The stringers contain generally fine-grained cubic opaque phases tha accompany one or more members of the assemblage sericite-calcite-chlorite. One of the stringers blossoms into a boudin of coarser opaque phases (sub- to anhedral; to 1.2mm diameter). Opaque phases can occur also as sparse disseminations outside the sinusoidal stringers.

There is a linear, vein-like zone of carbonate and apatite at the edge of the slide. It is unknown as to whether this zone is integral to the vein or derived from the wall rock.

REFLECTED LIGHT

Opaque mineral phases identified in sample RS-475-99, 2887.8' under reflected light are:

pyrite
marcasite
magnetite
chalcopyrite
sphalerite
native gold
arsenopyrite

The opaque minerals are dominantly pyrite. Pyrite occurs as generally euhedral to subhedral crystals that range to more than 1mm diameter, although most are in the range of <0.1mm to 0.5mm range. Cubic and rectangular are the most common crystal forms. Some of the pyrites appear to be mixed pyrite-marcasite crystals. Marcasite is also present as a discrete phase that appears to pseudomorph cubic pyrite crystals. One subhedral pyrite crystal noted along an undulatory stringer appears to have a core of magnetite (?; gray, isotropic, relatively low reflectance). Magnetite could well be a stable or metastable phase in this vein assemblage because the plagioclase presumably derived from the wall rocks is unaltered. The magnetite may be relict from the wall rock and possibly served as a nucleation site for the pyrite in this case.

Traces of very fine-grained (<0.025mm length), anhedral chalcopyrite accompany some pyrite stringers, and one stringer was found to host a trace of extremely fine-grained (<0.004mm length) native gold. Several irregular aggregates of motheaten sphalerite crystals are present in the vein and form intergranular to the quartz. The largest aggregate is approximately 1 mm in length, and the sphalerite shows characteristic yellow-brown internal reflections. Sphalerite occurs also as sparse disseminations in the vein. One irregular sphalerite crystal (appx 0.25mm diameter) contains tiny blebs of chalcopyrite.

Possible traces of very fine-grained arsenopyrite (?; <0.015mm) were identified in one of the stringers and as sparse disseminations. The phase is characterized bycreamy white color, moderate to high reflectance, and distinct anisotropy under incompletely crossed nicols. The identification is tentative, however, because the phase is anhedral and lacks the characteristic rhomb-shaped sections. There is an extremely fine-grained (<0.003mm diameter), anhedral phase that occurs locally with pyrite in the sinusoidal stringer zones. It is too fine-grained to obtain a positive identification, but may be pulverized magnetite.

CATHODOLUMINESCENCE (CL)

Quartz has a very dull red CL response. There does not appear to be a difference in CL response between the coarse and finer-grained quartz. It should be noted that most of the vein and breccia quartz examined under CL from other Rosebud samples does not luminescence.

The polysynthetically twinned mineral identified as **plagioclase** has a very dull brownish gray CL response, insufficient to distinguish it from **cordierite**. Most of the plagioclase is concentrated near a vein-like zone of carbonate and abundant apatite at the edge of the slide, although there are scattered crystals in the interior of the slide, also associated with a cloudy carbonate-apatite assemblage.

Two carbonate varieties appear to be present. An early carbonate identified tentatively as **dolomite** (or **calcite** with a higher Fe abundance) is disseminated in the vein and is also a component of the sinusoidal stringer zones with pyrite-sericite±chlorite. It is also the dominant component of a vein-like carbonate-apatite zone at the edge of the slide. This carbonate has a dull to moderate red to orange-red CL and has an abundance of perhaps 2-3%. The second, later, carbonate is **calcite.** Calcite has bright orange CL (Mn^{2+} activation). The calcite fills intercrystalline voids and forms small, discontinuous stringers that appear to cut the earlier, more iron-rich carbonate. Calcite abundance is approximately 1-2%.

Apatite has strong grayish to greenish-yellow CL. It occurs as fine-grained, euhedral to subhedral cystals. Apatite is highly concentrated in the vein-like carbonate-apatite zone at the edge of the slide. Apatite occurs also disseminated in the vein and as a component of some of the sinusoidal carbonate-sericite sulfide stringers. Overall apatite abundance is approximately 0.25%

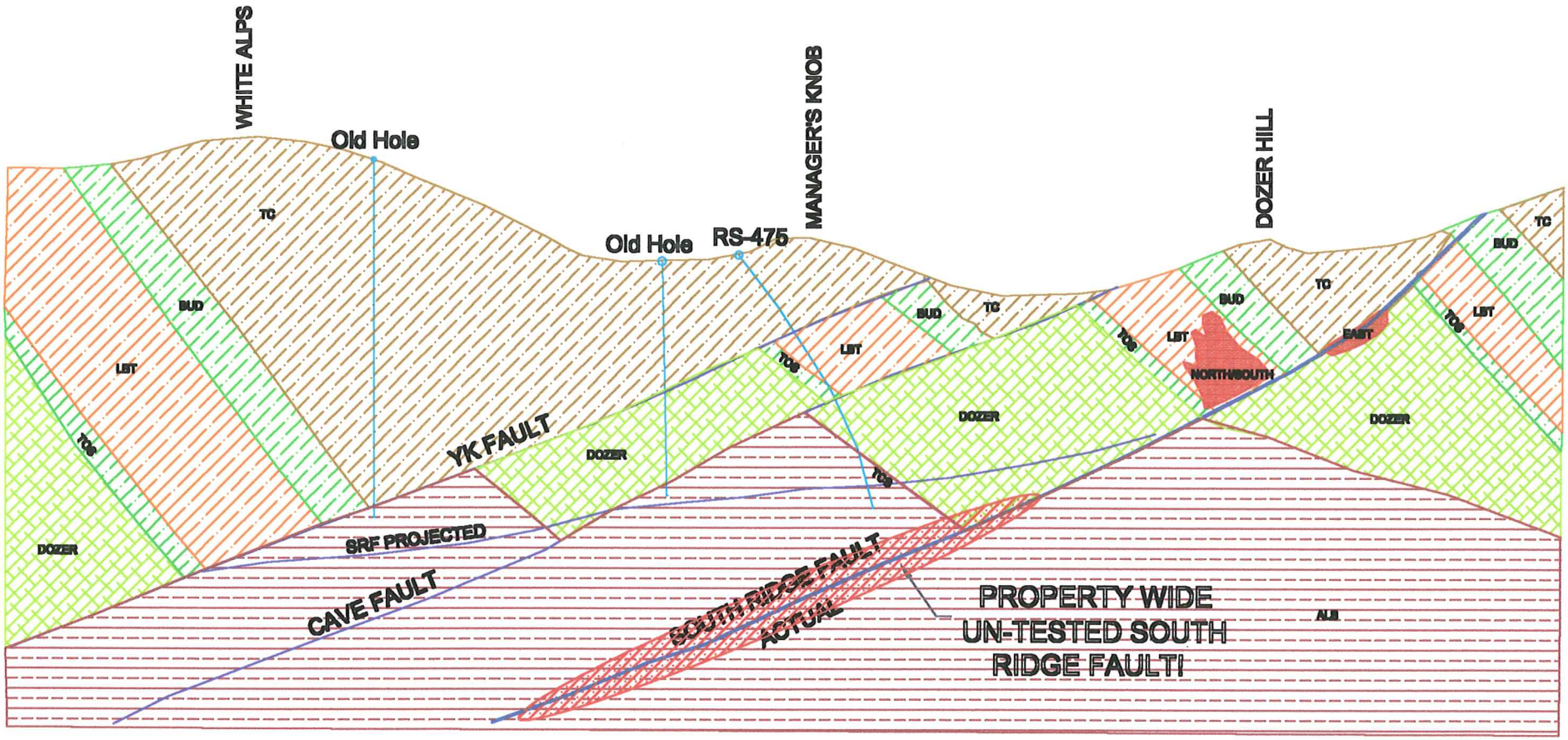
SUMMARY AND CONCLUSIONS

The character of the quartz vein from sample RS-475-99, 2887.8' is unlike other veins that I have examined from the Rosebud area, although my study of the large sample suite from the Rosebud mine area is as yet incomplete. The vein in question here is marked by several characteristics that render it unique among Rosebud veins that I have examined:

- The vein is sheared and exhibits considerable variation in quartz grain size.
- The vein contains sparse plagioclase (or cordierite) and magnetite, although these phases may be derived from wall rock (I currently have no information as to wall rock lithology). If the plagioclase is indigenous to the vein, it is probably albite.
- The vein contains sinusoidal stringers of sulfide mineralization. The stringers could have formed under the influence of shear deformation.
- The vein contains significant apatite, generally in association with iron-rich carbonate. Apatite has been noted associated with some, but not all, quartz-carbonate-sulfide veins elsewhere in the Rosebud mine area.
- Composite pyrite-marcasite crystals are present in the vein. Skeletal pyrite-marcasite crystals are the most common sulfide mineralogy in the Rosebud district, based on samples that I have examined to date.

It cannot be said with certainty that the vein sample RS-475-99, 2887.8' is of epithermal origin and related to the mineralized veins of the Rosebud gold-silver deposits. It seems likely, however, that the mineralization episode that produced the Rosebud deposits has overprinted this vein to some degree.

RE-INTERPRETED GEOLOGIC SECTION THROUGH THE NORTHWEST CORRIDOR



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BY	DATE	JOB TITLE	JOB NO.
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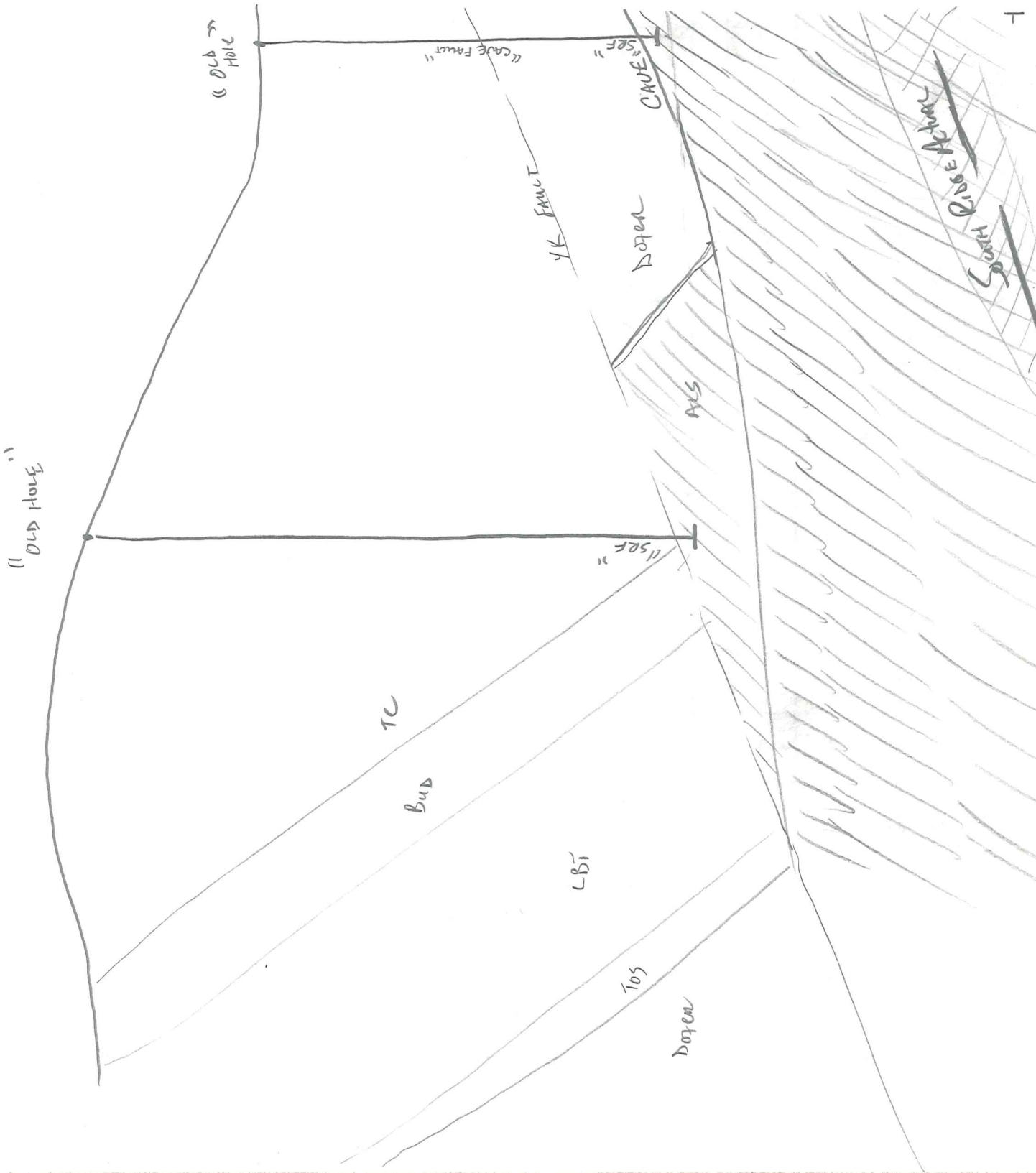

Rosebud Underground Exploration - Costs

$ 364,279 YTD 7/31/99

÷ 11,905 feet YTD 7/31/99

= $30.60/ft

includes: drilling → Actoin, LY
Assays → Barringer, AAL
Geol. contractor → Mackerrow
Camera rental
Mud → Baroid
core photography

excludes: Newmont Drill Services Labor
(Kanakoa, Arthur, Sine)

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BY KDA -9-1-99 DATE		JOB TITLE	JOB NO.
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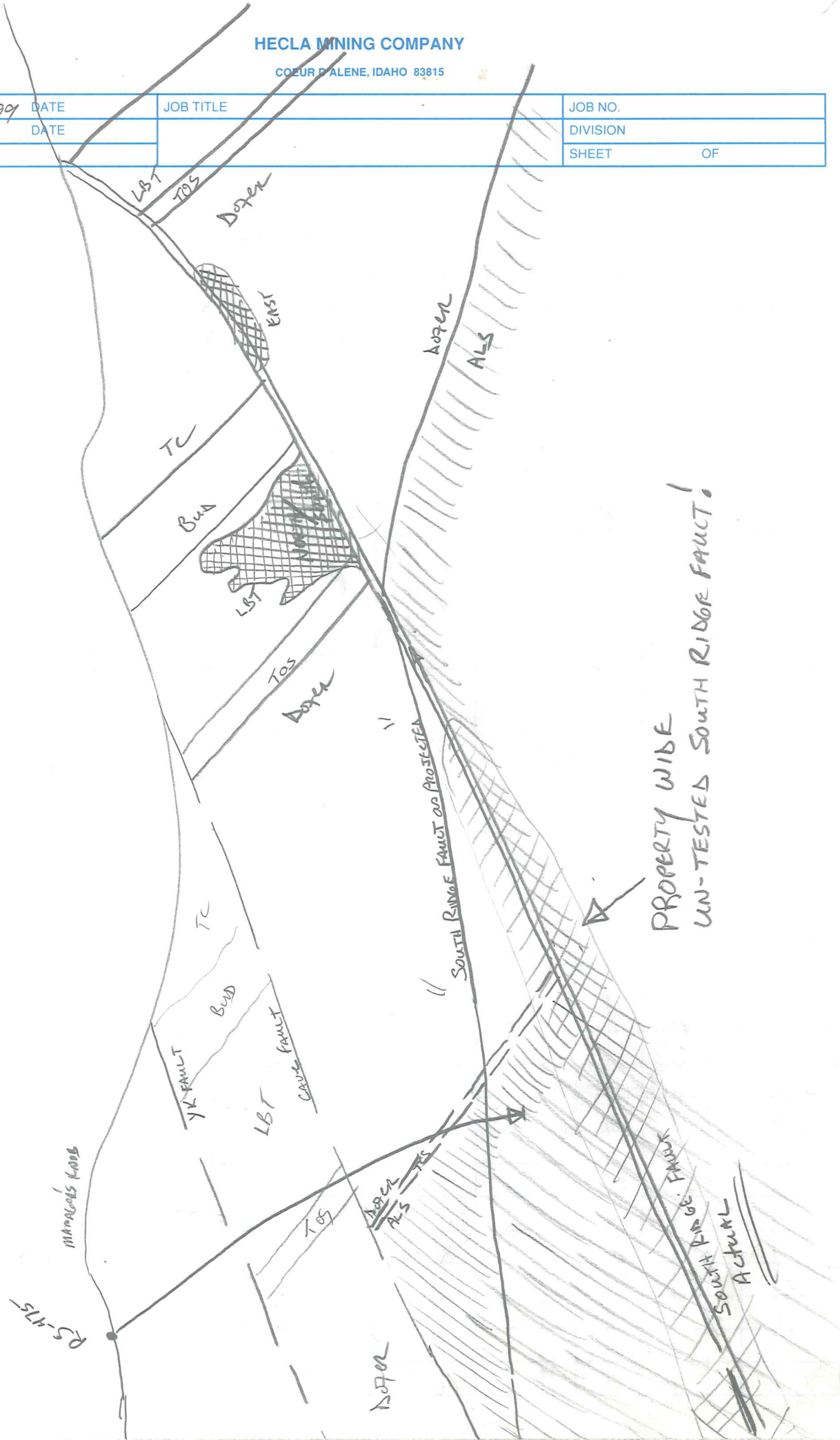
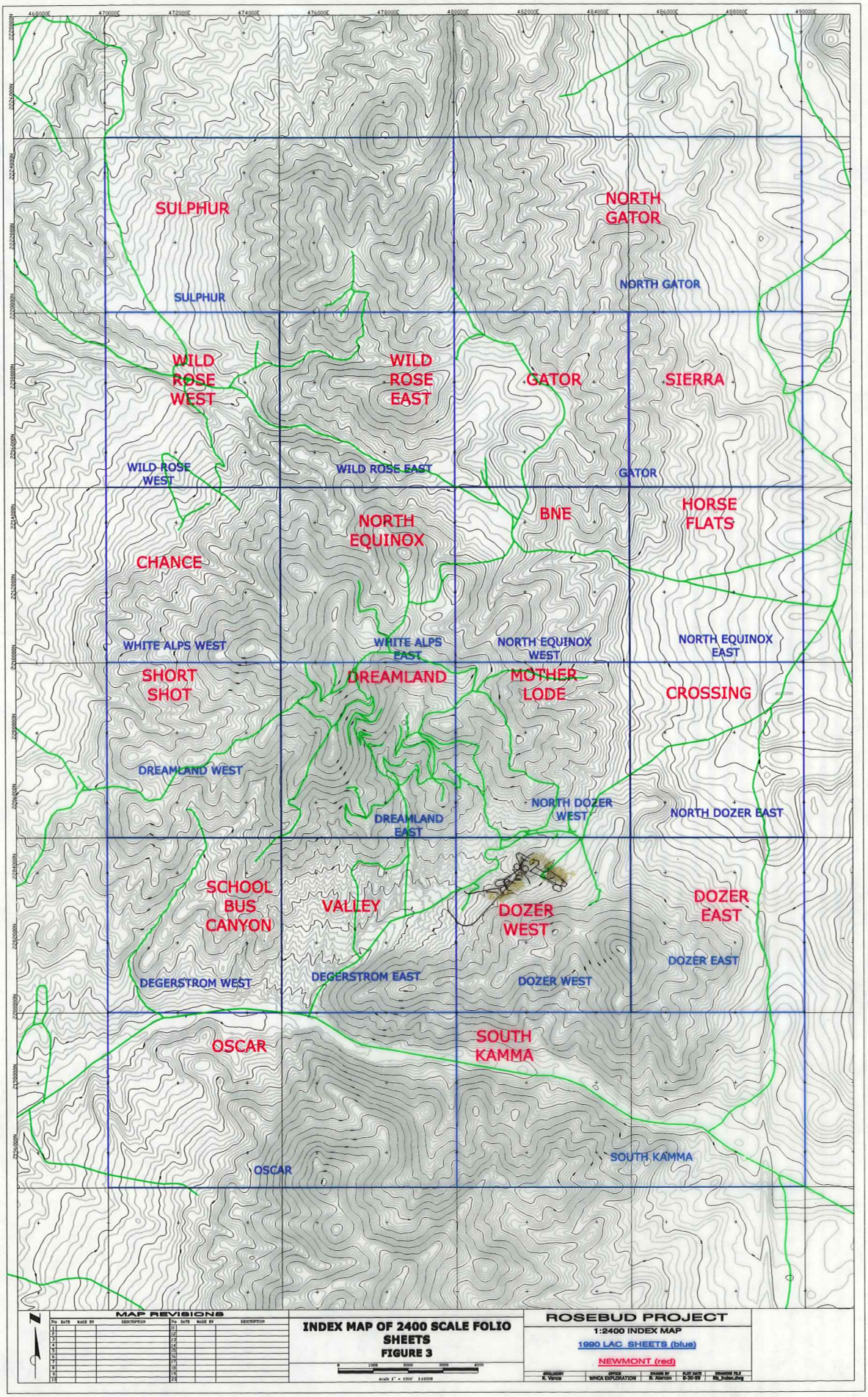
DWG. NO.			SHEET OF





MAP REVISIONS

No.	DATE	MADE BY	DESCRIPTION	No.	DATE	MADE BY	DESCRIPTION
1				11			
2				12			
3				13			
4				14			
5				15			
6				16			
7				17			
8				18			
9				19			
10				20			

INDEX MAP OF 2400 SCALE FOLIO SHEETS
FIGURE 3

scale 1" = 1000' 1:12000

ROSEBUD PROJECT
1:2400 INDEX MAP
1990 LAC SHEETS (blue)
NEWMONT (red)

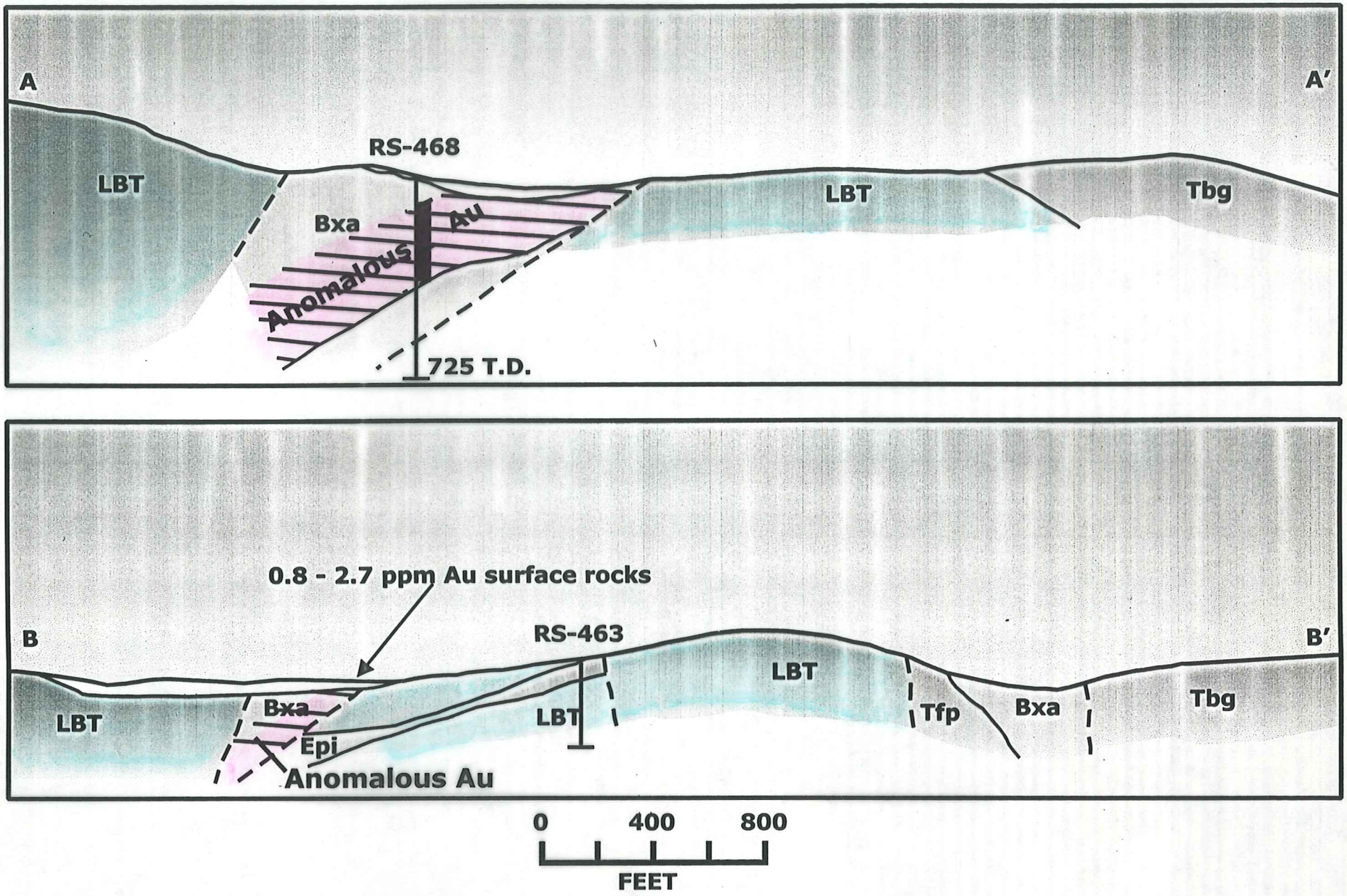
GEOLOGIST	OFFICE	DRAWN BY	PLOT DATE	DRAWING FILE
R. Vance	WMCA EXPLORATION	R. Atkinson	6-30-99	RB_Index.dwg

RESOURCE MODELING

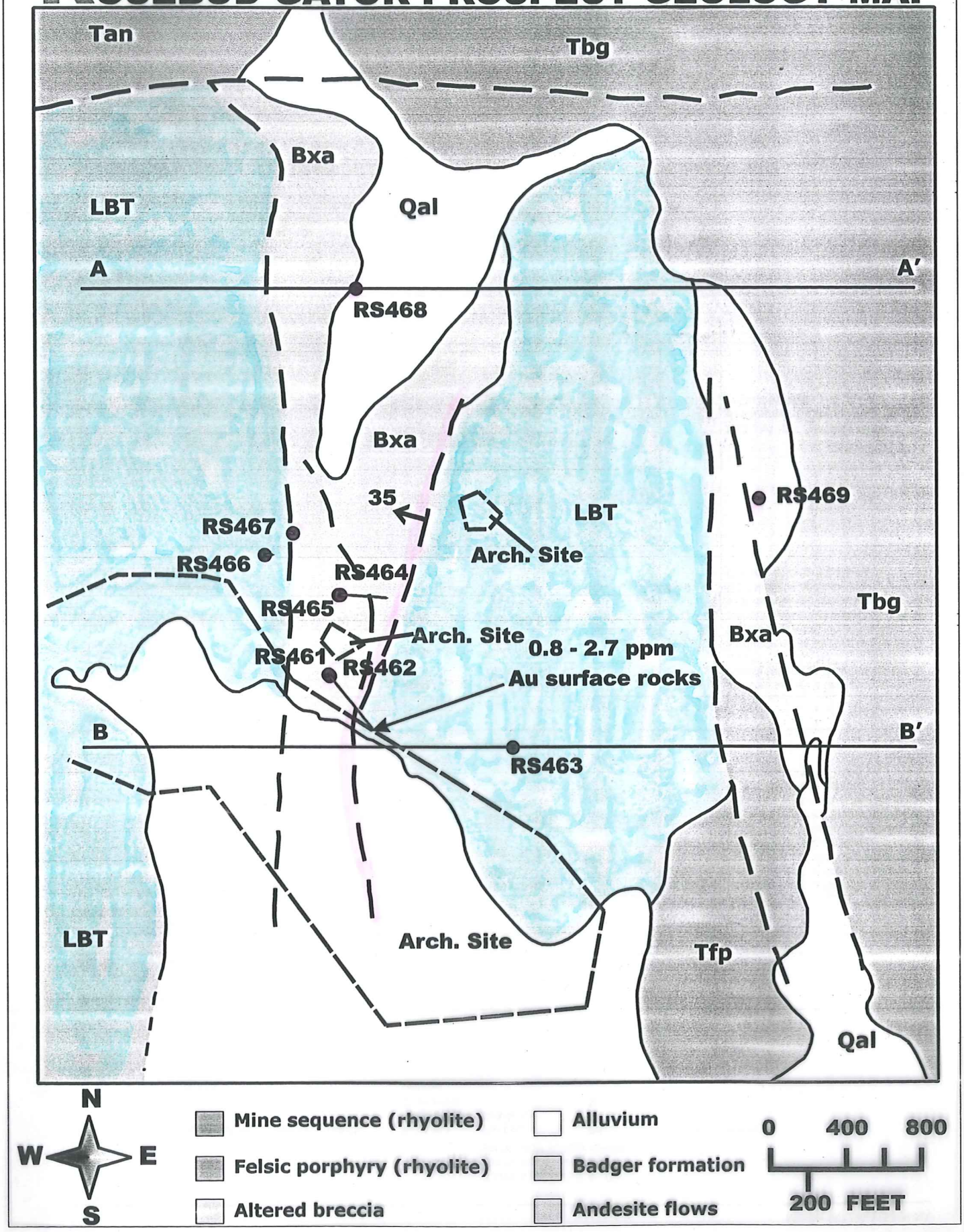
Geologically-controlled Geostatistical Model

- Geologic cross-sections on 25-foot centers at a scale of 1"=20' for the South Zone.
- Geologic cross-sections on 50-foot centers at a scale of 1"=40' for the North and East Zones
- Geologic bench plan maps on 12-foot centers at a scale of 1"=40'
- Gold grade distribution analysis:
  - -five major gold grade populations: 0.010 - 0.049 opt Au
0.050 - 0.249 opt Au
0.250 - 0.999 opt Au
1.000 - 4.499 opt Au
4.500 +
  - -fifteen major gold domains, defined by: grade distribution
geologic controls
style of mineralization
- Gold domain cross-sections at same centers and scales as geologic cross-sections
- Gold domain bench plan maps at same centers and scale as geologic plan maps
- Construction of 3-D model
- Variography performed over entire dataset; performed for each gold domain
- Ordinary kriging performed internal to each gold domain
  - -high-grade search limiter applied
  - -10'x10'x12' block size
- Audits performed by: Mine Development Associates, Inc. (S. Ristorcelli, Scott Hardy)
The Winters Company (D. Earnest, R. Sims)
HMC internal audit (D. Cameron)

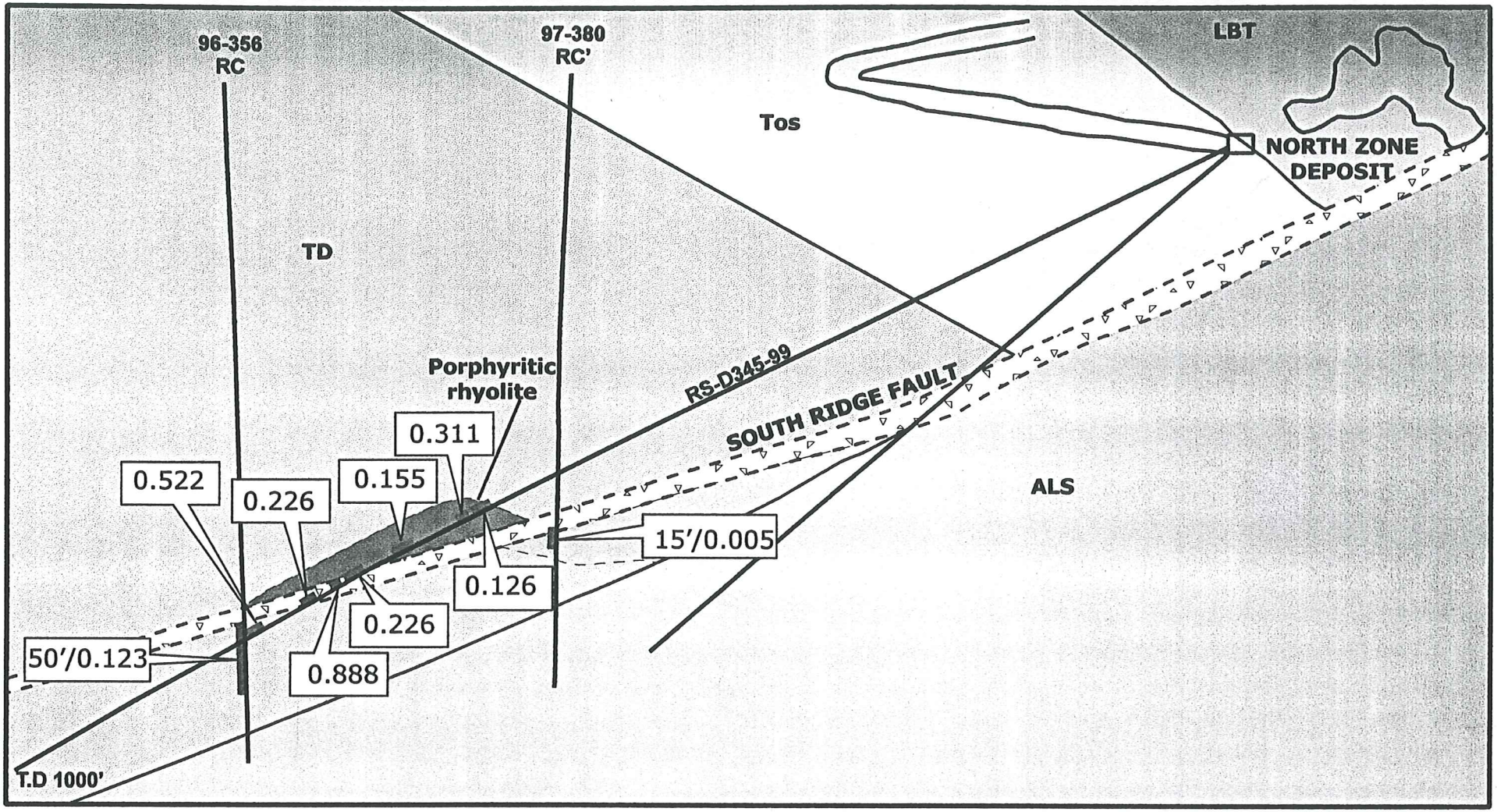
ROSEBUD GATOR PROSPECT CROSS SECTIONS



ROSEBUD GATOR PROSPECT GEOLOGY MAP



ROSEBUD PROJECT 1500 NE CROSS SECTION LOOKING NORTH EAST



0 100 200 FEET

GRADE LEGEND

Oz/ st Au
0.311

Figure 2.

ROSEBUD PROJECT 1500 NE CROSS SECTION LOOKING NORTH EAST

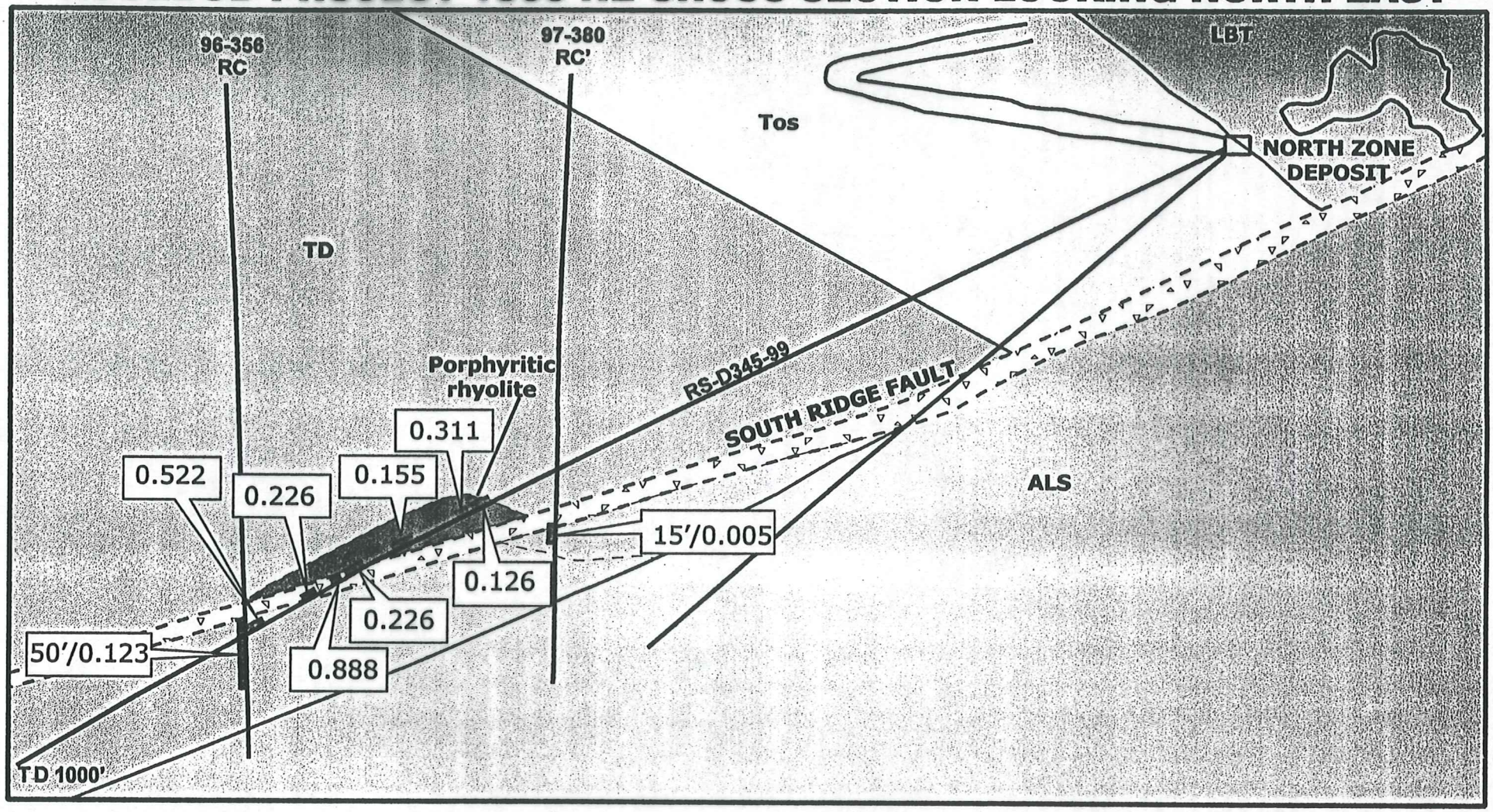


Figure 2.