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**THE ROSEBUD MINING COMPANY, LLC.**

**ROSEBUD RESOURCE & RESERVE ESTIMATE  
AS OF JANUARY 1, 1998**

Kurt D. Allen  
Ronald W. Clayton

December 19, 1997

## THE ROSEBUD MINING COMPANY, LLC.

### ROSEBUD RESOURCE & RESERVE ESTIMATE AS OF JANUARY 1, 1998

December 19, 1997

#### Executive Summary

The Rosebud Deposit is a volcanic-hosted, epithermal, gold silver deposit located in Pershing County, Nevada. The deposit and surrounding area (approximately 22 square miles) is controlled and operated by The Rosebud Mining Company, LLC., a joint-venture between Hecla Mining Company (50%) and Newmont Gold Corporation (50%). Hecla Mining Company is the manager of mining and Newmont Gold is the manager of milling and manager of exploration. The south zone of the Rosebud Deposit is presently being mined by underground, predominantly cut-and-fill methods, with the ore transported to Newmont Gold's Twin Creeks Pinon Mill for processing. Preproduction development began in October of 1996 with production beginning in late February 1997.

#### 1997 Production

During 1997, production at Rosebud came from six stopes within the South zone of the deposit. Production for the year totaled 197,951 tons at an average grade of 0.485 oz Au/ton and 3.08 oz Ag/ton, for 95,991 ounces gold and 610,500 ounces of silver. Mill recoveries for gold and silver averaged 96% and 58% respectively.

#### 1998 Measured and Indicated Resource

The 1998 Measured and Indicated Global Resource (0.01 Au oz/t resource cut-off) for the Rosebud Deposit (South, North, and East zones) is 10,138,952 tons at an average grade of 0.067 gold ounces per ton and 0.77 silver ounces per ton, containing 680,485 gold ounces and 7,822,172 silver ounces.

At a resource cut-off of 0.150 Au oz/ton, the 1998 Measured and Indicated Resource is 802,216 tons grading 0.496 gold ounces per ton and 3.40 silver ounces per ton, containing 397,957 ounces gold and 2,730,397 silver ounces.

#### Inferred Resource

In addition to the 1998 Measured and Indicated Resource, there are an additional Inferred Global Resource (0.01 Au oz/t resource cut-off) of 925,651 tons at an average grade of 0.099 oz Au/ton and 0.78 oz Ag/ton, containing 92,084 ounces gold and 723,785 ounces silver.

At a 0.150 Au oz/ton cut-off, the 1998 Inferred Global Resource includes 135,805 tons averaging 0.476 oz Au/ton and 2.15 oz Ag/ton, containing 64,653 contained gold ounces and 291,658 contained silver ounces.



## Proven and Probable Ore Reserve

The 1998 Proven and Probable Ore Reserve is 943,042 tons at an average grade of 0.420 gold ounces per ton and 2.92 silver ounces per ton, containing 395,634 gold ounces and 2,756,402 silver ounces.

## 1998 Reconciliation

Production to date has essentially substantiated the South zone reserve model, and has in fact shown the model to be slightly conservative. A comparison between actual production and the reserve model shows that the mine outperformed the model by producing an additional 18,008 tons (+14%) and 5,944 gold ounces (+7%) than predicted by the model. Given the close agreement between production and the reserve model, a reconciliation, rather than a complete remodel of the deposit, was completed to estimate the 1998 resource and reserve. Since all production during 1997 came from the South zone only, no changes were made to the North or East zones resource and reserve, with the exception of applying a revised economic cut off grade of 0.150 oz Au/ton.

The 1998 Proven and Probable Reserve was calculated by tabulating all Measured and Indicated Resource model blocks above a 0.150 oz Au/ton cut off grade that are located within the current mine production plan, excluding those blocks that were situated within the mined-out areas of the deposit.

Compared to the reported 1997 Rosebud proven and probable ore reserve, the 1998 proven and probable ore reserve contains 333,592 fewer tons, 104,250 fewer gold ounces, and 671,488 fewer silver ounces. These changes in the reserve can be attributed to:

- 1997 production;
- A substantial decrease in dilution applied to the South zone. The 1997 reserve incorporated 27.6% dilution; mining experience over the past year has shown that dilution can be held to an average of 13.8%, therefore, this lower dilution has been used in calculating the reserve. The result is the exclusion of nearly 82,000 tons of uneconomic material from the reserve;
- Increase in cutoff grade from 0.140 Au oz/ton to 0.150 Au oz/ton;
- Reclassification of ore blocks (i.e., blocks that were classified as Proven and Probable in the 1997 reserve that no longer meet that criteria);
- A decrease in the South Zone tonnage factor from 14.4 ft<sup>3</sup>/ton to 13.8 ft<sup>3</sup>/ton.

The net effect of the above listed items (excluding 1997 production) is a decrease of 103,676 tons averaging 0.061 oz Au/ton and 0.44 oz Ag/ton (6,337 ounces gold and 45,645 ounces silver).

A resource audit and review of production data was completed by Mineral Resources Development, Inc., with an additional review of production data by Mine Development Associates, Inc., who also assisted in the 1998 resource and reserve reconciliation and calculation.

## Conclusion

The first year of production at Rosebud has successfully substantiated the resource and reserve model in place for the deposit, with few exceptions. The majority of the negative adjustment to the reserve can be attributed to the removal of sub-economic material, thus increasing the average grade of the reserve. There is considerable confidence in the revised dilution figure, since it is based on actual operating experience. Some minor spatial/geometry/distribution discrepancies between the mine and the model have occurred, as there were several instances where the actual mining of ore grades occurred in locations where sub-grade material was modeled (and vice-versa). These areas will be the focus of the work in early 1998 when the deposit is updated and remodeled utilizing the production data. In addition, there were also a few thousand tons of material classified as Inferred that were successfully mined as ore.

A detailed listing of the 1998 Rosebud Resource and Reserve, Other Resources, and changes in inventory are included in tables 1 through 3 on the following pages. For convenience, tables have been included which illustrate 50 percent of the Rosebud Resource and Reserve data.

**ROSEBUD MINING COMPANY, LLC.**

100%

Table 1a. Rosebud Deposit, Estimated Resources and Ore Reserves as of January 1, 1998.																				
RESOURCES <sup>(1)</sup> (0.01 oz Au/t cut off)						UNMINABLE RESOURCE					DILUTION <sup>(2)</sup>					PROVEN & PROBABLE RESERVE <sup>(3) (4)</sup>				
Category	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Measured & Indicated Resource	10,138,952	0.067	0.77	680,485	7,822,172	9,195,910	0.031	0.55	284,851	5,065,770	201,279	0.074	0.75	14,916	150,845	943,042	0.420	2.92	395,634	2,756,402
Inferred Resource <sup>(5)</sup>	925,691	0.099	0.78	92,084	723,785															
<b>TOTAL</b>	<b>11,064,643</b>	<b>0.070</b>	<b>0.77</b>	<b>772,569</b>	<b>8,545,957</b>															

(1) Reported resources are for the Rosebud Deposit only (South, North, & East zones). Far East & East zone hanging wall mineralization is reported separately in Table 2.

(2) Dilution is included in Proven and Probable Reserve totals.

(3) Proven and Probable Reserves constitute in-place material at 0.15 oz Au/t cut off, corrected for dilution and mining recovery.

(4) Average process recovery is 96% for gold and 58% for silver.

(5) Inferred Resources include 135,805 tons grading 0.476 oz Au/t and 2.15 oz Ag/t (64,653 Au ounces, 291,658 Ag ounces) at 0.15 oz Au/t cut off.

**50% INTEREST**

Table 1b. Rosebud Deposit, Estimated Resources and Ore Reserves as of January 1, 1998.																				
RESOURCES <sup>(1)</sup> (0.01 oz Au/t cut off)						UNMINABLE RESOURCE					DILUTION <sup>(2)</sup>					PROVEN & PROBABLE RESERVE <sup>(3) (4)</sup>				
Category	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Measured & Indicated Resource	5,069,476	0.067	0.77	340,243	3,911,086	4,597,955	0.031	0.55	142,426	2,532,885	100,640	0.074	0.75	7,458	75,423	471,521	0.420	2.92	197,817	1,378,201
Inferred Resource <sup>(5)</sup>	462,846	0.099	0.78	46,042	361,893															
<b>TOTAL</b>	<b>5,532,322</b>	<b>0.070</b>	<b>0.77</b>	<b>386,285</b>	<b>4,272,979</b>															

(1) Reported resources are for the Rosebud Deposit only (South, North, & East zones). Far East & East zone hanging wall mineralization is reported separately in Table 2.

(2) Dilution is included in Proven and Probable Reserve totals.

(3) Proven and Probable Reserves constitute in-place material at 0.15 oz Au/t cut off, corrected for dilution and mining recovery.

(4) Average process recovery is 96% for gold and 58% for silver.

(5) Inferred Resources include 67,903 tons grading 0.476 oz Au/t and 2.15 oz Ag/t (32,327 Au ounces, 145,829 Ag ounces) at 0.15 oz Au/t cut off.



**ROSEBUD MINING COMPANY, LLC.**

100%

Table 2a. Other Resources as of January 1, 1998.						
Area	Category	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Rosebud Deposit	Unminable (1)	9,195,910	0.031	0.55	284,851	5,065,770
	Inferred (2)	925,691	0.099	0.78	92,084	723,785
	TOTAL	10,121,601	0.037	0.57	376,935	5,789,555
Far East / East Zone HW	Unminable (3)	1,010,364	0.034	0.21	34,352	212,982
	Inferred (4)	576,220	0.034	0.21	19,591	121,464
	TOTAL	1,586,584	0.034	0.21	53,943	334,446
UNMINABLE TOTAL		10,206,274	0.031	0.52	319,203	5,278,752
INFERRED TOTAL		1,501,911	0.074	0.56	111,675	845,249
GRAND TOTAL		11,708,185	0.037	0.52	430,878	6,124,001

- (1) Includes Measured & Indicated Resource of 36,639 tons grading 0.352 oz Au/t and 2.85 oz Ag/t (12,903 AuOz, 104,511 AgOz) at 0.15 oz Au/t cut off.  
(2) Includes 135,805 tons grading 0.476 oz Au/t and 2.15 oz Ag/t (64,653 AuOz, 291,658 AgOz) at 0.15 oz Au/t cut off, as reported in Table 1a.  
(3) Includes Indicated Resource of 23,707 tons grading 0.480 oz Au/t and 2.98 oz Ag/t (11,379 AuOz, 70,550 AgOz) at 0.15 oz Au/t cut off.  
(4) Includes 13,520 tons grading 0.480 oz Au/t and 2.98 oz Ag/t (6,490 AuOz, 40,238) at 0.15 oz Au/t cut off.

**50% INTEREST**

Table 2b. Other Resources as of January 1, 1998.						
Area	Category	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Rosebud Deposit	Unminable (1)	4,597,955	0.032	0.57	142,426	2,532,885
	Inferred (2)	462,846	0.099	0.78	46,042	361,893
	TOTAL	5,060,801	0.037	0.57	188,468	2,894,778
Far East / East Zone HW	Unminable (3)	505,182	0.034	0.21	17,176	106,491
	Inferred (4)	288,110	0.034	0.21	9,796	60,732
	TOTAL	793,292	0.034	0.21	26,972	167,223
UNMINABLE TOTAL		5,103,137	0.031	0.52	159,602	2,639,376
INFERRED TOTAL		750,956	0.074	0.56	55,838	422,625
GRAND TOTAL		5,854,093	0.037	0.52	215,439	3,062,001

- (1) Includes Measured & Indicated Resource of 18,320 tons grading 0.352 oz Au/t and 2.85 oz Ag/t (6,452 AuOz, 52,256 AgOz) at 0.15 oz Au/t cut off.  
(2) Includes 67,903 tons grading 0.476 oz Au/t and 2.15 oz Ag/t (32,327 AuOz, 145,829 AgOz) at 0.15 oz Au/t cut off, as reported in Table 1a.  
(3) Includes Indicated Resource of 11,854 tons grading 0.480 oz Au/t and 2.98 oz Ag/t (5,690 AuOz, 35,275 AgOz) at 0.15 oz Au/t cut off.  
(4) Includes 6,760 tons grading 0.480 oz Au/t and 2.98 oz Ag/t (3,245 AuOz, 20,119) at 0.15 oz Au/t cut off.



**ROSEBUD MINING COMPANY, LLC.**  
100%

<b>Table 3a. Changes to Ore Reserves</b>					
Item	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Reserve as of January 1, 1997	1,276,634	0.392	2.69	499,884	3,427,890
1997 Production					
Feb-Nov mill settlements <sup>(1)</sup>	197,951	0.485	3.08	95,991	610,500
Feb-Nov segregated waste	31,965	0.060	0.48	1,922	15,343
Total Production <sup>(2)</sup>	229,916	0.426	2.72	97,913	625,843
1997 Adjustments <sup>(3)</sup>	(103,676)	0.061	0.44	(6,337)	(45,645)
Reserve as of January 1, 1998	943,042	0.420	2.92	395,634	2,756,402

(1) February through October tonnage & ounces from mill settlement; November tonnage and ounces from mine production accounting.

(2) December production will not be milled until January, 1998; remains in reserve totals.

(3) Negative tonnage adjustment is due to dilution removed from reserves, increased cut off grade, revised tonnage factor, and reclassified reserve blocks.

**50% INTEREST**

<b>Table 3b. Changes to Ore Reserves</b>					
Item	Tonnage	Gold oz/t	Silver oz/t	Gold Ounces	Silver Ounces
Reserve as of January 1, 1997	638,317	0.392	2.69	249,942	1,713,945
1997 Production					
Feb-Nov mill settlements <sup>(1)</sup>	98,976	0.486	3.06	47,996	305,250
Feb-Nov segregated waste	15,983	0.061	0.55	961	7,672
Total Production <sup>(2)</sup>	114,958	0.426	2.72	48,957	312,922
1997 Adjustments <sup>(3)</sup>	(51,838)	0.061	0.44	(3,169)	(22,823)
Reserve as of January 1, 1998	471,521	0.420	2.92	197,817	1,378,201

(1) February through October tonnage & ounces from mill settlement; November tonnage and ounces from mine production accounting.

(2) December production will not be milled until January, 1998; remains in reserve totals.

(3) Negative tonnage adjustment is due to dilution removed from reserves, increased cut off grade, revised tonnage factor, and reclassified reserve blocks.

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## The Rosebud Mining Company, LLC.

### 1998 Rosebud Resource & Reserve Estimate

#### Introduction

The Rosebud Deposit is a volcanic-hosted, epithermal, gold silver deposit located in Pershing County, Nevada. The deposit and surrounding area (approximately 22 square miles) is controlled and operated by The Rosebud Mining Company, LLC., a joint-venture between Hecla Mining Company (50%) and Newmont Gold Corporation (50%). Hecla Mining Company is the manager of mining and Newmont Gold is the manager of milling and manager of exploration. The South zone of the Rosebud Deposit is presently being mined by underground, predominantly cut-and-fill methods, with the ore transported to Newmont Gold's Twin Creeks Pinon Mill for processing. Pre-production development began in October of 1996 with production beginning in late February 1997.

Production to date has essentially substantiated the South zone reserve model, and has in fact shown the model to be slightly conservative. A comparison between actual production and the reserve model shows that the mine outperformed the model by producing an additional 18,008 tons (+14%) and 5,944 gold ounces (+7%) than predicted by the model. Given the close agreement between production and the reserve model, a reconciliation, rather than a complete remodel of the deposit, was completed to estimate the 1998 resource and reserve. Since all production during 1997 came from the South zone only, no changes were made to the North or East zones resource and reserve, with the exception of applying a revised economic cut off grade of 0.150 oz Au/ton.

In November, Dr. Harry Parker, Senior Vice President of Mineral Resources Development, Inc., completed a resource audit including a review of production data. Charlie Muerhoff, Senior Geologist of Mine Development Associates completed a review of 1997 production data and assisted in the 1998 Rosebud Resource and Reserve reconciliation.

The resources reported herein have been classified according to SME definitions<sup>1</sup> and are divided into Measured, Indicated, and Inferred categories. Proven and Probable Reserves have been categorized pursuant to current SEC definitions.

Throughout this report, the term *zone* refers to areas of mineralization, and the term *domain* refers to specific types and distributions of gold mineralization. All units of measure used in this report are Imperial.

#### Geology and Mineralization

The Rosebud Deposit is situated in northwest Pershing County, Nevada, within the basin and range physiographic province. It is a low-temperature epithermal, quartz-sericite, gold-silver deposit which is generally hosted within a series of Tertiary (Miocene-age) volcanics and volcanoclastics, primarily andesitic to rhyolitic in composition. The volcanic package unconformably overlies the Jurassic/Triassic-age metasediment basement, which is also host to precious-metal mineralization. Ore-grade mineralization at the Rosebud Deposit has been divided into three zones: the South, East, and North zones, although lower-grade 'halo' mineralization generally transcends the spatial boundaries separating these zones. All proven and probable ore reserves reported for the Rosebud Deposit are contained within the South,

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<sup>1</sup> SME Working Party #79, *Ore Reserve Definition*, in Mine Engineering, April, 1991.



North, and East zones (figure 1). An area of mineralization proximal to the deposit, the Far East zone, is listed under the *Other Resources* category.

The structural setting in the Rosebud Deposit area is dominated by the east-west trending South Ridge Fault and the northeast trending Rosebud Shear. The *Rosebud Shear* is a regional fault series which strikes approximately N50°E to N°60E (down to the northwest) and displays up to 2,000 feet of left-lateral displacement and approximately 400 feet of normal displacement. The *South Ridge Fault* is a mineralized, arcuate-striking, early reverse dextral later normal sinistral listric fault (down to the north) which acted as a conduit for mineralizing fluids during the formation of the Rosebud Deposit. The fault is the footwall boundary to approximately two-thirds of the ore-grade mineralization in the deposit (South + North zones) and is the hanging wall boundary to the remaining ore-grade mineralization (East ± North zones). The South Ridge Fault terminates at its intersection with the Rosebud Shear; the offset portion of the South Ridge Fault has not been located to date.

Precious-metal mineralization in the Rosebud Deposit is controlled by structure and stratigraphy. In the South zone, gold and silver mineralization occurs on the hanging wall of the South Ridge Fault: 1) in northeast trending (N60°E ±) extension fractures to the last movement of the South Ridge Fault; 2) in east-west trending high-angle structures; 3) along flow/bedding planes, and 4) disseminated into specific andesitic volcanic/volcaniclastic facies, where there is a distinct clay-rich, silica-poor association with precious metals. In contrast, mineralization in the East zone is characterized by pervasive silica-replacement of the rhyolite host on the footwall of the South Ridge Fault, often with high-grade gold and silver mineralization situated within the fault zone itself. The North zone displays mineralizing styles and controls that are a combination of those seen in both the South and East zones.

The reader is referred to several previously released reports for a complete and detailed description of the geology, mineralization, and alteration at the Rosebud Deposit<sup>2</sup>.

#### Database for Resource Estimation

Data used in calculating the 1998 Rosebud Resource and Reserve Estimate was compiled from 1997 production and the 1997 Rosebud and Reserve Estimate. The 1997 Rosebud and Reserve Estimate was compiled from surface drilling performed by LAC Minerals prior to Hecla Mining Company's acquisition of Equinox Resources, and from surface and underground drilling, and underground sampling, completed by Hecla Mining Company from 1994 to 1996.

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<sup>2</sup> Muerhoff, C.V., The Rosebud Mining Company, LLC, Rosebud Deposit Resource and Reserve Estimate As of January 1, 1997.

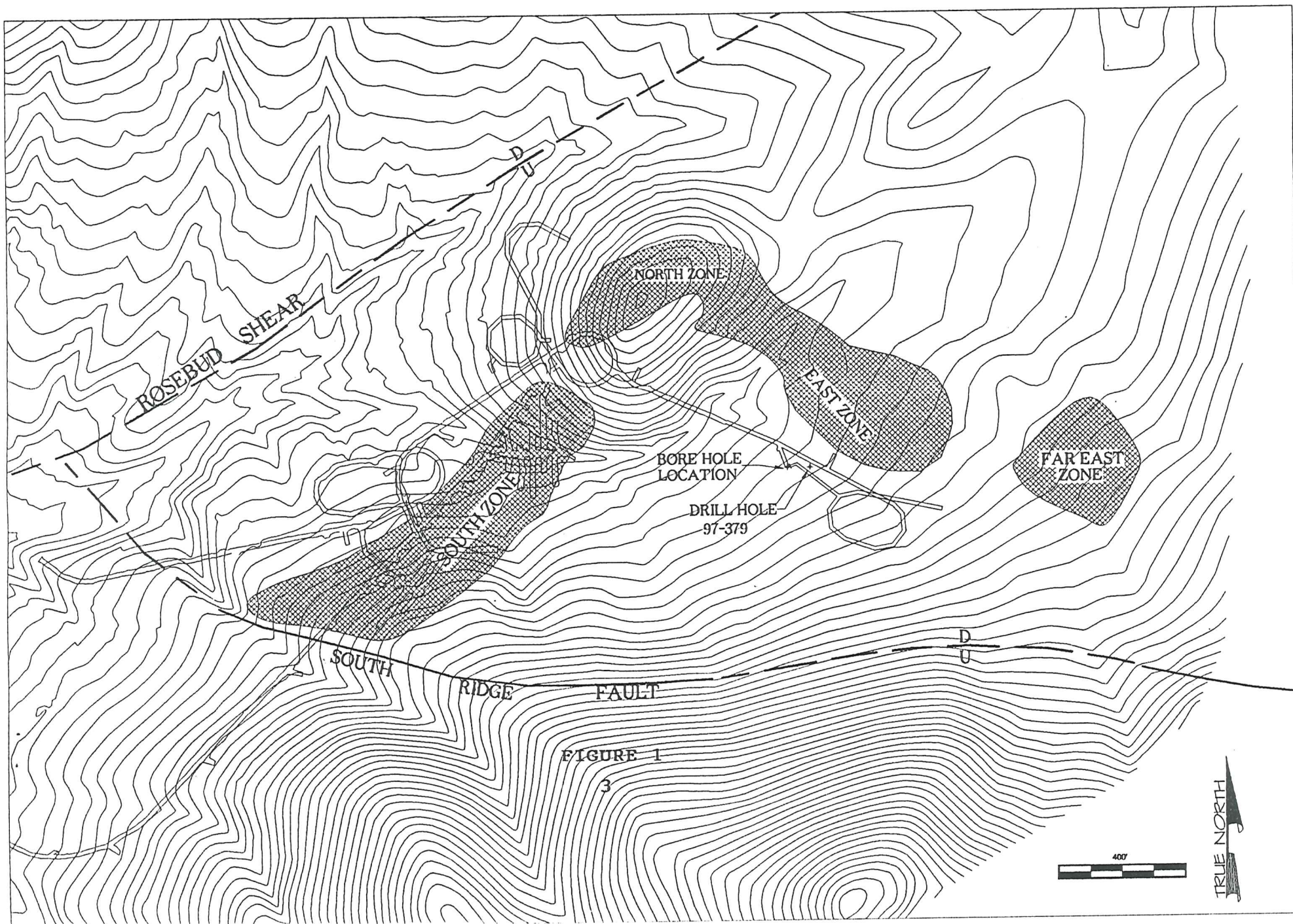
Clayton & Muerhoff, *Rosebud Project 1996 Mineral Inventory & Ore Reserve Estimate*, Hecla Mining Company internal report, January 5, 1996.

Czarnowsky, et.al., *Hecla Mining Company, Rosebud Feasibility Study*, January, 29, 1996.

Holmes & Muerhoff, *1995 Rosebud Mineral Inventory*, Hecla Mining Company internal report, January 20, 1995.

Muerhoff, C.V., *Summary of Alteration & Mineralization at Hecla Mining Company's Rosebud Deposit*, Hecla Mining Company internal report, May 10, 1995.







## Drilling

LAC Minerals (USA) completed approximately 204,000 feet of surface reverse-circulation and core drilling in the Rosebud Deposit area prior to 1994. A portion of this drilling was performed by LAC on claims controlled by Equinox Resources as part of an exploration option agreement between the two companies. At the time of Hecla's acquisition of the property from Equinox in 1994, the Rosebud Deposit was drilled out on nominal 100- to 150-foot spaced centers.

Drilling performed by Hecla Mining Company between 1994 and 1995 included 46 surface holes and 128 underground holes, totaling approximately 64,000 feet, and face and rib samples taken from underground development totaling approximately 3,000 feet. Surface holes were generally drilled to approximately 500 feet through the non- to weakly-mineralized strata overlying the ore body with reverse-circulation, then completed to their final depths with HQ-size core. Underground holes were drilled with N-size (NQ or NDBGM) core. Recovery from all core drilling averaged 94 percent. Upon the completion of the drilling, the deposit had been drilled out on 50-foot spaced drill fans, with nominal drill spacings of 25 feet to 40 feet in the South Zone, and 75 to 100 feet in the North and East zones.

## Analytical

Drill sampling by LAC Minerals was generally done on standard five-foot increments, using approximately ten pounds of reverse circulation cuttings or split core for the sample to be tested. The majority of analyses performed were on one assay-ton (30 grams) pulps which were prepared through non-site specific protocols. LAC contracted the majority of their analytical work to Reno area laboratories of Bondar-Clegg, GSI, and Chemex. Up to nine (9) repeat check assays were performed on the samples. The average of all assays and check assays for each sample was used in the resource estimation database.

Sampling of reverse-circulation drill intervals by Hecla was generally performed on ten-foot increments, mainly due to the use of using reverse-circulation for drilling through weakly- or unmineralized strata only, not for ore definition. Reverse-circulation samples of approximately 20 to 30 pounds were collected for analyses.

Sampling of core intervals (and underground faces and ribs) by Hecla were normally done on five-foot intervals, except where the sample would cross an observed geologic boundary (structure, change in lithology, alteration, etc.), in which case the end of the sample interval would coincide with the geologic boundary. Upon completion of geological and geotechnical logging, samples were submitted to American Assay Laboratories, Inc., of Reno, Nevada. In order to provide the most representative sample possible to the assay lab, whole core intervals were submitted. Sample preparation and assay protocols (two assay-ton fire assays) were designed to minimize the total variance of the fundamental sampling error, as per statistical methods formulated by Pierre Gy and Francis Pitard<sup>3</sup>. The average analytical variance was calculated to be 4.6 percent.

Analytical data from reverse-circulation cuttings, core, and ribs/face samples in the database for resource estimation were weighted averaged from the results of initial fire assays, check assays, cyanide bottle-roll test results (+ tail assay), and metallic screen assays. A comprehensive summary of analytical procedures and comparative tests performed by Hecla can be found in a previously issued report, entitled *1995 Rosebud Mineral Inventory*<sup>4</sup>.

<sup>3</sup> Pitard, F.F., *Pierre Gy's Sampling Theory and Sampling Practice*, second edition, CRC Press, 1993.

<sup>4</sup> Holmes & Muerhoff, *1995 Rosebud Mineral Inventory*, Hecla Mining Company internal report, January 20, 1995.

### Specific Gravity

Density measurements were taken on 959 core samples, proportionally representing the three ore zones, by Hecla geologists during the 1994 drilling campaign. From this data, tonnage factors of 13.4 cubic feet per ton for the South Zone and 12.9 cubic feet per ton for the North and East zones were determined. These tonnage factors were used for calculating the 1995 resource estimate and the 1996 resource and reserve estimate.

As reported in mid-1996, it became apparent that the specific gravity testing performed in 1994 was flawed, whereas some of the interstitial water was apparently still contained within the samples during the density measurement tests, thus biasing the results. Comparing the 1994 specific gravity results to laboratory testing completed by McClelland Laboratories for LAC Minerals indicated an overestimation of the specific gravity by approximately six percent overall. As a result, tonnage factors for the South, North, and East zones for the 1997 Resource and Reserve Estimate were adjusted to 14.4, 13.8, and 13.4 cubic feet per ton, respectively. Application of these tonnage factors to the 1996 Rosebud reserve resulted in a decrease of approximately 72,000 tons and 32,000 gold ounces. These revised tonnage factors were incorporated into the 1997 resource and reserve estimate.

During 1997 production, mine calculated ore tonnages (both survey volumes and geology measured volumes using the above 14.4 ft<sup>3</sup>/ton) consistently underestimated the scaled ore tonnages shipped to the Pinon mill. In July and August, a total of 45 ore host rock samples were collected from Stopes 13, 14, 21, 22, and 23, and sent to McClelland Labs in Reno for bulk density analysis. Results from these samples indicated that the average bulk density was 13.8 ft<sup>3</sup>/ton instead of the previously used 14.4 ft<sup>3</sup>/ton. This amounted to a 4.3% decrease in tonnage factor (increase in density). In addition, Francis Pitard stated in his report titled "Review of Mining and Processing Sampling Practices at the Rosebud Mining Company" dated August 25, 1997 that using data from the Rosebud Heterogeneity Test, he calculated an average density of 2.37. This density equated to a tonnage factor of 13.5 ft<sup>3</sup>/ton. The results from the samples collected in the active mining areas and Francis' calculation indicated that the previous tonnage factor used was conservative and should be changed. The new tonnage factor of 13.8 ft<sup>3</sup>/ton was put in use beginning October 1, 1997, and correlation between mine calculated ore tonnage and scaled ore tonnage shipped to the Pinon mill in October and November were in good agreement.

A memorandum addressing the change in specific gravity is included in the appendix<sup>5</sup>.

### **1997 Production**

Production during 1997 totaled 229,916 tons at a gold grade of 0.426 oz/ton and silver grade of 2.72 oz/ton totaling 97,913 gold ounces and 625,843 silver ounces. The ore portion of the 1997 production consists of 197,951 tons at a gold grade of 0.485 oz/ton and a silver grade of 3.08 oz/ton for a total of 95,991 gold ounces and 610,500 silver ounces. In addition, the 1997 production includes segregated waste tonnage of 31,965 tons at a gold grade of 0.060 oz/ton and a silver grade of 0.48 oz/ton for a total of 1,922 gold ounces and 15,343 silver ounces that was shipped to the waste dump. The ore production numbers for 1997 are based on mill settlements.

### **Resource Reconciliation**

During 1997, production at Rosebud came from the South zone only, within stopes 13, 14, 21, 22, 23, and 24 and substantiated the 1997 South zone model. Ore production during 1997 @ >0.140 Au oz/ton

<sup>5</sup> Allen, K. D., Results of the 45 Bulk Density Samples Submitted to McClelland Labs, Hecla Mining Company internal memorandum, July 1, 1996.



totaled 148,758 tons at a gold grade of 0.606 oz/ton containing 90,147 gold ounces. The model predicted 130,750 tons at a gold grade of 0.644 oz/ton containing 84,203 gold ounces. The mine outperformed the model by producing an additional 18,008 tons (+14%) and 5,944 gold ounces (+7%) than predicted by the model.

Due to this close agreement between the mining (gold grade, silver grade, and geology) and milling (gold grade, silver grade, and ounces produced) to the 1997 resource and reserve model estimate, re-modeling was not completed for the 1998 resource and reserve estimate. For the 1997 Resource modeling procedures and parameters the reader is referred to "The Rosebud Mining Company, LLC, Rosebud Deposit Resource and Reserve Estimate as of January 1, 1997" report dated January 29, 1997 by Charles V. Muerhoff. In November, Dr. Harry Parker, Senior Vice President of Mineral Resources Development, Inc., completed a resource audit including a review of production data, and Charlie Muerhoff, Senior Geologist of Mine Development Associates completed a review of 1997 production data. The 1998 Rosebud resource estimate was prepared jointly by Hecla staff and personnel from Mine Development Associates, Inc.

Data used for the 1998 Resource and Reserve reconciliation included:

- Mine to mill reconciliation figures through November, 1997 (i.e., through October production);
- November, 1997 production figures;
- South zone Measured and Indicated resource block Model (10X10X12);
- South zone Measured, Indicated, and Inferred resource block model (10X10X12);
- South zone Measured, Indicated, and Inferred resource sub-block model (2.5X2.5X3);
- 2-D and 3-D as-built models of all stopes (current to Nov., 30, 1997);
- 2-D and 3-D South zone mine design models (pre-mining);
- 40-scale Measured and Indicated resource block model maps;
- 40-scale mine planning maps.

#### Differences in Model and Reserve Parameters Between 1997 and 1998

There are three main differences in the tabulation of the resource and reserve between the 1997 model and the 1998 model:

- 1) The tonnage factor of the South zone only was changed from 14.4 ft<sup>3</sup>/ton in 1997 to 13.8ft<sup>3</sup>/ton in 1998.
- 2) The cut off grade was increased from 0.140 oz Au/ton in 1997 to 0.150 oz Au/ton in 1998.
- 3) The percent dilution included in the South zone Proven and Probable reserve was changed from 27.6% in 1997 to an average of 13.8% in 1998. The change in dilution is the actual dilution experienced over the past year's mining, as measured by the percentage of ounces and tons mined below the 0.14 cut-off that was sent to the mill.

#### Model Checks

The sub-blocked Measured, Indicated, and Inferred (MI&I) resource model was loaded in Surpac along with the 3-D solids of the as-built (actual surveyed mine openings) stopes. An extraction of the MI&I resource within the as-built solids was performed to check for correlation of model tons to actual production:

Extracted MI&I model tonnage:	228,523 tons
Actual production tonnage:	<u>229,916 tons</u>
Difference:	-1,393 tons



Since there was no sub-blocked model available for the Measured and Indicated (M&I) resource, a tabulation of all material inside the as-built stope solids was performed on the 10X10X12 and 2.5X2.5X3 M&I models to check for differences in volumes due to block sized. If the volume difference was found to be minimal, we would proceed to use the 10X10X12 block models to complete the rest of the reconciliation.

MI&I 10X10X12 model blocks within as-built stope solids: 229,776 tons / 93,828 AuOz

MI&I 2.5X2.5X3 model blocks within as-built stope solids: 228,523 tons / 92,115 AuOz

The resultant tonnage variance of 0.5% and gold ounce variance of 1.8% was considered acceptable and the reconciliation was performed on the 10X10X12 block models.

#### Reconciliation Procedures

The reconciliation of the South zone resource and reserve was completed by tabulating all of the M&I blocks above and below a cut off grade of 0.150 oz Au/ton that occurred both outside of the as-built stope solids and inside of the remaining mine design solids. The result represents all M&I material that is scheduled to be mined beyond November 30, 1997 (December's production was included in the 1998 resource and reserve since that material will still be on a stockpile at January 1, 1998). The actual percent dilution, tons and grade, experienced in the mine throughout the past years' production was calculated on a stope-by-stope basis and added to the tabulated model blocks that equaled or exceeded 0.150 oz Au/ton in grade. Those stoping areas that are yet to be mined were assigned the average mine-wide dilution of 13.8% at a grade of 0.077 oz Au/ton and 1.06 oz Ag/ton. No changes were made to the East and North zone resource and reserve except for the increase in the reserve cut off grade from 0.140 oz Au/ton to 0.150 oz Au/ton.

#### **1998 Reserve**

##### 1998 Measured, Indicated, and Inferred Resource

The following resource estimates reflect in-place tonnages and ounces for the Rosebud Deposit and for Other Resources on the Rosebud Property (Far East / East Zone hanging wall). Silver was not modeled independently from gold in the 1997 Resource and Reserve Estimate; silver grades and ounces contained have been determined based on the average silver-to-gold ratio calculated for each gold domain. A tabulation of the Measured, Indicated, and Inferred Resource at 0.01 Au oz/t increments is included in the appendix.

##### Rosebud Deposit - Measured and Indicated Resource

The 1998 Measured and Indicated Global Resource (0.01 Au oz/t resource cut-off) for the Rosebud Deposit (South, North, and East zones) is 10,138,952 tons at an average grade of 0.067 gold ounces per ton and 0.77 silver ounces per ton, for 680,485 contained gold ounces and 7,822,172 contained silver ounces.

At a resource cut-off of 0.150 Au oz/t, the Measured and Indicated Resource for the Rosebud Deposit is 802,216 tons grading 0.496 gold ounces per ton and 3.40 silver ounces per ton, for contained gold ounces of 397,957 and contained silver ounces of 2,730,397.

##### Rosebud Deposit - Inferred Resource

The 1998 Rosebud Deposit Inferred Global Resource (0.01 Au oz/t resource cut-off) is 925,691 tons at an average grade of 0.099 gold ounces per ton and 0.78 silver ounces per ton. Gold and silver ounces contained in inferred material total 92,084 and 723,785, respectively.

With a 0.150 Au oz/t resource cut-off applied, there are 135,805 tons grading 0.476 gold ounces per ton and 2.15 silver ounces per ton in the Rosebud Inferred Resource, for 64,653 contained gold ounces and 291,658 contained silver ounces. This inferred resource represents the very near-term up-side potential of the deposit (as it is currently defined). The majority of ore-grade inferred material is either proximal to or within the planned stoping areas and mine plan has been designed so that the inferred material can be extracted utilizing the current stope layout, if warranted.

#### Other Resources - Indicated and Inferred Resource

Other resources at Rosebud include the Far East and East Zone hanging wall areas of mineralization. These two areas were not re-modeled for the 1998; tonnages and grades for the *Other Resources* category are the same as in the 1997 resource document.

The Indicated Resource for Other Resources (0.01 Au oz/t resource cut-off) is 1,010,364 tons grading 0.034 gold ounces per ton and 0.21 silver ounces per ton, containing 34,352 gold ounces and 212,982 silver ounces.

The Inferred Resource for Other Resources is 576,220 tons grading 0.034 gold ounces per ton 0.21 silver ounces per ton, for contained gold and silver ounces of 19,591 and 121,464, respectively.

#### Proven and Probable Ore Reserve

The 1998 Rosebud Proven and Probable Ore Reserve is 943,042 tons at an average grade 0.420 gold ounces per ton and 2.92 silver ounces per ton, at a cut-off grade of 0.150 Au oz/t, for 395,634 contained gold ounces and 2,756,402 contained silver ounces. A summary of the ore reserve by zone is presented in table 1, and a detailed summary is included in the appendix.

Table 1. 1998 Rosebud Proven and Probable Ore Reserve

Zone	Tonnage	Au Grade (oz/t)	Ag Grade (oz/t)	Au Ounces	Ag Ounces
South	427,727	0.514	4.22	219,867	1,842,428
North	168,078	0.333	1.18	55,907	198,593
East	347,237	0.345	2.16	119,860	750,923
<b>Total</b>	<b>943,042</b>	<b>0.420</b>	<b>2.92</b>	<b>395,634</b>	<b>2,756,402</b>

The 1998 ore reserve calculation began by completing a detailed reconciliation between the 1997 ore reserve estimate and 1997 production figures. A total of 5 mining levels in the South zone were completely mined out during 1997. Within the South zone, the measured and indicated resource contained within the stope boundaries was tabulated according to material at or exceeding 0.150 Au oz/t and material less than 0.15 Au oz/t. On a bench by bench basis, comparing the resource tonnage and ounces to the tonnage and ounces tabulated for the stopes, extraction factors averaged 91 percent for tonnage and 95 percent for gold and silver ounces. Dilution based on 1997 production figures averaged 13.8 percent tonnage at a gold grade of 0.077 oz/ton and silver grade of 1.06 oz/ton. This actual dilution factor was then applied to the remainder of the South zone resource only. The 1997 Resource and Reserve Estimate dilution of 27.6% at a gold grade of 0.073 oz/ton was again used for the North and East zone resource to determine the overall proven and probable ore reserve.

Cut-off grade calculations and resource to reserve calculations for the 1997 proven and probable reserve are located in the appendix of this report. The 1998 Measured and Indicated Resource grade / tonnage curve is shown in Figure 2.



# Rosebud Deposit 1998 Measured & Indicated Resource Grade / Tonnage Curve

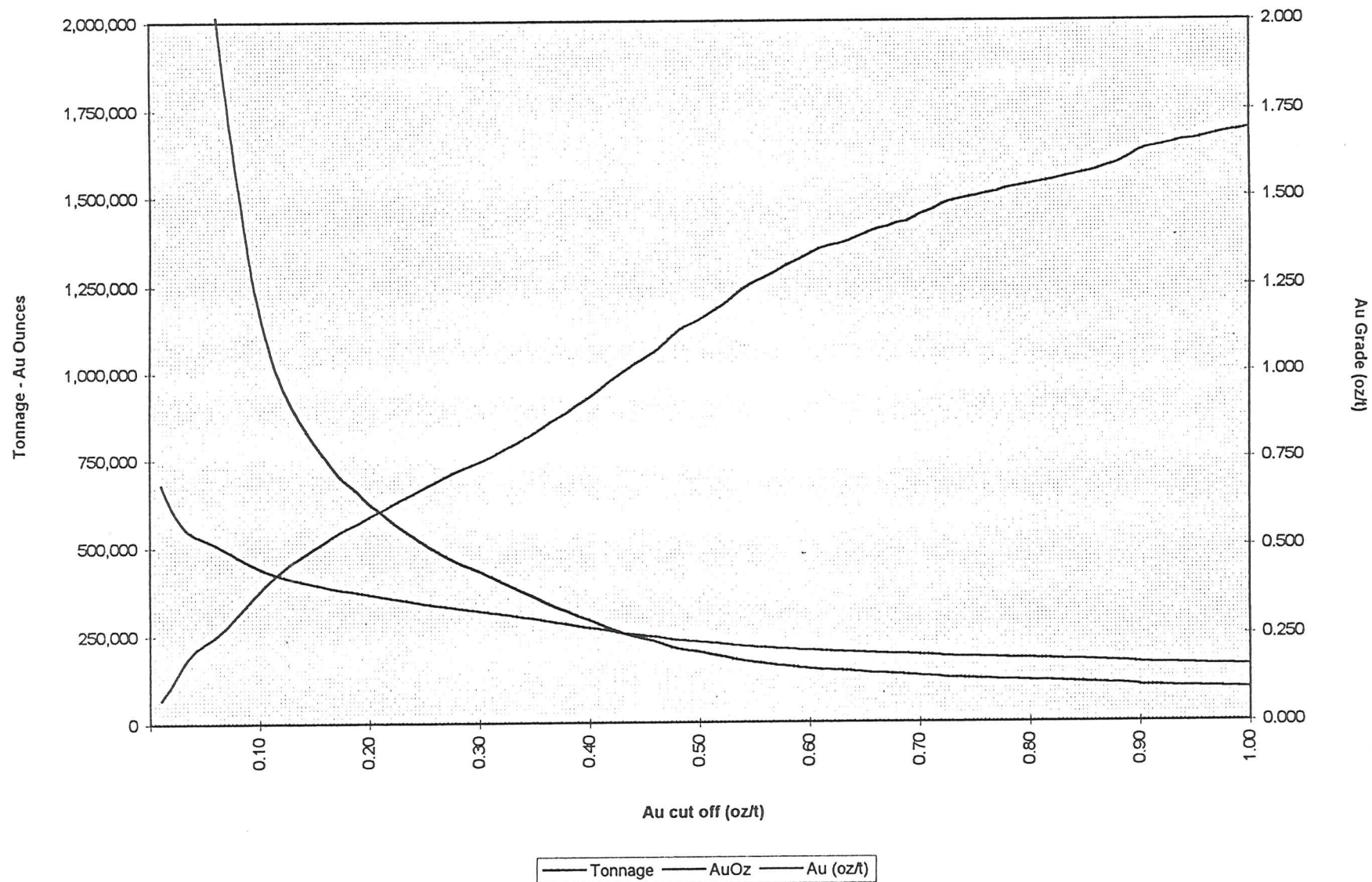


FIGURE 2

## Discussion

The 1998 Rosebud ore reserve contains 333,592 fewer tons, 104,250 fewer gold ounces, and 671,488 fewer silver ounces than the reported 1997 Rosebud ore reserve (summarized in table 2.). These figures include 229,916 tons of production containing 97,913 ounces of gold and 625,843 ounces of silver, and a negative adjustment of 103,676 tons containing 6,337 gold ounces and 45,645 silver ounces.

Table 2. 1998 Ore Reserve vs. Reported 1997 Ore Reserve

	<u>Tons</u>	<u>oz Au/t</u>	<u>oz Ag/t</u>	<u>AuOz</u>	<u>AgOz</u>
Reserves as of 1/1/97	1,276,634	0.392	2.69	499,884	3,427,890
1997 Production					
Mill Settlements	197,951	0.485	3.08	95,991	610,500
Segregated to Waste	31,965	0.060	0.48	1,922	15,343
Reserves as of 1/1/98	943,042	0.420	2.92	395,634	2,756,402
Adjustments	(103,676)	0.061	0.44	(6,337)	(45,645)

The change in the reserve from 1997 to 1998 can be attributed to:

- 1997 production.
- A decrease in dilution in the South zone from 27.6% at a gold grade of 0.073 oz/ton and a silver grade of 0.62 oz/ton to 13.8% at a gold grade of 0.077oz/ton and a silver grade of 1.06 oz/ton. This reduction in dilution for the South zone is based on actual dilution figures from production during 1997 and represents the subtraction of 81,518 tons grading 0.077 oz Au/ton, 1.06 oz Ag/ton from the 1998 South zone reserve.
- An increase in cutoff grade from 0.140 Au oz/ton to 0.150 Au oz/ton. Since only a slight increase (0.10 oz Au/ton) in the cut off grade occurred, the impact to the reserve was minimal:

South Zone	(11,506) tons @ 0.142 oz Au/ton (1,633) AuOz
North Zone	(8,293) tons @ 0.127 oz Au/ton (1,052) AuOz
East Zone	(32,763) tons @ 0.127 oz Au/ton (4,168) AuOz
Total	(52,562) tons @ 0.130 oz Au/ton (6,853) AuOz

The removal of this material from the reserve will increase the average grade of the 1998 reserve. We will undoubtedly recover and process the majority of this material regardless, since it is inside the stoping boundaries and well above our incremental cut off. It is only removed from the reserve because it does not meet cut off grade definitions.

- Reclassification of ore blocks (blocks that were classified as Proven and Probable in the 1997 reserve that no longer meet that criteria). These blocks were located in the mined out areas of South zone stopes 13, 22, and 23. They were removed from the Proven and Probable category because they were situated outside of the as-built stope solids and inside of the design solids on levels that mining (as attested to by the production figures), but the location of this material was inaccurate in the model. The negative adjustment to the reserve due to the removal of these blocks totals 27,818 tons and 13,137 gold ounces. Care was taken not to exclude blocks from the reserve that can be mined from adjacent levels.
- A decrease in the South zone tonnage factor from 14.4 ft<sup>3</sup>/ton to 13.8 ft<sup>3</sup>/ton resulted in 18,289 tons at a grade of 0.514 oz Au/ton (9,401 Au ounces) being added to the 1998 reserve.

To get a measure of the accuracy of the model, Dr. Harry Parker recommended dividing the model tons, gold grade, and ounces greater than or equal to 0.140 oz Au/ton by the actual tons, gold grade, and



ounces greater than or equal to 0.140 oz Au/ton. This comparison was completed with all tons at the 13.8 ft<sup>3</sup>/ton.

Table 3. Measure of Accuracy of the Model:

	Tons	Au Grade	Cont.'d Au Oz
Model >0.140 oz Au/t	130,750	0.644	84,203
Actual >0.140 oz Au/t	148,758	0.606	90,147
Actual/Model	114%	94.1%	107.1%
Difference	18,008	0.330	5,944

The gold grades and tonnages for the actuals above are based on the face and rib samples and geology measurements and will not correspond to the mill settlement tonnages and grades. The above measure of the accuracy of the model strongly indicates that not only did we indeed mine the ounces estimated by the 1997 Resource and Reserve Estimate, but we also mined an additional 18,008 tons at a grade of 0.330 oz/ton for an addition 5,944 gold ounces.

Please be aware that the overall adjustment to the reserve (-103,676 tons at a gold grade of 0.061 oz/ton) will not match the total of the itemized adjustments listed above because of the differences in tonnage factors from one year to the next and because of the methodology used to derive the new reserve. It was not a straight subtraction of production from the 1997 reserve to derive the 1998 reserve, but rather, the total amount of material within the designed stopes not yet mined constituted the 1998 reserve. There are some minor spatial/geometry/distribution discrepancies between the model and what is actually experienced underground, but the reserve tonnage and ounces appear to correlate well. There were several instances where the actual mining of ore grades occurred in locations where sub-grade material was modeled (and vice-versa), therefore, a one-to-one reconciliation is not possible (we mined ore in areas where ore was not projected). The areas where the actual gold distribution is inconsistent with the current model will be the focus of the work in early 1998 when the South Zone is remodeled utilizing our actual production data.

### Summary & Conclusions

The first year of production at Rosebud has, with minor exceptions, successfully substantiated the South zone model as production during 1997 has matched well with what the model was predicting. The majority of the negative adjustment to the reserve can be attributed to the removal of sub-economic material. Those few areas where the model hasn't matched well, will be the focus of work next year when the South zone is remodeled.

The 1998 Rosebud proven and probable reserve is 943,042 tons grading 0.420 Au oz/ton and 2.92 Ag oz/ton containing 395,634 ounces of gold and 2,756,402 ounces of silver. The subtraction of the lower grade sub-economic material from the reserve as compared to the 1997 reserve has raised the average grade and increased the potential for mining higher margin rock. The biggest impact to the reserve is the change in dilution. In addition, there are a few tons of material that was classified as Inferred that were successfully mined as ore.





THE ROSEBUD MINING CO., LLC  
MEMORANDUM

TO: Ron Clayton  
FROM: Kurt D. Allen *KDA*  
DATE: September 18, 1997  
SUBJECT: Results of the 45 Bulk Density Samples Submitted to McClelland Labs.

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A total of 45 ore host rock samples were collected from Stopes 13, 14, 21, 22, and 23, for bulk density analysis. Samples collected consist of 10 samples from Stope 13-4868, 5 samples from Stope 14-4796, 5 samples from Stope 21-4748, 7 samples from Stope 22-4640, 6 samples from Stope 22-4652, and 12 samples from Stope 23-4592. Sample rock types consist of planar laminated flow (PLAT), pink matrix breccias (PMBX), and leopard skin tuff (LST). These samples were submitted to McClelland Laboratories, Inc., in Sparks, Nevada, where bulk density determinations were completed by a standard volume displacement method with a weight differential check.

Results from the above 45 samples are attached. These results indicate that the average bulk density of all 45 samples is 13.8 cu. ft./ton (we currently use 14.4 cu. ft./ton). The average bulk density for Stope 13 is 14.1 cu. ft./ton, Stope 14 is 13.8 cu. ft./ton, Stope 21 is 14.1 cu. ft./ton, Stope 22 is 13.9 cu. ft./ton, and Stope 23 is 13.2 cu. ft./ton. The average bulk density of these latest samples is 4.3% lower (higher density) than the 14.4 cu. ft./ton we are currently using. We need to keep in mind that for these 45 samples, the 13.8 cu. ft./ton value is the most optimistic (densest) value because there is no way to account for open fractures or large voids not represented within the samples.

If we look at model vs. truck tonnages for June and July using the current 14.4 cu. ft./ton bulk density and then at the same using the indicated 13.8 cu. ft./ton, we see the following:

AT BULK DENSITY OF 14.4 cu. ft./ton			
	MODEL TONS	TRUCK TONS	DIFFERENCE
JUNE	15,896	17,795	1,899
JULY	23,404	23,847	443

AT BULK DENSITY OF 13.8 cu. ft./ton			
	MODEL TONS	TRUCK TONS	DIFFERENCE
JUNE	16,587	17,795	1,208
JULY	24,421	23,847	(151)

It appears that a bulk density change as indicated by the new samples would bring the tonnage discrepancy observed in June and July to a much lower level.

In addition to the above test work, Francis Pitard states in his report titled "Review of Mining and Processing Sampling Practices at the Rosebud Mining Company" dated August 25, 1997, that using data from the Rosebud Heterogeneity Test, he calculates an average density of 2.37. This

density equates to a bulk density of 13.5 cu. ft./ton. The Rosebud Heterogeneity Test was completed on material from the original cross-cut into the chimney part of the South Ore Zone (Stope 22). This by itself is not conclusive, however, it is an additional piece of data from a different avenue of testing that is in line with the current bulk density of 14.4 cu. ft./ton being to conservative.

I recommend the following:

- Beginning October 1, 1997, we start tracking tonnages using a bulk density of 13.8 cu. ft./ton for our monthly speedometer.
- At the end of each month when trucking and moisture tonnage results are completed we check tonnages using the average bulk density by stope (stope 13 currently 14.1 cu. ft./ton, stope 14 currently 13.8 cu. ft./ton, stope 21 currently 14.1 cu. ft./ton, stope 22 currently 13.9 cu. ft./ton, and stope 23 currently 13.2 cu. ft./ton).
- Compare tonnages calculated using bulk densities listed above to actual tonnages for a few months.
- Collect new bulk density samples within each new stope accessed.
- Make necessary bulk density change to reserves at year end.



## 1998 ROSEBUD RESOURCE ESTIMATE

## TOTAL ROSEBUD DEPOSIT RESOURCE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.01	10,138,952	0.067	680,485	0.77	7,822,172	925,691	0.099	92,084	0.78	723,785
0.02	5,503,376	0.111	612,632	1.13	6,244,850	606,567	0.144	87,268	1.02	620,237
0.03	3,372,909	0.167	563,012	1.51	5,093,929	383,532	0.214	81,966	1.34	512,539
0.04	2,609,686	0.206	537,284	1.75	4,562,484	307,138	0.258	79,373	1.51	464,711
0.05	2,288,922	0.229	523,165	1.90	4,345,655	283,758	0.276	78,365	1.57	446,464
0.06	2,039,485	0.250	509,523	2.04	4,170,745	265,251	0.292	77,341	1.62	430,547
0.07	1,785,060	0.276	493,020	2.23	3,976,425	248,267	0.307	76,252	1.68	416,604
0.08	1,536,236	0.309	474,379	2.43	3,736,601	226,336	0.330	74,626	1.75	396,639
0.09	1,324,423	0.345	456,503	2.63	3,483,966	205,082	0.355	72,821	1.82	373,993
0.10	1,177,972	0.376	442,750	2.79	3,288,610	197,146	0.366	72,074	1.86	365,710
0.11	1,056,601	0.407	430,125	2.96	3,129,818	185,059	0.383	70,809	1.90	351,291
0.12	970,531	0.433	420,313	3.09	3,003,110	167,362	0.411	68,787	1.97	329,749
0.13	902,376	0.456	411,862	3.21	2,893,105	152,477	0.439	66,949	2.04	310,422
0.14	849,677	0.477	404,972	3.31	2,808,536	142,030	0.462	65,552	2.10	298,255
0.15	802,216	0.496	397,957	3.40	2,730,397	135,805	0.476	64,653	2.15	291,658
0.16	758,292	0.516	391,150	3.52	2,666,434	128,719	0.494	63,550	2.22	285,223
0.17	716,247	0.536	384,220	3.63	2,597,543	124,571	0.505	62,876	2.25	280,608
0.18	685,841	0.552	378,922	3.72	2,549,138	120,326	0.516	62,137	2.30	276,407
0.19	658,995	0.567	373,975	3.81	2,507,655	111,810	0.542	60,564	2.37	264,499
0.20	628,057	0.586	367,971	3.92	2,461,994	105,656	0.562	59,371	2.44	258,037
0.21	604,002	0.601	363,048	4.01	2,423,672	100,164	0.581	58,245	2.52	252,107
0.22	576,977	0.619	357,257	4.12	2,377,130	95,147	0.601	57,167	2.59	246,422
0.23	553,570	0.636	352,017	4.22	2,334,034	90,420	0.620	56,103	2.66	240,792
0.24	533,433	0.651	347,296	4.31	2,298,805	86,663	0.637	55,216	2.72	235,829
0.25	511,739	0.668	342,002	4.37	2,237,529	82,629	0.656	54,231	2.79	230,159
0.26	492,978	0.684	337,234	4.47	2,202,257	78,541	0.677	53,191	2.86	224,295
0.27	474,615	0.700	332,376	4.57	2,166,784	75,162	0.696	52,300	2.92	219,411
0.28	459,883	0.714	328,333	4.65	2,137,549	68,657	0.736	50,508	3.03	208,020
0.29	446,284	0.727	324,461	4.73	2,108,699	66,670	0.749	49,940	3.07	204,672
0.30	432,914	0.740	320,530	4.81	2,080,345	64,862	0.762	49,407	3.11	201,814
0.31	419,134	0.755	316,336	4.89	2,048,057	62,232	0.781	48,604	3.18	197,848
0.32	403,447	0.772	311,401	4.98	2,011,105	61,069	0.790	48,240	3.20	195,503
0.33	389,596	0.788	306,909	5.08	1,977,403	59,582	0.802	47,756	3.24	192,856
0.34	374,226	0.806	301,759	5.13	1,919,597	57,892	0.815	47,197	3.28	190,162
0.35	359,728	0.825	296,776	5.23	1,882,780	56,641	0.826	46,768	3.31	187,557
0.36	344,660	0.846	291,432	5.35	1,842,458	50,690	0.881	44,651	3.45	174,656
0.37	329,739	0.867	285,991	5.41	1,783,781	45,428	0.941	42,734	3.61	163,914
0.38	318,769	0.884	281,885	5.45	1,735,764	40,834	1.004	41,017	3.77	154,023
0.39	304,756	0.907	276,493	5.57	1,697,293	38,422	1.043	40,090	3.87	148,717
0.40	293,702	0.927	272,137	5.61	1,647,621	36,641	1.075	39,385	3.94	144,421
0.41	281,334	0.950	267,137	5.66	1,593,384	34,066	1.126	38,343	4.05	137,886
0.42	267,725	0.977	261,491	5.80	1,552,434	32,103	1.169	37,528	4.15	133,295
0.43	257,343	0.999	257,090	5.84	1,503,218	31,228	1.190	37,155	4.20	131,076
0.44	248,045	1.020	253,052	5.87	1,456,828	29,795	1.226	36,533	4.27	127,222
0.45	240,158	1.039	249,544	5.89	1,414,706	28,977	1.248	36,169	4.32	125,136
0.46	232,175	1.059	245,910	5.91	1,372,392	28,358	1.266	35,888	4.36	123,632
0.47	222,195	1.086	241,275	5.88	1,306,942	27,181	1.300	35,340	4.43	120,493
0.48	212,276	1.114	236,567	5.93	1,257,736	25,741	1.346	34,654	4.52	116,438
0.49	206,133	1.133	233,589	5.92	1,221,302	24,492	1.390	34,051	4.68	114,619
0.50	201,246	1.149	231,176	5.91	1,189,569	23,332	1.435	33,478	4.70	109,648



## 1998 ROSEBUD RESOURCE ESTIMATE

## TOTAL ROSEBUD DEPOSIT RESOURCE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.51	194,737	1.170	227,892	5.91	1,151,816	22,948	1.450	33,285	4.73	108,544
0.52	189,111	1.190	224,996	5.91	1,116,879	21,520	1.512	32,547	4.85	104,411
0.53	181,844	1.216	221,187	5.92	1,077,192	20,928	1.540	32,235	4.91	102,674
0.54	175,619	1.241	217,858	6.00	1,053,955	20,816	1.546	32,176	4.92	102,343
0.55	171,324	1.258	215,522	5.97	1,023,343	20,575	1.558	32,046	4.94	101,558
0.56	167,825	1.273	213,583	6.02	1,010,937	19,873	1.593	31,657	4.98	99,015
0.57	164,023	1.289	211,436	5.99	982,604	19,444	1.616	31,415	5.02	97,693
0.58	160,221	1.306	209,249	6.05	969,034	19,360	1.620	31,366	5.03	97,435
0.59	156,910	1.321	207,315	6.09	956,244	19,229	1.627	31,290	5.05	97,024
0.60	153,718	1.336	205,419	6.14	944,140	19,213	1.628	31,280	5.05	96,973
0.61	150,556	1.352	203,506	6.09	917,038	19,207	1.628	31,277	5.05	96,954
0.62	148,872	1.360	202,474	6.12	910,447	19,083	1.635	31,201	5.06	96,482
0.63	147,147	1.369	201,396	6.14	903,606	18,993	1.640	31,145	5.06	96,175
0.64	144,710	1.381	199,849	6.18	894,533	18,859	1.647	31,061	5.08	95,721
0.65	142,223	1.394	198,246	6.22	884,585	18,780	1.651	31,009	5.08	95,441
0.66	139,936	1.406	196,749	6.26	876,098	18,865	1.647	31,064	5.07	95,736
0.67	138,668	1.413	195,905	6.28	870,972	18,810	1.649	31,027	5.08	95,544
0.68	136,486	1.425	194,433	6.22	849,277	18,624	1.659	30,902	5.09	94,880
0.69	135,278	1.431	193,606	6.24	844,562	18,656	1.658	30,924	5.09	95,002
0.70	133,048	1.444	192,059	6.29	836,547	18,569	1.662	30,864	5.10	94,681
0.71	131,360	1.453	190,870	6.32	830,785	18,569	1.662	30,864	5.10	94,681
0.72	127,430	1.476	188,061	6.44	820,868	18,531	1.664	30,836	5.11	94,633
0.73	125,716	1.486	186,821	6.48	814,773	18,531	1.664	30,836	5.11	94,633
0.74	124,663	1.492	186,047	6.51	811,118	18,586	1.661	30,875	5.10	94,845
0.75	123,502	1.499	185,182	6.53	806,081	18,006	1.691	30,446	5.21	93,750
0.76	122,544	1.505	184,459	6.54	801,935	18,049	1.689	30,478	5.20	93,922
0.77	121,495	1.512	183,657	6.56	797,122	17,960	1.693	30,411	5.20	93,348
0.78	119,978	1.521	182,482	6.59	790,619	17,960	1.693	30,411	5.20	93,348
0.79	119,021	1.527	181,732	6.61	786,301	17,960	1.693	30,411	5.20	93,348
0.80	118,086	1.533	180,990	6.62	782,088	17,960	1.693	30,411	5.20	93,348
0.81	117,117	1.539	180,210	6.64	777,598	18,047	1.689	30,480	5.19	93,720
0.82	116,333	1.544	179,571	6.65	773,921	18,047	1.689	30,480	5.19	93,720
0.83	115,151	1.551	178,595	6.68	768,686	18,047	1.689	30,480	5.19	93,720
0.84	114,042	1.558	177,672	6.70	763,674	18,047	1.689	30,480	5.19	93,720
0.85	112,966	1.565	176,764	6.72	758,722	18,058	1.688	30,489	5.19	93,770
0.86	111,778	1.572	175,750	6.74	753,389	18,145	1.684	30,563	5.19	94,165
0.87	110,109	1.583	174,310	6.78	746,782	17,950	1.693	30,393	5.22	93,782
0.88	108,657	1.593	173,041	6.82	741,535	17,588	1.710	30,077	5.29	93,082
0.89	106,265	1.609	170,928	6.90	733,285	17,099	1.734	29,642	5.39	92,241
0.90	103,321	1.629	168,296	7.04	727,084	16,400	1.769	29,018	5.56	91,173
0.91	101,953	1.639	167,058	7.07	720,854	16,311	1.774	28,938	5.58	90,980
0.92	101,253	1.644	166,419	7.09	717,581	16,311	1.774	28,938	5.58	90,980
0.93	100,193	1.651	165,440	7.11	712,398	16,311	1.774	28,938	5.58	90,980
0.94	99,005	1.660	164,329	7.13	706,182	16,311	1.774	28,938	5.58	90,980
0.95	98,591	1.663	163,941	7.14	703,945	16,311	1.774	28,938	5.58	90,980
0.96	97,629	1.670	163,025	7.16	698,829	16,333	1.773	28,959	5.58	91,090
0.97	96,805	1.676	162,230	7.17	694,525	16,398	1.770	29,021	5.58	91,424
0.98	95,845	1.683	161,293	7.19	689,353	16,442	1.768	29,064	5.57	91,654
0.99	95,161	1.688	160,621	7.21	685,774	16,442	1.768	29,064	5.57	91,654
1.00	94,196	1.695	159,661	7.22	680,493	16,417	1.769	29,039	5.57	91,520



## 1998 ROSEBUD RESOURCE ESTIMATE

## SOUTH ZONE

## Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.01	3,442,968	0.095	327,106	0.93	3,207,390	87,076	0.221	19,225	1.33	115404.07
0.02	1,805,981	0.168	304,209	1.58	2,853,184	43,073	0.430	18,536	2.54	109364.98
0.03	1,335,232	0.220	293,382	2.01	2,689,099	34,164	0.536	18,322	3.15	107582.36
0.04	1,171,976	0.246	287,832	2.22	2,607,554	32,214	0.567	18,260	3.32	107077.75
0.05	1,063,915	0.266	283,081	2.41	2,564,517	31,676	0.576	18,237	3.37	106891.75
0.06	960,184	0.289	277,371	2.62	2,512,784	30,168	0.602	18,159	3.52	106262.74
0.07	852,502	0.317	270,371	2.87	2,449,368	27,979	0.644	18,019	3.76	105135.54
0.08	741,577	0.353	262,050	3.16	2,346,059	25,977	0.688	17,869	4.00	103952.95
0.09	646,430	0.393	254,068	3.43	2,220,436	24,865	0.715	17,776	4.15	103235.06
0.10	568,780	0.434	246,780	3.70	2,104,145	23,260	0.758	17,625	4.39	102062.79
0.11	513,602	0.469	241,042	3.95	2,029,528	21,525	0.810	17,444	4.68	100711.35
0.12	476,303	0.497	236,791	4.13	1,968,495	17,897	0.952	17,030	5.45	97593.90
0.13	443,013	0.525	232,667	4.31	1,909,414	16,079	1.045	16,804	5.97	95931.14
0.14	421,148	0.546	229,944	4.44	1,871,351	15,773	1.063	16,765	6.07	95682.84
0.15	405,323	0.561	227,458	4.55	1,842,428	15,561	1.075	16,734	6.13	95457.55
0.16	388,812	0.578	224,899	4.69	1,821,703	15,365	1.087	16,705	6.20	95269.03
0.17	376,219	0.592	222,821	4.80	1,804,869	15,324	1.090	16,698	6.21	95220.73
0.18	364,170	0.606	220,725	4.91	1,787,889	15,281	1.092	16,691	6.23	95180.27
0.19	352,644	0.620	218,604	5.02	1,770,707	15,270	1.093	16,689	6.23	95169.36
0.20	341,303	0.634	216,404	5.14	1,752,888	15,227	1.096	16,681	6.25	95124.48
0.21	330,986	0.647	214,289	5.24	1,735,758	15,279	1.092	16,692	6.23	95182.04
0.22	318,154	0.665	211,543	5.39	1,713,509	15,225	1.096	16,681	6.25	95118.91
0.23	306,562	0.682	208,946	5.52	1,692,481	15,247	1.094	16,686	6.24	95145.76
0.24	295,645	0.698	206,392	5.65	1,671,792	15,215	1.096	16,678	6.25	95104.88
0.25	286,557	0.713	204,178	5.70	1,632,094	15,220	1.096	16,679	6.25	95086.57
0.26	276,216	0.730	201,552	5.83	1,611,107	15,137	1.101	16,660	6.27	94951.13
0.27	266,791	0.746	199,053	5.96	1,591,128	15,073	1.104	16,643	6.29	94847.58
0.28	258,443	0.761	196,756	6.09	1,572,775	14,997	1.109	16,625	6.32	94743.72
0.29	249,235	0.779	194,133	6.23	1,551,805	15,070	1.104	16,642	6.29	94837.86
0.30	242,204	0.793	192,066	6.34	1,535,280	15,091	1.103	16,646	6.29	94857.71
0.31	232,842	0.813	189,220	6.50	1,512,534	15,101	1.102	16,648	6.28	94834.18
0.32	225,201	0.830	186,813	6.63	1,493,292	15,058	1.105	16,635	6.29	94759.72
0.33	218,256	0.846	184,564	6.76	1,475,309	14,962	1.110	16,604	6.32	94536.24
0.34	210,952	0.863	182,114	6.81	1,436,313	14,990	1.108	16,616	6.31	94589.42
0.35	204,443	0.880	179,874	6.94	1,418,652	14,803	1.118	16,552	6.36	94162.35
0.36	195,637	0.903	176,748	7.13	1,393,996	14,287	1.146	16,368	6.50	92853.35
0.37	187,016	0.928	173,607	7.22	1,350,727	13,877	1.169	16,218	6.61	91793.73
0.38	180,496	0.948	171,170	7.28	1,313,516	12,848	1.232	15,832	6.93	89077.36
0.39	173,455	0.971	168,459	7.45	1,292,714	12,239	1.275	15,599	7.15	87481.22
0.40	167,305	0.992	166,035	7.51	1,256,418	11,360	1.342	15,250	7.49	85076.41
0.41	161,100	1.015	163,528	7.57	1,220,017	9,771	1.495	14,608	8.26	80673.37
0.42	155,984	1.035	161,405	7.72	1,204,180	9,289	1.551	14,407	8.54	79320.13
0.43	151,564	1.053	159,531	7.74	1,173,197	9,087	1.576	14,321	8.66	78723.04
0.44	145,883	1.077	157,067	7.80	1,138,338	8,856	1.606	14,220	8.81	78043.48
0.45	141,812	1.095	155,256	7.82	1,108,661	8,768	1.617	14,181	8.87	77788.17
0.46	138,045	1.112	153,540	7.82	1,080,044	8,766	1.618	14,180	8.87	77760.27
0.47	132,636	1.139	151,030	7.77	1,030,192	8,309	1.681	13,967	9.19	76389.31
0.48	127,934	1.163	148,795	7.81	999,087	7,436	1.822	13,551	9.92	73755.57
0.49	125,288	1.177	147,514	7.78	974,767	7,026	1.901	13,354	10.56	74175.04
0.50	122,654	1.192	146,214	7.75	950,594	6,108	2.112	12,901	11.43	69834.58

## 1998 ROSEBUD RESOURCE ESTIMATE

## SOUTH ZONE

## Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.51	119,693	1.209	144,722	7.73	925,466	5,822	2.191	12,757	11.85	68989.09
0.52	117,146	1.224	143,410	7.70	901,796	5,140	2.413	12,405	13.02	66899.63
0.53	113,043	1.250	141,261	7.72	873,220	4,791	2.551	12,221	13.74	65834.91
0.54	111,464	1.260	140,417	7.79	868,006	4,679	2.599	12,162	14.00	65504.12
0.55	109,266	1.274	139,221	7.74	845,776	4,503	2.680	12,067	14.43	64959.95
0.56	106,784	1.291	137,845	7.84	837,417	4,406	2.727	12,013	14.67	64654.87
0.57	104,151	1.309	136,358	7.81	813,847	4,192	2.837	11,893	15.26	63976.19
0.58	100,984	1.332	134,535	7.95	802,972	4,172	2.848	11,881	15.32	63911.29
0.59	99,361	1.344	133,589	8.02	797,326	4,101	2.887	11,840	15.53	63683.32
0.60	97,424	1.359	132,439	8.11	790,462	4,098	2.889	11,838	15.54	63673.16
0.61	96,270	1.368	131,741	8.02	772,255	4,092	2.892	11,835	15.56	63653.99
0.62	95,126	1.378	131,040	8.07	768,141	4,013	2.937	11,786	15.80	63386.95
0.63	93,929	1.387	130,292	8.13	763,760	3,923	2.990	11,730	16.08	63079.65
0.64	91,492	1.407	128,745	8.25	754,687	3,873	3.021	11,699	16.24	62905.67
0.65	89,543	1.424	127,489	8.35	747,331	3,795	3.069	11,648	16.50	62630.05
0.66	87,529	1.441	126,170	8.45	739,597	3,880	3.016	11,703	16.22	62924.67
0.67	86,506	1.451	125,490	8.50	735,609	3,902	3.003	11,717	16.15	63002.03
0.68	84,515	1.469	124,146	8.45	714,497	3,815	3.056	11,659	16.43	62690.01
0.69	83,589	1.478	123,513	8.50	710,858	3,913	2.997	11,726	16.11	63048.62
0.70	81,760	1.495	122,245	8.61	703,557	3,826	3.049	11,666	16.40	62728.18
0.71	80,585	1.507	121,417	8.67	698,791	3,826	3.049	11,666	16.40	62728.18
0.72	79,257	1.520	120,469	8.75	693,336	3,869	3.023	11,696	16.25	62888.85
0.73	77,973	1.533	119,539	8.82	687,987	3,869	3.023	11,696	16.25	62888.85
0.74	77,189	1.541	118,963	8.87	684,670	3,924	2.991	11,735	16.08	63100.74
0.75	76,361	1.550	118,346	8.92	681,120	3,924	2.991	11,735	16.08	63100.74
0.76	75,469	1.559	117,673	8.97	677,243	3,967	2.966	11,767	15.95	63273.22
0.77	74,576	1.569	116,989	9.03	673,313	4,011	2.942	11,801	15.82	63451.37
0.78	73,161	1.584	115,893	9.12	667,000	4,011	2.942	11,801	15.82	63451.37
0.79	72,204	1.595	115,143	9.18	662,682	4,011	2.942	11,801	15.82	63451.37
0.80	71,289	1.605	114,417	9.24	658,507	4,011	2.942	11,801	15.82	63451.37
0.81	70,320	1.616	113,637	9.30	654,017	4,098	2.896	11,870	15.57	63823.26
0.82	69,536	1.625	112,998	9.35	650,340	4,098	2.896	11,870	15.57	63823.26
0.83	68,491	1.637	112,136	9.42	645,377	4,098	2.896	11,870	15.57	63823.26
0.84	67,490	1.649	111,303	9.49	640,581	4,098	2.896	11,870	15.57	63823.26
0.85	66,510	1.661	110,476	9.56	635,823	4,109	2.891	11,879	15.54	63872.71
0.86	65,498	1.674	109,612	9.63	630,850	4,196	2.849	11,953	15.32	64268.47
0.87	64,355	1.688	108,625	9.71	625,172	4,196	2.849	11,953	15.32	64268.47
0.88	63,604	1.698	107,969	9.77	621,395	4,218	2.838	11,972	15.26	64372.42
0.89	62,254	1.715	106,779	9.87	614,543	4,261	2.818	12,009	15.15	64574.50
0.90	61,448	1.726	106,059	9.93	610,401	4,261	2.818	12,009	15.15	64574.50
0.91	60,339	1.741	105,055	10.02	604,627	4,261	2.818	12,009	15.15	64574.50
0.92	59,772	1.749	104,537	10.07	601,645	4,261	2.818	12,009	15.15	64574.50
0.93	58,858	1.762	103,693	10.14	596,786	4,261	2.818	12,009	15.15	64574.50
0.94	57,727	1.778	102,635	10.23	590,697	4,261	2.818	12,009	15.15	64574.50
0.95	57,313	1.784	102,247	10.27	588,460	4,261	2.818	12,009	15.15	64574.50
0.96	56,398	1.798	101,376	10.35	583,452	4,283	2.809	12,030	15.10	64684.65
0.97	55,658	1.809	100,662	10.41	579,343	4,348	2.781	12,092	14.95	65019.13
0.98	54,766	1.822	99,791	10.49	574,330	4,392	2.763	12,135	14.86	65249.42
0.99	54,144	1.832	99,180	10.54	570,812	4,392	2.763	12,135	14.86	65249.42
1.00	53,252	1.846	98,293	10.62	565,705	4,367	2.773	12,110	14.91	65115.34



## 1998 ROSEBUD RESOURCE ESTIMATE

## NORTH ZONE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.01	2,122,922	0.052	111,408	0.55	1,170,125	534,217	0.089	47,792	0.64	343211.00
0.02	1,446,698	0.070	101,265	0.68	985,930	387,880	0.118	45,597	0.78	303350.00
0.03	844,238	0.103	86,806	0.86	723,474	224,488	0.186	41,676	1.03	232172.00
0.04	474,901	0.156	74,248	1.04	495,441	153,698	0.255	39,269	1.23	188465.00
0.05	311,146	0.215	67,043	1.17	364,735	133,374	0.288	38,395	1.29	172611.00
0.06	232,056	0.270	62,769	1.24	288,232	122,201	0.309	37,769	1.32	161412.00
0.07	194,055	0.311	60,334	1.26	245,458	119,264	0.315	37,579	1.33	158059.00
0.08	169,648	0.345	58,528	1.27	214,619	117,882	0.318	37,476	1.33	156312.00
0.09	156,007	0.368	57,391	1.26	196,309	115,730	0.322	37,293	1.33	153365.00
0.10	151,788	0.375	56,996	1.27	192,599	114,691	0.324	37,194	1.33	152429.00
0.11	148,794	0.381	56,683	1.28	189,848	113,712	0.326	37,094	1.33	151551.00
0.12	144,397	0.389	56,181	1.29	186,927	111,723	0.330	36,863	1.34	150209.00
0.13	140,419	0.397	55,684	1.31	183,260	108,128	0.337	36,417	1.36	146921.00
0.14	135,845	0.405	55,057	1.32	179,884	103,102	0.347	35,739	1.39	143268.00
0.15	129,453	0.418	54,145	1.35	175,082	98,874	0.355	35,126	1.42	140038.00
0.16	121,352	0.436	52,890	1.39	168,467	92,533	0.369	34,137	1.46	134827.00
0.17	114,823	0.451	51,819	1.42	162,826	89,356	0.376	33,619	1.48	132098.00
0.18	108,769	0.467	50,759	1.45	157,244	85,410	0.386	32,932	1.50	128481.00
0.19	101,454	0.487	49,406	1.48	150,114	79,951	0.399	31,928	1.54	123189.00
0.20	89,180	0.527	47,025	1.54	137,569	74,008	0.416	30,775	1.58	117115.00
0.21	83,896	0.548	45,942	1.57	131,862	68,464	0.433	29,638	1.62	111127.00
0.22	77,546	0.575	44,583	1.61	124,702	63,501	0.450	28,571	1.66	105505.00
0.23	73,699	0.593	43,725	1.63	120,183	58,778	0.468	27,508	1.70	99906.00
0.24	69,075	0.617	42,638	1.66	114,457	55,469	0.482	26,728	1.73	95792.00
0.25	65,140	0.640	41,674	1.68	109,378	52,173	0.497	25,923	1.75	91555.00
0.26	61,646	0.662	40,783	1.70	104,684	48,746	0.514	25,049	1.78	86951.00
0.27	57,127	0.693	39,590	1.72	98,399	45,681	0.531	24,240	1.81	82688.00
0.28	53,345	0.723	38,554	1.74	92,939	42,218	0.552	23,288	1.84	77670.00
0.29	50,826	0.744	37,839	1.75	89,170	40,679	0.562	22,851	1.85	75368.00
0.30	47,433	0.777	36,841	1.77	83,914	38,917	0.574	22,333	1.87	72638.00
0.31	45,631	0.795	36,293	1.78	81,028	36,277	0.593	21,528	1.89	68396.00
0.32	43,949	0.814	35,763	1.78	78,243	35,345	0.601	21,236	1.89	66863.00
0.33	42,501	0.830	35,294	1.78	75,772	34,004	0.612	20,799	1.90	64560.00
0.34	40,968	0.849	34,782	1.79	73,308	32,291	0.626	20,230	1.91	61826.00
0.35	39,220	0.871	34,180	1.79	70,140	31,563	0.633	19,979	1.92	60503.00
0.36	38,061	0.887	33,768	1.79	67,966	27,930	0.669	18,686	1.92	53689.00
0.37	35,861	0.919	32,965	1.78	63,735	23,549	0.726	17,091	1.92	45287.00
0.38	33,853	0.952	32,212	1.77	59,768	20,183	0.785	15,835	1.92	38673.00
0.39	31,062	1.003	31,140	1.74	54,122	18,443	0.822	15,165	1.91	35143.00
0.40	29,852	1.027	30,664	1.73	51,616	17,552	0.844	14,813	1.90	33284.00
0.41	28,963	1.046	30,307	1.72	49,733	16,598	0.869	14,426	1.88	31249.00
0.42	27,645	1.077	29,761	1.70	46,859	15,117	0.914	13,812	1.85	28011.00
0.43	26,955	1.093	29,470	1.68	45,321	14,565	0.932	13,577	1.84	26775.00
0.44	26,726	1.099	29,370	1.68	44,798	13,810	0.959	13,249	1.81	25044.00
0.45	26,485	1.105	29,263	1.67	44,235	13,204	0.983	12,979	1.79	23627.00
0.46	25,855	1.121	28,977	1.65	42,724	12,587	1.009	12,699	1.76	22151.00
0.47	25,586	1.128	28,852	1.64	42,067	11,867	1.042	12,364	1.72	20383.00
0.48	25,233	1.137	28,685	1.63	41,185	11,300	1.070	12,094	1.68	18961.00
0.49	24,715	1.150	28,433	1.61	39,862	10,557	1.112	11,735	1.62	17070.00
0.50	24,019	1.169	28,089	1.58	38,047	10,315	1.126	11,615	1.59	16439.00

## 1998 ROSEBUD RESOURCE ESTIMATE

## NORTH ZONE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.51	23,338	1.189	27,745	1.55	36,235	10,217	1.132	11,566	1.58	16181.00
0.52	22,844	1.203	27,490	1.53	34,892	9,477	1.180	11,183	1.49	14161.00
0.53	21,728	1.238	26,905	1.46	31,811	9,234	1.197	11,055	1.46	13489.00
0.54	21,269	1.253	26,660	1.43	30,519	9,234	1.197	11,055	1.46	13489.00
0.55	21,154	1.257	26,598	1.43	30,189	9,191	1.200	11,032	1.45	13336.00
0.56	21,027	1.262	26,527	1.42	29,818	8,997	1.214	10,924	1.42	12796.00
0.57	20,896	1.266	26,453	1.41	29,428	8,782	1.230	10,802	1.38	12153.00
0.58	20,875	1.267	26,441	1.41	29,365	8,718	1.235	10,765	1.37	11960.00
0.59	20,763	1.270	26,375	1.40	29,107	8,658	1.239	10,730	1.36	11777.00
0.60	20,438	1.281	26,182	1.37	28,000	8,645	1.240	10,722	1.36	11736.00
0.61	20,305	1.285	26,102	1.36	27,577	8,645	1.240	10,722	1.36	11736.00
0.62	20,305	1.285	26,102	1.36	27,577	8,644	1.240	10,722	1.36	11732.00
0.63	20,305	1.285	26,102	1.36	27,577	8,644	1.240	10,722	1.36	11732.00
0.64	20,305	1.285	26,102	1.36	27,577	8,560	1.246	10,669	1.34	11452.00
0.65	20,305	1.285	26,102	1.36	27,577	8,559	1.246	10,668	1.34	11448.00
0.66	20,065	1.293	25,945	1.34	26,986	8,559	1.246	10,668	1.34	11448.00
0.67	20,065	1.293	25,945	1.34	26,986	8,482	1.252	10,617	1.32	11179.00
0.68	20,065	1.293	25,945	1.34	26,986	8,383	1.258	10,550	1.29	10827.00
0.69	20,065	1.293	25,945	1.34	26,986	8,317	1.263	10,505	1.27	10590.00
0.70	20,065	1.293	25,945	1.34	26,986	8,317	1.263	10,505	1.27	10590.00
0.71	20,001	1.295	25,900	1.34	26,749	8,317	1.263	10,505	1.27	10590.00
0.72	20,001	1.295	25,900	1.34	26,749	8,283	1.265	10,481	1.26	10462.00
0.73	20,001	1.295	25,900	1.34	26,749	8,283	1.265	10,481	1.26	10462.00
0.74	19,924	1.297	25,843	1.34	26,749	8,283	1.265	10,481	1.26	10462.00
0.75	19,644	1.305	25,635	1.29	25,357	8,253	1.267	10,459	1.25	10345.00
0.76	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.77	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.78	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.79	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.80	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.81	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.82	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.83	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.84	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.85	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.86	19,623	1.306	25,619	1.29	25,341	8,253	1.267	10,459	1.25	10345.00
0.87	19,491	1.309	25,506	1.29	25,229	8,234	1.268	10,442	1.25	10329.00
0.88	19,491	1.309	25,506	1.29	25,229	8,234	1.268	10,442	1.25	10329.00
0.89	18,839	1.323	24,927	1.31	24,656	8,164	1.271	10,380	1.26	10267.00
0.90	16,835	1.374	23,135	1.36	22,884	7,822	1.288	10,075	1.27	9965.00
0.91	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.92	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.93	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.94	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.95	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.96	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.97	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.98	16,753	1.377	23,061	1.36	22,811	7,822	1.288	10,075	1.27	9965.00
0.99	16,691	1.378	23,000	1.36	22,750	7,822	1.288	10,075	1.27	9965.00
1.00	16,691	1.378	23,000	1.36	22,750	7,822	1.288	10,075	1.27	9965.00



## 1998 ROSEBUD RESOURCE ESTIMATE

## EAST ZONE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.01	4,573,062	0.053	241,971	0.75	3,444,657	304,398	0.082	25,067	0.87	265170.00
0.02	2,250,697	0.092	207,158	1.07	2,405,736	175,614	0.132	23,135	1.18	207522.00
0.03	1,193,439	0.153	182,824	1.41	1,681,356	124,880	0.176	21,968	1.38	172785.00
0.04	962,809	0.182	175,204	1.52	1,459,489	121,226	0.180	21,844	1.40	169168.00
0.05	913,861	0.189	173,041	1.55	1,416,403	118,708	0.183	21,733	1.41	166961.00
0.06	847,245	0.200	169,383	1.62	1,369,729	112,882	0.190	21,413	1.44	162872.00
0.07	738,503	0.220	162,315	1.74	1,281,599	101,024	0.204	20,654	1.52	153409.00
0.08	625,011	0.246	153,801	1.88	1,175,923	82,477	0.234	19,281	1.65	136374.00
0.09	521,986	0.278	145,044	2.04	1,067,221	64,487	0.275	17,752	1.82	117393.00
0.10	457,404	0.304	138,974	2.17	991,866	59,195	0.291	17,255	1.88	111218.00
0.11	394,205	0.336	132,400	2.31	910,442	49,822	0.327	16,271	1.99	99029.00
0.12	349,831	0.364	127,341	2.42	847,688	37,742	0.395	14,894	2.17	81946.00
0.13	318,944	0.387	123,511	2.51	800,431	28,270	0.486	13,728	2.39	67570.00
0.14	292,684	0.410	119,971	2.59	757,301	23,155	0.564	13,048	2.56	59304.00
0.15	267,440	0.435	116,354	2.67	712,887	21,370	0.599	12,793	2.63	56162.00
0.16	248,128	0.457	113,361	2.73	676,264	20,821	0.610	12,708	2.65	55127.00
0.17	225,205	0.487	109,580	2.80	629,848	19,891	0.631	12,559	2.68	53289.00
0.18	212,902	0.505	107,438	2.84	604,005	19,635	0.637	12,514	2.69	52746.00
0.19	204,897	0.517	105,965	2.86	586,834	16,589	0.720	11,947	2.78	46141.00
0.20	197,574	0.529	104,542	2.89	571,537	16,421	0.726	11,915	2.79	45798.00
0.21	189,120	0.544	102,817	2.94	556,052	16,421	0.726	11,915	2.79	45798.00
0.22	181,277	0.558	101,131	2.97	538,919	16,421	0.726	11,915	2.79	45798.00
0.23	173,309	0.573	99,346	3.01	521,370	16,395	0.726	11,909	2.79	45740.00
0.24	168,713	0.582	98,266	3.04	512,556	15,979	0.739	11,810	2.81	44932.00
0.25	160,042	0.601	96,150	3.10	496,057	15,236	0.763	11,629	2.86	43517.00
0.26	155,116	0.612	94,899	3.14	486,466	14,658	0.783	11,482	2.89	42393.00
0.27	150,697	0.622	93,733	3.17	477,257	14,408	0.792	11,417	2.91	41875.00
0.28	148,095	0.628	93,023	3.19	471,835	11,442	0.926	10,595	3.11	35606.00
0.29	146,223	0.633	92,489	3.20	467,724	10,921	0.957	10,447	3.16	34466.00
0.30	143,277	0.639	91,623	3.22	461,151	10,854	0.961	10,428	3.16	34318.00
0.31	140,661	0.646	90,823	3.23	454,495	10,854	0.961	10,428	3.19	34618.00
0.32	134,297	0.661	88,825	3.27	439,570	10,666	0.972	10,369	3.18	33880.00
0.33	128,839	0.676	87,051	3.31	426,322	10,616	0.975	10,353	3.18	33760.00
0.34	122,306	0.694	84,863	3.35	409,976	10,611	0.975	10,351	3.18	33747.00
0.35	116,065	0.713	82,722	3.39	393,988	10,275	0.996	10,237	3.20	32892.00
0.36	110,962	0.729	80,916	3.43	380,496	8,473	1.133	9,597	3.32	28114.00
0.37	106,862	0.743	79,419	3.46	369,319	8,002	1.178	9,425	3.35	26833.00
0.38	104,420	0.752	78,503	3.47	362,480	7,803	1.198	9,350	3.37	26273.00
0.39	100,239	0.767	76,894	3.50	350,457	7,740	1.205	9,326	3.37	26093.00
0.40	96,545	0.781	75,438	3.52	339,587	7,729	1.206	9,322	3.37	26061.00
0.41	91,271	0.803	73,302	3.55	323,634	7,697	1.209	9,309	3.37	25964.00
0.42	84,096	0.836	70,325	3.58	301,395	7,697	1.209	9,309	3.37	25964.00
0.43	78,824	0.864	68,089	3.61	284,700	7,576	1.222	9,257	3.38	25578.00
0.44	75,436	0.883	66,615	3.63	273,692	7,129	1.271	9,064	3.39	24135.00
0.45	71,861	0.905	65,025	3.64	261,810	7,005	1.286	9,009	3.39	23721.00
0.46	68,275	0.928	63,393	3.66	249,624	7,005	1.286	9,009	3.39	23721.00
0.47	63,973	0.960	61,393	3.67	234,683	7,005	1.286	9,009	3.39	23721.00
0.48	59,109	1.000	59,087	3.68	217,464	7,005	1.286	9,009	3.39	23721.00
0.49	56,130	1.027	57,642	3.68	206,673	6,909	1.297	8,962	3.38	23374.00
0.50	54,573	1.042	56,873	3.68	200,928	6,909	1.297	8,962	3.38	23374.00

## 1998 ROSEBUD RESOURCE ESTIMATE

## EAST ZONE

Cumulative Tabulation at 0.01 oz Au/t Increments

Au cut off oz/t	Measured & Indicated					Inferred				
	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz	Tonnage	Au (oz/t)	AuOz	Ag (oz/t)	AgOz
0.51	51,706	1.072	55,425	3.68	190,115	6,909	1.297	8,962	3.38	23374.00
0.52	49,121	1.101	54,096	3.67	180,191	6,903	1.298	8,959	3.38	23350.00
0.53	47,073	1.126	53,021	3.66	172,161	6,903	1.298	8,959	3.38	23350.00
0.54	42,886	1.184	50,781	3.62	155,430	6,903	1.298	8,959	3.38	23350.00
0.55	40,904	1.215	49,703	3.60	147,378	6,881	1.300	8,947	3.38	23262.00
0.56	40,014	1.230	49,211	3.59	143,702	6,470	1.348	8,720	3.33	21564.00
0.57	38,976	1.248	48,625	3.57	139,329	6,470	1.348	8,720	3.33	21564.00
0.58	38,362	1.258	48,273	3.56	136,697	6,470	1.348	8,720	3.33	21564.00
0.59	36,786	1.287	47,351	3.53	129,811	6,470	1.348	8,720	3.33	21564.00
0.60	35,856	1.305	46,798	3.51	125,678	6,470	1.348	8,720	3.33	21564.00
0.61	33,981	1.344	45,663	3.45	117,206	6,470	1.348	8,720	3.33	21564.00
0.62	33,441	1.356	45,332	3.43	114,729	6,426	1.353	8,693	3.32	21363.00
0.63	32,913	1.367	45,002	3.41	112,269	6,426	1.353	8,693	3.32	21363.00
0.64	32,913	1.367	45,002	3.41	112,269	6,426	1.353	8,693	3.32	21363.00
0.65	32,375	1.379	44,655	3.39	109,677	6,426	1.353	8,693	3.32	21363.00
0.66	32,342	1.380	44,634	3.39	109,515	6,426	1.353	8,693	3.32	21363.00
0.67	32,097	1.385	44,470	3.38	108,377	6,426	1.353	8,693	3.32	21363.00
0.68	31,906	1.390	44,342	3.38	107,794	6,426	1.353	8,693	3.32	21363.00
0.69	31,624	1.396	44,148	3.37	106,718	6,426	1.353	8,693	3.32	21363.00
0.70	31,223	1.405	43,869	3.40	106,004	6,426	1.353	8,693	3.32	21363.00
0.71	30,774	1.415	43,553	3.42	105,245	6,426	1.353	8,693	3.32	21363.00
0.72	28,172	1.480	41,692	3.58	100,783	6,379	1.357	8,659	3.34	21282.00
0.73	27,742	1.492	41,382	3.61	100,037	6,379	1.357	8,659	3.34	21282.00
0.74	27,550	1.497	41,241	3.62	99,699	6,379	1.357	8,659	3.34	21282.00
0.75	27,497	1.498	41,201	3.62	99,604	5,829	1.416	8,252	3.48	20304.00
0.76	27,452	1.500	41,167	3.62	99,351	5,829	1.416	8,252	3.48	20304.00
0.77	27,296	1.504	41,049	3.61	98,468	5,696	1.431	8,151	3.43	19552.00
0.78	27,194	1.507	40,970	3.61	98,278	5,696	1.431	8,151	3.43	19552.00
0.79	27,194	1.507	40,970	3.61	98,278	5,696	1.431	8,151	3.43	19552.00
0.80	27,174	1.507	40,954	3.62	98,240	5,696	1.431	8,151	3.43	19552.00
0.81	27,174	1.507	40,954	3.62	98,240	5,696	1.431	8,151	3.43	19552.00
0.82	27,174	1.507	40,954	3.62	98,240	5,696	1.431	8,151	3.43	19552.00
0.83	27,037	1.511	40,840	3.62	97,968	5,696	1.431	8,151	3.43	19552.00
0.84	26,929	1.513	40,750	3.63	97,752	5,696	1.431	8,151	3.43	19552.00
0.85	26,833	1.516	40,669	3.64	97,558	5,696	1.431	8,151	3.43	19552.00
0.86	26,657	1.520	40,519	3.65	97,198	5,696	1.431	8,151	3.43	19552.00
0.87	26,263	1.530	40,179	3.67	96,381	5,520	1.449	7,998	3.48	19185.00
0.88	25,562	1.548	39,566	3.71	94,911	5,136	1.492	7,663	3.58	18381.00
0.89	25,172	1.558	39,222	3.74	94,086	4,674	1.552	7,253	3.72	17399.00
0.90	25,038	1.562	39,102	3.75	93,799	4,317	1.606	6,934	3.85	16633.00
0.91	24,861	1.566	38,942	3.76	93,416	4,228	1.621	6,854	3.89	16440.00
0.92	24,728	1.570	38,821	3.77	93,125	4,228	1.621	6,854	3.89	16440.00
0.93	24,582	1.574	38,686	3.78	92,801	4,228	1.621	6,854	3.89	16440.00
0.94	24,525	1.575	38,633	3.78	92,674	4,228	1.621	6,854	3.89	16440.00
0.95	24,525	1.575	38,633	3.78	92,674	4,228	1.621	6,854	3.89	16440.00
0.96	24,478	1.576	38,588	3.78	92,566	4,228	1.621	6,854	3.89	16440.00
0.97	24,394	1.579	38,507	3.79	92,371	4,228	1.621	6,854	3.89	16440.00
0.98	24,326	1.580	38,441	3.79	92,212	4,228	1.621	6,854	3.89	16440.00
0.99	24,326	1.580	38,441	3.79	92,212	4,228	1.621	6,854	3.89	16440.00
1.00	24,253	1.582	38,368	3.79	92,038	4,228	1.621	6,854	3.89	16440.00



Rosebud Mining Company, LLC  
1998 Proven & Probable Reserves

South Zone	Tons	Au (oz/t)	Ag (oz/t)	AuOz	AgOz
M&I Resource @ 0.15 oz Au/t	405,323	0.561	4.55	227,458	1,842,428
Planned Extraction of Material $\geq$ 0.15 oz Au/t	368,684	0.584	4.73	215,334	1,744,227
Dilution	59,043	0.077	1.06	4,533	62,659
Proven & Probable Reserve	427,727	0.514	4.22	219,867	1,806,886
Percent Mining Recovery (actual vs. model)	91.0%			94.7%	94.7%
Percent Dilution	13.8%				

North Zone	Tons	Au (oz/t)	Ag (oz/t)	AuOz	AgOz
M&I Resource @ 0.15 oz Au/t	129,453	0.418	1.35	54,145	175,082
Planned Extraction of Material $\geq$ 0.15 oz Au/t	121,686	0.432	1.40	52,521	169,830
Dilution	46,393	0.073	0.62	3,387	28,763
Proven & Probable Reserve	168,078	0.333	1.18	55,907	198,593
Percent Mining Recovery	94.0%			97.0%	97.0%
Percent Dilution	27.6%				

East Zone	Tons	Au (oz/t)	Ag (oz/t)	AuOz	AgOz
M&I Resource @ 0.15 oz Au/t	267,440	0.435	2.67	116,354	712,887
Planned Extraction of Material $\geq$ 0.15 oz Au/t	251,394	0.449	2.75	112,863	691,500
Dilution	95,843	0.073	0.62	6,997	59,423
Proven & Probable Reserve	347,237	0.345	2.16	119,860	750,923
Percent Mining Recovery	94.0%			97.0%	97.0%
Percent Dilution	27.6%				

Rosebud Total	Tons	Au (oz/t)	Ag (oz/t)	AuOz	AgOz
M&I Resource @ 0.15 oz Au/t	802,216	0.496	3.40	397,957	2,730,397
Planned Extraction of Material $\geq$ 0.15 oz Au/t	741,763	0.513	3.51	380,718	2,605,557
Dilution	201,279	0.074	0.75	14,916	150,845
Proven & Probable Reserve	943,042	0.420	2.92	395,634	2,756,402
Percent Mining Recovery	92.5%			95.7%	95.4%
Percent Dilution	21.3%				



Rosebud Mining Company, LLC.  
South Zone - 1998 Proven & Probable Reserve

Tabulation of M & I model blocks outside of as-built solids & inside design solids  
Dilution adjusted to historic average by stope  
Tonnage factor = 13.8 ft<sup>3</sup>/ton

Stope ID	Level	M&I blocks >= 0.15 oz Au/t within stope design				Dilution *				1998 Proven & Probable Reserve				% Dilution
		Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	
25	4412	2,400	174	0.254	44	382	28	0.075	2	2,782	202	0.229	46	13.7%
25	4424	18,600	1,349	0.225	303	2,957	214	0.071	15	21,557	1,563	0.204	319	13.7%
25	4436	56,400	4,089	0.297	1,174	8,968	650	0.082	53	65,368	4,739	0.259	1,227	13.7%
25	4448	60,600	4,394	0.309	1,358	9,635	699	0.089	62	70,235	5,092	0.279	1,420	13.7%
25	4460	72,600	5,264	0.262	1,379	11,543	837	0.096	80	84,143	6,100	0.239	1,459	13.7%
25	4472	43,200	3,132	0.351	1,099	6,869	498	0.090	45	50,069	3,630	0.315	1,144	13.7%
25	4484	42,000	3,045	0.575	1,751	6,678	484	0.065	31	48,678	3,529	0.505	1,782	13.7%
25	4496	53,700	3,893	0.623	2,425	8,538	619	0.075	46	62,238	4,512	0.548	2,472	13.7%
24	4508	50,700	3,676	0.941	3,459	8,061	584	0.066	39	58,761	4,260	0.821	3,497	13.7%
24	4520	34,500	2,501	0.771	1,928	5,486	398	0.083	33	39,986	2,899	0.677	1,961	13.7%
24	4532	83,100	6,025	0.510	3,073	13,213	958	0.095	91	96,313	6,983	0.453	3,164	13.7%
24	4544	73,200	5,307	0.380	2,017	11,639	844	0.078	66	84,839	6,151	0.339	2,082	13.7%
24	4556	87,300	6,329	0.387	2,449	13,881	1,006	0.082	83	101,181	7,336	0.345	2,532	13.7%
24	4568	185,400	13,442	0.371	4,987	29,479	2,137	0.076	162	214,679	15,579	0.331	5,149	13.7%
23	4580	47,250	3,426	0.492	1,685	4,583	332	0.072	24	51,833	3,758	0.455	1,709	8.8%
23	4592	Mined out				Mined out				Mined out				Mined out
23	4604	215,850	15,649	0.991	15,508	20,937	1,518	0.081	123	236,787	17,167	0.911	15,631	8.8%
23	4616	350,700	25,426	0.975	24,790	34,018	2,466	0.068	168	384,718	27,892	0.855	24,958	8.8%
23	4628	347,700	25,208	0.744	18,755	33,727	2,445	0.073	178	381,427	27,653	0.685	18,933	8.8%
22	4640	Mined out				Mined out				Mined out				Mined out
22	4652	Mined out				Mined out				Mined out				Mined out
22	4664	122,250	8,863	0.628	5,566	22,739	1,649	0.075	124	144,989	10,512	0.541	5,690	15.7%
22	4676	352,500	25,556	0.686	17,532	65,565	4,753	0.069	328	418,065	30,310	0.589	17,860	15.7%
22	4688	361,200	26,187	0.792	20,740	67,183	4,871	0.068	331	428,383	31,058	0.678	21,071	15.7%
22	4700	310,800	22,533	0.602	13,565	57,809	4,191	0.075	314	368,609	26,724	0.519	13,879	15.7%
22	4712	333,900	24,208	0.433	10,482	62,105	4,503	0.080	360	396,005	28,710	0.378	10,842	15.7%
22	4724	234,600	17,009	0.449	7,637	43,636	3,164	0.083	263	278,236	20,172	0.392	7,899	15.7%
21	4736	100,950	7,319	0.414	3,030	20,493	1,486	0.070	104	121,443	8,805	0.356	3,134	16.9%
21	4748	54,000	3,915	0.324	1,268	10,962	795	0.07	56	64,962	4,710	0.281	1,324	16.9%
21	4760	99,150	7,188	0.456	3,278	20,127	1,459	0.077	112	119,277	8,648	0.392	3,350	16.9%
21	4772	72,600	5,264	0.348	1,832	14,738	1,068	0.085	91	87,338	6,332	0.304	1,923	16.9%
21	4784	57,900	4,198	0.313	1,314	11,754	852	0.074	63	69,654	5,050	0.273	1,377	16.9%
14	4796	14,400	1,044	0.309	323	2,678	194	0.033	6	17,078	1,238	0.266	329	15.7%
14	4808	84,300	6,112	0.306	1,870	15,680	1,137	0.068	77	99,980	7,249	0.269	1,947	15.7%
14	4820	103,800	7,526	0.516	3,883	19,307	1,400	0.065	91	123,107	8,925	0.445	3,974	15.7%
14	4832	89,850	6,514	0.557	6,234	16,712	1,212	0.083	101	106,562	7,726	0.820	6,335	15.7%
14	4844	137,400	9,962	0.916	9,125	25,556	1,853	0.082	152	162,956	11,814	0.785	9,277	15.7%
14	4856	113,100	8,200	0.267	2,189	21,037	1,525	0.089	136	134,137	9,725	0.239	2,325	15.7%
13	4868	Mined out				Mined out				Mined out				Mined out
13	4880	Mined out				Mined out				Mined out				Mined out
13	4892	105,300	7,634	0.345	2,634	12,952	939	0.084	79	118,252	8,573	0.316	2,713	11.0%
13	4904	75,300	5,459	0.399	2,178	9,262	671	0.088	59	84,562	6,131	0.365	2,237	11.0%
13	4916	101,100	7,330	0.478	3,504	12,435	902	0.072	65	113,535	8,231	0.434	3,569	11.0%
13	4928	64,200	4,655	0.544	2,532	7,897	573	0.059	34	72,097	5,227	0.491	2,566	11.0%
12	4940	21,000	1,523	0.530	807	3,339	242	0.063	15	24,339	1,765	0.466	822	13.7%
12	4952	24,900	1,805	0.249	450	3,959	287	0.057	16	28,859	2,092	0.223	466	13.7%
12	4964	32,700	2,371	0.269	638	5,199	377	0.072	27	37,899	2,748	0.242	665	13.7%
12	4976	29,100	2,110	0.259	546	4,627	335	0.059	20	33,727	2,445	0.232	566	13.7%
12	4988	22,800	1,653	0.293	484	3,625	263	0.056	15	26,425	1,916	0.260	499	13.7%
12	5000	64,500	4,676	0.296	1,384	10,256	744	0.122	91	74,756	5,420	0.272	1,475	13.7%
12	5012	65,700	4,763	0.399	1,901	10,446	757	0.122	92	76,146	5,521	0.361	1,993	13.7%
12	5024	10,600	783	0.266	224	1,717	124	0.072	9	12,517	907	0.257	233	13.7%
Total		5,085,300	368,684	0.584	215,334	814,388	59,043	0.077	4,533	5,899,688	427,727	0.514	219,867	13.8%

Stope ID	Level	M&I blocks >= 0.14 oz Au/t within stope design				Dilution Based on Historic Average				Total				% Dilution
		Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	
25	4412-4496	349,500	25,339	0.376	9,533	55,571	4,029	0.083	336	405,071	29,368	0.336	9,869	13.7%
24	4508-4568	514,200	37,280	0.481	17,913	81,758	5,927	0.080	473	595,958	43,207	0.426	18,386	13.7%
23	4580-4628	961,500	69,709	0.871	60,739	93,266	6,752	0.073	493	1,054,766	76,470	0.801	61,232	8.8%
22	4640-4724	1,715,250	124,356	0.607	75,521	319,037	23,130	0.074	1,720	2,034,287	147,486	0.524	77,241	15.7%
21	4736-4784	384,600	27,884	0.385	10,722	78,074	5,660	0.075	426	462,674	33,544	0.332	11,148	16.9%
14	4796-4856	542,850	39,357	0.600	23,624	100,970	7,320	0.077	563	643,820	46,677	0.518	24,187	15.7%
13	4868-4928	345,900	25,078	0.433	10,848	42,546	3,055	0.077	237	388,446	28,162	0.394	11,084	11.0%
12	4940-5024	271,500	19,684	0.327	6,434	43,169	3,130	0.091	285	314,669	22,813	0.295	6,719	13.7%
Total		5,085,300	368,684	0.584	215,334	814,388	59,043	0.077	4,533	5,899,688	427,727	0.514	219,867	13.8%

\* Dilution stated above is based on operating experience for stopes 13, 14, 21, 22, & 23. Average mine-wide dilution applied to stopes 12, 24, & 25.

Rosebud Mining Company, LLC.  
South Zone - 1998 Proven & Probable Reserve

Tabulation of M & I model blocks outside of as-built solids & inside design solids  
Dilution adjusted to historic average by slope  
Tonnage factor = 13.8 ft<sup>3</sup>/ton

Stope ID	Level	M&I blocks >= 0.14 oz Au/t within stope design				M&I blocks >= 0.15 oz Au/t within stope design				Difference			
		Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz
25	4412	2,400	174	0.254	44	2,400	174	0.254	44	0	0		0
25	4424	18,600	1,349	0.225	303	18,600	1,349	0.225	303	0	0		0
25	4436	58,800	4,263	0.281	1,198	58,400	4,089	0.287	1,174	2,400	174	0.140	24
25	4448	63,900	4,633	0.300	1,390	60,600	4,394	0.309	1,358	3,300	239	0.135	32
25	4460	77,100	5,590	0.255	1,425	72,600	5,264	0.262	1,379	4,500	326	0.142	46
25	4472	46,800	3,393	0.335	1,137	43,200	3,132	0.351	1,099	3,600	261	0.143	37
25	4484	44,400	3,219	0.552	1,777	42,000	3,045	0.575	1,751	2,400	174	0.150	26
25	4496	57,300	4,154	0.593	2,463	53,700	3,893	0.623	2,425	3,600	261	0.146	38
24	4508	51,900	3,763	0.923	3,473	50,700	3,676	0.941	3,459	1,200	87	0.163	14
24	4520	39,000	2,828	0.699	1,976	34,500	2,501	0.771	1,928	4,500	326	0.147	48
24	4532	84,300	6,112	0.504	3,080	83,100	6,025	0.510	3,073	1,200	87	0.089	8
24	4544	73,200	5,307	0.380	2,017	73,200	5,307	0.380	2,017	0	0		0
24	4556	87,300	6,329	0.387	2,449	87,300	6,329	0.387	2,449	0	0		0
24	4568	189,000	13,703	0.367	5,029	185,400	13,442	0.371	4,987	3,600	261	0.161	42
23	4580	47,850	3,469	0.488	1,693	47,250	3,426	0.492	1,685	600	44	0.173	8
23	4592		Mined out				Mined out				Mined out		
23	4604	220,500	15,986	0.973	15,555	215,850	15,649	0.991	15,508	4,650	337	0.137	46
23	4616	356,700	25,861	0.961	24,852	350,700	25,426	0.975	24,790	6,000	435	0.143	62
23	4628	351,900	25,513	0.736	18,777	347,700	25,208	0.744	18,755	4,200	305	0.074	22
22	4640		Mined out				Mined out				Mined out		
22	4652		Mined out				Mined out				Mined out		
22	4664	124,950	9,059	0.617	5,589	122,250	8,863	0.628	5,566	2,700	196	0.119	23
22	4676	360,450	26,133	0.674	17,613	352,500	25,556	0.686	17,532	7,950	576	0.142	82
22	4688	370,200	26,840	0.776	20,827	361,200	26,187	0.792	20,740	9,000	653	0.134	87
22	4700	323,700	23,468	0.584	13,705	310,800	22,533	0.602	13,565	12,900	935	0.150	141
22	4712	344,100	24,947	0.424	10,578	333,900	24,208	0.433	10,482	10,200	740	0.129	96
22	4724	245,100	17,770	0.436	7,748	234,600	17,009	0.449	7,637	10,500	761	0.146	111
21	4736	103,050	7,471	0.409	3,056	100,950	7,319	0.414	3,030	2,100	152	0.169	26
21	4748	54,000	3,915	0.324	1,268	54,000	3,915	0.324	1,268	0	0		0
21	4760	102,750	7,449	0.445	3,315	99,150	7,188	0.456	3,278	3,600	261	0.142	37
21	4772	77,100	5,590	0.336	1,878	72,600	5,264	0.348	1,832	4,500	326	0.142	46
21	4784	57,900	4,198	0.313	1,314	57,900	4,198	0.313	1,314	0	0		0
14	4796	14,400	1,044	0.309	323	14,400	1,044	0.309	323	0	0		0
14	4808	87,600	6,351	0.300	1,905	84,300	6,112	0.306	1,870	3,300	239	0.147	35
14	4820	106,200	7,700	0.507	3,904	103,800	7,526	0.516	3,883	2,400	174	0.118	20
14	4832	92,850	6,732	0.931	6,267	89,850	6,514	0.957	6,234	3,000	218	0.152	33
14	4844	143,400	10,397	0.884	9,191	137,400	9,962	0.916	9,125	6,000	435	0.151	66
14	4856	115,200	8,352	0.265	2,213	113,100	8,200	0.267	2,189	2,100	152	0.157	24
13	4868		Mined out				Mined out				Mined out		
13	4880		Mined out				Mined out				Mined out		
13	4892	111,000	8,048	0.335	2,696	105,300	7,634	0.345	2,634	5,700	413	0.150	62
13	4904	81,300	5,894	0.360	2,240	75,300	5,459	0.399	2,178	6,000	435	0.142	62
13	4916	105,900	7,678	0.463	3,555	101,100	7,330	0.478	3,504	4,800	348	0.147	51
13	4928	66,600	4,829	0.530	2,559	64,200	4,655	0.544	2,532	2,400	174	0.155	27
12	4940	22,200	1,610	0.509	819	21,000	1,523	0.530	807	1,200	87	0.141	12
12	4952	24,900	1,805	0.249	450	24,900	1,805	0.249	450	0	0		0
12	4964	36,000	2,610	0.258	673	32,700	2,371	0.269	638	3,300	239	0.149	36
12	4976	30,900	2,240	0.253	567	29,100	2,110	0.259	546	1,800	131	0.156	20
12	4988	24,600	1,784	0.282	503	22,800	1,653	0.293	484	1,800	131	0.143	19
12	5000	69,300	5,024	0.266	1,437	64,500	4,676	0.296	1,384	4,800	348	0.152	53
12	5012	65,700	4,763	0.399	1,901	65,700	4,763	0.399	1,901	0	0		0
12	5024	11,700	848	0.275	233	10,800	783	0.286	224	900	65	0.143	9
Total		5,244,000	380,190	0.571	216,966	5,085,300	368,684	0.584	215,334	158,700	11,506	0.142	1,633

Stope ID	Level	M&I blocks >= 0.14 oz Au/t within stope design				M&I blocks >= 0.15 oz Au/t within stope design				Difference by Stope			
		Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz	Volume (ft <sup>3</sup> )	Tonnage	oz Au/t	AuOz
25	4412-4496	369,300	26,774	0.364	9,738	349,500	25,339	0.376	9,533	19,800	1,436	0.142	204
24	4508-4568	524,700	38,041	0.474	18,025	514,200	37,280	0.481	17,913	10,500	761	0.147	112
23	4580-4628	976,950	70,829	0.859	60,877	961,500	69,709	0.871	60,739	15,450	1,120	0.124	138
22	4640-4724	1,768,500	128,216	0.593	76,061	1,715,250	124,356	0.607	75,521	53,250	3,861	0.140	539
21	4736-4784	394,800	28,623	0.378	10,831	384,600	27,884	0.385	10,722	10,200	740	0.148	109
14	4796-4856	559,650	40,575	0.587	23,802	542,850	39,357	0.600	23,624	16,800	1,218	0.146	178
13	4868-4928	364,800	26,448	0.418	11,050	345,900	25,078	0.433	10,648	18,900	1,370	0.147	202
12	4940-5024	265,300	20,664	0.318	6,583	271,500	19,664	0.327	6,434	13,800	1,001	0.149	149
Total		5,244,000	380,190	0.571	216,966	5,085,300	368,684	0.584	215,334	158,700	11,506	0.142	1,633

\* Dilution stated above is based on operating experience for stopes 13, 14, 21, 22, & 23. Average mine-wide dilution applied to stopes 12, 24, & 25.



# Cut-off Grade Calculation

	Mining Cut-Off	Must Take Cut-Off
Royalty @ 4% NSR	104.0%	104.0%
Gold Recovery <sup>1</sup>	95.5%	95.5%
Silver Recovery	60.0%	60.0%
Gold Price	\$350.00	\$350.00
Silver Price	\$5.20	\$5.20
Ag : Au Ratio <sup>2</sup>	6.8	6.8
Refining & Shipping <sup>3</sup>	\$1,094,391	\$1,094,391
Mining	\$31,823,801	\$0
Milling	\$10,063,135	\$10,063,135
Trucking & Sampling	\$15,246,381	\$15,246,381
Site G&A	\$9,329,750	\$0
Engineering	\$1,587,945	\$0
Geology	\$1,520,857	\$0
Total Cost	\$70,666,261	\$26,403,908
Total Tons	\$1,346,996	\$1,346,996
Cost per Ton	\$52.46	\$19.60
Cut-off Grade <sup>1</sup>	0.154	0.057

(1) The cut-off grades utilized for reserve calculation assumes the available mill capacity of 30,000 tons per month will be utilized.