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GOLD DISTRIBUTION AT RED MOUNTAIN, NORTHWESTERN BRITISH COLUMBIA

by

Marc A. Prefontaine

An independent project submitted
to the Department of Geological Sciences
in conformity with the requirements for
the non-research Master of Science degree
in Mineral Exploration

September, 1995

Department of Geological Sciences
Queen's University
Kingston – Ontario – Canada

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ABSTRACT

The Red Mountain Property is an advanced gold exploration project located 18 kilometres east of the port town of Stewart, British Columbia. It is presently accessible only by helicopter. As of February 1993, a geological resource of 2.5 million tonnes grading 12.8 grams gold per tonne and 38.1 grams silver per tonne had been delineated.

The Red Mountain deposit is hosted by Upper Triassic to Lower Jurassic stratified rocks and Early Jurassic intrusions of the Hazelton Group. To the west are Tertiary and older plutons of the Coast Belt, and to the east are Middle and Upper Jurassic rocks of the Bowser Lake Group. Hydrothermal alteration and mineralization is probably genetically related to the Lower Jurassic intrusions. The ore zones have been tilted to the southwest (probably during mid-Cretaceous development of the Skeena fold and thrust belt).

The main rock types are: thin-bedded sedimentary rocks, predominately siltstones and ash tuffs, volcaniclastics and hornblende-feldspar porphyritic diorite intrusions. Extensive zones of brecciation are associated with the intrusions and ore. Breccias range from angular in-situ breccias, through monolithic dislocation breccias, to heterolithic transported breccias.

Intense alteration is widespread on the property. In the hangingwall of the Marc and AV Zones, it is characterized by potassium feldspar, sericite, chlorite, and tourmaline. Alteration in the ore is characterized by very intense sericite and pyrite which overprints older alteration assemblages. The ore is surrounded by 5 to 10 metre concentric zones of sphalerite and pyrrhotite. Lesser sericite and pyrite alteration characterizes the footwall, and gypsum stockwork veinlets occur approximately 200 metres below the ore. Still deeper, chlorite alteration and trace molybdenite and chalcopyrite are present.

The ore occurs in both stratified rocks and intrusions, but principle concentrations occur in the intrusions adjacent to contacts. Gold occurs in pods and stockwork veins of coarse crystalline pyrite. Ore is found in three northwest plunging, southwest dipping, ellipsoidal zones that are approximately 300 metres long, 5-25 metres thick, and 75 metres wide (the Marc, AV, and JW zones). A fourth zone of low grade gold enrichment (the 141 zone) lies to the west of the ore zones. The AV zone represents the northwest fault offset of the Marc zone while the JW zone is a separate zone and is located northwest of the AV zone. The 141 zone is located west of the Marc and AV zones.

Gold contour zoning indicates that the Marc-AV system forms an inverted cone shape with low grade gold enrichment (0.3-1.0 g/T Au) forming the base and high grade gold (>3.0g/T Au) forming the top. Gold-bearing fluids migrated towards the northwest along permeable beds forming the northern extent of the AV zone and possibly the JW zone. Low grade gold enrichment suggests the possibility of the JW zone being a separate hydrothermal centre. The same is true for the 141 zone, low grade gold at depth and its mere size suggest a separate hydrothermal centre.

Hydrothermal fluids rose from depth in a feeder system and deposited precious metals at a specific paleodepth. Ore grade mineralization occurs near the contact between two intrusive phases and proximal to rafts of sedimentary rock.

Red Mountain is a hydrothermal Au-Te-Ag deposit related to a multiphase intrusion. Early hydrothermal alteration assemblages reminiscent of porphyry deposits have been overprinted by epithermal alteration and mineralization.

ACKNOWLEDGMENTS

Permission to carry out this project was granted by Lac Minerals Ltd. In particular, I would like to thank Garfield MacVeigh, former Regional Exploration Manager. He approved the project, supported my application to Queen's, and sponsored a visit to Red Mountain by Dr. R. Mason. The visit by Dr. Mason was of significant benefit to the project.

I am grateful to Dr. R. Mason for his guidance, enthusiasm, and confidence he instilled in me during the past year.

"Never mind the other stuff, if you want to understand what is going on, start by contouring the gold"--you were right.! *"They're everywhere"* Bob, did you mean hydrothermal breccias or Tim Hortons?

At Queen's, many graduate students provided me with their insight into gold deposits. I am particularly grateful to Paul Johnston for his advise, reviews of the paper, and computer help (I would have been here until Christmas if it were not for his help). Folk hero Rob Penczak helped with the petrographic work and made Kingston a true cultural experience. Tutelage by Brian Townley on statistics and insight on epithermal systems made my life more complicated. Without Tom Ullrich's help with the diagrams, the reader would have had to put up with my artistic inabilities.

At Red Mountain, many people went out of their way to help me, both in passing on their geological wisdom and in sending me the necessary information to complete the project, they include: S. Carrol, C. Greig, R. McLeod, P. Pelletier, M. Sieb, D. Rhys, J. Watkins, R. Walker, and G. Wober.

I am grateful to Dave Cawood (project manager) for his support and confidence in me. Most of all, I thank him for rescuing me from the snake infested jungles of South America. I'll always remember Dave for his charisma and deep conversations while the two of us waited for the first pot of coffee to brew each morning.

It would not have been possible to complete this project without the extraordinary efforts of Hans Smit (Chief Geologist at Red Mountain). Hans went far beyond the call of duty while gathering necessary reports, sections, and polished thin sections from many people (including himself) who at the time were being dismissed as a result of the Barrick takeover of Lac.

Hans laid the foundation of our present understanding of the Red Mountain deposit. His encouragement in allowing the many geologists in his employ to expand their geological abilities was an example to all of us.

"Happy-Happy-Happy, Joy-Joy-Joy..."

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1. INTRODUCTION

1.1 OVERVIEW

The Red Mountain gold-telluride-silver property is an advanced exploration project located 18 kilometres east of the port town of Stewart, British Columbia (Fig. 1). Red Mountain is located within the "Golden Triangle", an area in which several mines including Eskay Creek, Snip, and Premier are located. As of February 1993, a geological resource of 2.5 million tonnes grading 12.8 grams gold per tonne and 38.1 grams silver per tonne had been delineated (Lac Minerals Ltd., May 1993 Red Mountain Project Prospectus).

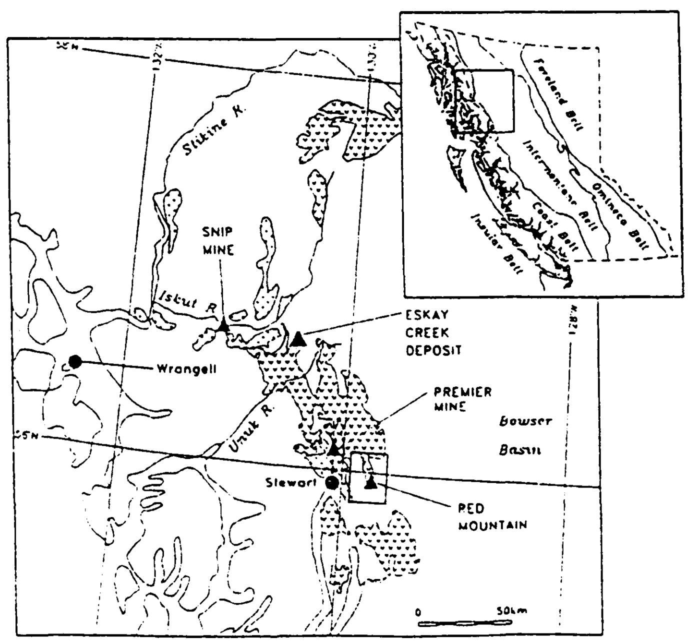


Figure 1: Location Map of Red Mountain (Rhys et al., 1995)

1.2 SCOPE OF PROJECT

The author was a project geologist on Red Mountain for one and a half years and was extensively involved with core logging, ore reserve estimations, geological modeling, and underground development.

It was evident that a study of the gold distribution (especially low grade levels) would aid future exploration efforts, ore reserve estimations, and the general understanding of the hydrothermal system. The work completed in this project included gold contour zoning, statistical analysis of assay values in the Marc zone, limited petrographic work and a review of previous reports on geology, ore mineralogy, hydrothermal alteration, and metallurgy.

This report documents gold distribution in the context of geological setting and hydrothermal alteration. The geological characteristics of mineralization and its relevance to metallurgy and statistical analysis are also discussed.

1.3 HISTORY

Red Mountain was staked by Wotan Resources under the direction of Dino Kremenezi in 1988 and 1989. During the summer of 1989, Dave Kennedy, then senior geologist with Bond Gold, was flying over Red Mountain on the way to another property that Bond was conducting an exploration program on. The striking gossan covering Red Mountain prompted him to land the helicopter and take some grab samples. Myth has it that Mr. Kennedy was wearing but a pair of loafers and so had two passengers in the back seat of the helicopter get out and take the samples. The gossan sampled by Marc Gauthier, a draftsman with Bond Gold, returned high grade gold values (and was named the Marc Zone). Bond Gold quickly struck a deal with Wotan Resources and by that fall (1989) diamond drilling had led to the discovery of the Marc zone. Bond Gold was purchased by Lac Minerals in October of 1989.

The project geologist that carried out the initial drill program was the late Andreas Vogt. He oversaw exploration efforts until his untimely death near Red Mountain in 1991. Between 1989 and 1991, a total of 20,000 metres was drilled in 89 diamond drill holes. Mineralization was interpreted to occur in two north-south trending lenses.

By late 1992, a new team of Lac geologists including Craig Nelson (vice president exploration), Garfield MacVeigh (regional exploration manager), and John Watkins (senior geologist) had begun work on Red Mountain. Level plan and sectional compilation and interpretation indicated that mineralization was actually northwest-southeast trending. That summer, a 4,000 metre, 13 hole program confirmed that mineralization was trending northwest-southeast and that mineralization occurred in two continuous zones; the Marc and AV zone (named after A. Vogt). In addition, a drill hole was completed 200 metres northwest of any previously intersected mineralization to test for the northwestern strike extension of the AV zone. This hole successfully intersected mineralization and the following year was to prove to be a third mineralized zone. It was named the JW zone after John Watkins.

By the end of the 1992 exploration program a mineral inventory of 2.5 million tonnes grading 12.8 g/t Au and 38.1 g/t Ag was estimated. The potential for a major deposit was apparent , and Lac Minerals initiated an extensive program in 1993 under the direction of Garfield MacVeigh (managed by Dave Cawood and Hans Smit) to bring the mineral inventory into reserve categories and to explore for additional mineralization.

In 1993 and 1994 76,503 metres were drilled in 304 diamond drill holes from surface and underground. A total of 1315 metres of underground development was completed. Development included a decline in the Marc footwall and the AV hangingwall and three crosscuts through the Marc zone.

In September of 1994, American Barrick Gold Corporation purchased Lac Minerals Limited and subsequently (1995) vended the property to Royal Oak Mines Limited.

2. REGIONAL GEOLOGICAL SETTING

Red Mountain is located in a belt of Upper Triassic to Middle Jurassic sedimentary, volcanic and plutonic rocks of the Stikinia terrane (Figure 2). It is near the boundary of the Intermontane and Coast belts along the southwestern margin of the Bowser Basin (Greig et al., 1994).

Lower Jurassic to Middle Jurassic marine clastics and Paleozoic to Lower Jurassic oceanic arc volcanic and volcaniclastic rocks crop out in the Red Mountain area (Greig et al., 1994). These units belong to the Hazelton Group and were exposed in fold and thrust culminations of the latest Jurassic or Early Cretaceous to Tertiary Skeena Fold Belt (Greig et al., 1994).

Jurassic and Tertiary aged intrusive rocks have been mapped in the region. The early to middle Jurassic plutons are roughly coeval and cospatial with Hazelton Group volcanics (Greig et al., 1994). Lower Jurassic hornblende-feldspar porphyritic (Goldslide) intrusives are considered to be the most significant being associated with precious metal mineralization. The Goldslide intrusion has been dated at approximately 200 million years by $^{40}Ar/^{39}Ar$ hornblende (200 Ma; Schroeter et al., 1992) and U-Pb zircons (201.8 ± 0.5 Ma; Greig et al., 1995).

Red Mountain occurs within the core of a northwest-trending antiform which has been complexly faulted (Greig et al., 1994). Greig et al., (1994) interpreted a thrust fault following along Bitter Creek (Figure 1) which faulted Upper Triassic rocks against the Lower Jurassic rocks which underlie the Red Mountain property.

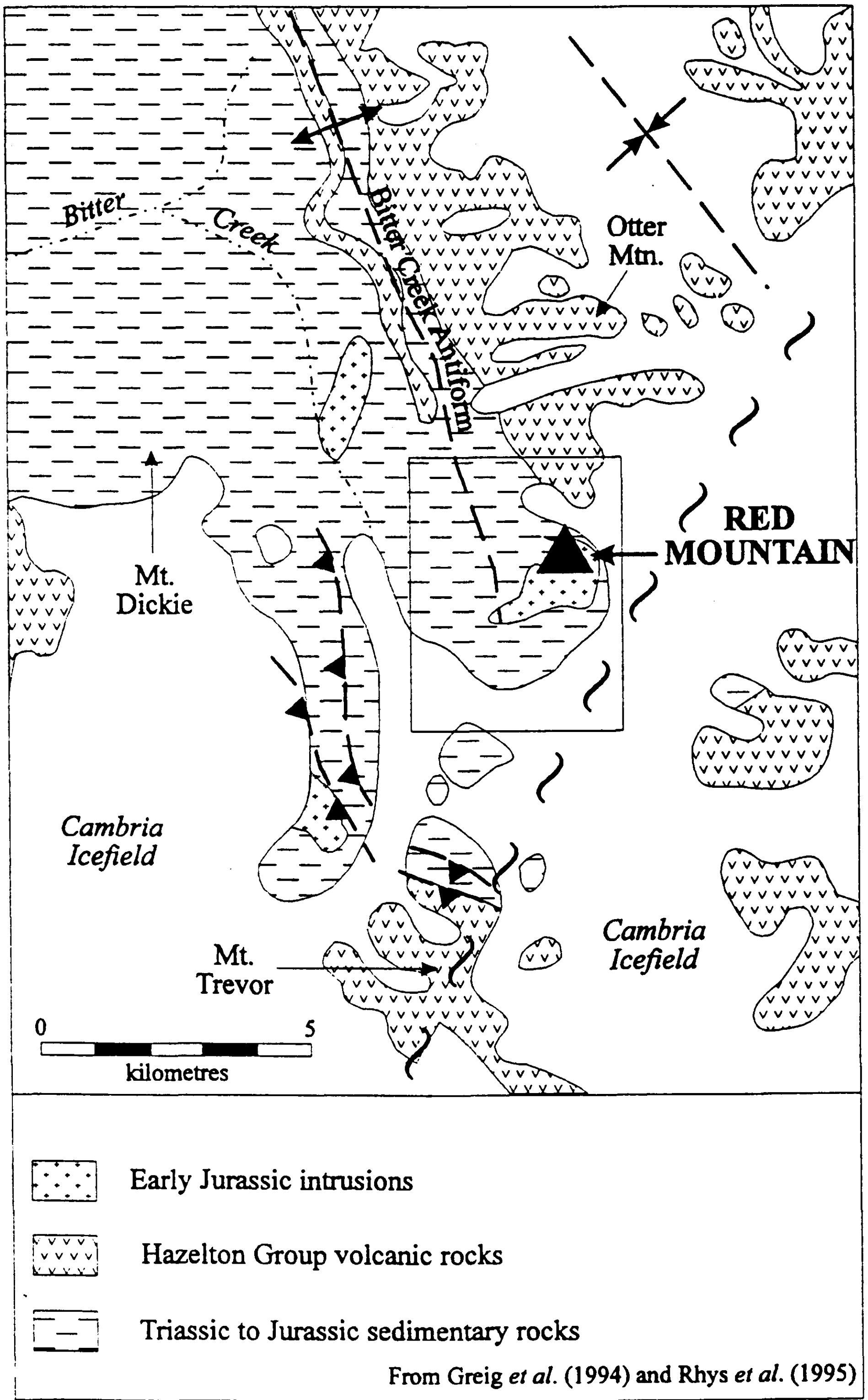


Figure 2: Geology of the Red Mountain Area.

3. LOCAL GEOLOGY

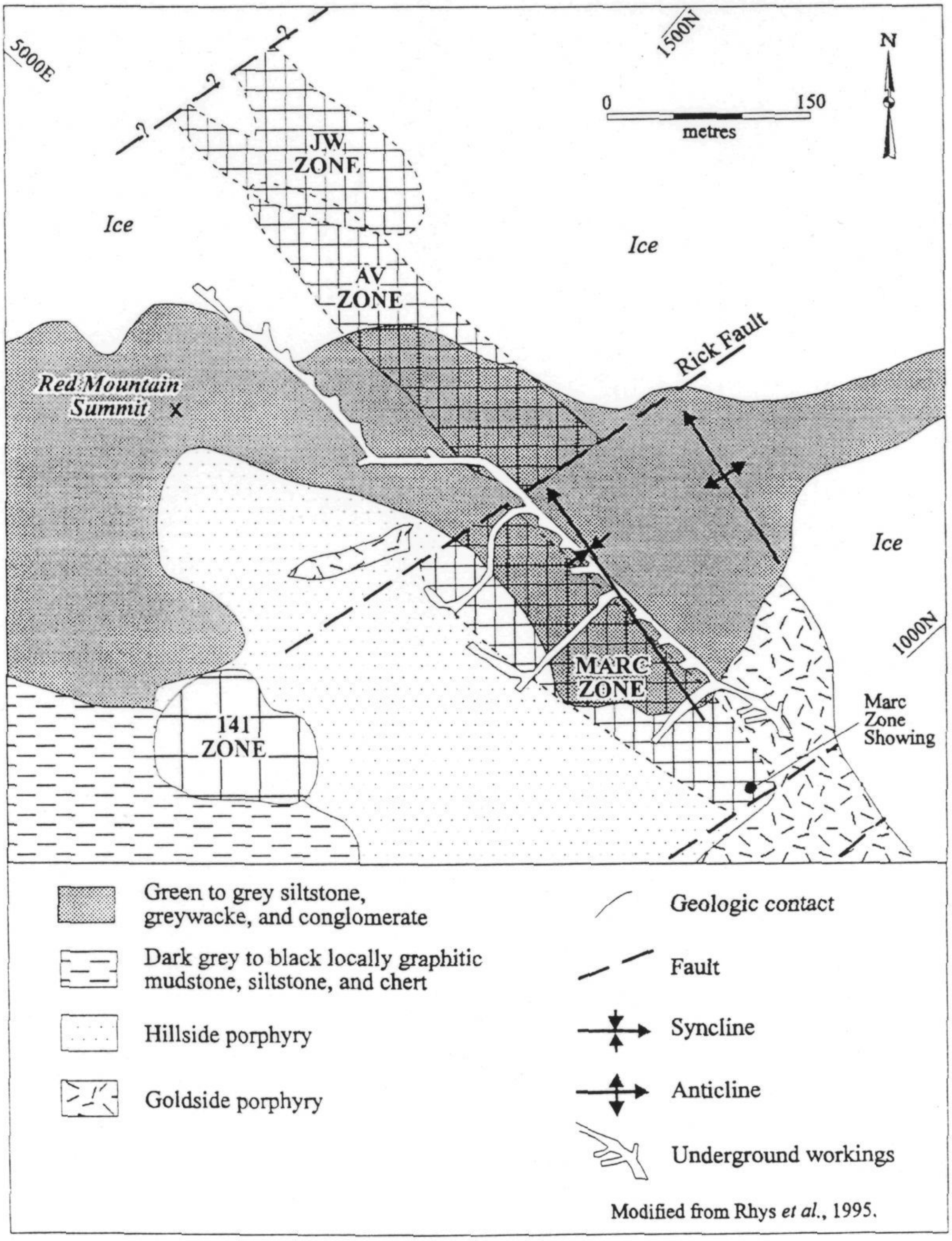
Red Mountain is underlain by Middle to Upper Triassic and Early Jurassic sedimentary and volcanic rocks. These bedded rocks are mostly mudstones, wackes, and ash tuffs. They are predominately carbonaceous and can locally be graphitic. The carbonaceous nature of the sediments gives them a black color. Next to intrusions, they tend to be carbon leached and sericite altered. Stratigraphic packages range in thickness from as little as 1 metre to up to 200 metres. Bedding thickness is on the order of a few centimetres and generally strikes northwest with dips varying because of folding.

Early Jurassic plutons, sills, and dykes have intruded the volcano-sedimentary package (Fig. 3). There are also Tertiary aged dykes and stocks on the property, but proximal to the ore, these are insignificant and only occur as small dykes. The largest intrusion (the Goldslide-Hillside intrusion) lies beneath the mountain peak and in fact is the reason for the preservation of the mountain. Peripheral to the summit, sill like intrusions occur and are probably related to the main intrusive stock beneath the summit. The orebody is located beneath the summit approximately at the contact between two phases of the Goldslide stock. Ore occurs both in the sediments and Hillside porphyry but is mainly in the latter.

In general, the intrusions have a dioritic composition and are porphyritic. Two intrusive phases are recognized in the vicinity of the ore zones; the Hillside porphyry and the Goldslide porphyry. Both are moderately to strongly altered and are distinguished from one another in hand specimen on the basis of texture. One or two other phases of porphyritic diorite have also been mapped.

The Hillside porphyry lies above the Goldslide porphyry. It is fine to medium grained and contains 25 to 50% 1 to 3 mm hornblende and plagioclase phenocrysts. Hornblende phenocrysts have been almost completely altered to

Figure 3: Geological Map of Red Moutain



chlorite and muscovite. The presence of Goldslide porphyry dykes crosscutting the Hillside porphyry and xenoliths of Hillside porphyry within the Goldslide porphyry dykes, indicate that the Hillside is older than the Goldslide porphyry (Rhys et al., 1995).

The Goldslide porphyry is readily distinguished from the Hillside porphyry by the presence of larger hornblende phenocrysts (3 to 7 mm). It is a hornblende ± biotite ± quartz porphyry with a fine-grained to aphanitic groundmass. The top of the Goldslide porphyry is usually strongly brecciated. The brecciation is distinguished by angular to subangular fragments separated by a dark rock flour matrix. The fragments appear pulled apart as opposed to transported and reworked.

Contact relationships between bedded rocks and intrusives are variable. Contacts can be sharp, brecciated, and even appear gradational because of the similar grain size between the sediments and intrusives. In places, alteration has destroyed primary textures making it difficult to distinguish sedimentary from intrusive rocks.

Brecciated contacts are usually composed of bedded fragments in an igneous matrix. The brecciated contact areas vary in width from a few centimetres to up to tens of metres. Sedimentary breccia fragments are usually angular to sub-rounded and range in size from a few centimetres to tens of metres (observed underground). Fragment size can decrease gradationally from the sediment contact outward into the intrusion. The brittle appearance of the brecciation (angular fragments and a pull apart appearance) indicates that the sediments were fully lithified at the time of intrusion. However, by Greig et. al (1994) and Rhys (1995 pers. comm.) have observed outcrops showing lobate textures, quenched textures, and intrusive material injected into the sediments (indicating that the sediments were not fully lithified before they were intruded).

Extensive zones of hydrothermal brecciation are associated with the ore environment. These range from angular in-situ (fit-together) breccias through monolithic dislocation breccias to heterolithic breccias with some fragment rounding and matrix banding. Both bedded sedimentary rocks and porphyritic igneous rocks are brecciated. Breccias range from large zones of complex geometry to distinct tabular dykes. Hydrothermal breccia dykes appear localized near contacts of hornblende porphyry in the upper parts of the section while in the lower part (in the Goldslide porphyry), they are more abundant and appear throughout the section.

Multiple stages of brecciation are present. Pre-ore breccias are indicated by breccias that display the same hydrothermal alteration as the country rocks. Syn-ore breccias are characterized by ore vein cement, and post-ore breccias include those with a rock flour matrix containing isolated fragments of breccia and ore.

Red Mountain sits in the footwall of a steepened thrust (Greig et al., 1994). Both the ore zones and the host rocks have been disrupted by folding and faulting. The large amount of intrusive rock makes it difficult to trace out units at length and thus makes it difficult to resolve fold and fault geometry in detail. Structural studies by Calon (1993), Caddey (1993), and Helmstaed (1991) have significantly contributed to the present understanding of deformation on Red Mountain. The following is a brief description of the structures that have affected the ore zones.

The ore and country rocks have been affected by northwest plunging upright cylindrical folds. These mesoscopic folds are open to tight and locally can be isoclinal (Rhys et al., 1995). At least two phases of brittle faulting affect Red Mountain lithologies (including ore). The earliest faults are northwest dipping with right lateral normal displacements and include the Rick fault (Fig. 3). Southwest dipping faults with reverse displacements cut the northwest dipping faults and disrupt the ore zones, for example, the 050 fault.

Before folding and thrusting, the geometry of the gold system included vertical feeder systems and horizontal orebodies. Regional folding has tilted the orebodies to the southwest giving them an approximate dip of 60°. The feeder system now dips moderately to the northeast (40°). This conforms to the deformation in the region which has been documented by Greig et al., (1994).

4. HYDROTHERMAL ALTERATION AND MINERALIZATION

4.1 HYDROTHERMAL ALTERATION

Alteration is strong and widespread over the property. All pre-Tertiary rocks have been hydrothermally altered. The sediments and intrusives display similar alteration assemblages. The only major difference being that the sediments, which are/were carbon bearing, have been carbon leached to varying intensities.

The most striking and widespread alteration minerals observed on Red Mountain are K-feldspar, tourmaline, sericite, chlorite, and pyrite. K-feldspar is observed, with varying intensities, over most of the property. It is particularly strong in the hangingwall and footwall of the ore. K-feldspar is a relatively early alteration and has been overprinted and replaced by later alteration assemblages. Tourmaline is also fairly early and is strongest in the hangingwall of the ore zones.

Figure 4 is presented to provide the alteration zone dimensions and spatial relationships. The general pattern of alteration assemblages and sequences observed on Red Mountain is as follows:

1. An early (pre-ore) pervasive bleaching event, probably caused by feldspathic (K-feldspar) alteration, affected all lithologies.

2. Tourmaline veinlets cut the K-feldspar alteration. It occurs throughout the section (although is strongest in the hangingwall of the ore) but laterally is more restricted to the mineralized zones (extending outward 200 or 300 metres).

3. In the extreme hangingwall and the lowest part of the footwall, pervasive chlorite alteration is present. Chlorite is present 300 metres above the ore

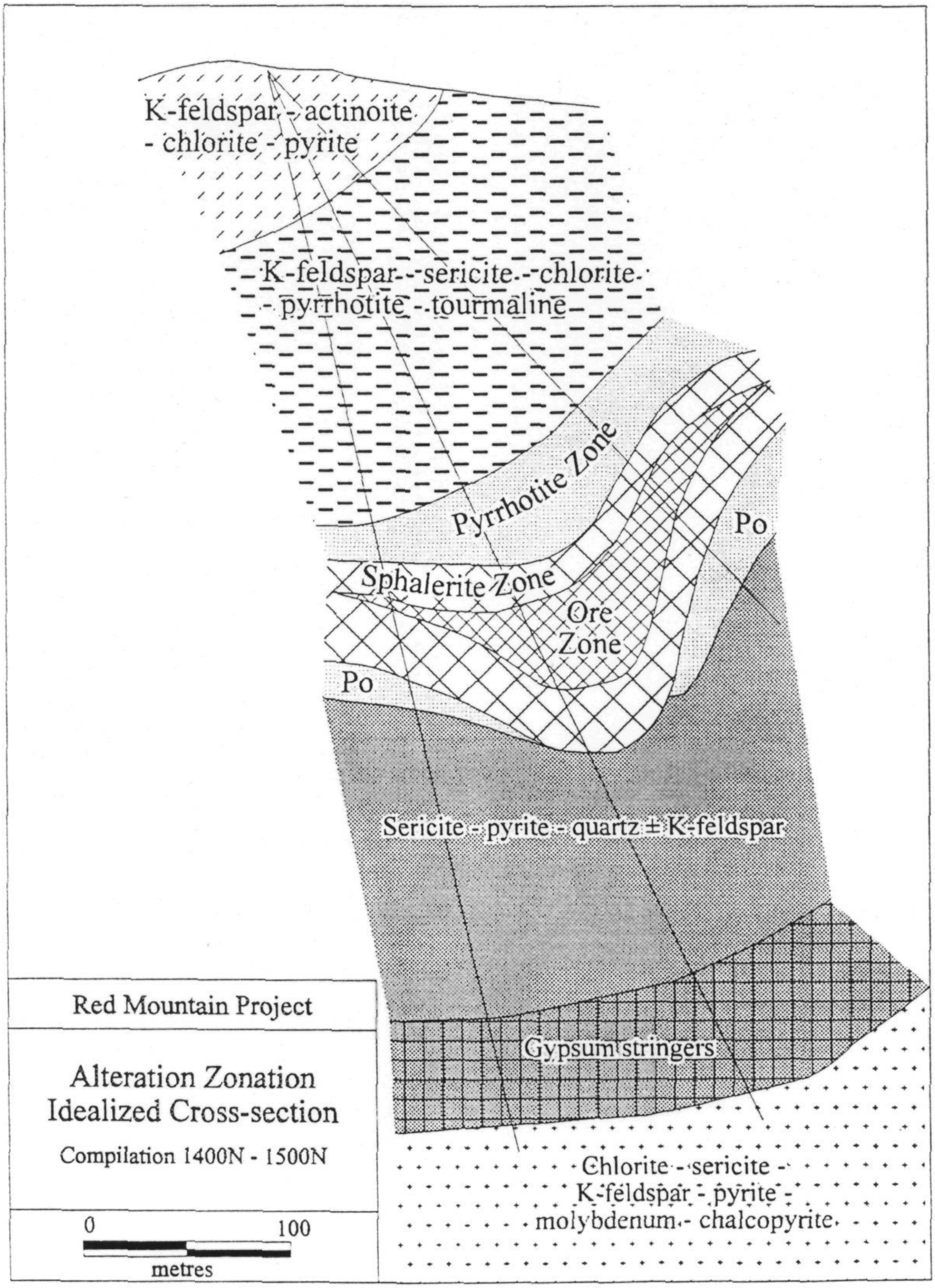


Figure 4: Hydrothermal alteration zones.

and 250 metres below the ore. Note that chlorite is intimately associated with ore deposition and is further described in this section.

4. Chlorite alteration intensity gradationally decreases towards the orebodies (in all directions) and is replaced by sericite. An overall increase in bleaching intensity is observed towards the ore.

5. The ore zone is marked by auriferous pyrite veinlets which cut intense pervasive sericite alteration. Later sericite is also present (occurring in the pyrite veinlets) and is intimately associated with mineralization.

Alteration on Red Mountain has been documented petrographically by Thompson (1994). Table 1 provides a summary of alteration minerals and their relative timing.

The following description of the major alteration zones on Red Mountain is extracted from Thompson (1994) and Rhys et al. (1995). From top to bottom, the major alteration assemblages observed on Red Mountain (see also Figure 4) are:

4.1.1 Hangingwall Alteration

K-feldspar-actinolite-chlorite-pyrite-calcite-tourmaline-albite-pyrrhotite. In this zone K-feldspar and actinolite are the dominant alteration minerals; sometimes actinolite is more abundant than K-feldspar but the actinolite is commonly replaced by chlorite. Actinolite and chlorite occur as replacement of mafic phenocrysts (hornblende and less commonly pyroxene). K-feldspar occurs as fine grains in the groundmass and as replacement of plagioclase. Amphiboles are replaced by actinolite, K-feldspar, chlorite, sphene, and rutile. Albite appears to be largely confined to zones within sulphides, along fractures throughout the section (Thompson, 1994).

Table 1: Dominant alteration minerals and their relative timing, abundance and relationship to mineralization. Major elements associated with each are also shown. (Thompson, 1994).

Timing	Mineral	Major Elements	Above Ore	Immediate Above Ore	Ore	Below Ore
LATE	Tremolite	Ca (Mg, Fe)	—			
	Axinite	Ca, Mn, Fe	——			
	Calcite, Fe-Carbonates	Ca (Fe, Mn)	—	——		——
	Mg-Chlorite	Mg (Fe)		____(bn/gy)	__(gy/bn)	____(gy)
	Gypsum	Ca				-
	Quartz	Si	—	—	—	—
	Sericite	K, Al (Cr, Ti, Ba)		—	————	————
	Muscovite	K, Al			—	—
	Sphalerite	Fe		——	-	
	Pyrrhotite	Fe		——	-	
	Pyrite	Fe		—	————	——
MIDDLE	Tourmaline	Na (Mg, Fe, Mn, Li, Al)		————	—	——
	Ba-Kspr				__(prev. pet.)	
	TiO2	Ti	—	——	-	-
	Albite	Na		—	-	-
	Quartz	Si		——	—	——
	Apatite	Ca, P		-	-	-
	K-spr	K	—————	—————		——
EARLY	Actinolite	(Mg. Fe, Mn)	—————			-
	Clinozoisite Epidote	Ca, Al - Ca, Fe		—		
	Mg-Chlorite	Mg (Fe)	___ (bl)	——		

K-feldspar-sericite-chlorite-carbonate-tourmaline-albite-pyrrhotite-pyrite. In core the most distinct feature of this zone is that rock color changes from a green to grey (chlorite/actinolite to sericite dominant assemblage). Pyrrhotite increases downward from trace to up to 1.5%. It is in this section that most of the tourmaline occurs. Tourmaline is brown (Fe-rich) and occurs as veinlets and disseminations.

4.1.2 Ore Zone Alteration

Sericite alteration is intimately associated with the mineralization, and at the hand specimen scale, the ore zone is hosted by strong sericitically altered rocks (which helps distinguish ore from waste). Outside the ore zone, the sericite alteration is weaker. The sericite alteration and precious metal mineralization occured late in the hydrothermal system. Sericite replaces most primary rock textures and generally overprints all previous alteration assemblages. The predominant alteration minerals present in the ore zone are summarized in Table 2.

The work by Thompson (1994), Barnett (1991), and Swanson (1994) on chlorite and carbonates indicates that an iron enrichment occurred with time as the hydrothermal fluids evolved. There is also a spatial Fe enrichment towards the ore.

Columnar quartz associated with muscovite and rare K-feldspar (which are also aligned) form veins throughout the ore zones. The veins are especially concentrated in and around sulphide grains. Barnett (1991) notes that these are pressure shadow type features and evidence for growth of quartz, muscovite, and K-feldspar crystals within a regime of oriented stress. The only other evidence of growth within a stress regime is sericite shears described by Fischer (1995) (these are described below).

Table 2: Summary of alteration minerals associated with ore

Mineral (in order of abundance)	Occurrence	Timing relative to ore minerals	Reference Source
Ore Minerals		--- -------	
Sericite	Vein, replacement of minerals, pervasive. Distribution of clays suggests that veins were originally quartz with some other mineral like albite or adularia.	- - - - - - - ---	Fischer (1995) Thompson (1994) Barnett (1991)
Muscovite	Veinlets and pervasive in groundmass	- - - - - ----	Fischer (1995) Barnett (1991)
Carbonate	Veinlets, composition ranges from calcite to ferroan calcite and dolomite.	------- -	Fischer (1995) Thompson (1994) Barnett (1991)
Quartz	Veins, quartz has a stretched or columnar texture. Most of the gold is associated with these veins.	-------	Fischer (1995) Thompson (1994) Barnett (1991)
Tourmaline	Colorless, in po-py clumps and in altered country rock. Included in the outer rims of py but not in po or sp.	------	Fischer (1995) Thompson (1994) Barnett (1991)
Ba-Kspar	As veinlets, rarely grains of Ba-poor K-spar in groundmass (this is possibly preserved from an older alteration event).	---	Barnett (1991) Fischer (1995) Thompson (1994)
Albite	Veinlets	- - - -	Thompson (1994) Barnett (1991)
Apatite	In veinlets and fractures	- - -	Thompson (1994) Barnett (1991)
Mg-Chlorite	In veinlets and as vein selvages. Chlorite can exhibit compositional variations in terms of Fe/Mg ratios that correlate with textural variations. Deep green Fe-rich chl occurs in carbonate veins that extend into the wall rock and as interstitial clumps between sulphide grains. Traces of Mg-rich colorless chl have been observed as inclusions within the sphalerite where associated with pyrite. Traces of Mg-chl also occurs with pyrh.	- - - - - - - - - - - -	Thompson (1994) Barnett (1991)
Barite	As isolated grains included in and in cracks of pyrite	- - - -	Barnett (1991)

Barnett (1991) and Fisher (1995) suggest that the pressure shadow features in sulphides were produced in a tensional regime of open space vein development and mineral growth. As the rock section was gradually pulled apart the minerals developed the elongated habit. In many samples, pyrite and pyrrhotite veinlets with oriented marginal zones of calcite and quartz are situated within pervasively muscovite altered country rock that does not have a fabric.

Barnett (1991) concluded that early pyrite-apatite-quartz-muscovite hydrothermal assemblages replace granodiorite. Certain samples have highly crystalline quartz grains that project into cavities sealed by fine-grained muscovite in features reminiscent of greisen.

4.1.3 Footwall Alteration

Sericite-pyrite-quartz ± K-feldspar ± carbonate. Intense sericite has replaced most minerals and overprinted previous alteration assemblages. Pyrite averages 3% and occurs as veins and disseminations. Vein envelopes of chlorite, sericite and locally pale brown tourmaline are common (Rhys et al., 1995). Colorless tourmaline occurs locally (Thompson, 1994).

Sericite-gypsum-pyrite-sphene ± calcite ± quartz. The base of the footwall alteration zone described above is cut by gypsum-pyrite-anhydrite veins. These veins make up 30% of the rock mass. It appears that these veins were originally anhydrite and then hydrated to gypsum. There is also a dark red-brown mineral in the groundmass which is probably sphene (this has not been confirmed petrographically).

Chlorite-sericite-K-feldspar-pyrite-molybdenite-chalcopyrite-carbonate-quartz. This alteration zone is highlighted by the decrease in sericite and increase in chlorite. K-feldspar is present but its intensity is not well documented; Thompson (1994) describes it as weak to moderate in one thin section. Traces of molybdenite and chalcopyrite are observed in veinlets of quartz and feldspar. In hole MC93-103, which is the deepest drilled hole on the property (930m), the first trace of molybdenite was observed along a fracture at the very top of this alteration zone (at approximately 800m depth).

4.2 MINERALIZATION

4.2.1 Occurrence of Gold

Ore is found in three northwest plunging, southwest dipping elliptical to semi-tabular zones which are approximately 300 metres long, 5-25 metres wide, and 75 metres high. The zones are named the Marc, AV (which is the fault offset of the Marc), and JW zones (Fig. 3). Figure 5 is a longitudinal projection to illustrate the overall geometry and grade/width distribution of the ore zones. Ore is defined on section by a minimum 3 g/T Au grade over a minimum 3 metre mining width.

A fourth zone, the 141 zone, is located just west of the ore zones (Fig. 3). The 141 is an area of low grade gold enrichment 200 metres long, 75-250 metres wide and 50-300 metres high. The nature and extent of the 141 zone is not fully understood.

Precious metals occur in distinct zones of stockwork pods, veins, and breccia veins of coarse crystalline pyrite. The pyrite veins are typically 0.5 centimetres to up 1.0 metre wide and 1.0 to several metres long. Veins are variably spaced, commonly 2 to 10 per metre, and generally have moderate to steep (20°-90°) southwest and northeast dipping orientations (Rhys et al., 1995). The contacts between the surrounding sphalerite mineralization and the ore are relatively abrupt, occurring over the space of 1 metre. These coarse crystalline veins are unique to the property and thus make it fairly easy to recognize ore.

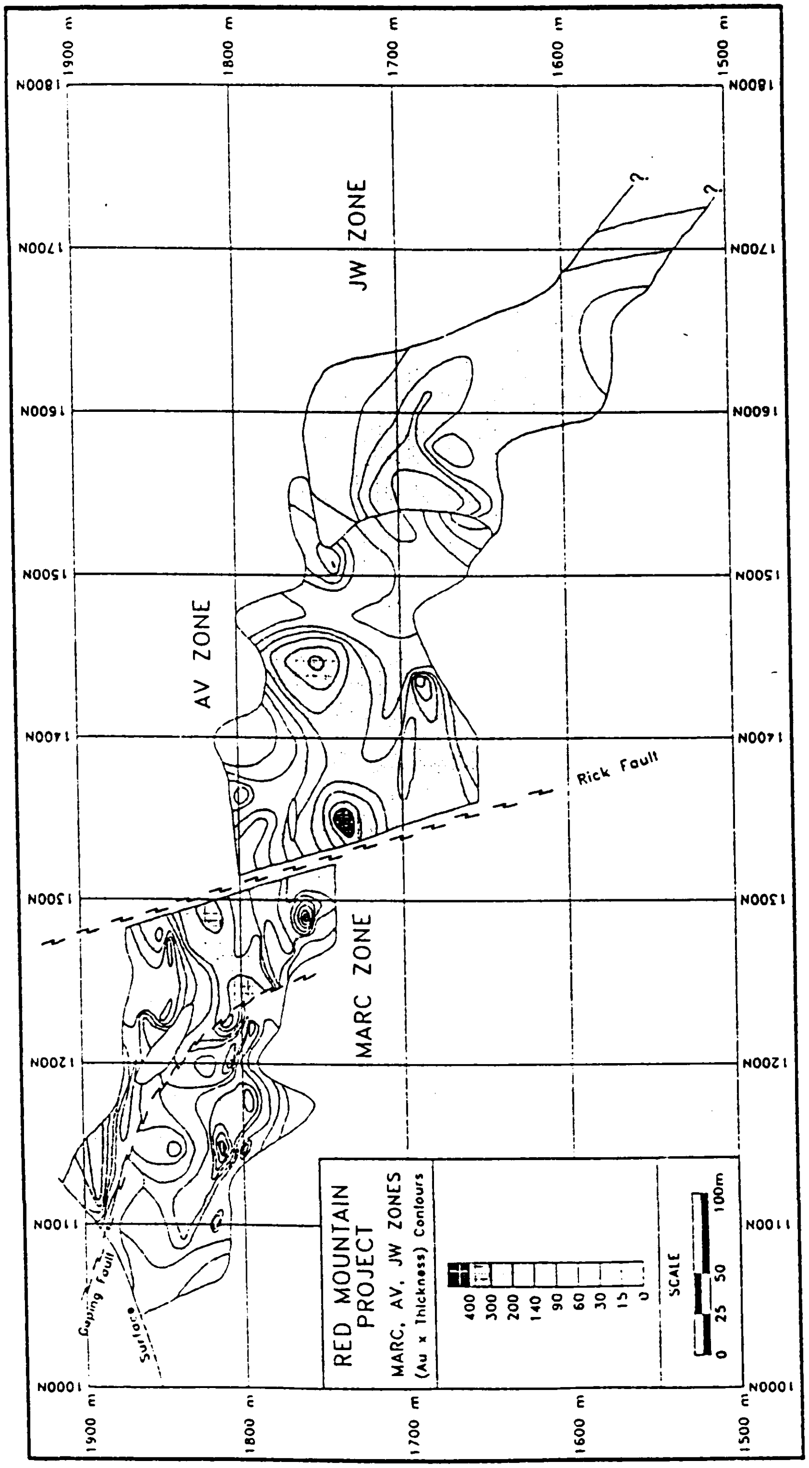


Figure 5: Longitudinal projection of the Red Mountain Ore Zones (Au × Thickness).

The ore is surrounded by a 5-10 metre disseminated sphalerite halo, which in turn is surrounded by a 5-10 metre pyrrhotite halo. Ore occurs in both the sediments and intrusive, and is primarily in the intrusive adjacent to the contact between the two units. Although a single controlling structure (or bounding structures) have not been observed, the linear shape of the ore body suggests that it is structurally and/or stratigraphically controlled.

4.2.2 Gold Distribution

Gold values were contoured on a suite of 1:500 sections (from 1050N to 1600N), six of these are presented as Figures 6 to 11. Contour zoned intervals used were 0.3 to 1.0 g/T Au, 1.0 to 3.0 g/T Au, and greater than 3.0 g/T Au. Statistical work carried out at Red Mountain indicated that 0.3 g/T Au was anomalous. Material of this grade (0.3-1.0 g/T Au) cannot be readily distinguished visually as most as most of the rocks around the ore zone are strongly altered (the presence of roughly 5-6% pyrite in the footwall indicates a strong possibility of low grade Au enrichment).

The following describes the nature and distribution of gold that resulted from the ore zoning exercise:

The Au zoning, especially in low grade zones, illustrates the shape of the hydrothermal system. Overall, the gold enrichment is cone shaped with the root dipping to the northeast. The top of the cone, which is the high grade ore zone, dips to the southwest.

Au zoning indicates that gold-bearing hydrothermal fluids rose through the rock column and deposited the Au at a specific paleohorizon or paleodepth (pressure threshold?).

In the centre of the orebody (1200N to 1475N), a cone shape is prominent (Figs. 6-9). Most of the high grade gold (>3.0 g/T) occurs at the very top of the system and rarely does anomalous gold occur above it (Figs. 6-10).

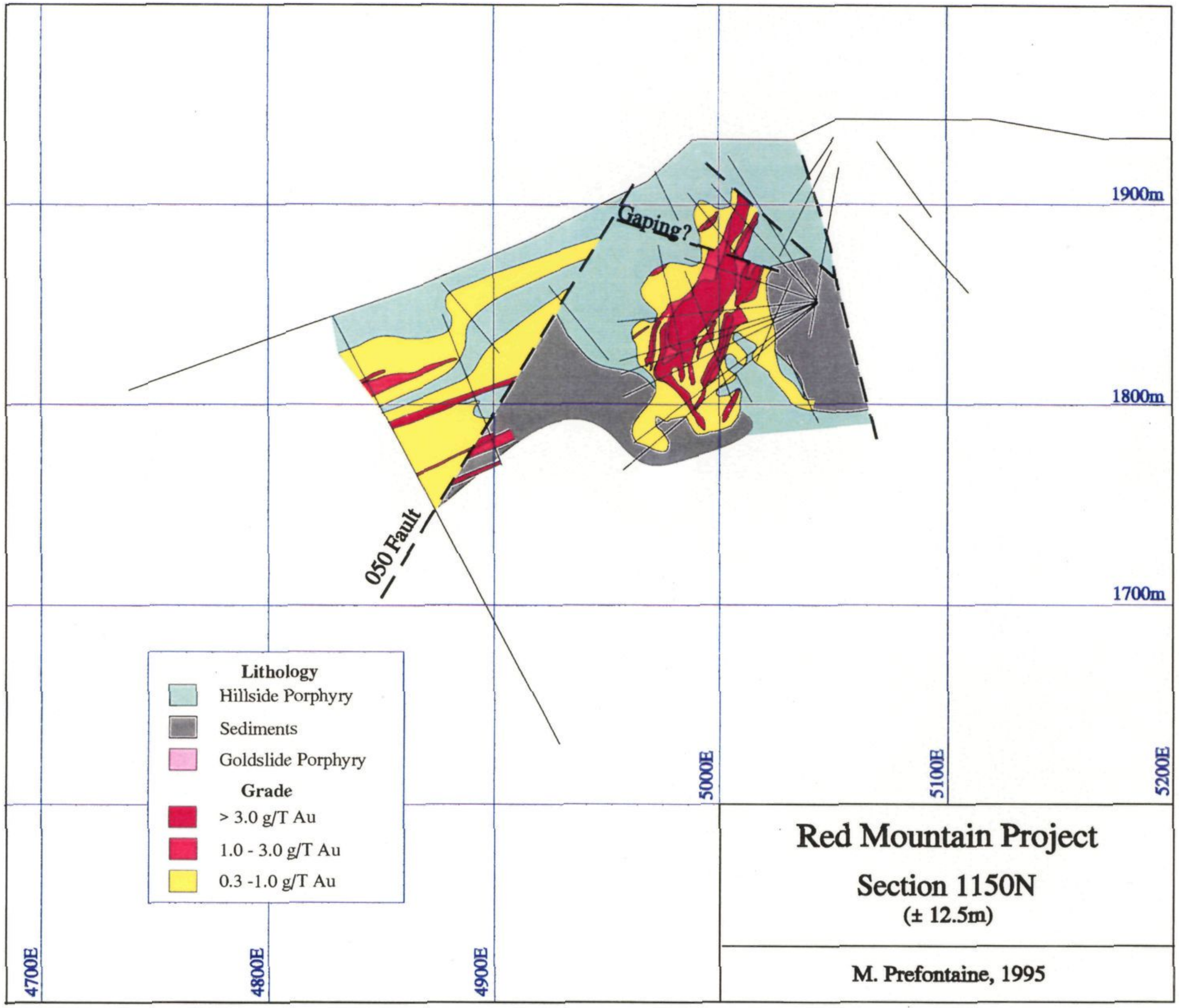


Figure 6: Gold distribution, Section 1150N.

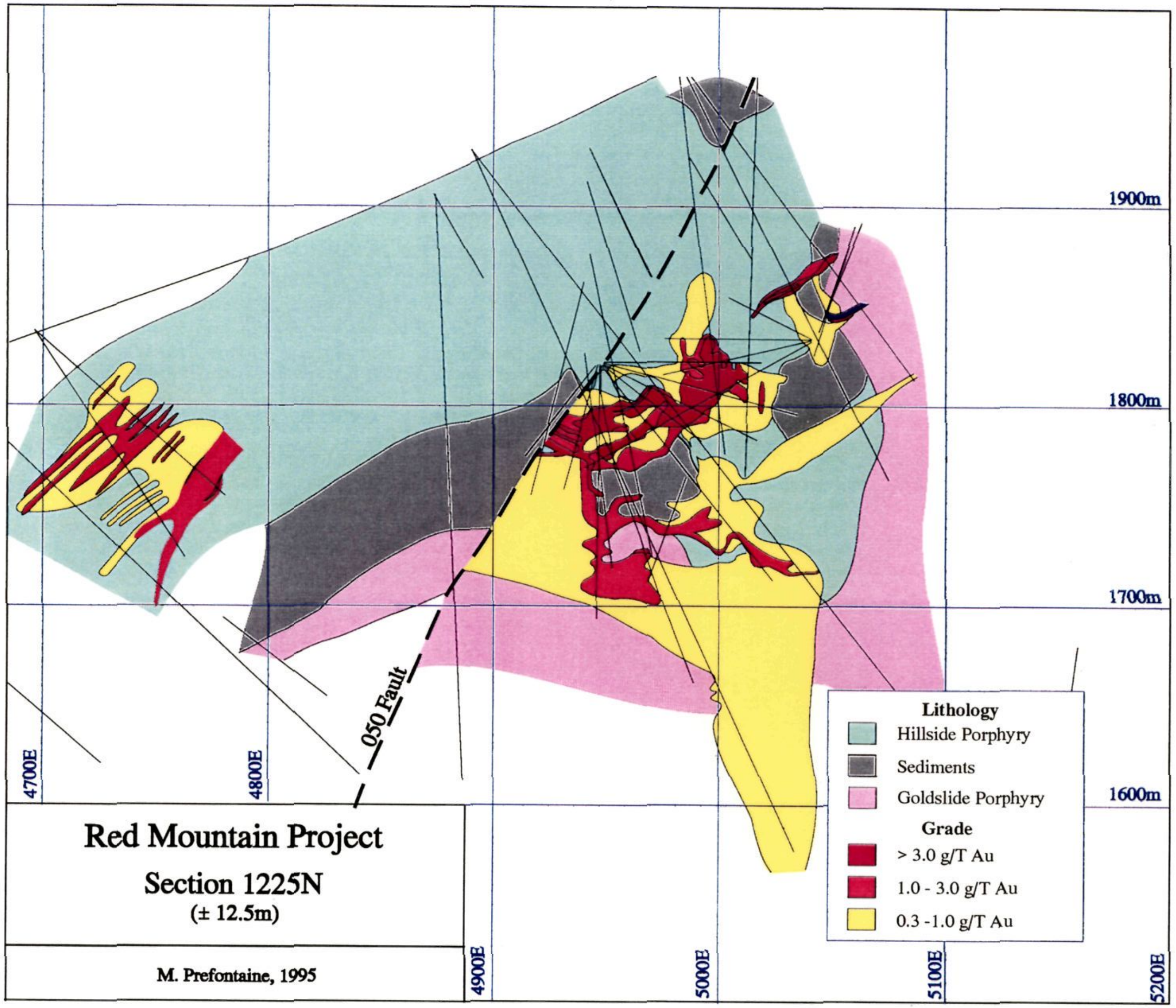


Figure 7: Gold distribution, Section 1225N.

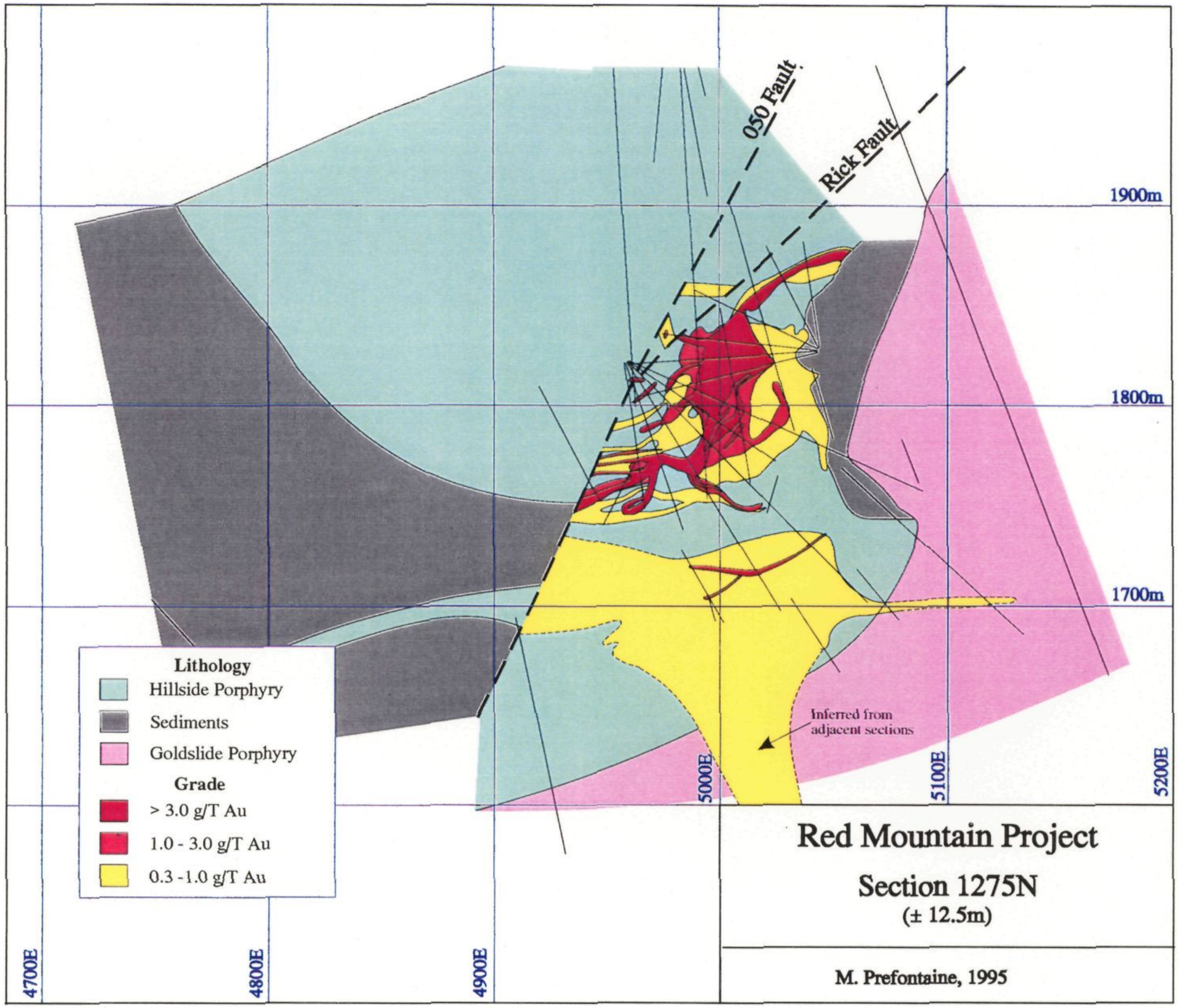


Figure 8: Gold distribution, Section 1275N.

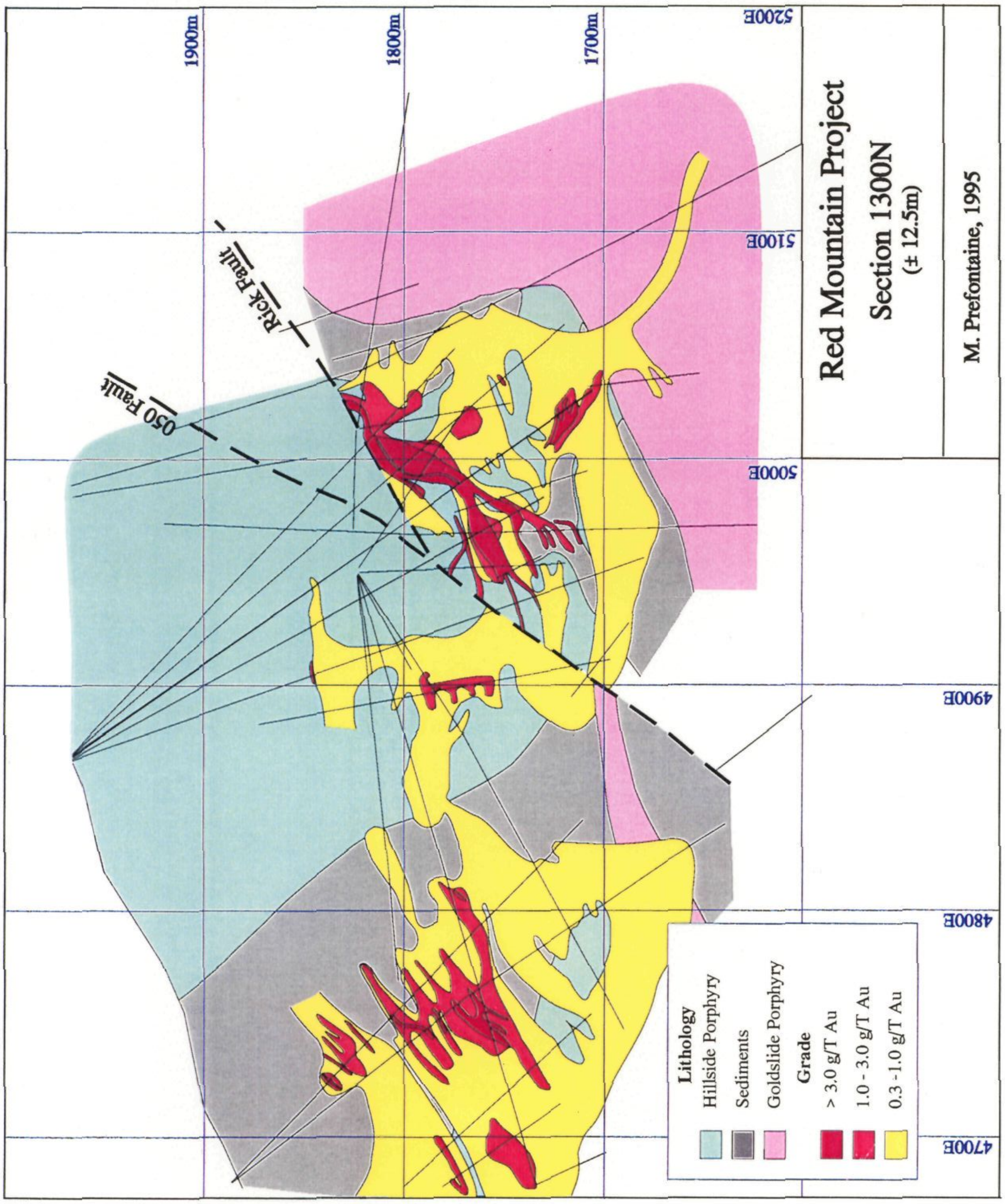


Figure 9: Gold distribution, Section 1300N.

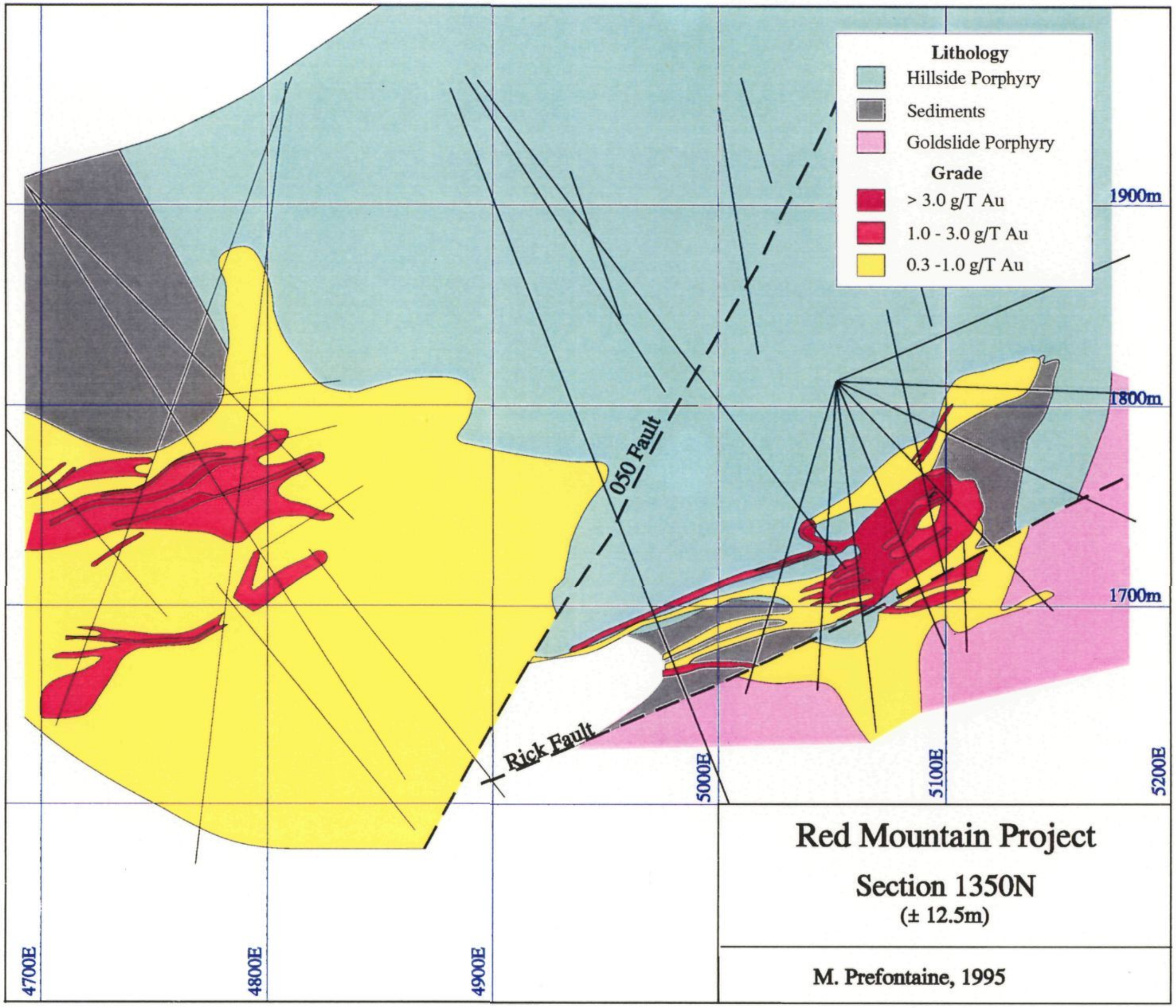


Figure 10: Gold distribution, Section 1350N.

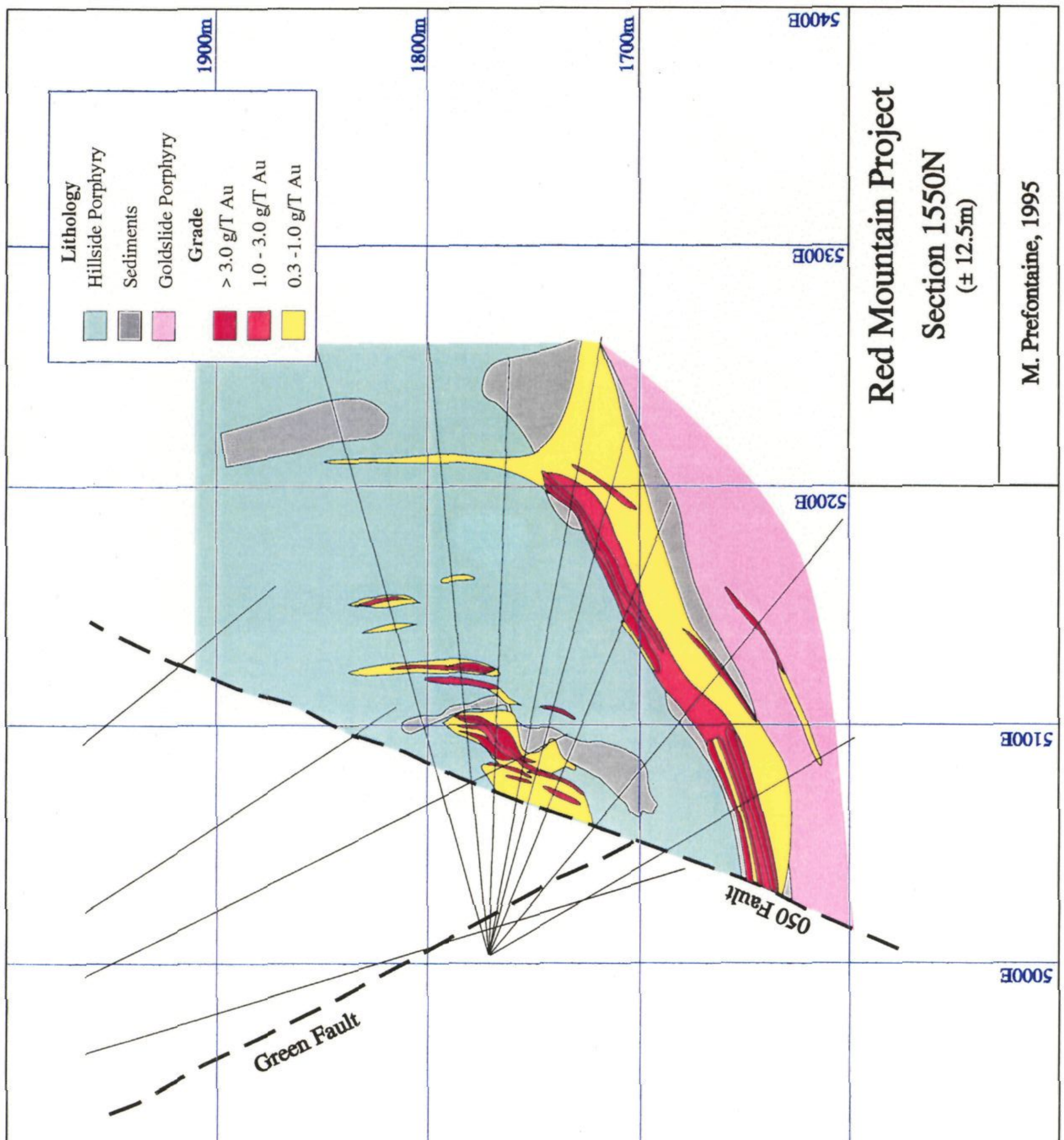


Figure 11: Gold distribution, Section 1550N.

The low grade (0.3-1.0 g/T) generally fills in around the base of the high grade and forms a cup shape (or the top and sides of the cone), Figures 6 and 8 best illustrate this geometry. With depth, low grade gold narrows in width and forms the stem of the cone (Figs. 7,8,10). Below the Marc zone, the low grade values that form the base of the cone generally occur between 5000E - 5100E and between 1750 m - 1500m elevation (Figs 7-10). The Rick fault displaces the AV zone 80m downwards relative to the Marc Zone (Fig. 5).

The Marc zone (high grade contours) occurs approximately between 1175m and 1900m elevation while the AV zone occurs between 1575m and 1800m elevation. High grade gold values are restricted to a horizon which coincides with three lithologic variables: 1) A raft of strongly altered sediments which appear to dip the same amount and in the same direction as the ore zone on section; 2) The base of the finer-grained Hillside Porphyry unit (most of the ore is hosted in a unit of the Hillside which cuts the sediments; and 3) The top of the finer-grained and younger Goldslide Porphyry unit. Extreme brecciation recognized in drillcore marks the top of the Goldslide porphyry.

The south end of the Marc zone is faulted off while the northern extent of the AV zone appears to represent the extent of the hydrothermal system in that direction (Fig. 11). Although the JW zone coincides with the northern extent of the AV zone, it appears to be a separate orebody. This point is illustrated on Section 1550N (Fig. 11) where both the AV and JW zones are hosted in separate sediment horizons. The JW zone lies below the AV zone and there are no anomalous gold values between the two that would link them.

North of Section 1500N, there are no anomalous gold values below the AV zone that would indicate a feeder system rising from depth. Instead, it is likely that the precious metal bearing fluids rose from depth further south, migrated northward along the sediment horizon and deposited the gold.

The JW zone is hosted predominately in a sediment horizon (but not entirely) situated below the sediment horizon that hosts the northern extent of the AV zone (Fig. 11). The JW zone starts at 1500N and extends northward 250m to 1750N (Fig. 5). It is open to the north. Both sediment horizons have the same apparent flat dip on section and both appear to be folded (Fig. 11). Unlike the northern extent of the AV zone, low grade gold occurs below the JW zone. However, because of the lack of drillhole information, the configuration and extent of low grade Au beneath the JW zone is not fully understood.

The 141 zone (the entire area west of the 050 fault) is a large area of low grade gold enrichment (Figs. 10 and 11). Minor flat lying narrow zones of high grade enrichment occur. These higher grade zones usually occur within sediment horizons or commonly occur at contacts between sediments and sills. If the displacement of the 050 fault, Rick fault, and other faults (which have the same characteristics as these) were removed, it is likely that the 141 zone would be located at roughly the same elevation as the Marc-AV zones. Au zoning indicates that the 141 zone contains almost as much gold as the Marc-AV system. It is not certain whether the gold bearing hydrothermal fluids originated in the Marc-AV system and migrated westward along bedding or if the 141 zone has its own hydrothermal centre. The latter is more probable, given that the anomalous gold continues to depth and covers such a large volume of rock.

4.2.3 Ore Minerals

Mineralization consists of native gold, electrum, gold-silver tellurides, silver tellurides, and silver bearing sulphasalts. Scanning electron microprobe and polished section work by Barnett (1991),Fischer (1995), Ford (1994), Lakefield Research Laboratories (1991), and Brenda Process Technology (1994) have identified the following ore minerals:

Table 3: Ore Minerals Identified

Mineral	Chemical Formula
Aurostibnite	$AuSb_2$
Boulangerite and/or Jammesonite	$(Pb,Ag)_3FeSbS_4$
Calaverite	$AuTe_2$
Electrum	Au with 5-20%, rarely 30%, Ag
Gold	Au
Hessite	Ag_2Te
Muthamannite	$(Au,Ag)Te$
Petzite	Ag_3AuTe_2
Sylvanite and/or krennerite	$(Au,Ag)Te_2$
Tellurbismuth	BiTe
Tetrahedrite	$(Cu,Ag,Zn,Fe)_{12}Sb_4S_{13}$

Other accessory opaque minerals, in order of abundance, include; pyrite, pyrrhotite, sphalerite, chalcopyrite and minor galena, native tellurium, tellurantimony, and altaite. Gangue minerals within the ore zones, in order of abundance, include; sericite, muscovite, carbonate (calcite, dolomite, and ferroan dolomite), quartz, chlorite, tourmaline, and K-feldspar.

4.2.4 Distribution of Ore Minerals

Fisher (1995) notes that Gold, electrum, and precious metal tellurides appear to have three main types of crystallization sites:

1. Precious metal minerals occur predominately (95%) as inclusions in and along internal cracks of pyrite. The precious metals are usually associated with ribbon quartz, carbonate, and sericite. The pyrite has a typical grain size in the range of 75-150 microns while the precious metal inclusions have an average grain size in the range of 0.5-15 microns. Barnett (1991) and Fischer (1995) note that precious metal minerals also occur as inclusions in pyrrhotite, sphalerite and coarse arsenopyrite (85-200 microns). However, the amount of precious metals in these minerals is

volumetrically insignificant. There is a much larger volume of pyrrhotite and sphalerite that do not contain precious metal minerals (Barnett, 1991).

2. The next most favorable sites are clumps of what is now sericite. Concentration of the ore minerals is in rectangular patches with sharp boundaries. The ore minerals could have concentrated while the hydrothermal fluids were replacing feldspar or mafic phenocrysts with sericite. Note that Fischer mentions that the ore minerals could have preferentially concentrated in mafic phenocrysts before the sericite replaced them.

3. Precious metal minerals are also found in quartz-carbonate fiber veins (the quartz has a columnar appearance). Fisher (1995) interprets these as shears (it is likely that the shear-like appearance is the result of regional deformation). Zones containing abundant muscovite-sericite would deform while zones containing less sericite would not. Note that gold and electrum are also observed in veinlets between pyrite veins that do not display shearing.

4.2.5 Ore Mineral Paragenesis

The following pargenic sequence of sulphide mineralization is derived primarily from the limited but thorough work of Fischer (1995) on 8 samples and Barnett (1991) on 20 samples. It has been modified by the author's polished section work (38 samples, 8 of which were the same as Fischer's) and core logging. Table 4 provides a summary.

The first sulphide event consisted of coarse euhedral pyrite, the timing of pyrrhotite is difficult to determine but it is possible that a phase of pyrrhotite was deposited before the coarse pyrite. Porphyroblastic pyrite (similar optically to the coarse euhedral pyrite with gold) has been observed in pyrrhotite.

Fischer (1995) notes a second phase of pyrite which he describes as "dirty" anhedral pyrite with or without ore minerals. By "dirty" Fischer means that this second generation of pyrite contains many inclusions including; albite, pyrrhotite, sphalerite, electrum, and hessite. The dirty anhedral pyrite forms irregular overgrowths on euhedral pyrite (the euhedral pyrite contains very few inclusions). A general observation from scanning the polished sections is that the earliest ore mineral event is composed predominately of this dirty pyrite and tellurides --mostly silver bearing (hessite, etc.).

Table 4: Mineralization Paragenesis

Clean pyrite	------ - - - - - - - - - - ------- ------- - - - - - - - - - - - -
Dirty py w/ hess	------
Dirty py w/ aspy, tetr	------
Pyrrhotite	- - - ---------- - - - - - - - - - - ----------
Altaite	- - - --------
Hessite	------ --------
Sylvanite/krennerite	- - - --------
Calaverite	- - - --------
Electrum	- - - --------
Gold	--------
Chalcopyrite	----- --------
Boulangerite	- - - --------
Tellurbismuth	--------
Petzite	- - - --------
Sphalerite	- - - ----- - - - - - - ---------
Arsenopyrite	-----
Tetrahedrite	-----
Sericite	- - - - - - - - - - - - - - - - - - - --------------
Carbonate	-------- - - - -
"Stretched" quartz	--------
Tourmaline	--------
K-feldspar	-------

The third pyrite event was initially relatively inclusion-free and then grades to inclusions of tellurides, gold, and electrum on the outer rims. Fischer notes this as the main ore mineral event.

Stage I mineralization: Barnett (1991) lumps all of these pyrite and ore mineral stages into one event. Electrum, gold, Au-Ag tellurides and antimonides occur as inclusions in coarse pyrite and arsenopyrite in a gangue assemblage of quartz, apatite, K-feldspar, muscovite, and Mg chlorite. After mineralization, Stage I was brecciated and fragmented by explosive hydrothermal activity. A second generation of pyrite (without other ore minerals), quartz, and muscovite then cemented the breccia fragments.

The transition from Stage I to Stage II is marked by the transition from pyrite stability to pyrrhotite stability; the development of Fe-rich sphalerite and chalcopyrite (in core, chalcopyrite is observed more frequently in pyrrhotite veins); and a trend to Fe enrichment in chlorite. Barnett (1991) also mentions that a pulse of Ba-rich fluids produced Ba-zoned K-feldspar at this transitional stage.

Fischer's work concurs with the pyrrhotite mineralization at this stage of the paragenic sequence. The sphalerite mineralization is the last event in Fischer's sequence and is consistent with the polished section work carried out in this project.

Barnett (1991) describes Stage II as a cementation and alteration, of variable intensity, of Stage I assemblages. The main hydrothermal assemblage includes pyrrhotite, sphalerite, chalcopyrite, Ba-rich K-feldspar, apatite, epidote, Mn-scapolite, Fe-chlorite, siderite, and F-Cl-amphibole. Another pulse of Ba-rich fluids produced Ba-zoned K-feldspar and fluids evolved to increased iron contents stabilizing iron-rich chlorite and siderite. Some Stage I pyrite with precious metal minerals was replaced by and included within massive pyrrhotite and sphalerite.

The last stage of mineralization reflected a cooling of the hydrothermal system producing pyrite and chlorite-muscovite-sphalerite-chalcopyrite-pyrite veinlets. No precious metal minerals have been observed in this assemblage.

4.3 ORE QUALITY

4.3.1 Gold Recovery

Several metallurgical studies were carried out to investigate the recoverability of gold. Most studies were carried out on drill core but one 100 Kg bulk sample from underground was also investigated. The investigations included mineralogical investigations (using a microprobe), floatation tests, cyanidation tests, size fraction analysis, and grindibility analysis.

Metallurgical testing indicates that the ore is amenable to cyanidation processes for the extraction and recovery of gold and silver. Samples from all three ore zones were tested, but the majority of metallurgical work was completed using material from the Marc zone as it was the most fully explored at the time. Gold extractions are variable across the three ore zones, ranging from 92.8% to 84.3%. Results from the work carried out by Brenda Process Technology are summarized in Table 5 below.

Table 5: Head Assays and Predicted Precious Metal Extractions (from Austin, J.A., 1994)

	Head Assays		Residue Assays		Extractions	
	Au g/t	Ag g/t	Au g/t	Ag g/t	Au %	Ag %
Marc Zone	12.5	47.6	1.30	7.0	89.6	85.3
AV Zone	7.9	24.6	1.25	7.0	84.3	71.5
JW Zone	10.7	20.6	0.77	3.0	92.8	85.4

4.3.2 Character of Ore

The following summarizes the character of ore from Ford (1993):

Gold in the Marc zone and JW zone is dominated by native gold and petzite, while in the AV zone gold occurs dominantly as tellurides (petzite and calaverite). Note that the reports indicate that the rock type of all samples submitted was intrusive rock, but that the AV and JW zone samples were actually sedimentary rock (the author collected these samples). At the time these samples were collected (July, 1993), drilling had only intersected AV and JW ore in sediments. Subsequent drilling intersected ore in these zones hosted in intrusive (especially the AV zone) and further metallurgical testing is required on these zones.

In the Marc zone, analysis was carried on a variety of ore types: high grade ore (>3 g/t Au); low grade ore (1-3 g/t Au); and ores with elevated As, Te, and tetrahedrite contents. Gold in both the low grade and high grade ore samples occurs as native gold and petzite. Te rich ore is characterized by petzite with lesser native gold. High As- ore is dominated by native gold, petzite, with lesser calaverite, aurostibnite, montabrayite, and krennerite. Tetrahedrite ore is dominated by native gold, calaverite and aurostibnite.

During the exploration programs, all samples submitted for gold and silver fire assay were also analyzed for 32 elements using the ICP technique. The trace element results were entered into the computer data base but were never comprehensively studied. Only a preliminary study which included contouring Au, Ag, As, Sb, Cu, and Zn on longitudinal projections was completed. The contouring indicated that trace element values and silver values increase with increasing gold.

4.3.3 Textural Relations

Precious metal grains range in size from 1 to 13 μm and average 2 to 4 μm. They occur predominately encapsulated in pyrite (at least 90%) but also occur encrusted on pyrite and encapsulated by carbonate, muscovite, quartz, chalcopyrite, sphalerite, and tetrahedrite.

Ford (1994) notes that gold losses are primarily the result of encapsulation of 1 to 2 μm particles of native gold, petzite, calaverite, krennerite, aurostibnite and montbrayite in pyrite. Resistance of aurostibnite and montbrayite to cyanidation accounts for some gold loss in residues of Te-rich samples and As-rich ore from the Marc zone. Incomplete cyanidation of telluride minerals is responsible for gold loss in residues from the AV zone and Te-rich ores.

The work carried out by Brenda Process Technology indicated that recoveries in the high telluride ore and the AV zone (high telluride) can be improved significantly by leaching with a high lime concentration. Using oxygen in the leach also enhanced extraction in the AV zone.

4.3.4 Grain Size

Grind size sensitivity test work was carried using a 1 gram/litre NaCN concentration, a leach time of 48 hours and a pH of 10.5 to 11.0. Brenda Process Technology concluded that extraction of precious metals is not significantly altered with grinding, but overall extractions are improved with the use of a finer grind. Extraction of gold increases with grinds finer than 90 percent minus 400 mesh.

A detailed study on coarse gold distribution has not been carried out. In very high grade core samples (>30 g/t Au) visible gold is frequently observed. Grains range in size from 0.5 to 1mm. High grade ore samples were methodically analyzed by metallics assay. Results from metallics assay often returned slightly higher (0.5 to 2 g/t Au) values than the fire assay suggesting that nugget effects are minimal in Red Mountain ore.

4.3.5 Bond Index

Two bond work index tests were conducted on Marc zone material. The bond work index on a Marc zone composite sample from core was determined to be 17.36 kWhr/tonne and a bulk underground sample was determined to be 19.22 kWhr/tonne.

Additional testing using Marc zone material indicate that the ore is amenable to conventional SAG milling and ball milling.

4.3.6 Specific Gravity

Specific gravity determinations were completed on all three zones by Brenda Process Technology. Results are summarized in Table 6.

Table 6: Summary of Specific Gravity Determinations

Ore Zone	Specific Gravity (g/cc)
Marc Zone Composite	2.81
AV Zone Composite	3.00
JW Zone Composite	2.85

These results are similar to the specific gravity measurements made on core samples. Specific gravity was measured on every ore intersection sample at the analytical laboratory during the 1993 and 1994 drill programs.

5. GOLD ASSAY RESULTS

5.1 STATISTICAL SUMMARY OF THE MARC ZONE

A basic statistical analysis was completed on the Marc zone drill hole intersections that define the ore blocks used in the geological resource calculations. Summary results are listed in Table 7 and the gold grade distribution is displayed in Figure 12.

Results display a non-normal arithmetic distribution with the majority of the gold values falling below 18.3 g/T Au. This simple frequency distribution indicates one single population with 37 samples above 60 g/T Au and no obvious secondary populations. The ninety fifth percentile is 27.4 g/T Au.

Table 7: Statistical Summary of Gold Grades in Marc Zone Ore Blocks

No. Samples	1736
Mean	11.0
Median	5.3
Mode	2.2
Standard Deviation	21.6
Variance	468.7
Kurtosis	107.3
Skewness	8.4
Range	373.6
Minimum	0.1
Maximum	373.7

Additional statistical analysis was carried out using the software Prob plot (Stanley, 1987). Results are summarized as histograms and probability plots and are included as Appendix 1.

The logarithmic histogram indicates that gold is lognormally distributed. It displays a Gaussian distribution with no secondary populations apart from two subtle deviations (one on each side of the histogram) within the main population.

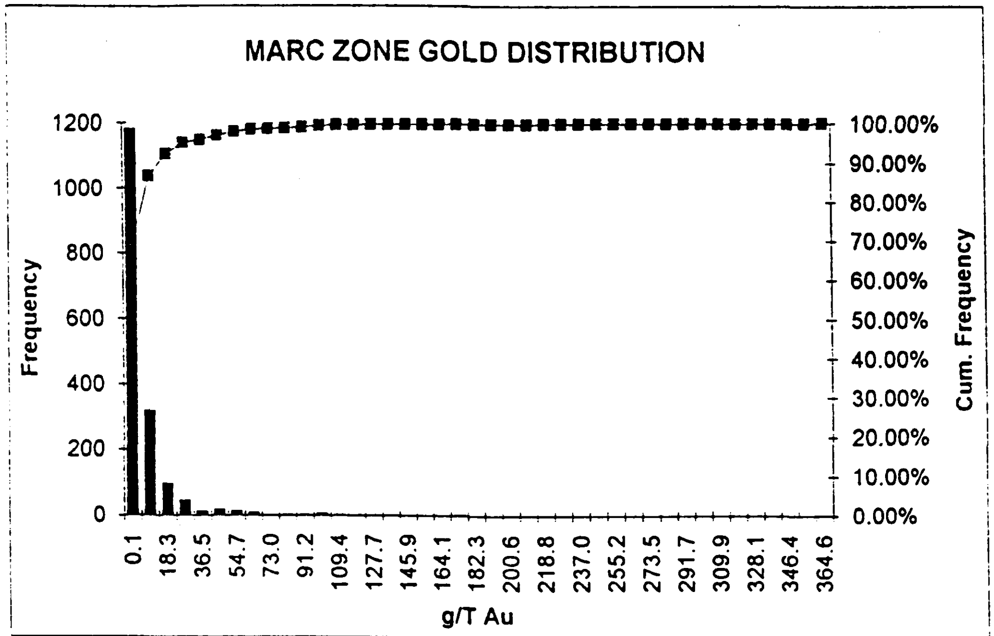


Figure 12: Gold Distribution in the Marc zone.

Probability plots were used to model population distributions (Appendix 1). Two cases were analyzed, a one population model which exhibits a good fit line with a mean value of 5.1 ppm Au and threshold values between 0.43 and 61.7 ppm Au (at 95% confidence levels). The second case analyzed used a three population model. The best fit curve was approximated by Chi Squared parameter estimates (summary of population statistics are included in Appendix 1). Population 1 exhibits a mean value of 0.57 ppm Au and threshold values between 0.15 and 2.2 ppm Au. Population 2 exhibits a mean value of 5.7 ppm Au and threshold values between 0.94 and 34.7 ppm Au. Population 3 exhibits a mean value of 49.9 ppm Au and threshold values between 13.2 and 188.7 ppm Au. All these are at 95% confidence level with population 1 representing 10.22% of all samples, population 2 84.26% of all samples and population 3 5.53% of all samples.

5.2 DRILL TESTING GOLD VARIANCE

Eight holes were drilled from underground to test for variance within the Marc Zone. Two horizontal holes were drilled along Section 1200N (U93-1001 and U93-1002) before driving the crosscut. Four inclined holes, in the 1295N crosscut, were drilled perpendicular to the Marc Zone. These holes were spaced within 1 metre of each other. In addition, two holes (U94-1159 and 1160) were drilled from the 1295 crosscut longitudinally down the Marc Zone towards the southeast to test for continuity of mineralization along strike. The ore zone in hole U94-1159 (drilled at +1°) ended at the Gaping fault. In U94-1160 (drilled at −15°), the ore zone ended where predicted.

1) Tests in the 1200N Crosscut

Figure 13 provides a comparison of the grade distribution through the ore zone in both drill holes. It also compares the overall grade average returned from the two drill holes, the muck samples and the sample tower samples. The comparison is rather crude since the sample tower and muck sample grades were calculated simply by averaging the grades of the 8 rounds and measuring the overall 24 metre width they cover.

Muck sample grades were determined by taking 20 evenly spaced samples from the muck pile on surface. Sample Tower samples involved splitting the entire round and reducing it into two 100 Kg bags. These were in turn split

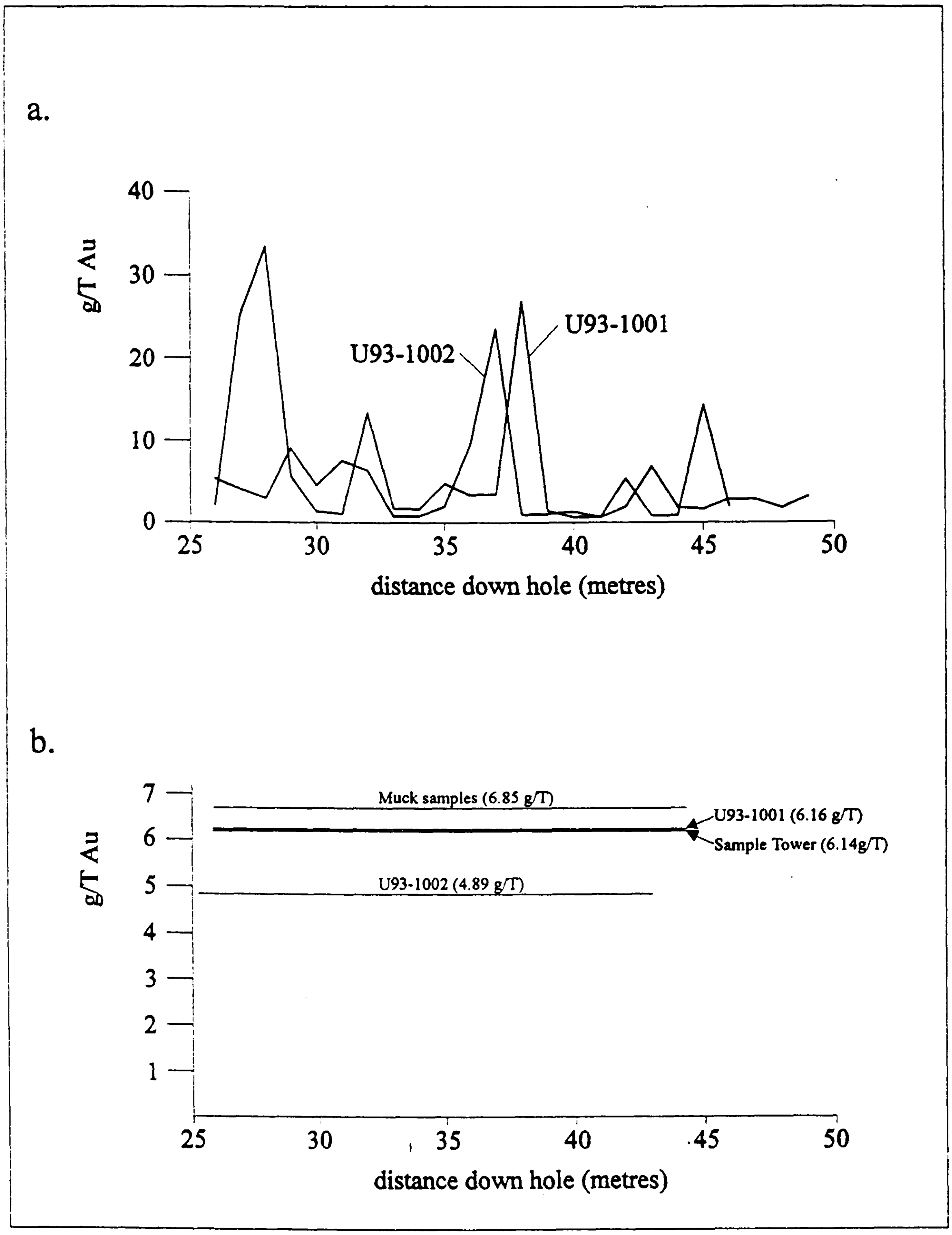


Figure 13: a) Grade distribution of two parallel drillholes in 1200N Crosscut.
b) Grade comparison from bulk samples, muck samples, and drill holes through 1200N Crosscut.

down to 8 samples which were submitted for 1 assay Tonne analysis. The theory being to as closely approximate the core sampling and analysis.

Drill hole information displays the same overall spiky distribution (peaks and valleys), with both holes generally correlating well. Drill hole U93-1001 intersected one 33 g/T Au sample which drill hole U93-1002 did not. This accounts for the lower overall grade of 4.89 g/t Au over 34 metres versus 6.85 g/T Au in drillhole U93-1001.

The average gold grade from muck samples (6.85 g/T), sample tower samples (6.14 g/T Au), and drill hole U93-1001 (6.16 g/T Au) of the 1200N is consistent, which suggests that mineralization is homogeneous and that there should be no significant grade estimation problems.

The grade in all of these samples was reduced by dilution from the Gaping fault. This fault cuts and displaces the ore zone in the crosscut. In drill core, dilution is caused by 5 metres of low grade broken rock and while mining, fractured rock would cave into the rounds.

2) Tests in Four Holes Drilled Across the Ore in the 1295N Crosscut

The gold distribution within the ore zone in the four holes drilled within 1 metre of each other is also fairly consistent. Gold enrichment occurs at roughly the same location, the same intensity, and over the same width (Figure 14). The spiky nature of the gold grades is also similar, with each hole containing approximately 3 high grade spikes. Average grades for each intersection are summarized in Table 8. Gold grades in three of the holes are similar (within 3 g/T Au) to each other but the gold grade in hole U94-1155 is considerably lower. It appears as though U94-1155 did not intersect the ore zone until 3 m further downhole, suggesting irregularities in the ore zone contact.

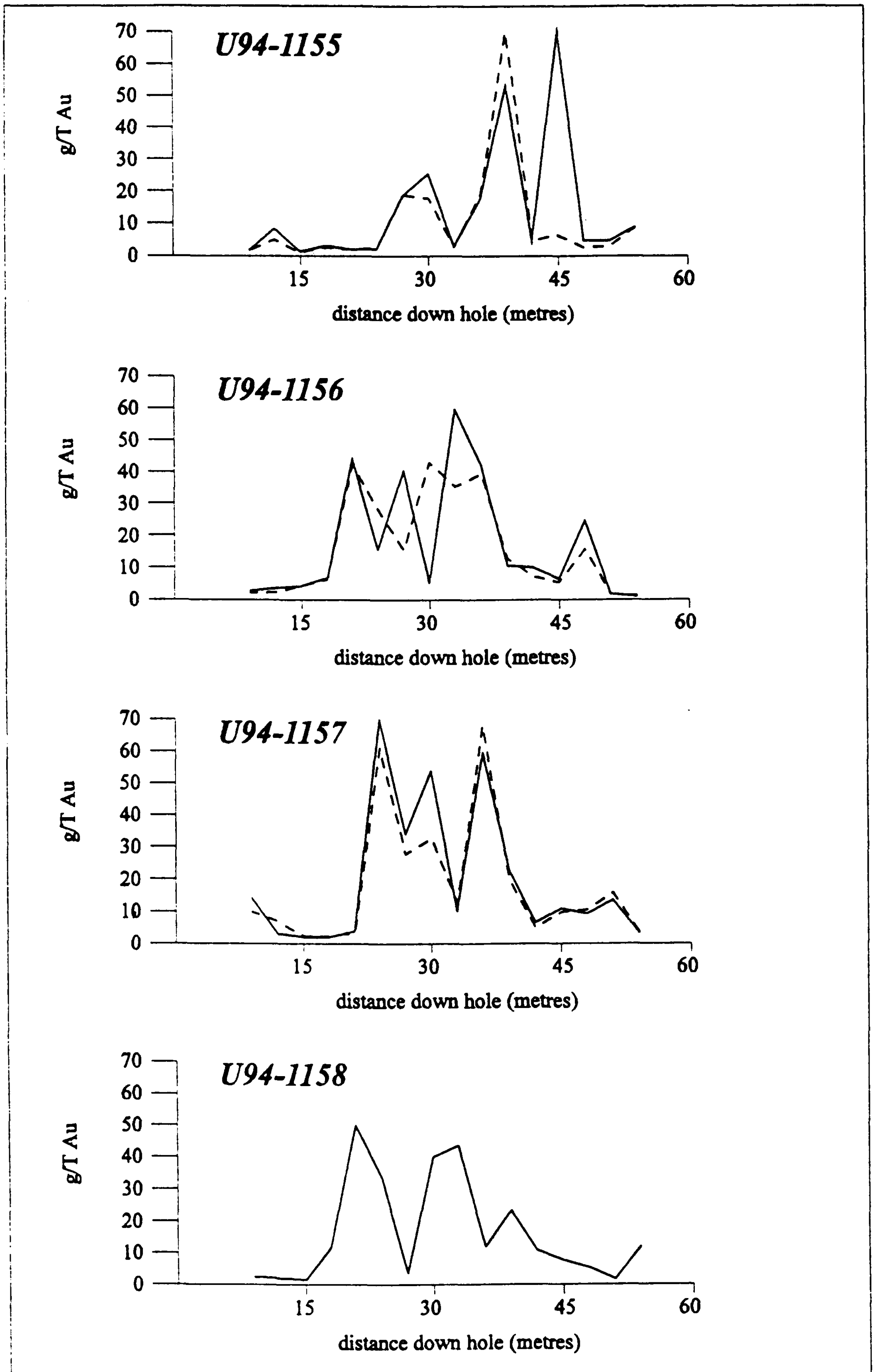


Figure 14: Grade variability of one metre spaced drillholes
(dashed lines represent second half of core).

Assay results indicate that the second half of the core (Table 8) compares very well. Only minor discrepancies are observed and are the result of additional or larger gold bearing pyrite veinlets across the core sample.

Table 8: Average Gold Grades (over 15 metres) in U94-1155, 1156, 1157, 1158

U94-1155	2nd half	U94-1156	2nd half	U94-1157	2nd half	U94-1158
14.20	11.03	17.39	18.46	20.36	18.87	17.24

Although the gold distribution appears consistent in this 4 to 6 metre wide area, the average grade is somewhat inconsistent. This test indicates a variability of up to 20% within a 6 metre area. The drill hole spacing used to estimate reserves in the Marc, AV, and JW zones was 12.5 metres, 25 metres, and 25 metres respectively. Each drillhole ore intersection in the Marc zone is used to estimate the grade over a 12.5 metres area (6.25 metres on each side of the hole).

3) Tests Along Strike of the Marc Zone

The grade distribution in the drillholes drilled along strike is relatively similar. Both holes (Figure 15) display a peak and valley style grade distribution (reflecting the stockwork nature of the orebody). Peaks and valleys are roughly the same amplitudes and widths. Average grades in the two drillholes over the same lengths (from 2 to 55 metres depth) were 23.7 g/T Au over 53 metres (U94-1159) and 29.01 g/T Au over 53 metres (U94-1160). The ore intersection in U94-1159 was actually 21.0 g/T Au over 72 metres. These results indicate a fairly significant gold grade variation when it is taken into consideration that the two drillholes are situated within a drillhole spacing area which one drillhole has been used to estimate grade in the resource calculations. The variability is caused by drillhole U94-1160 intersecting fewer high grade intervals (pyrite veins).

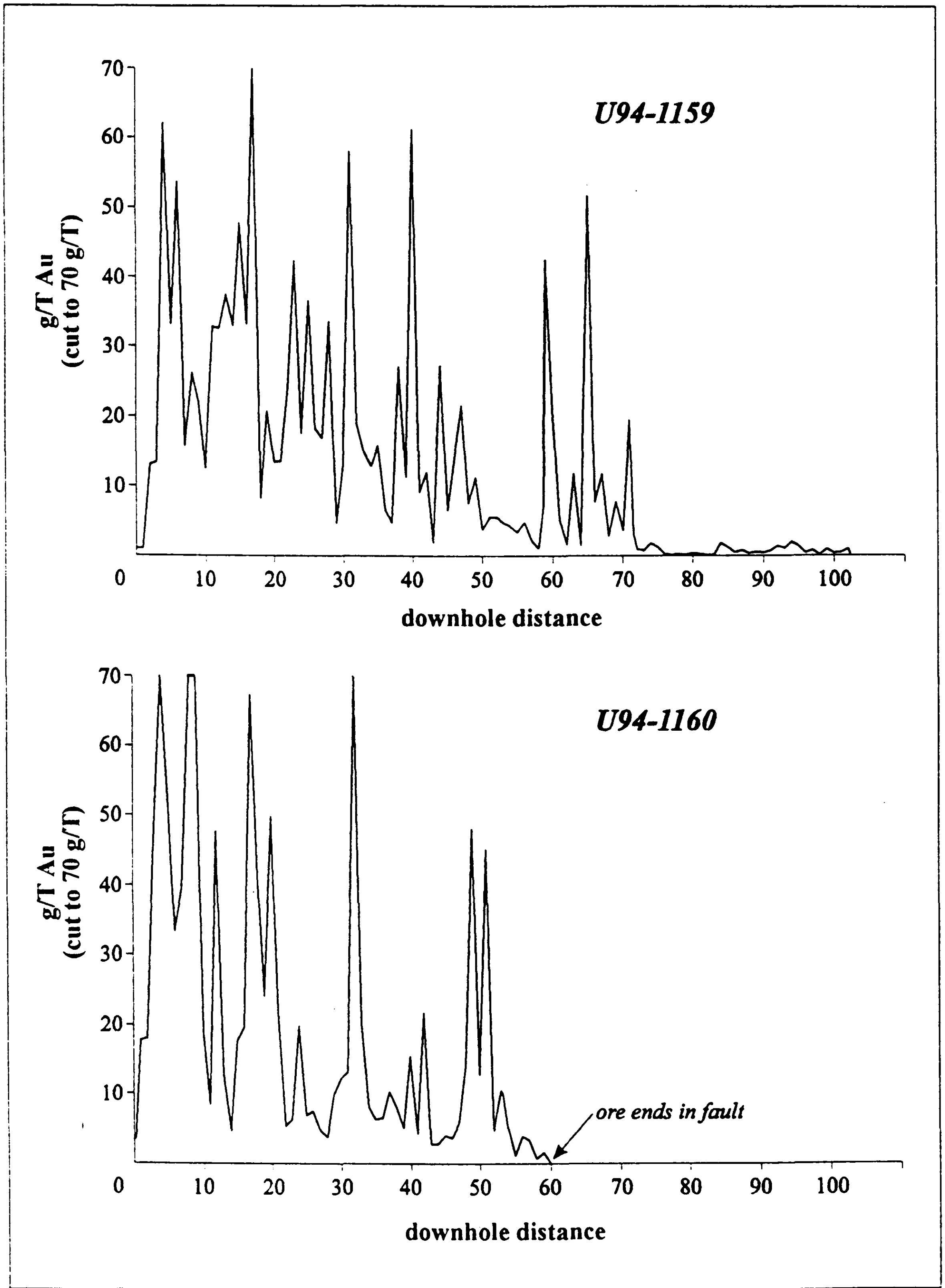


Figure 15: Grade distribution profiles in two drillholes drilled along strike of the Marc Zone.

6. DISCUSSION

Gold zoning (especially the 0.3 to 1.0 g/T Au interval) indicates that precious metal fluids originated at depth, travelled up through the Goldslide porphyry depositing trace amounts of gold and then deposited as a pyrite-precious metal stockwork at a particular paleodepth/paleoelevation. Because of the paucity of deep drilling, it is uncertain at what depth the precious metal fluids originated or at what depth they began depositing gold. The gold zoning does however demonstrate that the fluids rose from a feeder-type system roughly perpendicular to the ore zones (thus dipping to the northeast), and this feeder was probably vertical at the time of ore formation. As previously indicated, the ore zones have been tilted to the southwest.

Faulting makes the physical link between the Marc-AV zones and the 141 zone difficult to interpret. The 141 zone could either be an outward continuation of the Marc-AV zone that has been dislocated by faults or be a separate hydrothermal centre. It is likely that the latter is the case with the 141 zone representing a separate hydrothermal centre. Ore zoning indicates that anomalous gold is present to the maximum depth of drillhole penetration suggesting that the 141 zone was sourced from its own (thus separate) feeder system. The mere size of the 141 zone also suggests that it was a separate hydrothermal centre. If Red Mountain was located beside a highway in the southwest US, the 141 zone would be an economic open-pittable deposit.

The JW zone is located north of the AV zone and like the northern end of the AV zone is hosted in a raft of bedded sediments. Again drillhole information is too scarce to fully document its distribution. Three possible scenarios exist:

1) Like the AV zone, gold-bearing hydrothermal fluids which originated further south (in the Marc-AV hydrothermal centre) migrated along the sediment horizon northward and deposited the gold.

2) The JW zone is hosted in a raft of sedimentary rock located just above the upper contact of the Goldslide porphyry. The hangingwall (and part of the footwall?) is the Hillside porphyry. The AV zone may be faulted down to form the JW zone. Therefore the upper mineralization interpreted as AV zone on Section 1550N may actually represent hangingwall mineralization?

3) Drillholes indicate gold mineralization below the JW zone on sections 1550N (see Fig. 11) and 1600N (unfortunately this section was not drafted and included in this report). This mineralization may be indicating a feeder system to the JW zone at depth.

The location of the Marc-AV and JW zones coincides with 1) the Goldslide - Hillside porphyry contact, 2) rafts of sedimentary rocks, and 3) an oxidation/reduction interface.

1) Although the majority of the mineralized stockwork zones are hosted in the Hillside porphyry, gold did not extend far up into it. In fact, ore zoning indicates that the high grade ore marks the upper limit of anomalous gold. The Hillside porphyry not only provided an excellent host for the ore but it is probable that it acted as a somewhat impermeable boundary. Textural differences between the Hillside and Goldslide porphyries do not indicate a sufficient permeability contrast to support this idea. It is however possible that earlier alteration (feldspathic) decreased the permeability in the Hillside porphyry (effectively sealing it up) prior to precious metal deposition. The Hillside porphyry possesses a significant early K-feldspar alteration overprint. This early feldspathic alteration could have emanated from the intrusion of the Goldslide porphyry.

   Further evidence of the importance of the Hillside porphyry acting as an impermeable cap and host to mineralization (or any intrusive rock) is the 141 zone. Low grade gold in the 141 zone is abundant and widespread but there is substantially less intrusive rock and hydrothermal alteration.

2) There exists a strong spatial association between sediment rafts and ore. Sediments acted as a conduit for the precious metal bearing fluids forming the northern extent of the AV zone and southern extent of the JW zone. The Marc zone is also partially hosted in sediments but the majority of mineralization occurs in a depression of Hillside porphyry between two rafts of sediments.

3) Petrographic work by Thompson (1995) and Barnett (1991) demonstrated that the ore zones occur at an oxidation boundary. Thompson (1995) notes that a broad actinolite - K-feldspar zone was overprinted by a reduced Fe assemblage, marked by changes in the chlorite composition, introduction of Fe-rich sphalerite, tourmaline, and pyrrhotite. Thompson (1995) also notes that this reduced Fe zone may be controlled by the presence of sediments. In addition, high grade ore occurs at roughly the same elevation. This may have resulted from boiling close to the paleowater table.

Hydrothermal alteration and mineralization at Red Mountain display similarities to both porphyry and epithermal type deposits. A new classification termed alkalic-type epithermal gold deposits has been developed by Bonham (1984), Mutscheler et al. (1984), and most recently by Richards (1995). Red Mountain displays some similarities to the deposits described in this classification. It is important to note that Richards (1995) emphasizes that the term 'alkalic-type' is a less than satisfactory term to describe gold-rich deposits that are associated with rocks of an alkalic affinity. However, Richards' paper provides some excellent deposit descriptions which in turn help to understand some of the characteristics of the nature and distribution of hydrothermal alteration and mineralization at Red Mountain.

Early K-feldspar alteration, tourmaline alteration, and the occurrence of chalcopyrite and molybdenite within a propylitic alteration assemblage (below the ore zones) are factors reminiscent of porphyry-type Cu-Mo-Au deposits. However, gold zoning indicates that mineralization was sourced from depth, and crosscuts early alteration. Unlike porphyry copper style mineralization, mineralization at Red Mountain is not enveloped around or within intrusive phases. Gold-silver-telluride mineralization is associated with a later sericite event not an early potassic event typical of porphyries (it is acknowledged that Au in many porphyry deposits is associated with a later phyllic event and that mineralization does not necessarily have to be associated with potassic alteration).

Red Mountain is a hydrothermal Au-Te-Ag deposit related to an alkalic multiphase high-level intrusion. Porphyry style alteration has been overprinted by epithermal alteration and mineralization assemblages.

Figure 16 is provided to emphasize the shape and to highlight the potential for further mineralization. This model is based largely on the Cripple Creek (Colorado) and the Emperor (Fiji) deposits. Ore in both of these deposits occurs in faults as opposed to Red Mountain where no controlling structures have been recognized. The shape of the Marc-AV system displayed by the ore zoning is remarkably similar to that of Richards' (1995) schematic model (Fig. 17).

The stockwork breccias on both diagrams are roughly the same size and occur at approximately the same location. An intriguing exploration target is highlighted in the schematic indicating that mineralization actually occurs below the stockwork at the top of the feeder system (this is further discussed in the next section on exploration potential). Note that the feeder system in the model of Richards (1995) and Bonham (1986) extends at least 1000 metres below the stockwork zone, drill penetration at Red Mountain extends approximately 350 metres below the stockwork zone.

The mineral assemblages described at Cripple Creek, Emperor and Porgera are similar to those at Red Mountain. They usually consist of gold, electrum, gold tellurides, silver, silver tellurides, sulphasalts, and arsenopyrite hosted in quartz-pyrite and/or quartz veins.

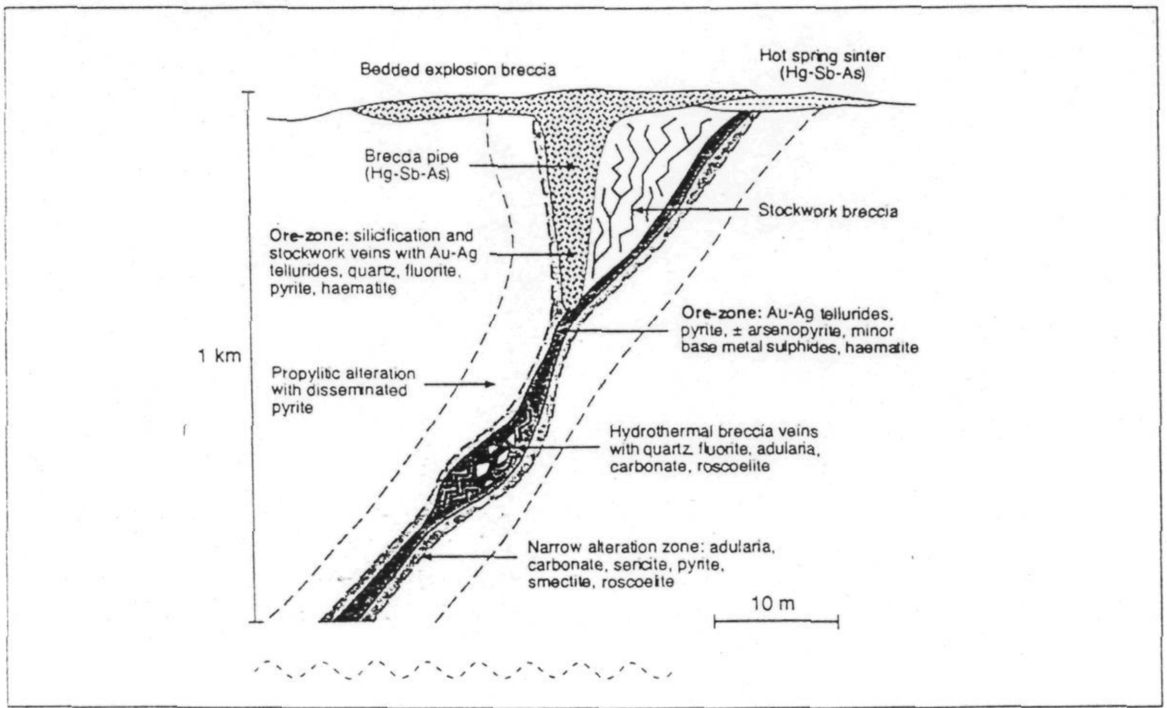


Figure 16: Schematic model of an alkali-type Au-Ag deposit (from Richards, 1995).

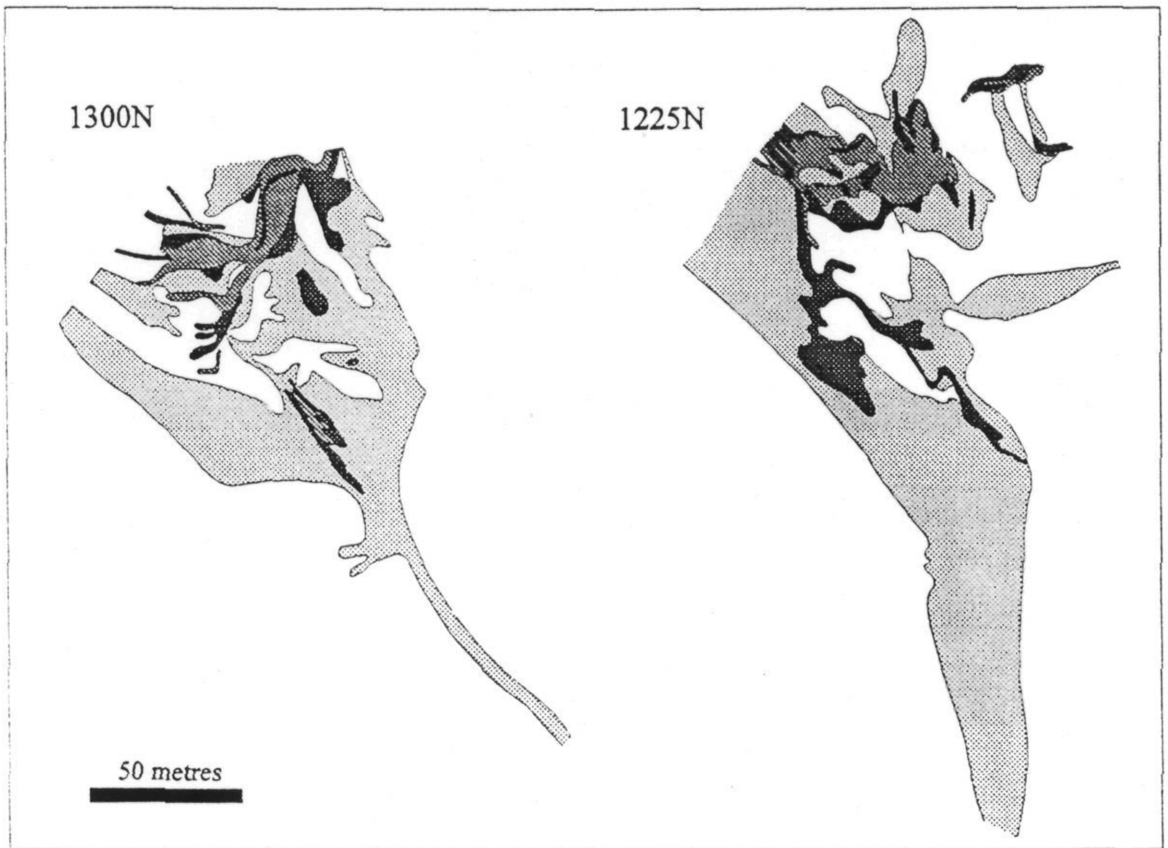


Figure 17: Marc zone gold systems from Sections 1225N and 1300N.

However alteration patterns in these deposits are not similar to Red Mountain. Alteration on Red Mountain is far more widespread, much like the alteration at the Hemlo deposit (Ontario) or the alteration at the Porgera deposit (New Guinea) (which has been classified by Richards as an alkalic-type epithermal system). The footwall of the Marc-AV zones appears far wider than that in the schematic diagram. That is unless drilling on Red Mountain is in the opposite plane and thus the feeder system is actually perpendicular to the precious metal - stockwork mineralization.

Richards (1995) also notes that the precious metals are sourced from an intrusion at depth and that there is a possibility of a porphyry copper deposit at depth.

7. EXPLORATION POTENTIAL

Work from this project has highlighted two immediate drill targets:

1. The JW zone is open to the north. The ore zoning indicates the possibility of a feeder system for the JW zone. If the JW zone is a separate hydrothermal centre, the possibility of discovering an ore zone the size of the Marc-AV system is good. This area is not fully understood and is further complicated by faulting. It is imperative that a set of level plans be generated to study both the fault offset and the trend of mineralization. Perhaps the trend of the JW zone is not northwest and drilling has simply caught its edge. It has happened on this property before!

2. There is potential for a bonanza vein or zone within the feeder system. Two drillholes were completed to test this target in 1994 and both intersected low grade mineralization. The first hole (U94-1143), which was drilled from the 1295N crosscut (it appears on section 1300N as the lowest intersection in the low grade feeder system), intersected a 22 metre quartz-calcite stockwork that contained maraposite and low grade gold. Only 4 metres of this intersection returned elevated gold values (the highest was 1.32 g/T Au) but it was encouraging that mineralization was present where predicted. The second hole (MC94-189) was drilled from surface on section 1200N. The drillhole intersected bleached zones with elevated pyrite contents. Low grade gold was reported (H. Smit, pers. comm. 1995). It is possible that this hole is located too far to the east to have tested the feeder system.

   The bonanza target has not been fully tested. Further drilling should be carried out to test for high grade mineralization along the strike and dip extent of the feeder system. It is also possible that the feeder system is oriented perpendicular to the strike of the ore zones. Some drillholes should be drilled perpendicular to section.

Hydrothermal alteration and mineralization is strong and widespread over Red Mountain, it is therefore possible that there are other hydrothermal centres in the region. The following lists some exploration criteria to use while exploring for new centres:

1) Jurassic aged intrusions (especially thick build-ups of intrusive rock).

2) Widespread feldspathic alteration.

3) Strong sericite alteration.

4) The contact between the Hillside and Goldslide porphyries, especially where rafts of sedimentary rocks have been preserved.

8. CONCLUSIONS

The gold distribution indicates that:

1. Low grade (0.3-1.0 g/T Au) gold mineralization demonstrates that the Marc-AV system is the shape of an inverted cone. Gold zoning further demonstrates that gold-bearing hydrothermal fluids rose vertically from depth and deposited high grade mineralization at a specific paleodepth.

2. The feeder system extends from the southern end of the Marc zone (1050N) northward approximately 450 metres to Section 1500N. North of 1500N, gold-bearing fluids traveled along a permeable bed of sedimentary rock.

3. The JW zone and AV zones are probably separate ore zones. In addition, it is possible that the JW zone is a separate hydrothermal centre.

4. The 141 zone is probably a separate hydrothermal centre. Gold mineralization in the 141 zone is extensive but too low grade to be economic.

5. In the Marc zone, statistical analysis has demonstrated that gold grades are lognormally distributed and that 95% of all assay samples defining the 3 g/T Au ore blocks range between 0.1 and 27.4 g/T Au. Ore reserve estimations should be completed using cut-off grades of 27.4 g/T Au, 61.7 g/T Au (upper threshold of 1 population distribution model), and 34.7 g/T Au (upper limit of population 2 consisting of 84.26% of sample in 3 population model). These should then be compared to a reserve estimation using uncut gold grades. This exercise would establish whether or not very high grade samples significantly increase the overall grade of the Marc Zone. Separate statistical analysis should also be carried out on the AV and JW zones.

6. In the 1200N crosscut, core samples, muck samples, and sample tower gold grades are similar. Drill tests illustrate the stockwork nature of the ore. This exercise also demonstrated that gold grades are similar in distribution. Differences in the average gold grade of ore zone intersections in core resulted from one or two high or low values within an intersection.

7. There are two exploration drill targets: the system is open to the north and there is the potential for a bonanza zone within the feeder system.

8. Gold deposits are usually composed of several different styles of mineralization. The differences between the Marc, AV, JW, and 141 zones are evidence that gold mineralization is extensive and diverse on Red Mountain. The potential for discovering additional ore zones is promising.

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APPENDIX 1

Summary of Statistics from PROBPLOT Software

```
17:47:09                    Marc zone Au distribution                  09/12/95

##########################################################################
SUMMARY STATISTICS and HISTOGRAM                              ARITHMETIC VALUES

 Variable = Au                Unit =      ppm                 N =  1736

     Mean =     11.028         Min =     0.070   1st Quartile =      2.560
Std. Dev. =     21.650         Max =   373.700         Median =      5.290
     CV % =    196.323    Skewness =     8.356   3rd Quartile =     11.400

==========================================================================
  %    cum %    cls int          (# of bins = 33  -  bin size =   11.676)
 ----- -----   --------          ----------------------------------------
 0.00  0.03    -5.768
53.97 53.97     5.908            ******************************* -->  221
31.62 85.58    17.584            ******************************* -->  129
 7.20 92.77    29.260            *****************************
 2.65 95.42    40.936            ***********
 1.21 96.63    52.612            *****
 1.21 97.84    64.288            *****
 0.69 98.53    75.964            ***
 0.17 98.70    87.640            *
 0.23 98.93    99.315            *
 0.35 99.28   110.991            *
 0.23 99.51   122.667            *
 0.06 99.57   134.343
 0.06 99.63   146.019
 0.00 99.63   157.695
 0.00 99.63   169.371
 0.06 99.68   181.047
 0.00 99.68   192.723
 0.06 99.74   204.399
 0.00 99.74   216.075
 0.12 99.86   227.751
 0.00 99.86   239.427
 0.00 99.86   251.103
 0.00 99.86   262.779
 0.00 99.86   274.455
 0.00 99.86   286.130
 0.00 99.86   297.806
 0.00 99.86   309.482
 0.00 99.86   321.158
 0.00 99.86   332.834
 0.00 99.86   344.510
 0.00 99.86   356.186
 0.00 99.86   367.862
 0.12 99.97   379.538
 --------------------------------------------------------------------------
                                 0         1         2         3         4

                        Each "*" represents approximately 4.2 observations.

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17:48:18                 Marc zone Au distribution                    09/12/95

##########################################################################
SUMMARY STATISTICS and HISTOGRAM                          LOGARITHMIC VALUES

 Variable = Au                 Unit =      ppm                 N =  1736

     Mean =     0.7169         Min =    -1.1549   1st Quartile =    0.4082
Std. Dev. =     0.5312         Max =     2.5725         Median =    0.7235
     CV % =    74.0909    Skewness =    -0.1111   3rd Quartile =    1.0569

        Anti-Log Mean =      5.211      Anti-Log Std. Dev. : (-)     1.534
                                                             (+)    17.705

==========================================================================
  %   cum %   antilog  cls int  (# of bins = 33   -  bin size =    0.1165)
----- -----  --------  -------  --------------------------------------------

 0.00  0.03     0.061  -1.2131
 0.06  0.09     0.080  -1.0967
 0.12  0.20     0.105  -0.9802
 0.06  0.26     0.137  -0.8637
 0.06  0.32     0.179  -0.7472
 0.69  1.01     0.234  -0.6307  ***
 0.52  1.53     0.306  -0.5143  **
 0.98  2.50     0.400  -0.3978  ****
 1.32  3.83     0.523  -0.2813  *****
 2.42  6.25     0.684  -0.1648  **********
 2.53  8.78     0.895  -0.0483  **********
 2.71 11.49     1.170   0.0682  ***********
 3.46 14.94     1.530   0.1846  **************
 4.26 19.20     2.000   0.3011  *****************
 6.11 25.30     2.616   0.4176  *************************
 8.53 33.82     3.420   0.5341  ***********************************
 9.97 43.78     4.473   0.6506  ******************************* -->   41
 9.91 53.68     5.849   0.7671  ******************************* -->   41
 8.87 62.55     7.648   0.8835  ************************************
 8.58 71.13    10.000   1.0000  ***********************************
 7.37 78.50    13.077   1.1165  ******************************
 6.68 85.18    17.099   1.2330  ***************************
 4.61 89.78    22.359   1.3495  *******************
 3.00 92.77    29.238   1.4659  ************
 2.42 95.19    38.232   1.5824  **********
 1.21 96.40    49.993   1.6989  *****
 1.61 98.01    65.372   1.8154  *******
 0.58 98.59    85.481   1.9319  **
 0.69 99.28   111.777   2.0484  ***
 0.35 99.63   146.163   2.1648  *
 0.06 99.68   191.125   2.2813
 0.17 99.86   249.919   2.3978  *
 0.00 99.86   326.800   2.5143
 0.12 99.97   427.331   2.6308
--------------------------------------------------------------------------
                                0         1         2         3         4

                    Each "*" represents approximately 4.2 observations.

##########################################################################
```

17:57:10 Marc zone Au distribution 09/12/

##

PARAMETER SUMMARY STATISTICS FOR PROBABILITY PLOT ANALYSIS

Data File Name = PRFREQ.TXT

Variable = Au   Unit = ppm   N = 1736
N CI = 33

Transform = Logarithmic   Number of Populations = 1

# of Missing Observations = 0.

==

Class Interval Data Chi Squared Parameter Estimates

Population	Mean	Std Dev	Percentage
1	5.171	- 1.497 + 17.866	100.00

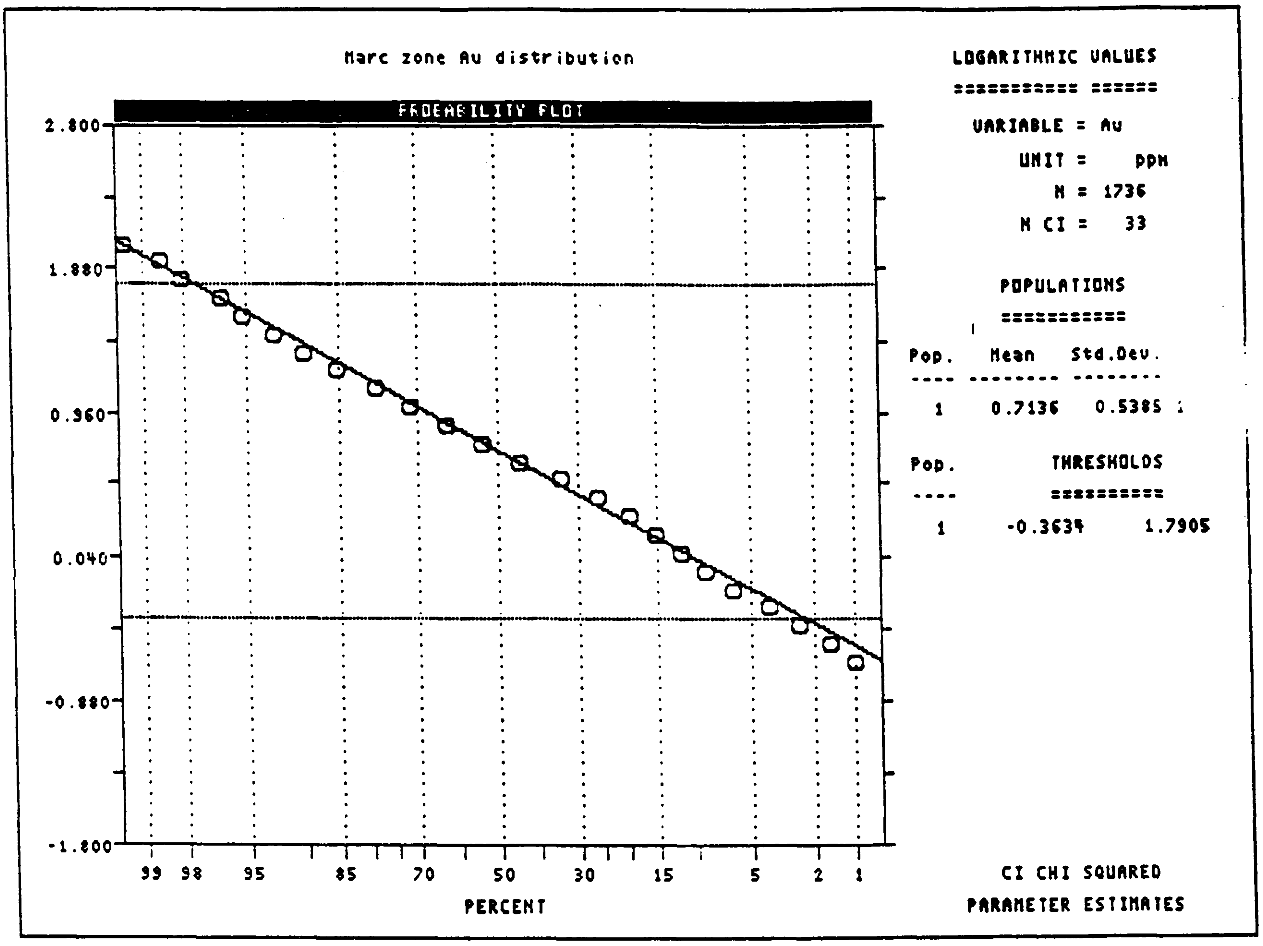
==

Default Thresholds.

Standard Deviation Multiplier = 2.0

Pop.	Thresholds	
1	0.433	61.729

##


Marc zone Au distribution
PROBABILITY PLOT
2.800
1.880
0.960
0.040
-0.880
-1.800
99 98 95 85 70 50 30 15 5 2 1
PERCENT
LOGARITHMIC VALUES
VARIABLE = Au
UNIT = ppm
N = 1736
N CI = 33
POPULATIONS
Pop. Mean Std.Dev.
1 0.7136 0.5385
Pop. THRESHOLDS
1 -0.3634 1.7905
CI CHI SQUARED
PARAMETER ESTIMATES

18:11:05 Marc zone Au distribution 09/12/

##

PARAMETER SUMMARY STATISTICS FOR PROBABILITY PLOT ANALYSIS

Data File Name = PRFREQ.TXT

Variable = Au Unit = ppm N = 1736
N CI = 33

Transform = Logarithmic Number of Populations = 3

# of Missing Observations = 0.

==

Class Interval Data Chi Squared Parameter Estimates

Population	Mean		Std Dev	Percentage
1	0.573	-	0.294	10.22
		+	1.118	
2	5.734	-	2.332	84.26
		+	14.099	
3	49.873	-	25.642	5.53
		+	97.003	

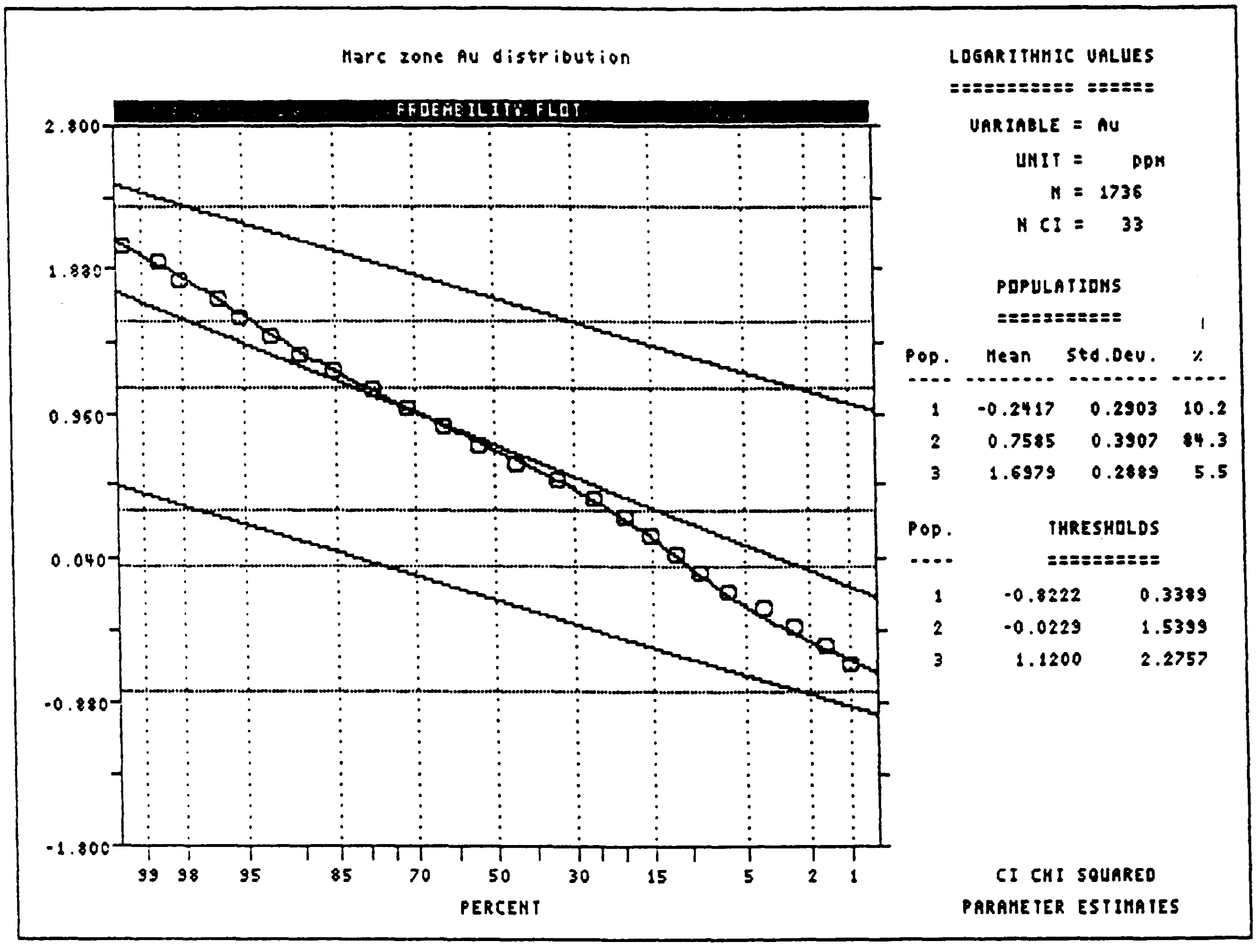
==

Default Thresholds.

Standard Deviation Multiplier = 2.0

Pop.	Thresholds	
1	0.151	2.182
2	0.949	34.665
3	13.183	188.671

##


Marc zone Au distribution
PROBABILITY PLOT
2.800
1.880
0.960
0.040
-0.880
-1.800
99 98 95 85 70 50 30 15 5 2 1
PERCENT
LOGARITHMIC VALUES
VARIABLE = Au
UNIT = ppm
N = 1736
N CI = 33
POPULATIONS
Pop. Mean Std.Dev. %
1 -0.2417 0.2903 10.2
2 0.7585 0.3907 84.3
3 1.6979 0.2889 5.5
Pop. THRESHOLDS
1 -0.8222 0.3389
2 -0.0229 1.5399
3 1.1200 2.2757
CI CHI SQUARED
PARAMETER ESTIMATES