

Geological Report on the Early Stages of Development of the Mooseland Gold District (NTS 11D/15), Halifax County

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Introduction

Discovery of gold at Mooseland was first documented in 1858 and gold was mined intermittently between 1863 and 1934, with total recorded production of 3,865 oz. (Bates, 1987). Sporadic exploration has continued at Mooseland: the most serious effort was made by Acadia Minerals and Hecla Mining in the late 1980s, with the drilling of 135 diamond-drill holes and the sinking of a 400 foot shaft (e.g. Covey, 1988). In 2003 Azure Resources Corporation optioned the Mooseland property and in late 2003 and early 2004 the company established a decline and carried out bulk sampling of the Little North and Cummings belts. This report describes surface mapping in the Mooseland District, and the geology of the underground development completed by Azure Resources.

Location and Geological Setting

The Mooseland Gold District is one of many past-producing Meguma gold deposits occurring in the Meguma Terrane (Fig. 1a). The district straddles the Mooseland Road approximately 18 km north of Highway 7 (Fig. 1b). Historical workings occur in the area between the Musquodoboit Batholith to the west and the Tangier River Fault to the east, and were mainly restricted to the south limb of the Mooseland Anticline (West Zone, Figs. 1, 2). Exploration diamond-drilling by Acadia Minerals in the late 1980s intersected auriferous veins on the east side of the Tangier Fault. The veins are thought to represent the faulted extension of the main Mooseland vein array (East Zone, Fig. 2).

The vein system at Mooseland consists of mainly stratabound veins in slate or metasiltstone intervals of the metasandstone-dominated Goldenville Formation. Where two or more distinct veins occur within a slate interval, the term “belt” is used to refer to the stratigraphic interval hosting those veins. Stratigraphy and related structure provide the principal framework for the stratabound veins and, therefore, a detailed cross-section is presented to evaluate the vein system. Although the district extends westward to the Musquodoboit Batholith, cross-cutting relations between the veins and the granite, or associated contact metamorphism, have not been established.

A decline was initiated in 2003 on the north limb of the Mooseland Anticline, east of the Mooseland Road (Fig. 2). The decline trends west-southwest, crossing the fold hinge at a small angle, and then south-southeast, cutting perpendicular to the hinge through the south limb, where it exposes the Bismark, Irving, Little North and Cummings belts (inset, Fig. 2). Drifts were developed east and west of the decline on the Little North and Cummings belts for the purpose of obtaining bulk samples. The underground exposures have been utilized to establish a cross-section of the development (Fig. 3) and to evaluate the three-dimensional character of the Little North and Cummings belts.

Structure

At this deposit, the Mooseland Anticline defines a steep, tight (inter-limb angle of ~35°) chevron structure (Fig. 3b). A well developed, fine continuous cleavage in the slate or metasiltstone is steeply dipping, with a small angle to bedding,

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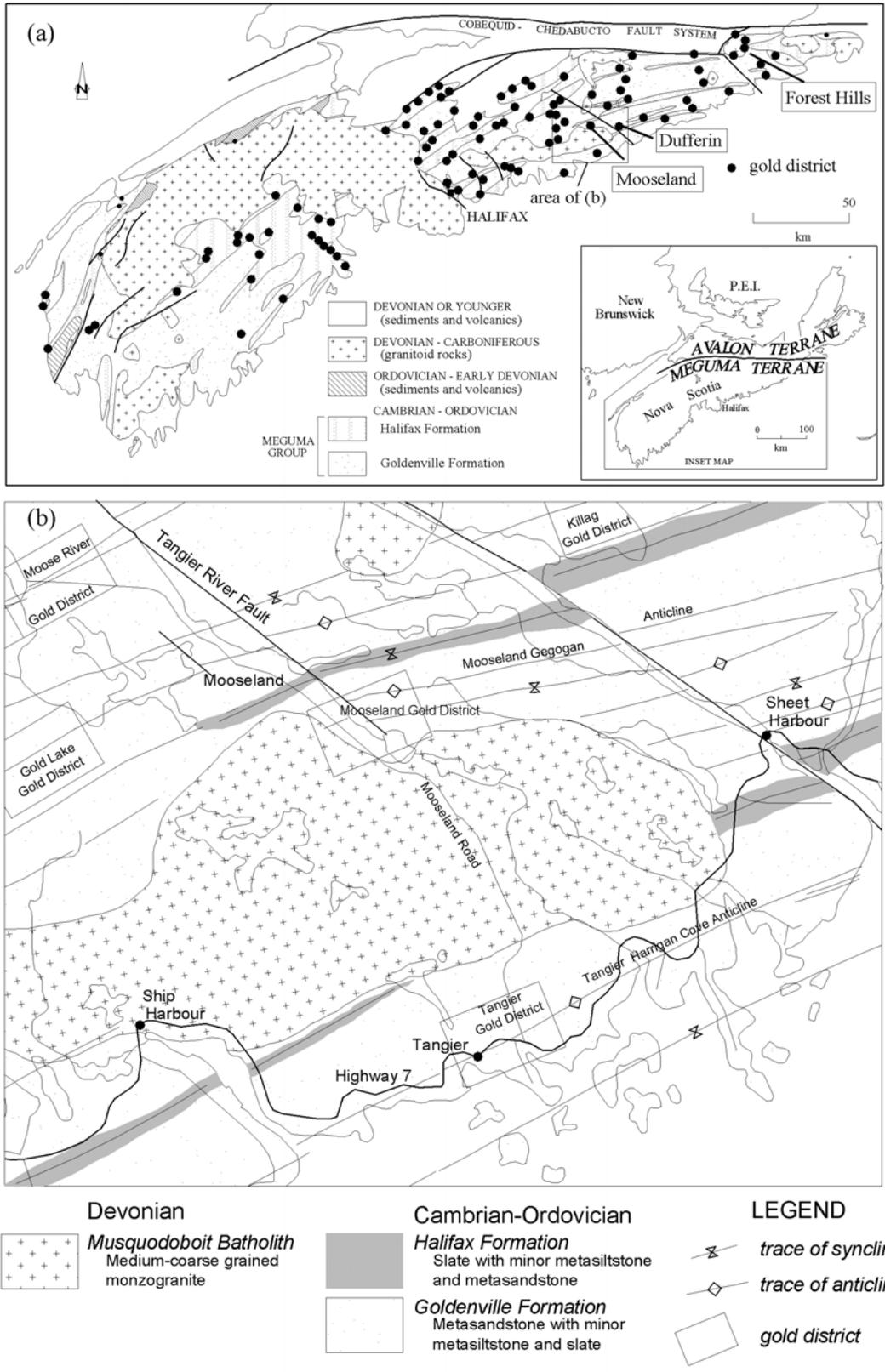


Figure 1. (a) Simplified geological map of the Meguma Terrane showing the location of the Mooseland and other Meguma gold districts. (b) Map showing the geological setting of the Mooseland Gold District.

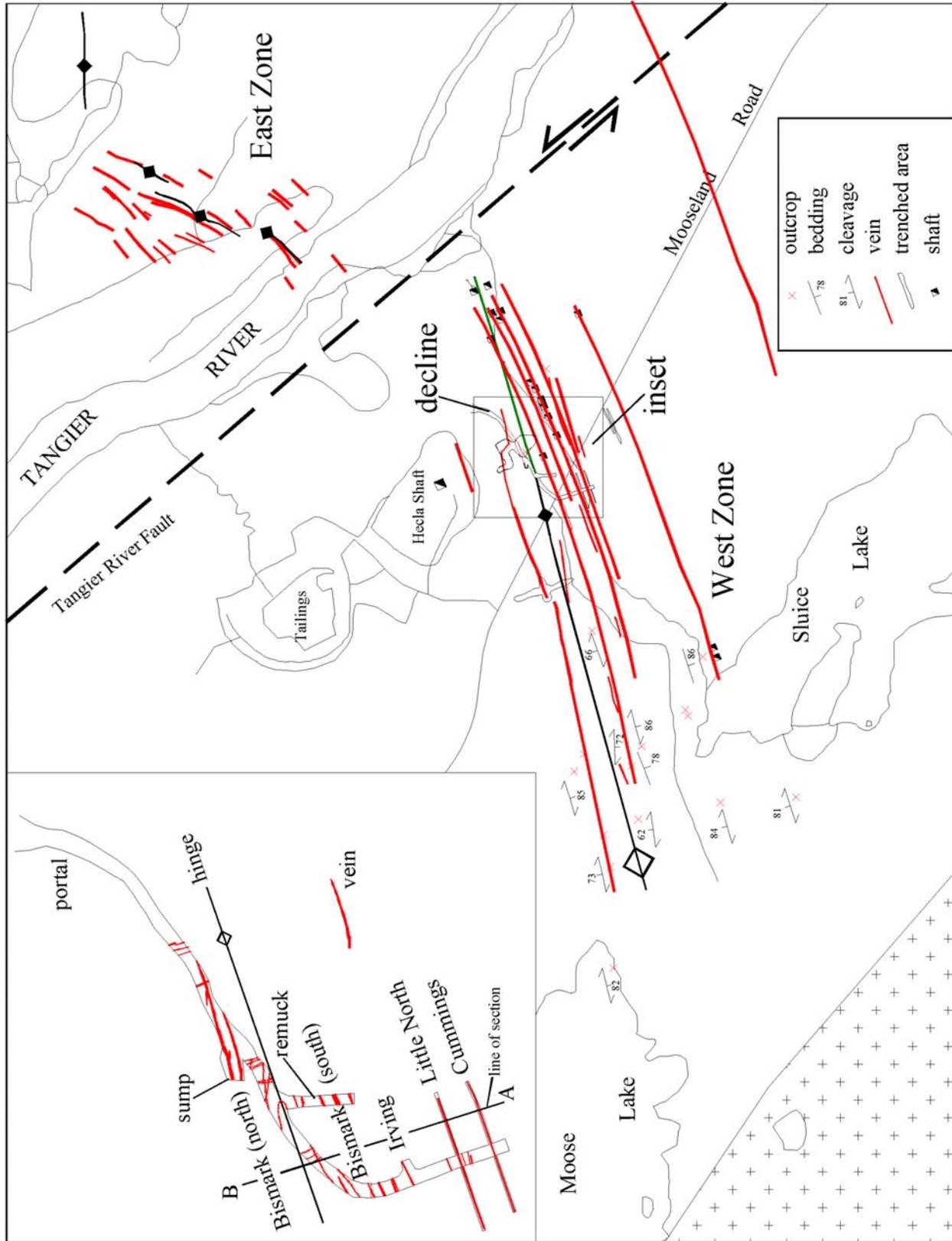


Figure 2. Geological map of the Mooseland Gold District showing the general geology, areas of previous mining and the location of current underground development conducted by Azure Resources. Inset map shows the map projection of current (early 2004) underground development.

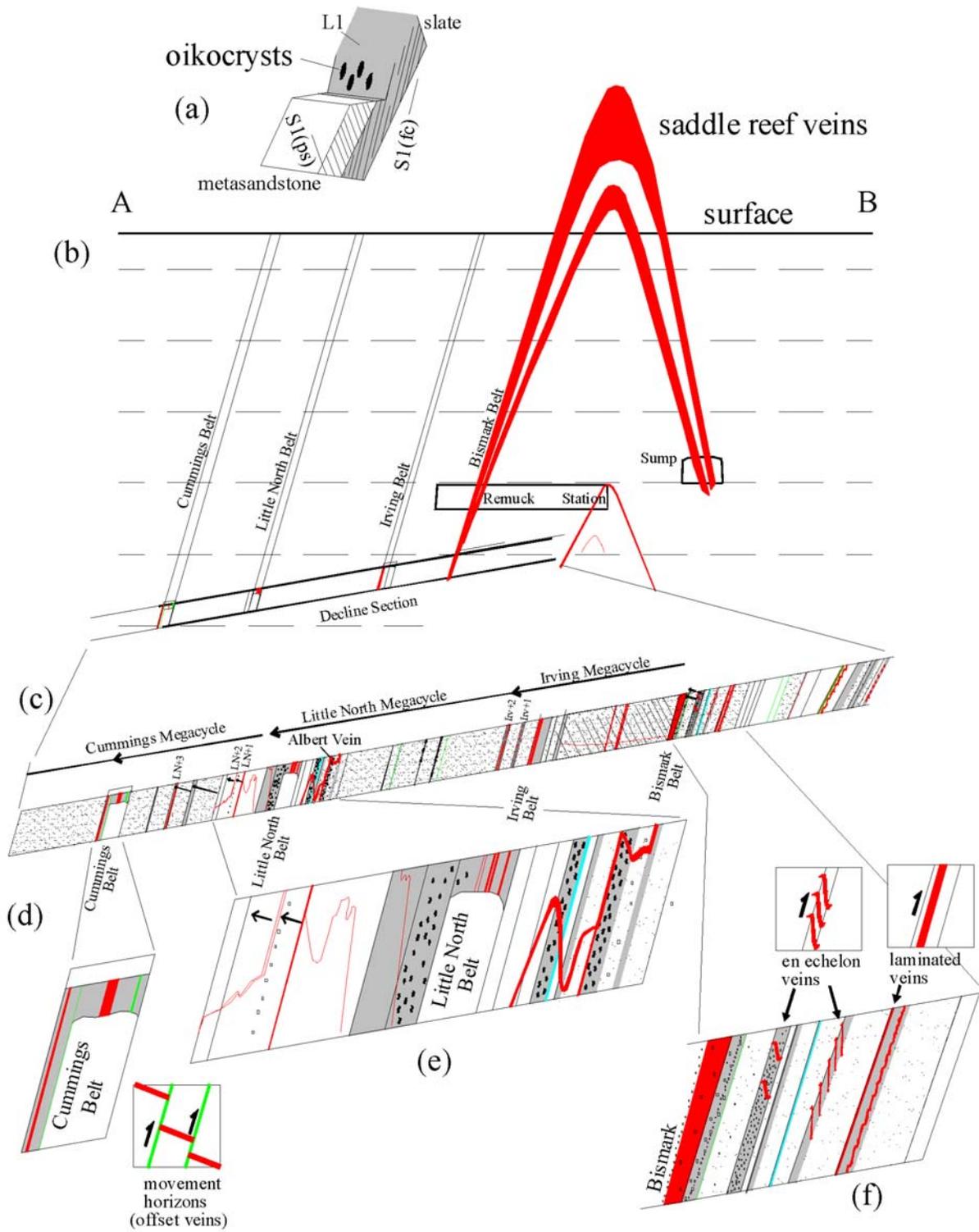


Figure 3. Cross section and detailed section of the Mooseland Anticline constructed from underground development. (a) Schematic diagram showing structural elements related to the Mooseland Anticline; L_1 =bedding-cleavage intersection; $S_{1(fc)}$ =fine continuous cleavage in slate; $S_{1(ps)}$ =spaced pressure solution cleavage in metasandstone. (b) General cross section of the underground development showing the projected workings and the principal mineralized belts. See line of section A-B in inset of Figure 2 for location of section. (c) Detailed section for the lower part of the decline. (d) Detailed section of the Cummings Belt. (e) Detailed section of the Little North Belt. (f) Detailed section of the Bismark Belt.

whereas a well developed, spaced, pressure solution cleavage in the metasandstone is generally observed at a moderate angle to bedding (Figs. 3a, 4b, 5a). Faribault (1899a) indicated that the anticline formed a dome structure centred west of the Mooseland Road; however, bedding-cleavage intersection lineations and fold hinges invariably plunge slightly to the east (Fig. 4b). There is a notable thickening in the hinge zone, typical of chevron style folds, which is likely accommodated by flow of metasiltstone and slate, and by saddle reef formation.

Distinct elongate mineral aggregates, called oikocrysts (Kontak *et al.*, 1990), which define a pronounced mineral lineation, are ubiquitous in dark slate-metasiltstone intervals throughout the Mooseland district and have been previously described by Melvin (1987) and Kontak *et al.* (1990). These mineral aggregates are typically pencil-shaped, with a long axis measuring 1-2 cm and a width of 1-2 mm (Fig. 5b). The aggregates occur within the cleavage plane and their long axes are perpendicular to the fold axis (bedding-cleavage intersection lineation; Figs. 4b, 5b), and are interpreted to reflect fold-related strain. Oikocrysts trend steeply to the west (Fig. 4b), consistent with east-plunging bedding-cleavage lineations, supporting an east-plunging fold axis. Quartz pressure shadows occurring on sulphide minerals, most notably arsenopyrite, also define a

down-dip lineation, likely recording the same fold-related strain as the oikocrysts.

A crenulation cleavage, S_{2C} , is locally developed, crenulating the fine continuous S_1 cleavage in slate and metasiltstone. The crenulation is shallow dipping, and the intersection with S_1 , or bedding, has a shallow plunge to the east. This crenulation cleavage is restricted to bedding-parallel zones adjacent to bedding-concordant veins or movement horizons. A similar crenulation noted in the Waverly-Halifax airport area, including the Oldham Gold District, was interpreted to reflect shear resulting from flexural-slip folding (Horne *et al.*, 1997). A mineral fabric defined by biotite, S_{2M} , is recognized in some thin sections. This fabric is most commonly observed in biotite forming oikocrysts, but is locally developed in the matrix (Fig. 5c). This fabric appears to be parallel to the crenulation cleavage, and may reflect mineral growth recording the same strain as the crenulation cleavage (S_{2C}).

Stratigraphy

As with most Meguma lode gold deposits, stratigraphy plays an important role in the development and distribution of veins, with many occurring as bedding-concordant veins in metasiltstone and slate intervals. These veins occupy structures that record flexural-shear strain,

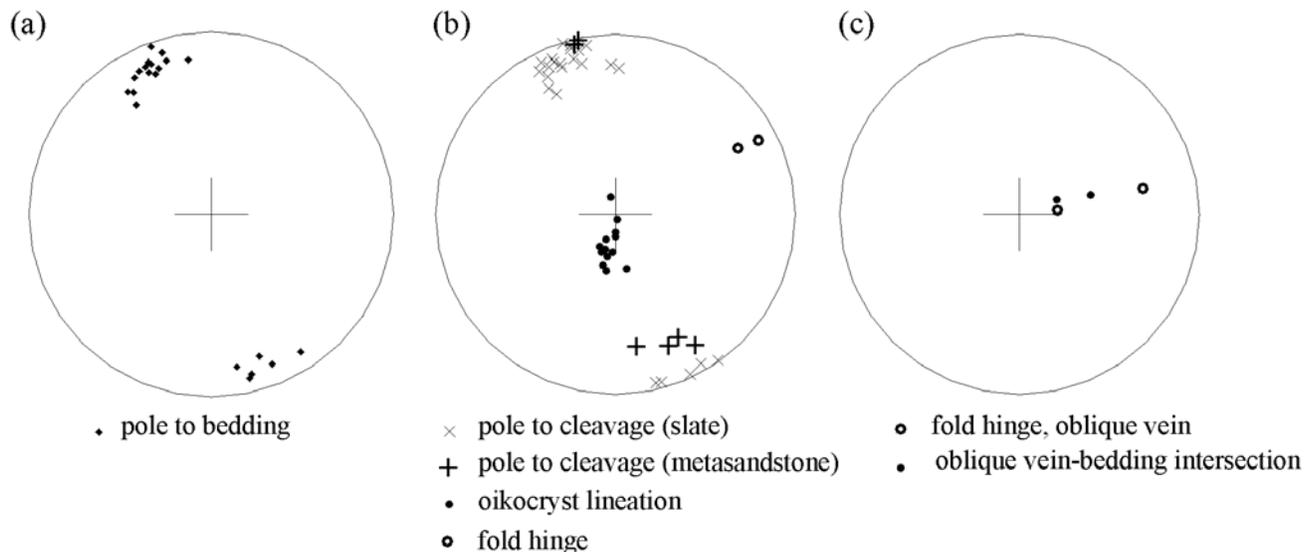


Figure 4. Lower hemisphere equal area stereoplots of structural data from the Mooseland Gold District; (a) and (b) present data for the Mooseland Anticline and include surface and underground data; (c) represents data for the oblique veins of the Little North Belt.

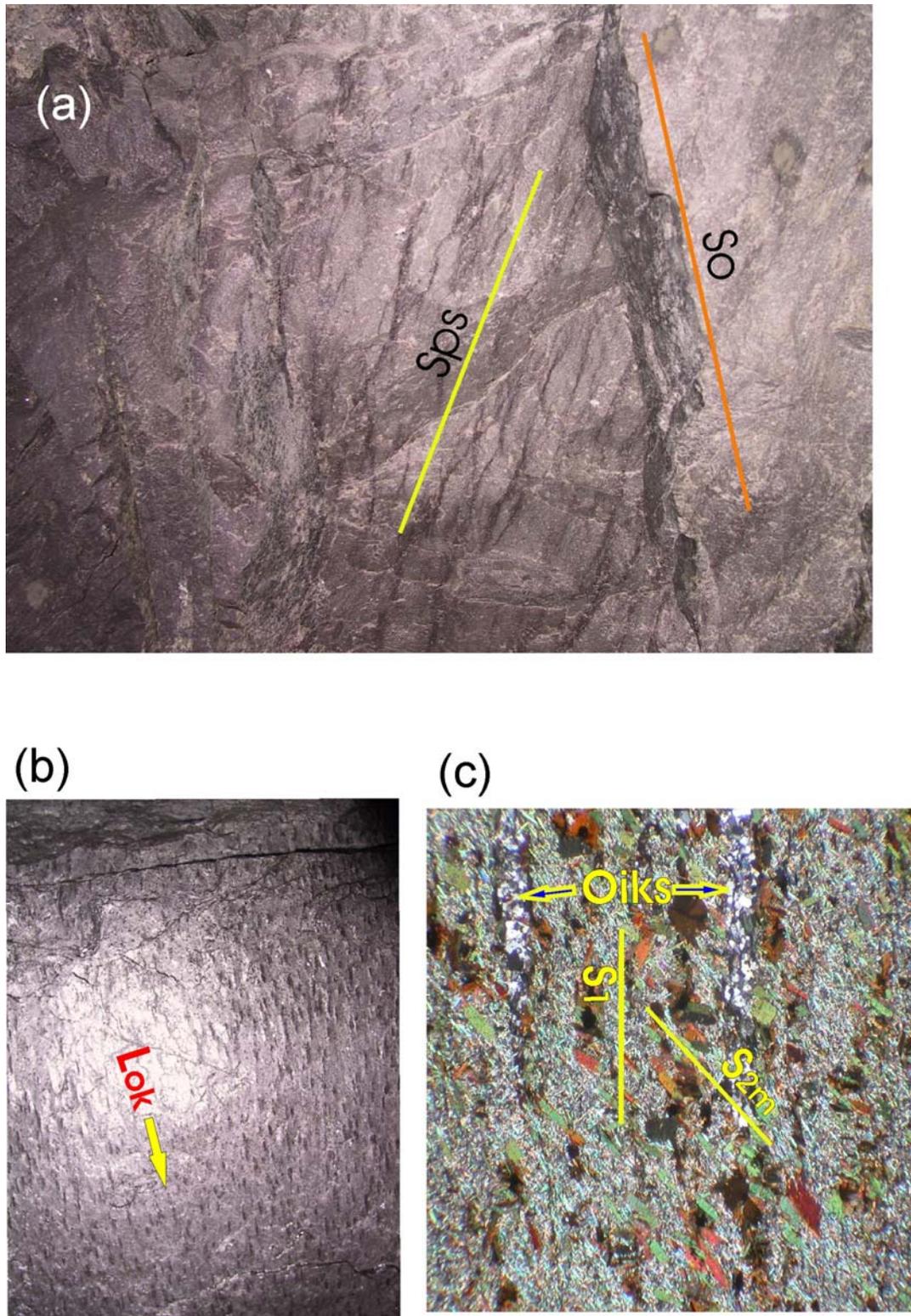


Figure 5. (a) Photograph of altered and cleaved metasandstone; S_{ps} = well developed spaced pressure solution cleavage; S_o = bedding. (b) Photograph of cleavage plane in metasiltstone with abundant oikocrysts defining a lineation perpendicular to the bedding-cleavage intersection (L_1). (c) Microphotograph of metasiltstone showing a mineral fabric defined by aligned biotite (S_{2m}) oblique to the principal cleavage (S_1). Section cut perpendicular to cleavage and parallel to the oikocryst lineation; Oiks=oikocrysts.

which is focused in the incompetent units during folding; therefore, the distribution of bedding-concordant veins should be evaluated in the context of stratigraphy. Intense alteration at the Mooseland deposit often makes it difficult to distinguish metasiltstone from slate, so these units have been generally grouped; exceptions include designation of distinct black slate. Stratigraphy is characterized by fining-upward cycles, dominated by metasandstone at the base and fining upward into relatively thin metasiltstone and/or slate intervals at the top. Contacts within cycles are gradational; however, contacts between cycles are usually sharp (i.e. sharp contact between the slate at the top of a cycle and the metasandstone at the base of the overlying cycle). The thickness of cycles ranges from several metres to less than 1 m.

There is at least an apparent large-scale systematic stratigraphic variation, characterized by thick intervals of metasandstone-dominated cycles with only very minor metasiltstone-slate, and thinner intervals dominated by relatively thin cycles where slate-metasiltstone represent larger parts of individual cycles. This systematic variation may represent large-scale sedimentary cycles (megacycles) which, like individual cycles, are characterized by thick metasandstone-dominated intervals overlain by thinner intervals with significant metasiltstone-slate (Fig. 3c). Although minor bedding-concordant veins occur within thin metasiltstone layers at the tops of individual thick metasandstone-dominated cycles, the main bedding-concordant veins occur within the intervals of relatively thin cycles at the top of megacycles and represent the veined and mineralized “belts”. For reference, the identified megacycles are named for the belt that is located at the top of the cycle (e.g. Little North Megacycle; Fig. 3c). The apparent large-scale cycles that control the distribution of intervals with considerable fine-grained rocks appear to have a fairly regular distribution, accounting for the systematic distribution of belts (Fig. 3b).

Veins - Belts

Introduction

As outlined above, the majority of veins observed

in this section are bedding-concordant, occurring in metasiltstone and slate at the tops of cycles. Several bedding-concordant vein types occur, including massive bedding-parallel, laminated bedding-parallel, en echelon vein arrays, and saddle reef veins. In addition to general classification, individual veins have distinct mineralogical and textural characteristics.

Below the Bismark

The Bismark Belt is structurally the lowest belt of the four so far exposed in the Mooseland District. However, development below the Bismark Belt has encountered several additional minor bedding-concordant veins. Although not currently of economic interest, these veins are important to understanding the Mooseland vein array and, therefore, these various vein types are discussed here.

En Echelon Veins

Two sets of bedding-concordant en echelon vein arrays occur immediately below the Bismark vein, with exposures located in the decline and in the remuck station (Figs. 3f, 6a). Individual veins have a sigmoidal shape and crosscut metasiltstone intervals, with their ends pinned in metasandstone. The intersection of these veins with bedding is parallel to the fold hinge, and they record a shear sense consistent with flexural shear: movement of the structurally higher beds toward the hinge. En echelon bedding-concordant vein arrays are common in Meguma lode gold deposits and a more detailed explanation of their formation is provided in Horne and Jodrey (2001).

Laminated Bedding-parallel Veins

A laminated bedding-parallel vein occurs below the en echelon veins mentioned above, exposed in the remuck station and the decline. This vein is ~3 cm thick and is characterized by a distinct laminated ribbon texture (Fig. 6b), similar to “laminated” bedding-parallel veins documented in other Meguma lode gold deposits (e.g. Smith and Kontak, 1988a). This vein is persistent along strike in diamond-drill holes and consistently yields elevated gold levels.

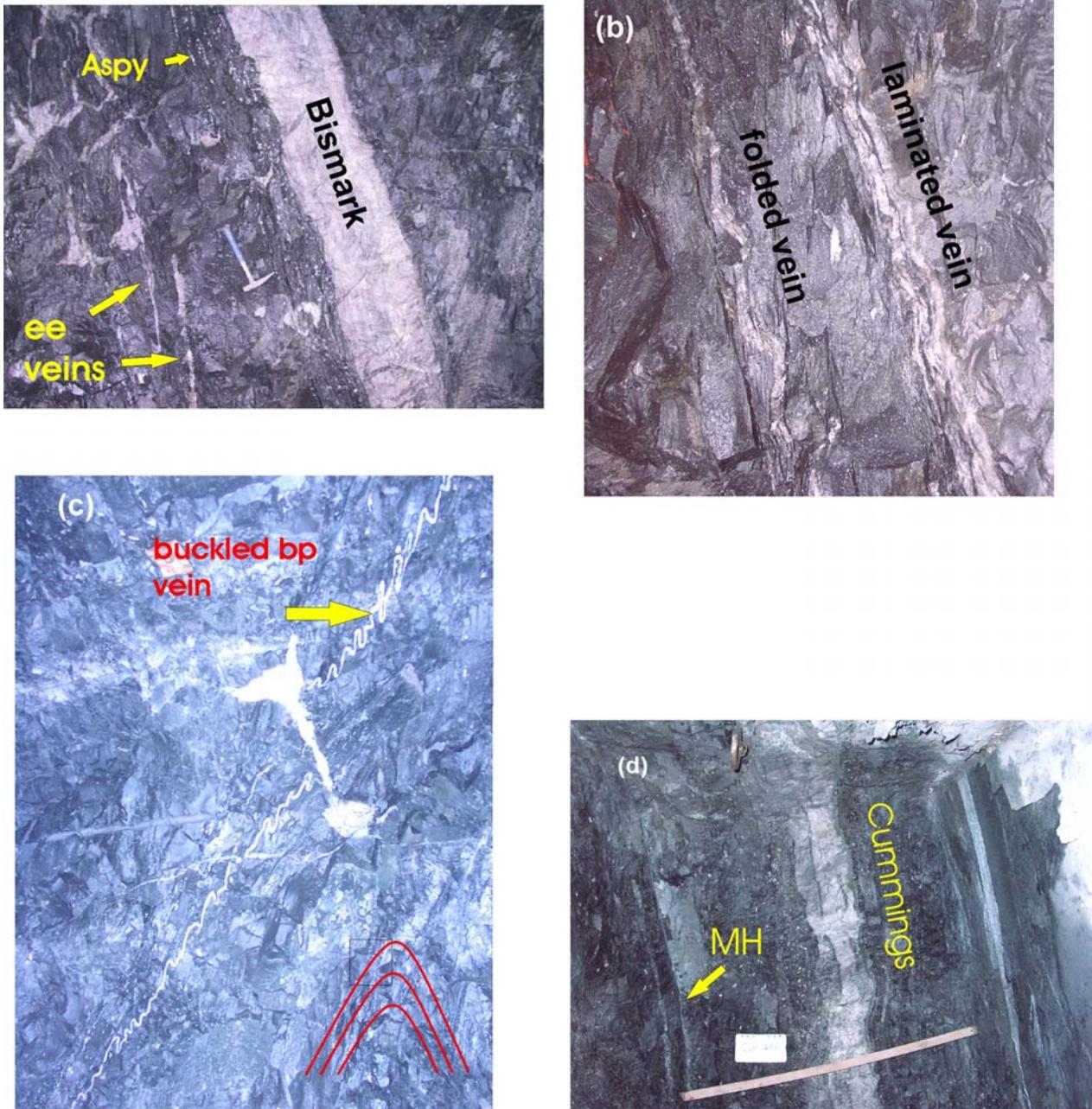


Figure 6. (a) Photograph of the Bismark vein in the decline. Note the coarse laminations, coarse arsenopyrite in the footwall slate, and en echelon (ee) veins. (b) Photograph of a laminated vein. (c) Photograph of tightly buckled vein exposed on the south limb near the fold hinge; relative position to fold shown in inset in lower right of photograph. (d) Photograph of east face of the Cummings Belt, east drift; MH = movement horizon.

Buckled Bedding-parallel Veins

Three, variably buckled, bedding-parallel veins are found below the Bismark Belt. A thin (1-2 cm), tightly folded (locally isoclinal) bedding-parallel vein is exposed on the south limb in the remuck station, and in the fold hinge in the decline adjacent to the remuck station (Fig. 6c). Fold geometry is parasitic to the main anticline and fold tightness decreases down dip. The lack of buckled veins on steep fold limbs away from the hinge zone, both in the underground development and diamond-drill core, suggests that buckling is restricted to the hinge area.

Bismark Belt

The Bismark Belt is exposed in the hinge zone at surface, where it was previously mapped in the area between the highway and the portal (Kontak *et al.*, 1990). Underground, the Bismark Belt is exposed on the north limb in the sump and on the south limb in the remuck station and the main decline (inset, Fig. 2). The belt includes two bedding-concordant veins at surface, and in the remuck station and sump exposures of the decline. However, at lower levels in the decline only the upper vein is present and the vein generally thins down dip. The overall shape of the Bismark veins is consistent with a saddle reef (Fig. 3b). The veins occur within a black slate interval, with the upper vein in contact with a thick, overlying metasandstone-dominated interval (Irving Megacycle) (Fig. 3c). The veins consist of coarsely laminated and massive quartz with coarse-grained arsenopyrite. High concentrations of arsenopyrite occur in the footwall slate as medium to coarse crystals (Fig. 6a), locally forming bands parallel to bedding. Minor, fine-grained arsenopyrite occurs in the hanging wall metasandstone adjacent to the vein. Although these veins are impressive with respect to size and abundance of arsenopyrite, analytical results invariably indicate low contents of gold.

Irving Belt

Although historical surface work on the Irving Belt was extensive, only minor veins of a few centimetres width occur in the Irving Belt exposed in the decline, and only minor drifting was

completed. The Irving Belt consists of two bedding-concordant veins in metasiltstone-dominated cycles near the top of the Irving Megacycle (Fig. 3c). On the west wall of the decline the upper vein occurs at the contact with overlying metasandstone with the other in the middle of the metasiltstone interval. En echelon and spur veins occur between these two bedding-parallel veins. The veins contain chlorite and pyrrhotite; however, arsenopyrite is rare.

Irving +1 Vein and Irving +2 Vein

Two thin veins in metasiltstone at the top of the two sedimentary cycles overlying the Irving Belt are referred to as the Irving +1 and Irving +2 veins (Fig. 3c). These veins consist of thin (~1 cm) quartz veins with significant chlorite and minor pyrrhotite. Although not significant in size or appearance, a sample of the Irving+1 vein yielded elevated gold levels.

Little North Belt

The Little North Belt (LNB) is an approximately 1 m thick interval of slate, which hosts three distinct bedding-concordant veins (Figs. 3e, 7): the *Little North footwall vein*, the *Little North twin vein* and the *Covey vein* (Fig. 7a). In addition, steeply dipping oblique veins, which are oriented at a small, clockwise angle (~10°) to bedding, and cross veins, which occur at a high angle to bedding, intersect the bedding-parallel veins of the Little North Belt. These veins often affect the thickness and character of the bedded veins (Fig. 7 a, c). Folded veins within a few metres of the hanging wall (e.g. Albert vein, Fig. 3e) and the footwall (Little North +1, +2, Fig. 3e) of the Little North Belt appear to be related to oblique veins of the Little North Belt and are discussed here. Bedding-parallel movement horizons consisting of millimetre-thick clay seams occur within the belt.

Little North footwall vein (LNf): The structurally lowest bedding-parallel vein, the Little North footwall vein (LNf), is typically a 2-4 cm thick and consists primarily of massive white quartz with a granular texture, and contains few to no inclusions or sulphide. Visible gold was not observed in this vein, except where crosscut by later oblique veins.

In the west drift, steeply dipping oblique veins in the hanging wall locally cut through the Little North Belt and merge with, and follow, the LNF vein. Where this occurs the LNF is effectively thickened, the vein has a laminated texture, and contains sulphide. In the east drift, this vein is connected with the Twin vein (below) by extensional spur veins of massive quartz (Fig. 7d) resulting in thickening of the LNF vein. Where this occurs significant coarse gold was observed.

Little North twin vein (LNT): The middle bedding-concordant vein of the Little North Belt typically consists of a pair of veins separated by a thin septa of wallrock, and is herein referred to as the Little North twin vein (LNT) (Fig. 7a). The upper margin of the upper vein invariably consists of approximately 1 cm of actinolite(?) with abundant pyrrhotite and arsenopyrite.

Covey vein (LNC): The uppermost vein, referred to as the Covey vein (LNC), is typically 6-15 cm in thickness and consists of variably laminated quartz. The vein is locally composite in character, including laminated margins with a core of massive quartz. The boundary between the laminated margins and the massive quartz is generally defined by a septa of wallrock. Locally numerous sites of visible gold were noted within the milky quartz segment along the septa of wallrock between the laminated and massive vein segments.

Oblique veins: Veins cutting stratigraphy at a low angle in both the hanging wall and footwall of the Little North Belt are referred to as oblique veins. The Albert vein (Fig. 7b) consists of a planar bedding-parallel vein occurring at the top contact of a sedimentary cycle on the east side of the decline and across the back of the decline. On the west face of the decline this vein crosscuts stratigraphy and includes folded and bedding-parallel segments, with the vein migrating down

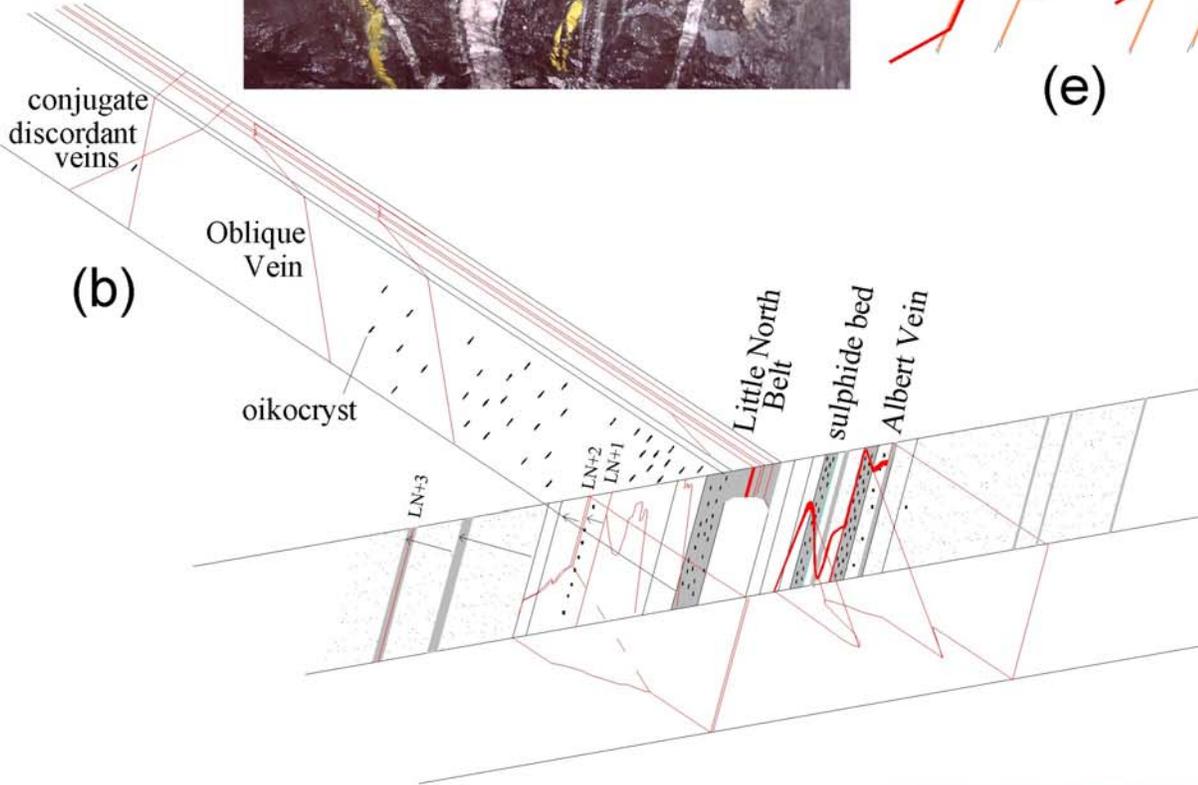
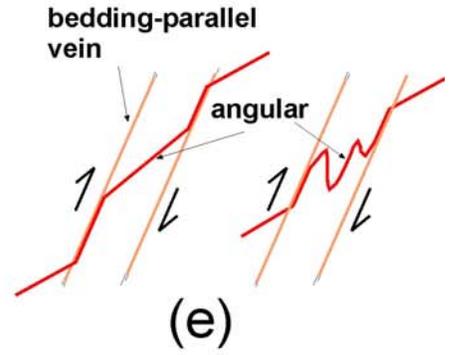
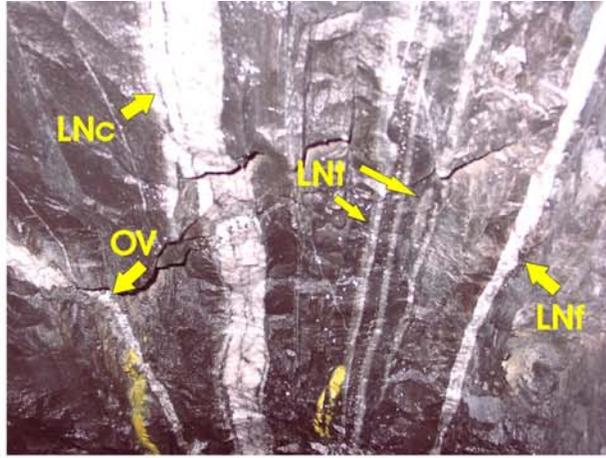
dip as it goes up section; the enveloping surface of the folds is shallower than bedding (Fig. 7b). At the floor of the decline on the west wall this vein is only about 1 m from the Little North Belt, which it likely intersects below the level of the decline. The geometry of this vein from the east to west walls of the decline reflects a moderate to steep plunge for the folds exposed on the west wall, as shown in Fig. 7b. Coarse visible gold was observed in the Albert vein on the east wall of the decline. Veins with similar geometry as the Albert vein are exposed in the hanging wall of the Little North Belt (Fig. 7). In the case of the Little North +2 vein, the continuity of the vein from west to east wall was observed in the floor of the decline as shown in Fig. 7b.

Several steeply dipping veins that intersect stratigraphy at a small angle are exposed in the hanging wall of the Little North Belt in the west drift (Fig. 7b). Their intersection with bedding, exposed on the hanging wall side (south) of the drift, plunges moderately to steeply to the east (Figs. 4c, 7b), similar to fold hinges of the folded segments of the Albert and Little North +2 veins. Some oblique veins are tightly folded where they cross the Little North Belt, with fold hinges plunging to the east, similar to the vein-bedding intersection. Where these oblique veins intersect bedding-parallel veins of the Little North Belt they merge with one of the veins, becoming bedding-parallel and effectively thickening the bedded veins (Fig. 7c). Within this drift the oblique veins dip steeper than bedding; however, these vein segments may represent the north limb of folded discordant segments (cf. Albert vein).

Although only limited structural data exist for the oblique veins, they show no apparent relationship to the shallow-plunging Mooseland Anticline, and the mechanism of vein development is not obvious. Viewed in a profile section of the

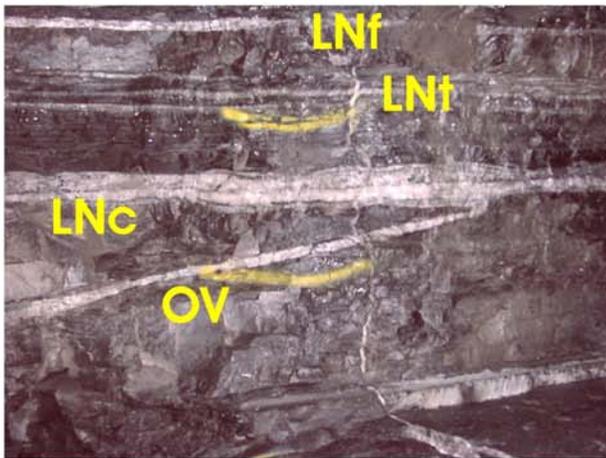
Figure 7. (next page) (a) Photograph of the back of the west drift on the Little North Belt showing the three principal bedding-parallel veins and oblique veins (width of photo 1.4 m). (b) Diagram of the west drift of the Little North Belt showing the geometry and relationships of veins. (c) Photograph of the back of the Little North Belt (west drift) showing an oblique vein merging with, and thickening, a bedding-parallel vein (height of photo 1 m). (d) Photograph of the east face of the Little North Belt (east drift) showing late quartz filling an extensional jog between the footwall and twin veins (width of photo 1.2 m). (e) Diagram showing the interpreted development of oblique veins formed as bedding-parallel and discordant (extensional) segments in response to bedding-parallel shear with folding of discordant segments during progressive shear. (LNF = Little North footwall vein; LNT = Little North twin vein; LNC = Little North Covey vein; OV = Oblique veins.)

(a)

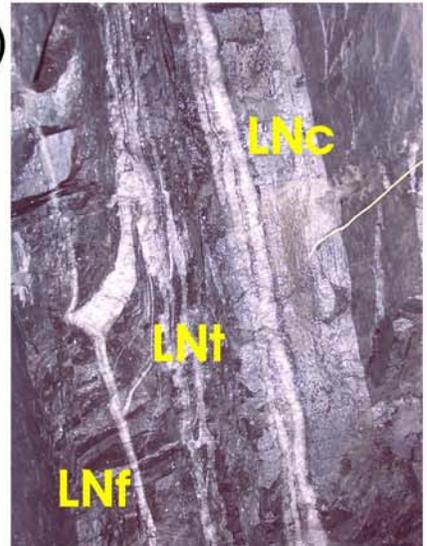


(b)

(c)



(d)



folds defined by the oblique veins, these veins show a similarity to “angular veins” (Faribault, 1899b; Armstrong, 1937) and can be explained by progressive bedding-parallel shear perpendicular to the fold hinges of the folded oblique veins (Fig. 7e). The oblique veins formed as linked bedding-parallel and discordant segments, the latter representing extensional veins, in response to oblique, sinistral, reverse bedding-parallel shear, with discordant segments becoming folded (Fig. 7e). The kinematics of the oblique veins are not consistent with flexural-folding strain, which is recorded by bedding-concordant veins and oikocrysts, and the mechanism of vein formation is not understood. Although the shear strain implied by the folds is significant, as yet we have not recognized features recording this strain in the wallrock.

Conjugate discordant veins: Steeply dipping discordant veins that strike approximately perpendicular to bedding form a systematic conjugate pair exposed along the walls and back of the drifts of the Little North Belt. One set dips steeply whereas the other dips moderately toward the west, such that the acute angle of the veins on bedding (or cleavage) is approximately bisected by oikocryst lineations, implying these veins record fold-related strain. These conjugate veins generally cut through other veins, indicating a relatively late origin.

Gold Mineralization: Although there is only limited exposure of the Little North Belt, coarse visible gold and elevated assays appear to be restricted to the areas where angular veins intersect and merge with bedding-parallel veins. Base metal sulphides, notably galena, sphalerite and chalcopyrite, are commonly found close to visible gold.

Cummings Belt

The Cummings Belt consists of an approximately 1.2 m thick interval dominated by metasiltstone, and is characterized by a single thick vein (Cummings vein) in the middle of the interval, and a thin vein that has not been mined near the top of the belt. Movement horizons occur near the

footwall and hanging wall of the belt and define the walls of the drift.

Movement Horizon: A significant movement horizon, defined by a 1-2 cm thick “clay” (fault gouge) layer, occurs near the footwall of the Cummings Belt and defines the footwall of the drift. This movement horizon is continuous over the approximately 45 m of strike length exposed and occurs at the top of a slate interval, which is part of the underlying metasandstone cycle, and the base of a thin (10 cm) strongly altered metasandstone bed within the Cummings Belt. A laminated vein locally occurs within the movement horizon, and is deformed (sheared) by the movement horizon. Coarse carbonate (calcite) locally occurs as matrix to a brecciated zone associated with the movement horizon. Displacement on the movement horizon is recorded by two offset discordant veins, which indicate 2.9 m of sinistral strike separation as measured in the back of the drift. Lineations recording the slip vector were not observed and, therefore, the displacement on the movement horizon was not determined. A less significant movement horizon characterized by a few millimetres thick clay layer occurs about 30 cm below the top of the belt, and defines the hanging wall of the drift.

Cummings Vein (Ccv): This vein occurs approximately 40 cm above the footwall movement horizon, roughly in the middle of the belt, and ranges from 15-50 cm in width. The vein consists predominantly of massive, milky white quartz, although a coarse laminated texture, similar to the Bismark Vein, is apparent. Spur veins occur in the footwall of the Cummings vein, where the contact with the wallrock is welded. The upper contact of the vein is characterized by a distinct band of chlorite and sulphide (arsenopyrite) within the vein and adjacent wallrock. Arsenopyrite is abundant as coarse crystals in the footwall wallrock, and as isolated coarse crystals in the hanging wall.

Hanging Wall Vein (Chw): A 2-4 cm thick quartz vein occurs within a 30 cm thick metasiltstone interval above the hanging wall movement horizon, and has not been mined.

Alteration

Several styles of alteration are associated with the vein system at Mooseland, including sulphide alteration (arsenopyrite, pyrrhotite, pyrite \pm base metal sulphides), carbonate alteration and, most notably, widespread bleaching of the metasandstone. The oikocrysts described above are spatially restricted to the veined area and are also considered to reflect alteration associated with vein formation. The description of alteration given here is based only on hand sample observation, and we recognize the need for a petrographic study in order to fully establish the types and character of alteration.

Sulphide Alteration

Typical of all Meguma lode gold deposits, arsenopyrite occurs in wallrock adjacent to veins in the Mooseland deposit. The distribution of arsenopyrite in wallrock appears largely controlled by lithology, with typically high concentrations in slate adjacent to veins, and lower concentrations in metasandstone. A good example of this was observed in the Bismark Belt (Fig. 6a). Arsenopyrite also occurs in the wallrock of discordant veins.

Pyrrhotite locally occurs in anomalous concentrations in metasiltstone and slate. Although concentrations show a lithologic control, individual pyrrhotite aggregates define a down-dip lineation along cleavage, similar to the oikocrysts. Metasandstone-hosted pyrrhotite occurs as fine disseminations and as coarse aggregates up to several centimetres long, which locally appear to parallel cleavage. Small (few mm) pyrrhotite aggregates in metasandstone locally have a distinct rim of arsenopyrite. Although pyrrhotite is common throughout the Meguma Group stratigraphy, and may not be related to vein genesis, we note that pyrrhotite is common within the veins as well. Masses of pyrrhotite with arsenopyrite and chlorite locally occur adjacent to veins. Pyrite is common, but occurs mainly as films on fractures, in particular fractures cutting quartz veins.

Bleaching

Much of the metasandstone in the district exhibits a bleached colour variation, interpreted to result from intense hydrothermal alteration. Typically, the altered metasandstone consists of maroon and pale green areas producing a mottled texture, which commonly defines a fabric in profile sections that is locally parallel to bedding, but more commonly parallel to pressure-solution cleavage (Fig. 5a). In the latter case, dark (maroon) areas represent cleavage zones, presumably originally rich in phyllosilicate minerals. The light coloured areas appear to be silicified, but the pale green colour reflects chloritization of biotite.

Discussion

Vein Array

The vein array at Mooseland, including bedding-parallel veins (some buckled), bedding-concordant en echelon arrays, saddle reefs, and discordant veins, is similar to vein arrays at other Meguma gold deposits (e.g. Horne and Jodrey, 2000; Horne and Culshaw, 2001; Sangster, 1980; Smith and Kontak, 1988). Horne and Jodrey (2002) and Horne and Culshaw (2001) demonstrated a syn-folding origin for these veins arrays, with veins recording flexural-shear strain. A similar origin is supported at the Mooseland deposit by the geometric relation of veins to the fold, and by limited kinematic data provided by en echelon veins. An exception is found in the oblique, folded veins found on the west side of the decline within and adjacent to the Little North Belt. The fold axis, fold geometry and the intersection of these veins with bedding implies these veins record oblique-sinistral, south-side-up reverse shear. Although the mechanism for this shear is not understood, we note the proximity of the Musquodoboit Batholith, which presumably exerted stress on the country rock during emplacement.

Controls on Mineralization

Variation in grade has been recognized within veins of Meguma lode gold deposits, and it is critical to understand potential controls on this variation for economic recovery. Faribault (1899b, 1913) referred to “ore shoots” and “pay zones”, and described them as generally planar structural zones which commonly trend parallel to fold structure, such as the axial plane. Armstrong (1937) proposed his angular theory, where the intersection of “angular” veins with bedded veins defined ore shoot geometry. Recently, this theory was affirmed at the Forest Hills deposit, where ore shoots were defined by the intersection of angular and bedded veins, which plunge parallel to the fold hinge (Levesque and Campbell, 1990). At the Caribou deposit (Fig. 1) a discordant “flexure” with stockwork veins overprinting the bedded vein system defines a rich ore shoot (Bell, 1948) and steeply plunging ore shoots were defined at the Beaver Dam deposit (Smith and Kontak, 1988b).

Although it is early in the assessment of the Mooseland deposit, visual and analytical data suggest that zones of elevated gold (ore grade) in the Little North Belt are restricted to the areas where (relatively) late massive quartz veins overprint the pre-existing bedding-parallel veins. West of the decline, common occurrences of visible gold appear to be restricted to the area intersected by the “oblique veins” described above. These oblique veins are similar to “angular veins” described by Armstrong (1937), who noted that the intersection of angulars with bedding, and thus ore shoot geometry, varied from deposit to deposit, with no consistent relationship to the fold structure. If the occurrence of these veins defines the ore zone, then the associated “shoot” plunges steeply to the east, as defined by the intersection of these veins on bedding and fold hinges in the folded segments of these veins.

East of the decline, late quartz overprinting the bedding-parallel vein system is locally represented by quartz-filled dilational jogs linking the footwall and twin veins, with associated quartz variably thickening the bedding-parallel veins. Coarse gold was locally observed in the late massive quartz, both in the jog and bedding-parallel segments. The

axis of the dilational jog is nearly horizontal, close to the hinge of the Moseland Anticline.

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