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Abstract: The newly discovered mineralizations of the Westwood Project (14.2 Mt at 7.6 g/t Au, 3.5 Moz Au), found in the Doyon-Bousquet-LaRonde mining camp, represent one of the most significant precious- and base-metal discoveries made in the last few years in Quebec.

The mineralizations occur in three east-trending corridors stacked, from north to south: Zone 2 Extension, North Corridor, and Westwood-Warrenmac Corridor. The ore zones of the Westwood-Warrenmac Corridor consist of stratiform auriferous semimassive to massive sulphide lenses containing variable but significant amounts of Cu, Zn, and Ag.

The Westwood-Warrenmac ore zones lie in the same stratigraphic position as the Bousquet 2-Dumagami and LaRonde 20 North Au-rich lenses in the upper member of the Bousquet Formation, with felsic rocks of the base of the upper member in the footwall, and a distinctive calc-alkaline Fp- and Qz-phyric rhyolite (unit 5.3), a tholeiitic to transitional basaltic andesite (unit 5.4), and a transitional to calc-alkaline rhyodacite-rhyolite (unit 5.5) in the hanging wall. This implies that: 1) there is a significant potential for Au-rich volcanogenic massive suphide (VMS) lenses at Westwood, as well as in the western part of the Doyon-Bousquet-LaRonde mining camp, 2) the western part of the Doyon-Bousquet-LaRonde camp is open to exploration for LaRonde Penna and Bousquet 2-Dumagami style mineralizations, and 3) transitional to calc-alkaline volcanic centres can be very prospective for precious-metal-enriched VMS-forming and intrusion-related systems.

Résumé : Les minéralisations du projet Westwood (14,2 Mt à 7,6 g/t de Au pour 3,5 millions d'onces de Au) nouvellement mises au jour dans le camp minier Doyon-Bousquet-LaRonde représentent l'une des découvertes de métaux précieux et usuels les plus importantes faites au Québec au cours des dernières années.

Les minéralisations sont contenues dans trois corridors orientés est-ouest qui se superposent du nord vers le sud : zone 2 Extension, corridor Nord, et corridor Westwood-Warrenmac. Les zones minéralisées du corridor Westwood-Warrenmac sont principalement constituées de lentilles stratiformes de sulfures aurifères semi-massifs à massifs contenant des quantités variables mais significatives de Cu, Zn et Ag.

Les zones minéralisées du corridor Westwood-Warrenmac sont situées à la même position stratigraphique que les lentilles riches en Au de Bousquet 2-Dumagami et LaRonde 20 Nord dans le membre supérieur de la Formation de Bousquet où l'éponte inférieure est formée de roches felsiques de la base du membre supérieur et l'éponte supérieure d'une rhyolite porphyrique à feldspath et à quartz calco-alcaline (unité 5.3), d'une andésite basaltique tholéiitique à transitionnelle (unité 5.4) et d'une rhyodacite-rhyolite transitionnelle à calco-alcaline (unité 5.5). Ceci implique que 1) il y a un potentiel significatif pour des lentilles de sulfures massifs riches en Au à Westwood, ainsi que dans la partie ouest du camp minier Doyon-Bousquet-LaRonde, 2) la partie ouest du camp minier Doyon-Bousquet-LaRonde est ouverte à l'exploration pour des minéralisations de style Bousquet 2-Dumagami et LaRonde Penna et 3) les centres volcaniques transitionnels à calco-alcalins peuvent présenter un fort potentiel pour les systèmes de sulfures massifs volcanogènes enrichis en métaux précieux et ceux reliés aux intrusions.

INTRODUCTION

The newly discovered mineralizations of the Westwood Project represent one of the most significant precious- (Au-Ag) and base-metal (Zn, Cu) discoveries made in the last few years in Quebec, with resources of 14.2 million tons at an average grade of 7.6 g/t Au (3.5 million ounces; Iamgold Corporation, 2008c). This major discovery was made in the Doyon-Bousquet-LaRonde (DBL) mining camp located in the eastern part of the Blake River Group in the Abitibi subprovince (Fig. 1a). The DBL camp is one of Canada's most prolific Au districts, with 25 Moz of Au contained (Dubé et al., 2007; Mercier-Langevin et al., 2007c). Gold is hosted in three main deposit types: 1) Au-rich volcanogenic massive sulphide (VMS) deposits (~12.3 Moz Au), 2) synvolcanic sulphide veins, stockwork, and dissemination deposits (~5.7 Moz Au), and 3) intrusion-hosted, sulphide-rich quartz veins and orogenic (remobilized) sulphide-rich Au-Cu veins (~7.6 Moz Au). In addition to Au, the DBL camp is also a major Zn, Cu, and Ag producer (Mercier-Langevin et al., 2007d).

The Westwood Project mineralizations are hosted in the 2701–2697 Ma Bousquet Formation (Lafrance et al., 2005; Mercier-Langevin et al., 2007a), which constitutes one of the youngest packages of volcanic rocks of the Blake River Group (Lafrance et al., 2005; Goutier et al., 2007; McNicoll et al., 2007). The Bousquet Formation and the deposits it hosts were, and still are, subject to a considerable amount of scientific work (*see* Mercier-Langevin et al., 2007d and references therein), including, more recently, geological mapping and synthesis of earlier work (Lafrance et al., 2003), detailed geochronology (Lafrance et al., 2003; Mercier-Langevin et al., 2004, 2007a, 2008b; Mercier-Langevin, 2005), 3-D modelling (Fallara et al., 2004), and numerous thematic studies (Belkabir et al., 2004; Dubé et al., 2004, 2007; Galley and Lafrance, 2007; Mercier-Langevin et al., 2004, 2007a, b, 2008b; Mercier-Langevin, 2005).

A detailed study of the Westwood Project geology and mineralization was initiated by the Geological Survey of Canada (GSC) in collaboration with Iamgold and the Institut national de la Recherche scientifique, centre Eau, Terre et Environnement (INRS-ETE) in 2006 as part of the Doyon-Bousquet-LaRonde mining camp metallogenic synthesis undertaken under the joint Geological Survey of Canada (Targeted Geoscientific Initiative 3 Abitibi) and the Ministère des Ressources naturelles et de la Faune (Copper Plan) projects.

A first phase of detailed core logging and sampling on a series of selected drillholes was undertaken in the summer of 2006. The main objective of this first phase was to better define the stratigraphic context of the Westwood Project mineralization and to get a first characterization of the ore and alteration styles developed in this area (e.g. Mercier-Langevin et al., 2008a, c). A second and a third phase of core logging and sampling on recent exploration and delineation drillholes, plus underground mapping in newly completed exploration drifts, followed in 2007 and 2008. Preliminary results pertaining to the stratigraphic context of the Westwood Project mineralizations are presented here. The specific objectives of this report are to establish the exact position of the Westwood-Warrenmac Corridor in the DBL camp stratigraphy by providing some key preliminary observations and supportive data, and to highlight the exploration potential of the Westwood area and of the western part of the DBL camp.

GEOLOGICAL SETTING

Iamgold's Westwood Project is located midway between the Doyon mine to the west and the Bousquet 1 mine to the east (Fig. 1b, 2). Numerous mineralized zones of variable lateral and vertical extent are still being defined. These ore zones are stacked from north (base) to south (top) within the Bousquet Formation (Fig. 2) as is the case elsewhere in the camp, where ore lenses can be found at different levels in the stratigraphy (Fig. 3). The DBL camp stratigraphy, schematized on Figure 3 from three sections (Doyon mine area, Bousquet 1 mine area, and LaRonde Penna mine area), has been defined in detail in Lafrance et al. (2003) and in Mercier-Langevin et al. (2007a) and is only briefly summarized here.

The base of the stratigraphy is composed of massive to pillowed, mafic, tholeiitic volcanic rocks of the Hébécourt Formation (called the Lower Blake River assemblage in Ontario: Ayer et al., 2002, 2005). The Hébécourt Formation is overlain by the Bousquet Formation (Lafrance et al., 2003), both occurring in a southward-younging homoclinal sequence, with nearly vertical dips (Lafrance et al., 2003). Younger sedimentary rocks are found to the north (Kewagama Group; ca. 2686 Ma; Davis, 2002) and south (Cadillac Group; ≤2689 Ma in the LaRonde Penna mine area; Mercier-Langevin et al., 2007a).

The Bousquet Formation is divided into a lower member and an upper member (Lafrance et al., 2003; Mercier-Langevin, 2005; Mercier-Langevin et al., 2007b). The 200 to 600 m thick lower member of the Bousquet Formation is dominated by mafic to intermediate and tholeiitic to transitional rocks. It includes an 80 to 300 m thick package dominated by volcaniclastic rocks at its base (Lafrance et al., 2003), known as the Bousquet scoriaceous tuff (Mercier-Langevin et al., 2008b). The volcaniclastic rocks, ranging in grain size from tuff to tuff breccia, are basaltic to andesitic (rarely dacitic to rhyolitic) in composition and have a tholeiitic to transitional magmatic affinity (Lafrance et al., 2003; Mercier-Langevin et al., 2008b). The Bousquet scoriaceous tuff units are overlain to the west by massive to fragmental felsic volcanic rocks (Fig. 3) of tholeiitic to transitional magmatic affinity (Lafrance et al., 2003). The upper part of the lower member of the Bousquet Formation consists of a succession of massive to pillowed, mafic to intermediate and tholeiitic to transitional flows (Fig. 3).

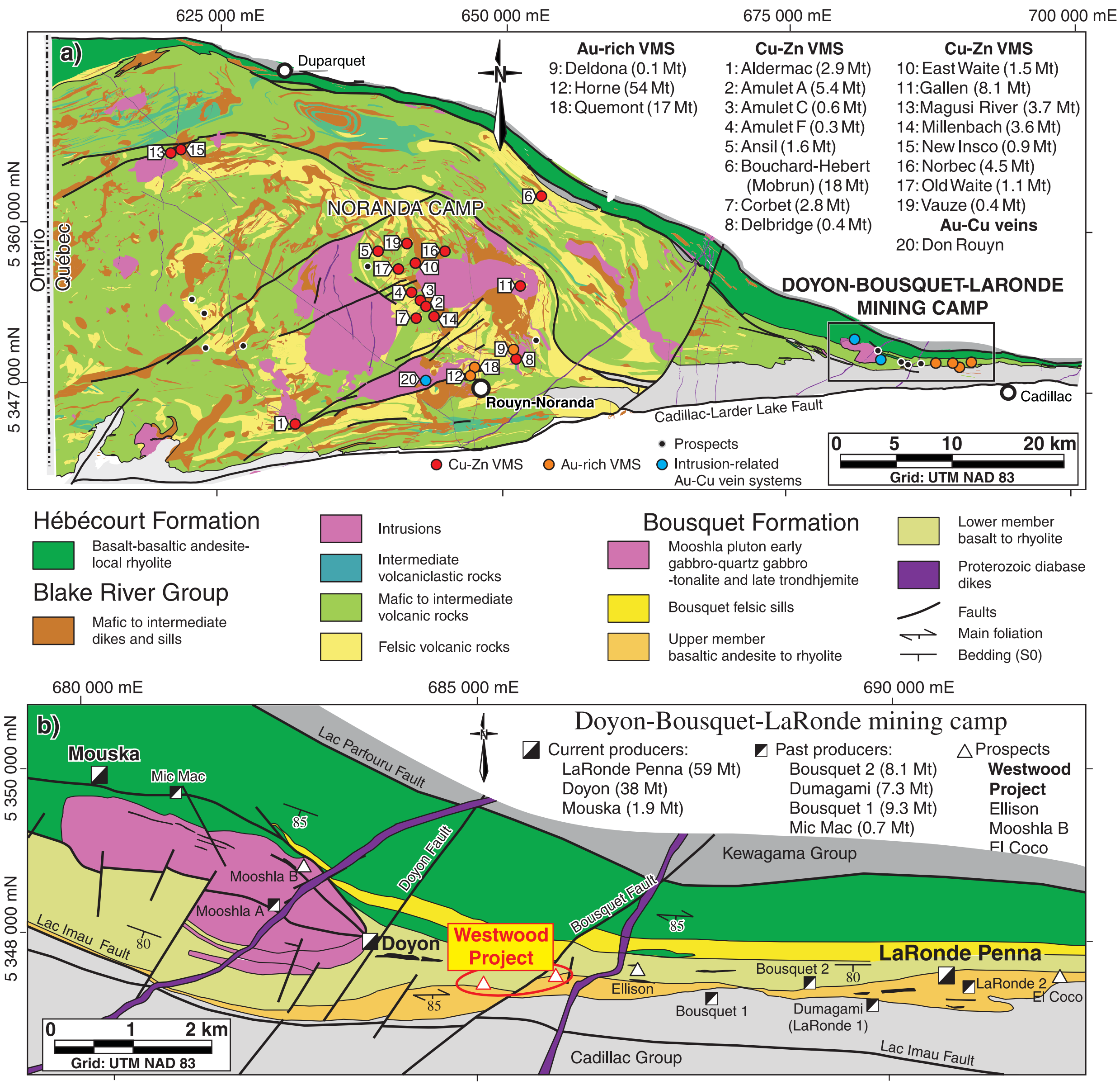

Figure 1. a) Simplified geological map of the Eastern Blake River Group of the Abitibi greenstone belt showing the location of the main volcanogenic massive sulphide deposits of the Noranda and Doyon-Bousquet-LaRonde mining camps. **b)** Simplified geological map of the Bousquet Formation, which hosts the Au-rich volcanogenic massive sulphide deposits and the intrusion-hosted Au-quartz veins of the Doyon-Bousquet-LaRonde mining camp, highlighting the location of the Westwood Project. UTM grid (Nad 83). (*From* Mercier-Langevin et al., 2007c.)

The upper member of the Bousquet Formation is dominated by transitional to felsic volcanic and shallow intrusive rocks of transitional to calc-alkaline magmatic affinity (Lafrance et al., 2003; Mercier-Langevin et al., 2007b) forming flows, lobes, flow-breccia deposits and sill complexes. These units host a significant part of the DBL camp deposits and are thought to have played a key role in the formation, location and preservation of the ore lenses at LaRonde Penna and at Bousquet 2-Dumagami (Dubé et al., 2007; Mercier-Langevin et al., 2007a).

DESCRIPTION OF THE WESTWOOD-WARRENMAC CORRIDOR MINERALIZATION HOST SEQUENCE

The mineralizations of the Westwood Project are located in three east-trending corridors stacked from north to south, or from the base to the top of the stratigraphy (Fig. 4). The overall resource estimate amounts to 14.2 million tons at an average grade of 7.6 g/t Au for a total of 3.5 million ounces of gold contained (Iamgold Corporation, 2008c). The northernmost corridor hosts the mineralization of Zone 2 Extension (Fig. 4), which consists of centimetre- to decimetre-wide auriferous quartz veins and veinlets containing various amounts of sulphides. These veins are highly strained and are commonly associated with widespread white mica alteration and pyrite disseminations. Deformation was focused in and around these strongly altered areas. The Zone 2 Extension ore zones share some analogies with the Doyon mine Zone 2 mineralization (*see* Savoie et al., 1990; Mercier-Langevin et al., 2007d).

The next mineralized corridor is called the North Corridor (Fig. 4). It consists mainly of Au-rich quartz and local, base-metal-bearing sulphide veins and veinlets associated with distal chlorite, biotite and occasional garnet alteration, and proximal white mica alteration.

The southernmost mineralized corridor is called the Westwood-Warrenmac Corridor (Fig. 4). The mineralization of the Westwood-Warrenmac Corridor consists of continuous, auriferous, semimassive to discontinuous Au-rich massive sulphide lenses containing variable amounts of base metals (Cu and Zn). The ore zones of the Westwood-Warrenmac Corridor appear to be stratiform, as most of the known ore seems to be located at the same stratigraphic level (*see* discussion below), but there is probably more than one mineralized interval, because satellite ore zones are found locally a few metres away (north and south) from the "main horizon". The Westwood-Warrenmac Corridor comprises mainly newly discovered ore lenses, for the most part below elevations of 4000 m (depths of 800 m; Fig. 2), but it also comprises the Warrenmac lens (Fig. 2, 4) that was discovered many years ago by surface exploration (Savoie et al., 1991; Moorhead et al., 2000, 2001). The Westwood-Warrenmac Corridor resources, excluding the

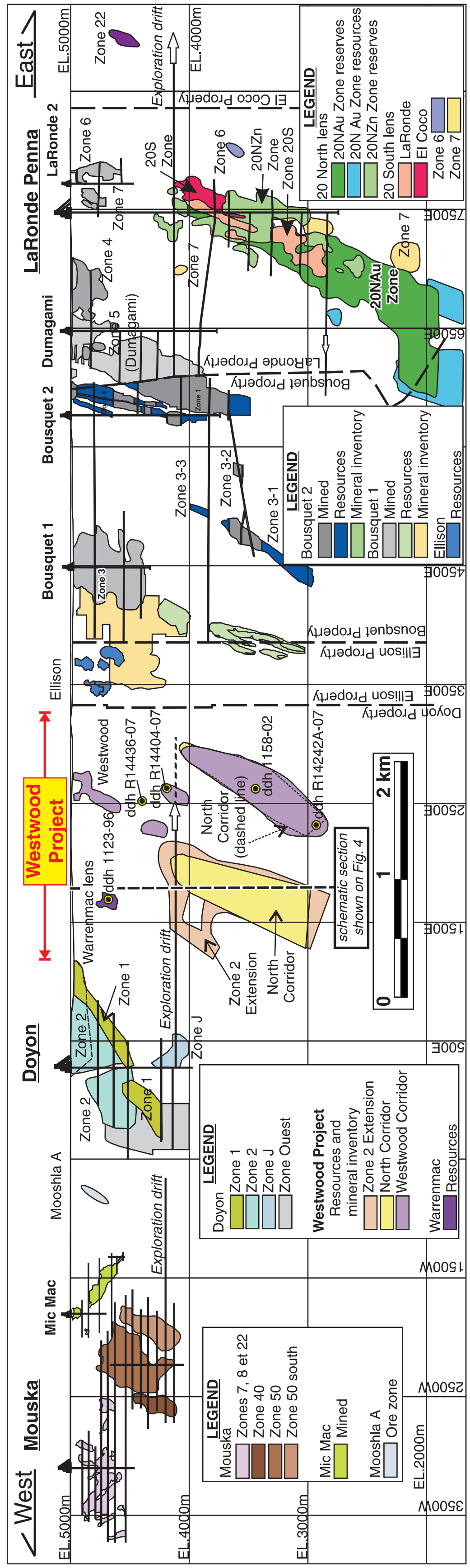

Figure 2. Composite longitudinal section (looking north) of the Doyon-Bousquet-LaRonde mining camp showing the distribution of the main ore zones (past production, reserves, resources, and geological mineral inventory). The location of the schematic section (Fig. 4) is also illustrated, as well as the locations of drillholes discussed in text. (*Modified from* Mercier-Langevin et al., 2007c, d.)

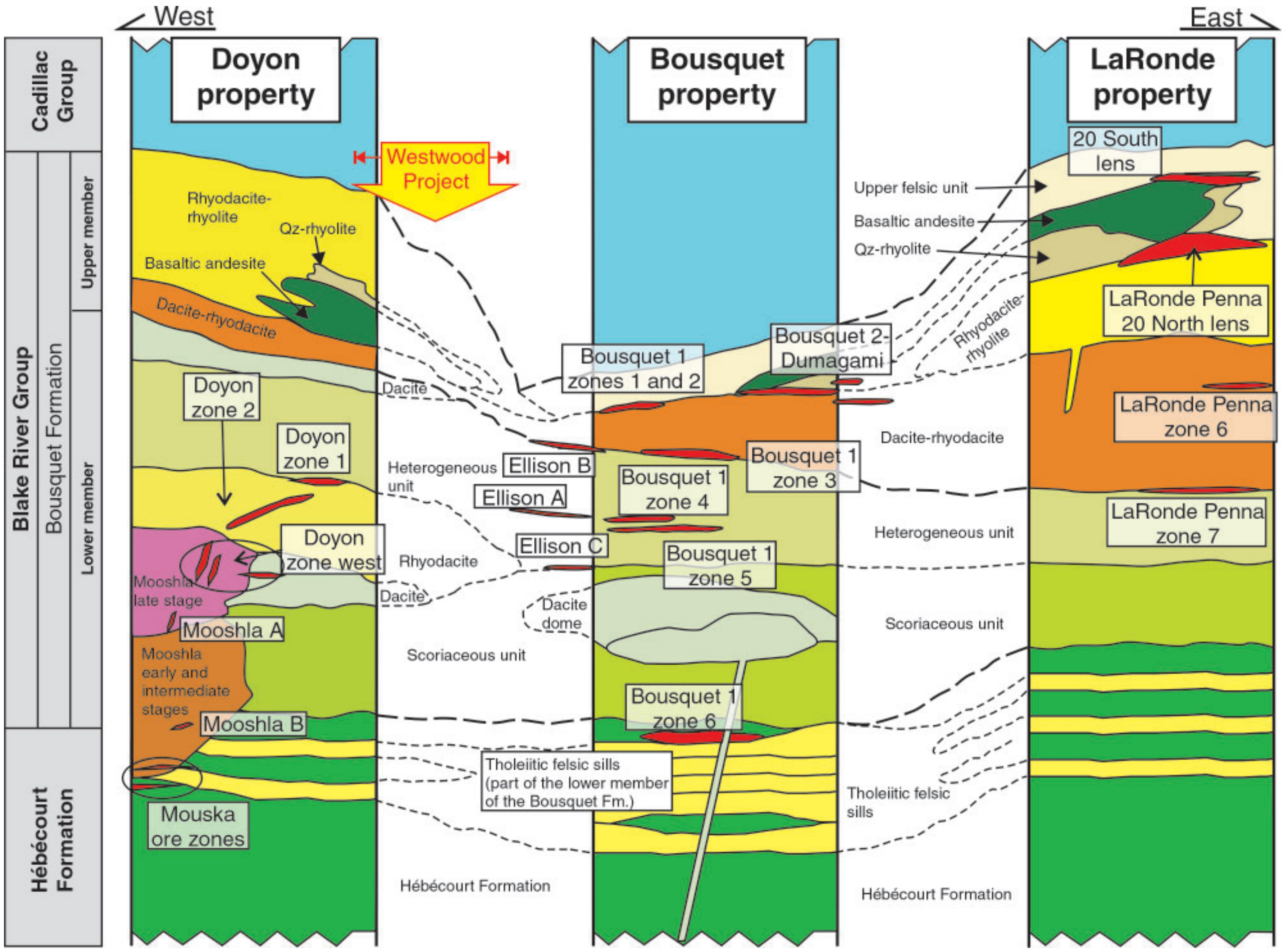

Figure 3. Simplified stratigraphy of the Doyon-Bousquet-LaRonde mining camp illustrating the stratigraphic setting of the main ore lenses in the Doyon, Bousquet 1 and LaRonde areas. The ore lenses are not to scale. (*From* Mercier-Langevin et al., 2007d; *modified from* Lafrance et al., 2003).

Warrenmac lens resources, amount to 6.2 million tons at an average grade of 4.6 g/t Au for a total of about 1 million ounces of Au (Iamgold Corporation, 2008b), plus significant amounts of Cu, Zn and Ag. The Warrenmac lens resources are estimated at 0.3 million tons at 6.9 g/t Au and 4.5% Zn (Iamgold Corporation, 2008b). So, for simplicity, the newly discovered ore zones of the Westwood-Warrenmac Corridor, comprising the Warrenmac lens, are herein referred to as the Westwood-Warrenmac ore zones.

Overview of the Westwood-Warrenmac ore zones

The Westwood-Warrenmac ore zones located along the “main horizon” consist of a relatively thin (≤8 m), but laterally and vertically extensive sheet of disseminated, semimassive and massive sulphides that is traced from surface to a depth of more than 2000 m (Fig. 2, 4), with the ore zones still being open at depth (Fig. 2). Narrow lenses (≤20 cm) of Au- and Zn-bearing massive sulphides related to the Warrenmac lens (Fig. 5a) outcrop about 1 km east of the Doyon mine shaft (Savoie et al., 1991; Moorhead et al., 2000, 2001). There are numerous accumulations, or lenses, of massive sulphides along the Westwood-Warrenmac “main horizon”, consisting mainly of auriferous concentrations of pyrite and sphalerite with relatively minor amounts of chalcopyrite and galena (Fig. 5b). Late regional metamorphism and deformation are responsible for the development of millimetre- to centimetre-wide bands of pyrite porphyroblasts and sphalerite, mimicking the main east-trending schistosity (Fig. 5b).

The massive sulphide lenses that are part of the Westwood-Warrenmac ore zones are generally underlain by narrow zones of semimassive sulphides and transposed veins and veinlets containing various amounts of pyrite (Fig. 5c), chalcopyrite (Fig. 5d) and sphalerite. The semimassive sulphides and sulphide veins are hosted by strongly sericitized and locally silicified rocks of the footwall sequence (*see* below). Very well preserved clasts of the footwall felsic rocks are also present in the massive sulphides as shown on Figure 5e, which suggests that the mineralization was formed, at least in part, by sub-seafloor replacement of the

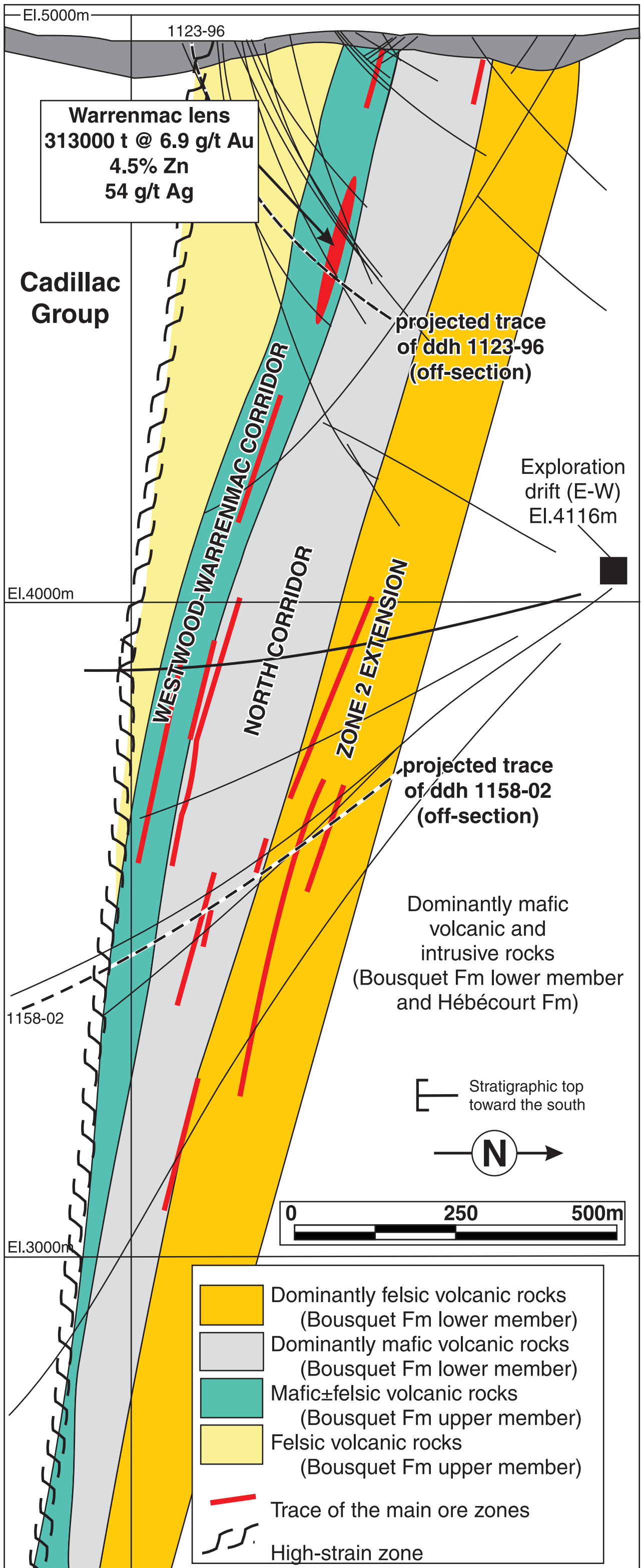

Figure 4. Simplified geological section (looking west) through the Westwood Project mineralized corridors showing the stacking of ore zones from north (Zone 2 Extension) to south (Westwood-Warrenmac Corridor). (*Modified from* Iamgold Corporation, 2007).

host rocks, a process that has been invoked for the formation of the giant LaRonde Penna 20 North lens east of Westwood (Dubé et al., 2007; Mercier-Langevin et al., 2007a).

The massive sulphide lenses of the Westwood-Warrenmac ore zones are linked by laterally and vertically extensive mineralized zones that are mostly continuous (Fig. 2). These zones comprise narrow bands of auriferous, semimassive sulphides (Fig. 5f), sulphide-rich veins and veinlets, and sulphide disseminations mostly hosted in strongly altered (Sr-Qz-Bo ±Gt-Chl-Py) rocks of the footwall sequence, and locally partly hosted in altered rocks of the hanging-wall sequence. Aluminosilicates (kyanite and andalusite) are also present in the intensively altered zones surrounding the mineralization, especially at depth in the mine (Mercier-Langevin et al., 2008c), which is similar to the alteration zonation at the LaRonde Penna mine (Dubé et al., 2007). The stratigraphic position of the Westwood-Warrenmac ore zones is discussed in greater detail below, but this observation suggests a replacement-style mechanism for the formation of the Westwood-Warrenmac mineralization.

Footwall unit of the Westwood-Warrenmac ore zones

The Westwood Project area is characterized by the presence of numerous mineralized zones associated with well developed and relatively large hydrothermal alteration haloes where late regional deformation was focused, hindering the recognition of primary textures. However, as is the case elsewhere in the DBL camp, strain is heterogeneously distributed (e.g. Mercier-Langevin et al., 2007a) and it is locally possible to differentiate units and volcanic facies (e.g. Lafrance et al., 2003; Mercier-Langevin et al., 2007a).

Moreover, the use of geochemistry has been shown to be very effective at identifying and mapping units in the DBL camp (e.g. Lafrance et al., 2003; Mercier-Langevin et al., 2008b), especially around major ore zones (e.g. Dubé et al., 2007; Mercier-Langevin, 2005; Mercier-Langevin et al., 2007a, b). This approach, combining detailed petrographic and textural descriptions and lithogeochemistry, was applied to the Westwood Project study. The following discussion is largely based on the results obtained from drillhole 1158-02 (*see* Fig. 2 and 3 for location) that crosscuts a large part of the stratigraphy of the Westwood Project area and the Westwood-Warrenmac ore zones at depth, and on some key observations made elsewhere in the area.

The samples selected for geochemical analysis along drillhole 1158-02 show that the footwall sequence of the Westwood-Warrenmac ore zones (~1050–1895 m) is composed of mafic to felsic rocks (Fig. 6a). The magmatic affinity of the mafic and intermediate rocks is tholeiitic, whereas the felsic rocks are transitional (Fig. 6b).

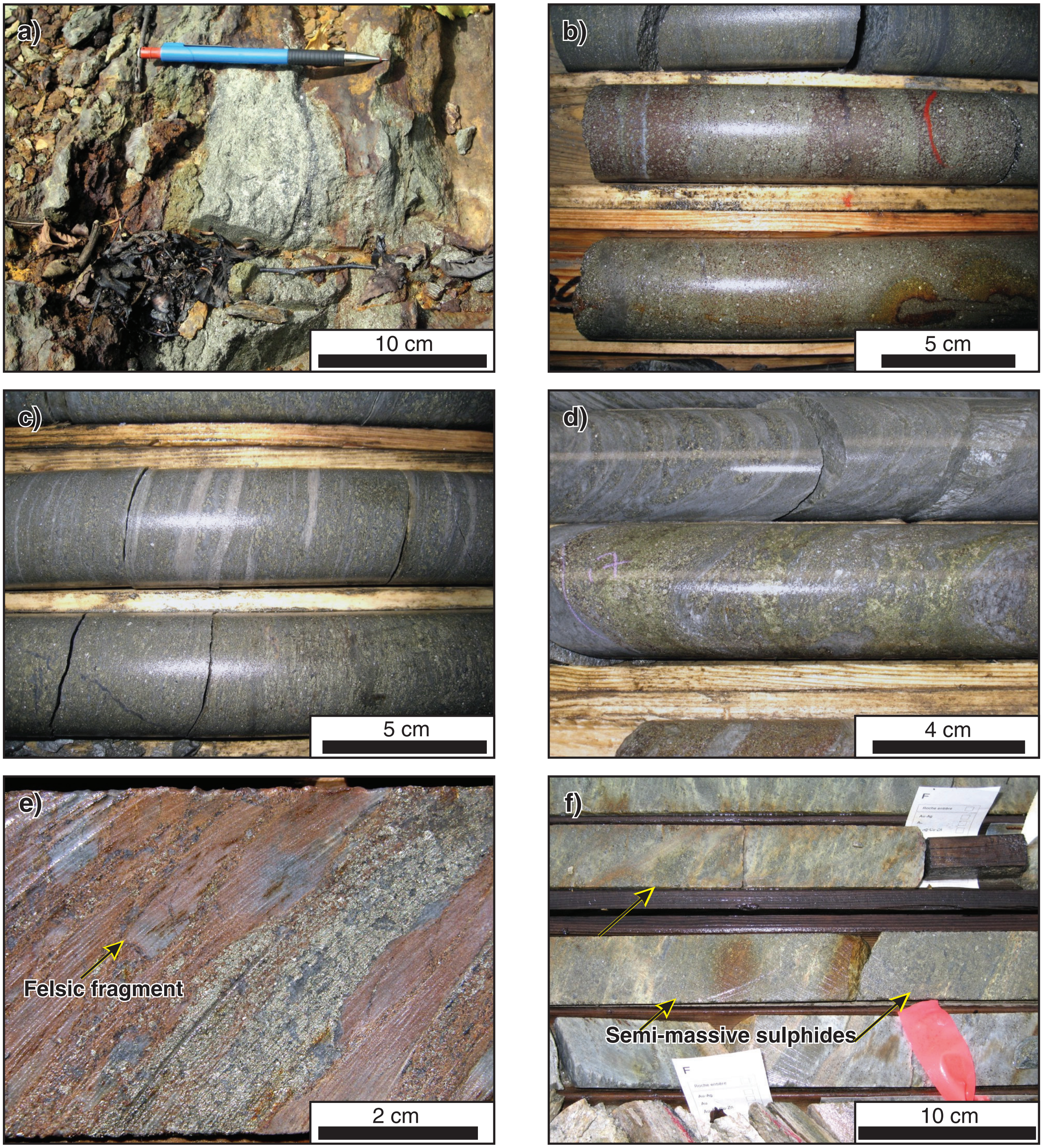

Figure 5. a) Banded massive sulphides (pyrite, sphalerite, and chalcopyrite) of the Westwood-Warrenmac ore zones (Warrenmac lens) that outcrop east of the Doyon mine. **b)** Metamorphosed and deformed (banded) massive sulphides of the Westwood-Warrenmac ore zones intersected at depth; drillhole R14436-07 at 626 m. **c)** Semimassive sulphides of the Westwood-Warrenmac ore zones with remnants of strongly sericitized footwall rocks; drillhole R14436-07 at 623 m. **d)** Transposed chalcopyrite-rich veins and veinlets in strongly sericitized footwall felsic rocks in the immediate footwall of the Warrenmac lens of the Westwood-Warrenmac ore zones, drillhole 1277-07 at 359 m. **e)** Well preserved felsic fragment within the massive sulphides of the Warrenmac lens, Westwood-Warrenmac Corridor, drillhole 1123-96 at 282 m. **f)** Semimassive sulphides and sulphide-rich veins of the Westwood-Warrenmac ore zones at depth. The auriferous sulphides are emplaced within altered rocks of the footwall and of the hanging wall; drillhole 1158-02 at 1901 m.

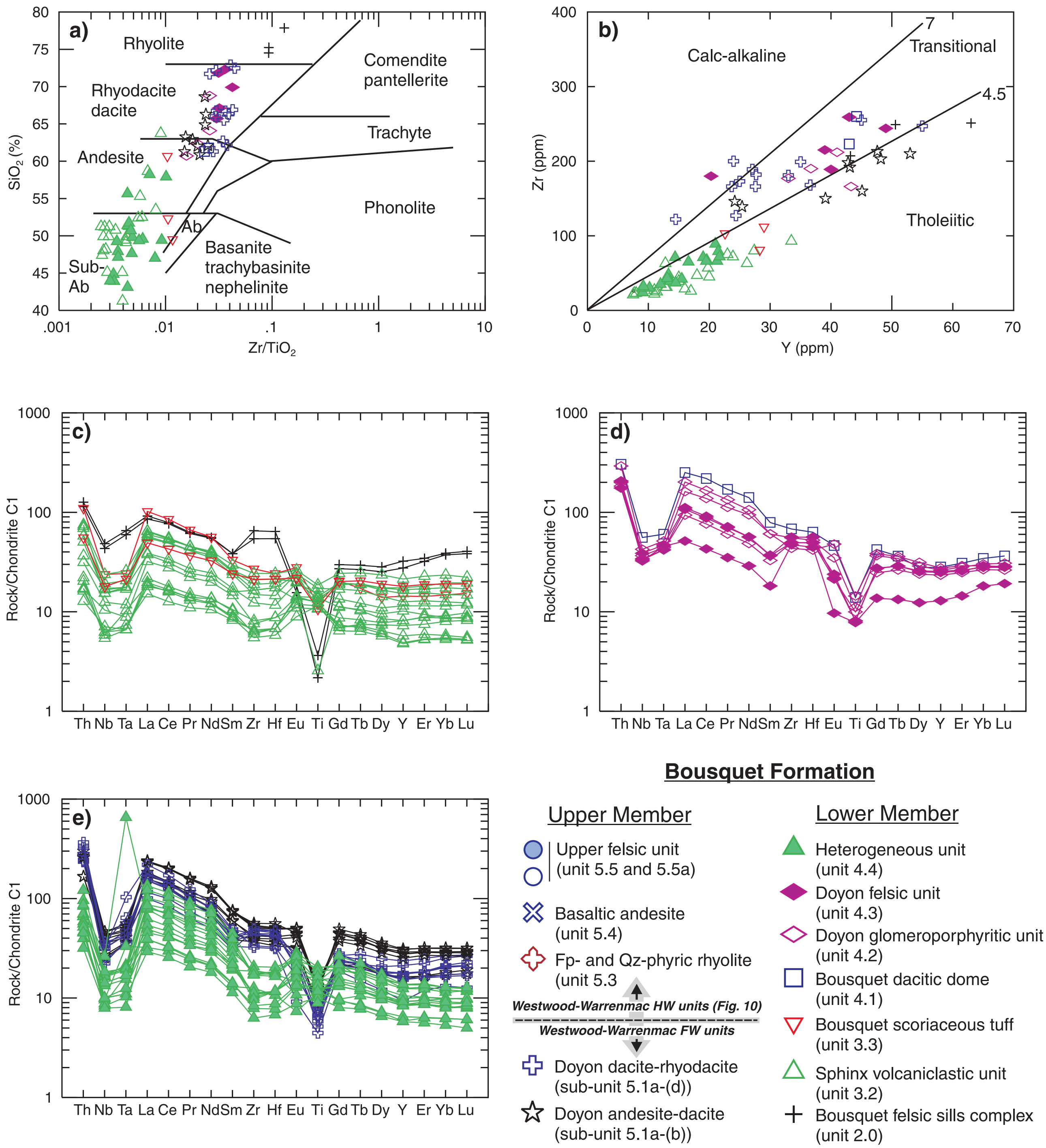

Figure 6. Geochemistry of the volcanic (± intrusive) rocks of the Bousquet Formation units sampled in drill-hole 1158-02 (*see* location on Fig. 2, 4) in the footwall sequence of the Westwood-Warrenmac ore zones. **a)** Winchester and Floyd (1977) classification diagram. **b)** Magmatic affinity diagram from Barrett and MacLean (1999). **c)** C1 chondrite normalized (McDonough and Sun, 1995) multi-element patterns for units 2.0, 3.2, and 3.3. **d)** C1 chondrite normalized (McDonough and Sun, 1995) multi-element patterns for units 4.1, 4.2, and 4.3. **e)** C1 chondrite normalized (McDonough and Sun, 1995) multi-element patterns for unit 4.4 and subunits 5.1a-(b) and 5.1a-(d). (Legend shared with Fig. 10; FW = footwall, HW = hanging wall, Ab = alkali basalt, Sub-Ab = Sub-alkaline basalt).

The base of the sequence exposed along drillhole 1158-02, from about 1050 m to 1220 m, is composed of tholeiitic rhyolite of unit 2.0 (Bousquet felsic sills complex, Bousquet Formation lower member) intercalated with basalt from the Hébécourt Formation (Fig. 7). The massive, quartz and feldspar porphyritic rhyolite is characterized by elevated Si and Zr contents and by a high Zr/TiO_2 ratio (Fig. 7) that contrasts with that of the other units of the Bousquet Formation. The rhyolite of unit 2.0 is also characterized by slightly enriched (about 100x chondritic values) high field-strength-element (HFSE) and light rare-earth-element (LREE) patterns, flat heavy-rare-earth element (HREE) patterns, a strong positive Zr-Hf anomaly, and a very strong negative anomaly in Ti (Fig. 6c).

The following few hundreds of metres along drillhole 1158-02 (from 1220 m to ~1650 m; Fig. 7) consist predominantly of coherent to fragmental mafic to intermediate rocks of units 3.2 (Sphinx volcaniclastic unit) and 3.3 (Bousquet scoriaceous tuff) intercalated with thin, coherent to fragmental felsic bands of units 4.1 (Bousquet dacitic dome), 4.2 (Doyon glomeroporphyritic unit), and 4.3 (Doyon felsic unit). The mafic to intermediate rocks of units 3.2 and 3.3 are mostly composed of banded lapilli tuffs with some amygdular fragments (Fig. 8a). These rocks are basaltic to andesitic (Fig. 6a) and mostly tholeiitic (Fig. 6b) with low values in Zr and elevated Ti values (Fig. 7), whereas the felsic rocks are mainly transitional dacite and rhyodacite (Fig. 6a, b) with Zr values over 150 ppm (Fig. 7) and TiO_2 values below 0.7 wt. % (Fig. 7). Rocks from units 3.2 and 3.3 are characterized by negative Nb-Ta and Zr-Hf anomalies (Fig. 6c), and by contradictory but relatively weak Ti anomalies, whereas the felsic rocks show a positive Zr-Hf anomaly and a pronounced negative Ti anomaly (Fig. 6d). The chondrite-normalized multi-element plots show that rocks from units 3.2 and 3.3 are characterized by slightly HFSE- and LREE-enriched patterns (Fig. 6c), similar to those of the Bousquet scoriaceous tuff at LaRonde Penna (*see* Mercier-Langevin et al., 2008b).

The felsic rocks of units 4.1, 4.2, and 4.3 are commonly difficult to distinguish texturally in altered and high-strain zones. They appear to be coherent to volcaniclastic, with block- and lapilli-sized fragments lying in a fine-grained matrix (Fig. 8b, c). The felsic rocks of units 4.1, 4.2, and 4.3 sampled in drillhole 1158-02 show relatively steep HFSE and LREE patterns, and flat to slightly U-shaped HREE patterns (Fig. 6d), typical of transitional to calc-alkaline felsic rocks of the Bousquet Formation (e.g. Mercier-Langevin et al., 2007b).

The upper part of footwall sequence (~1650–1895 m) can be divided into two parts, a mafic-dominated lower half and a felsic upper half (Fig. 7). The mafic-dominated lower half is composed of basaltic to andesitic rocks of unit 4.4 (Fig. 6a) and it hosts the North Corridor mineralization as shown on Figure 7, with the best Au values spatially associated with thin intervals of felsic rocks of unit 5.1a (Doyon dacite-rhyodacite) intercalated with unit 4.4 (Bousquet heterogeneous unit). The basaltic to andesitic rocks of unit 4.4 (Bousquet Formation lower member) sampled in drillhole 1158-02 are tholeiitic (Fig. 6b) and characterized by multi-element patterns showing HFSE and LREE enrichments, relatively flat HREE at about 10x chondritic values, and pronounced negative Nb-Ta and Zr-Hf anomalies (Fig. 6e). The felsic rocks of unit 5.1a (Bousquet Formation upper member) are andesitic to rhyodacitic (Fig. 6a) and tholeiitic to calc-alkaline (Fig. 6b).

The rocks of unit 5.1a (Doyon dacite-rhyodacite), equivalent to unit 5.1b (LaRonde dacite-rhyodacite) at LaRonde Penna, can be divided into two subunits at Westwood with an andesite-dacite subunit (5.1a-(b)) and a dacite-rhyodacite subunit (5.1a-(d)). The rocks of subunit 5.1a-(b) sampled in drillhole 1158-02, which are commonly strongly altered and appear to be massive, are andesitic to dacitic (Fig. 6a) and tholeiitic to transitional (Fig. 6b), whereas rocks of subunit 5.1a-(d), which are massive to fragmental (lapilli tuff; Fig. 8d), are slightly more felsic (dacitic to rhyodacitic) and transitional to calc-alkaline (Fig. 6b). The Zr and TiO_2 contents tend to be more elevated for subunit 5.1a-(b) than for subunit 5.1a-(d), helping to quickly differentiate them geochemically (e.g. Fig. 7, 9). Both subunits are characterized by chondrite-normalized multi-element plots showing strong enrichments in HFSE and LREE, pronounced negative Nb-Ta and Ti anomalies, and flat HREE patterns at about 20x chondritic values (Fig. 6e), perhaps with a slightly more elevated content in HREE for subunit 5.1a-(b). The andesitic to dacitic rocks from subunit 5.1a-(b) are characterized by a negative Zr-Hf anomaly and no Eu depletion, whereas the dacitic to rhyodacitic rocks from subunit 5.1a-(d) are characterized by a positive Zr-Hf anomaly and a weak depletion in Eu (Fig. 6e). The subunits 5.1a-(b) and -(d) host the proximal footwall alteration associated with the precious- and base metal-bearing sulphides of the Westwood-Warrenmac ore zones (Fig. 7, 9) and they commonly show total destruction of the primary textures and mineral assemblages, which have been replaced by locally highly strained (Fig. 8e) and metamorphosed hydrothermal assemblages of chlorite, biotite, sericite, Mn-rich garnet, quartz, and carbonate (Fig. 8f).

Hanging wall units of the Westwood-Warrenmac ore zones

Three main units, part of the Bousquet Formation upper member, are present in the hanging wall of the Westwood-Warrenmac ore zones: 1) a basaltic andesite (unit 5.4), 2) a rhyolite (unit 5.3) and 3) a rhyodacite-rhyolite (unit 5.5 and subunit 5.5a). Each of these units is commonly strongly altered. Their distribution in the hanging wall of the ore zones is heterogeneous, with major thickness variations from one place to another (e.g. drillhole 1158-02 versus 1123-96: Fig. 7, 9), with basaltic andesite or rhyolite or even rhyodacite-rhyolite as the immediate hanging-wall rock.

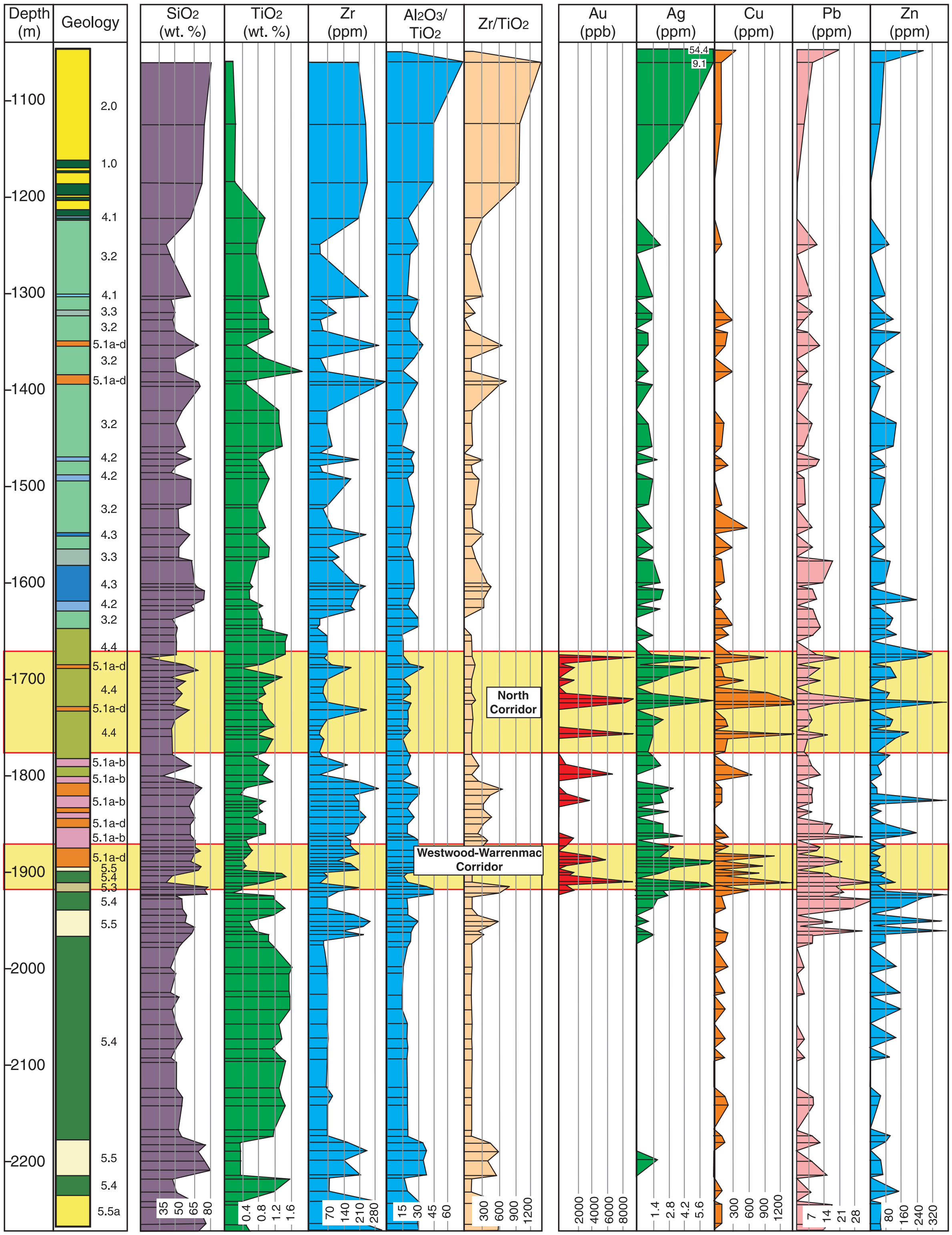

Figure 7. Geochemical profile of drillhole 1158-02 (for location *see* Fig. 2, 4). Location of analyzed samples and results are indicated by short horizontal lines. See Figure 6 for units legend.

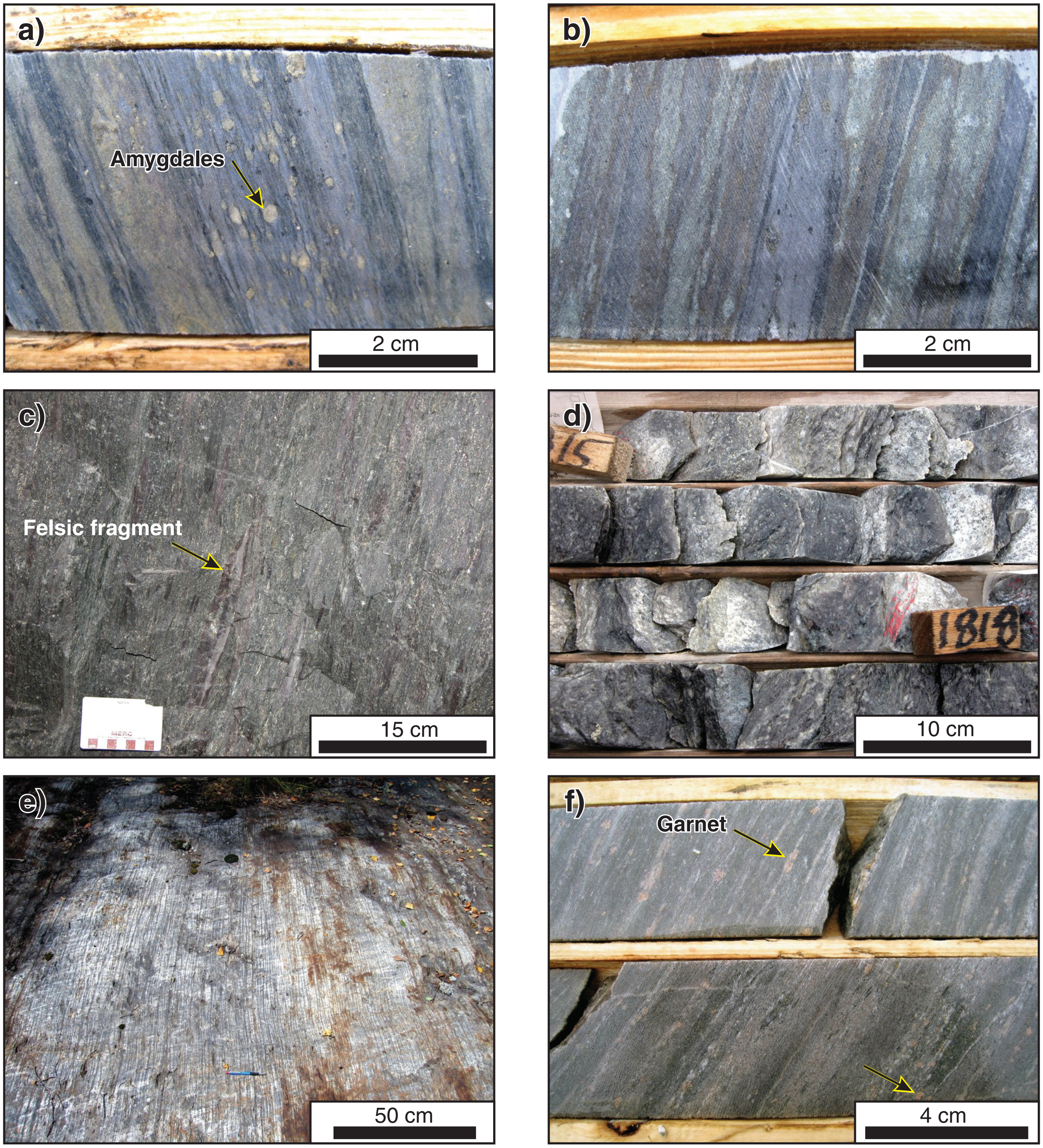

Figure 8. a) Highly strained mafic to intermediate lapilli tuff of unit 3.3 showing amygdaloidal fragments; drillhole R14404-07 at 535 m. **b)** Banded felsic block and lapilli tuff of unit 4.1; drillhole R14404-07 at 510 m. **c)** Underground exposure of unit 4.3 felsic block and lapilli tuff, 14500E drift, west wall. **d)** Sericite-altered and schistose brecciated dacite-rhyodacite (block and lapilli tuff) of subunit 5.1a-(d) in the immediate footwall of the Westwood-Warrenmac ore zones at depth; drillhole 1158-02 at 1818 m. **e)** Highly strained and altered (sericite, quartz, biotite, chlorite and garnet) felsic volcanic rocks in the immediate footwall of the Westwood-Warrenmac ore zones at surface. **f)** Metamorphosed (upper greenschist-lower amphibolite facies) hydrothermal alteration assemblage composed mainly of varying amounts of sericite, chlorite, biotite, Mn-rich garnet, quartz, and carbonate developed in the Westwood-Warrenmac ore zones immediate footwall rocks; drillhole R14404-07 at 596 m.

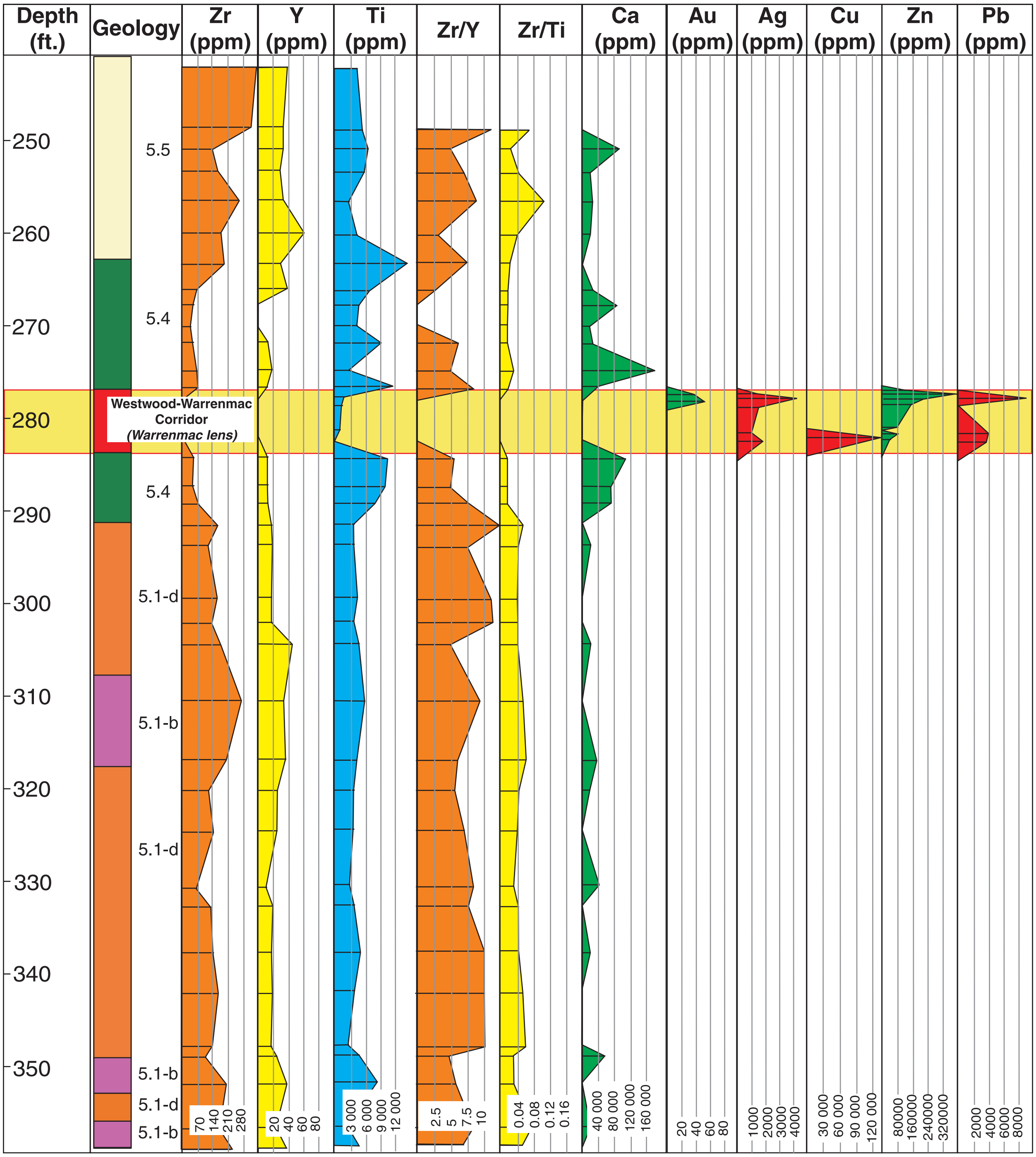

Figure 9. Geochemical profile of drillhole 1123-96 (for location *see* Fig. 2, 4). Location of analyzed samples and results are indicated by short horizontal lines. Analysis where obtained by X-ray fluorescence (XRF) using a portable XRF device. See Figure 6 for unit numbers legend.

The mafic to intermediate unit (5.4) is basaltic to andesitic and tholeiitic to transitional in composition (Fig. 10a, b). This basaltic andesite, which is locally pinkish as a result of the hydrothermal alteration (Fig. 11a, b), is generally massive and dark green (Fig. 11c), but it is locally fragmental (lapilli tuff), feldspar glomeroporphyritic, and amygdaloidal. The geochemical signature of the basaltic andesite constrasts strongly with that of the other two units of the hanging-wall sequence, with low SiO_2 and Zr contents and elevated TiO_2 (Ti) content (Fig. 7, 9). The chondrite-normalized multi-element plot of samples of unit 5.4 taken in drillhole 1158-02 is characterized by moderate HFSE and LREE enrichments, negative Nb-Ta and Zr-Hf anomalies, and a weak positive anomaly in Eu (Fig. 10c).

The rhyolite located in the hanging-wall sequence is highly siliceous (Fig. 10a) and calc-alkaline (Fig. 10b). It is porphyritic with feldspar and bluish quartz phenocrysts (Fig. 11d). The porphyritic texture is commonly partly to totally obscured by hydrothermal alteration and late deformation (Fig. 11e). The chondrite-normalized multi-element plot for samples of unit 5.3 from drillhole 1158-02 is characterized by strong HFSE and LREE enrichments and moderate depletions in HREE (Fig. 10c), with pronounced negative Nb-Ta and Ti anomalies and a weak positive Zr-Hf anomaly.

The rhyodacite-rhyolite is transitional to calc-alkaline (Fig. 10b). Different volcanic facies characterize this feldspar-phyric unit: massive, brecciated (block and lapilli tuff; Fig. 11f) and laminated (crystal tuff and fine tuff intercalated with argillaceous laminae). Some samples of this unit, showing similar petrographic and textural features, seem to be slightly more felsic, and are attributed to a subunit (5.5a; Fig. 7, 10). The multi-element plot for samples of unit 5.5, including samples from subunit 5.5a, shows similar patterns to those of unit 5.3 and subunit 5.1a-(d) with strong enrichments in HFSE and LREE, flat HREE at about 30x chondritic values, negative Nb-Ta and Ti anomalies, and a positive Zr-Hf anomaly (Fig. 10d).

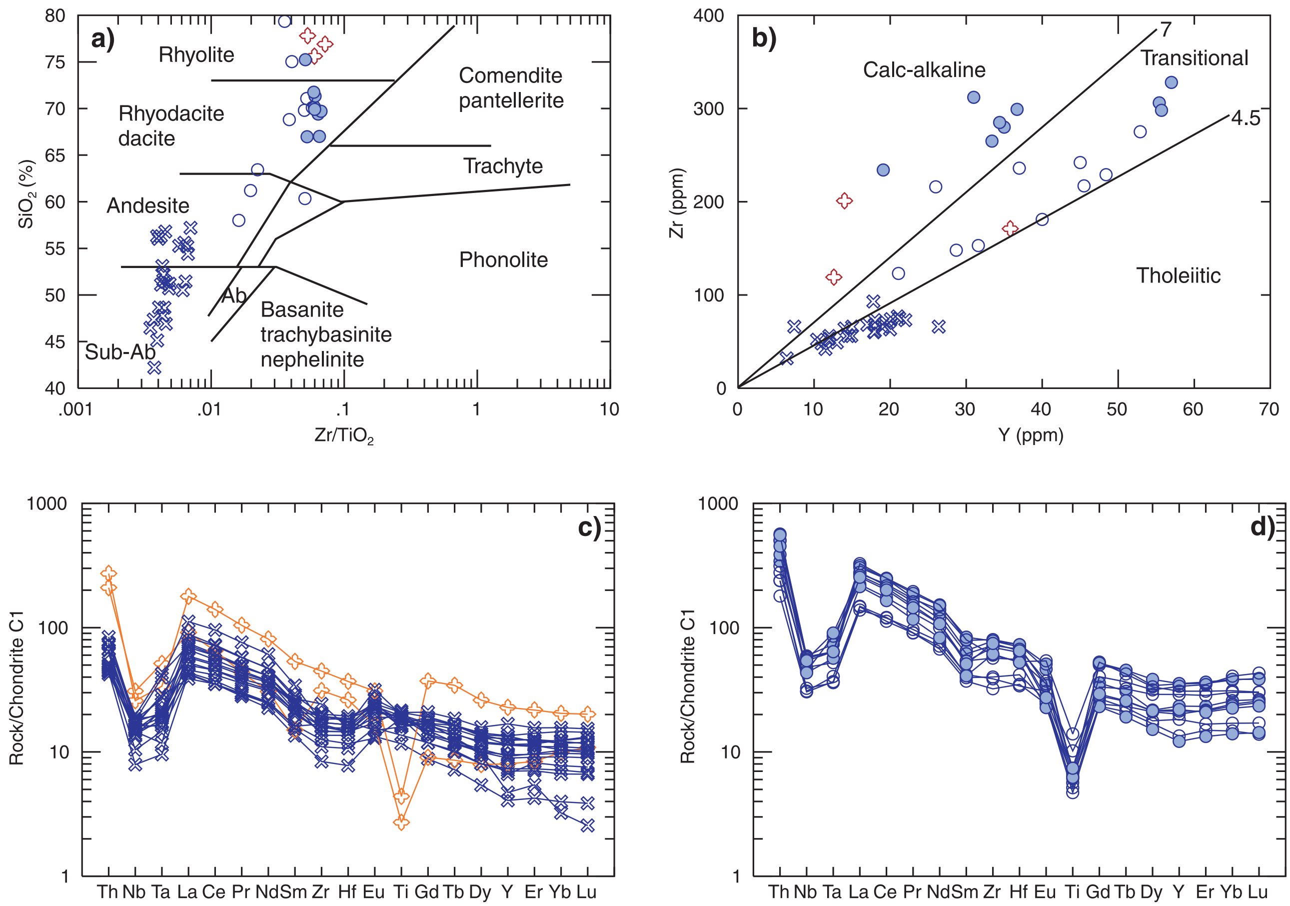

Figure 10. Geochemistry of the volcanic (± intrusive) rocks of the Bousquet Formation units sampled in drillhole 1158-02 (for location *see* Figure 2, 4) in the hanging-wall sequence of the Westwood-Warrenmac ore zones. **a)** Winchester and Floyd (1977) classification diagram. **b)** Magmatic affinity diagram from Barrett and MacLean (1999). **c)** C1 chondrite normalized (McDonough and Sun, 1995) multi-element patterns for units 5.3 and 5.4. **d)** C1 chondrite normalized (McDonough and Sun, 1995) multi-element patterns for units 5.5 and 5.5a. (For legend, *see* Figure 6; Ab = alkali basalt, Sub-Ab = Sub-alkaline basalt).

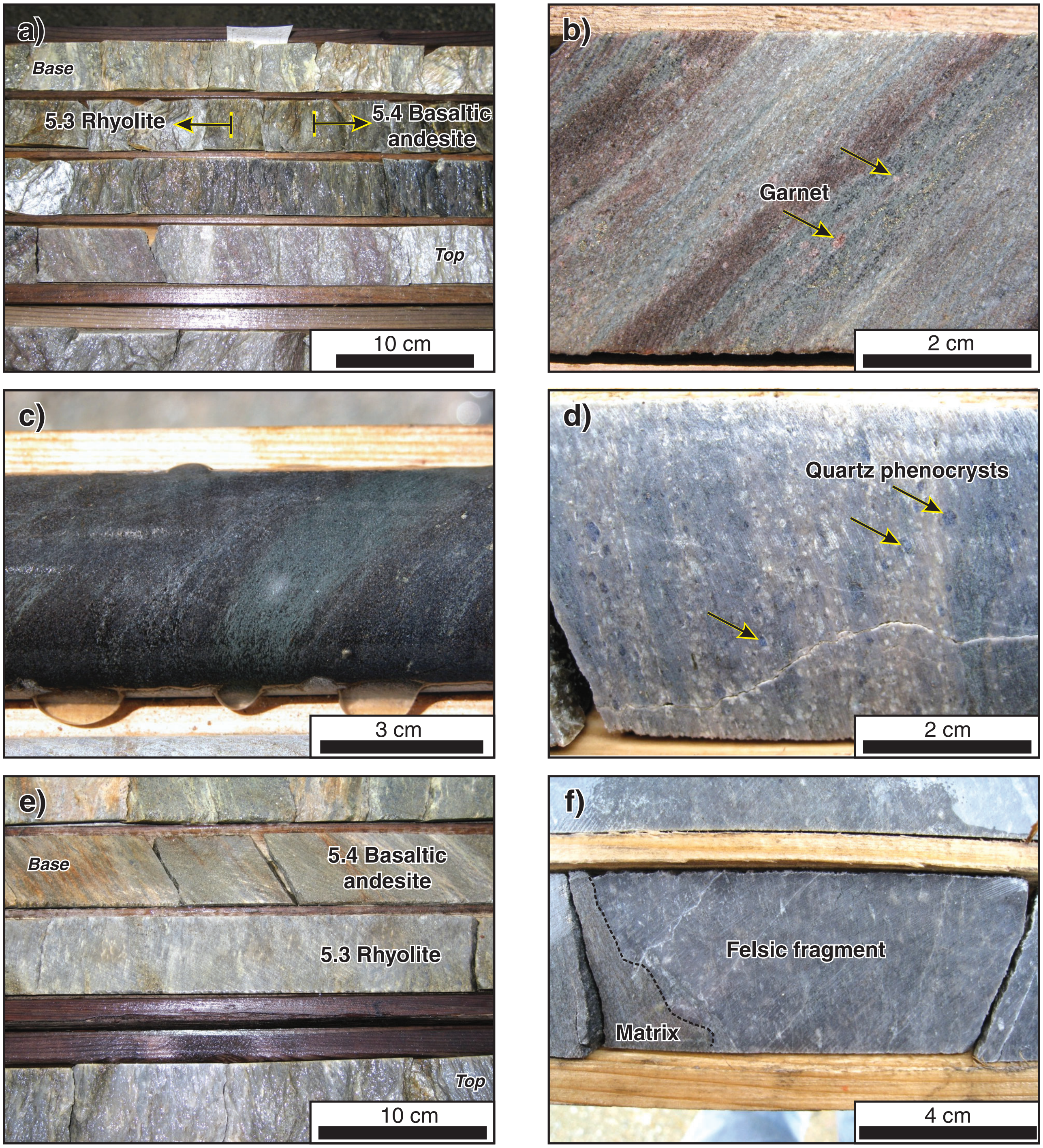

Figure 11. a) Pinkish-altered massive basaltic andesite in the hanging wall of the Westwood-Warrenmac ore zones; drillhole 1158-02 at 1921 m. **b)** Biotite-, garnet-, sericite-, and quartz-altered basaltic andesite in the Westwood-Warrenmac ore zones hanging wall; drillhole R14242A-07 at 1690 m. **c)** Slightly biotite-altered, massive basaltic andesite; drillhole R14242A-07 at 1677 m. **d)** Feldspar- and quartz-phyric rhyolite with bluish quartz phenocrysts, Westwood-Warrenmac ore zones hanging-wall sequence; drillhole R14404-07 at 626 m. **e)** Highly strained (schistose) and sericite-altered rhyolite with total destruction of the primary porphyritic texture; drillhole 1158-02 at 1911 m. **f)** Rhyodacite-rhyolite brecciated facies; drillhole R14404–07 at 630 m.

DISCUSSION

Preliminary interpretations: the stratigraphic setting of the Westwood-Warrenmac ore zones

A comparison of the main host units of the Westwood-Warrenmac ore zones with those hosting the Bousquet 2-Dumagami and LaRonde Penna 20 North massive sulphide lenses, about 2 km to the east, strongly suggests that they were all formed at the same stratigraphic level. The position of the Westwood Project mineralizations was previously believed to be lower in the DBL camp stratigraphy; a part of the uppermost (and most fertile in terms of Au-rich VMS lenses) Bousquet Formation sequence was considered to be missing in this part of the camp (*see* Lafrance et al., 2003; Mercier-Langevin et al., 2007d). This is indeed not the case, as is further discussed here.

The distal footwall unit of the Westwood-Warrenmac ore zones is composed of tholeiitic felsic rocks (unit 2.0) intercalated with the basalts of the Hébécourt Formation and overlain by tuffaceous mafic to intermediate units (Bousquet scoriaceous tuff; units 3.2 and 3.3). The chemistry of the Hébécourt Formation basalts and of units 2.0, 3.2, and 3.3 at Westwood is similar to the chemistry of the basalts, tholeiitic rhyolites (unit 2.0) and volcaniclastic rocks (units 3.2 and 3.3) of the LaRonde Penna mine area (Fig. 12a).

The following part of the Westwood-Warrenmac ore zones footwall stratigraphy consists mainly of basaltic rocks (unit 4.4) intercalated with thin bands of felsic rocks and overlain by felsic rocks (subunits 5.1a -(b) and -(d)) of the base of the Bousquet Formation upper member. This again is comparable to the Bousquet 2-Dumagami proximal footwall sequence, with unit 5.1b as the immediate footwall unit to the ore (Lafrance et al., 2003; Mercier-Langevin et al., 2007a). Unit 4.4 has the same composition at Westwood as at LaRonde Penna (Fig. 12b), except for a slightly greater chemical variability that can possibly be explained by the strong alteration of unit 4.4 hosting the North Corridor mineralization at Westwood. The chondrite-normalized multi-element patterns and trace and major element ratios (Table 1) of subunits 5.1a-(b) and -(d) are very similar to those of the felsic rocks of the Bousquet Formation upper member at LaRonde Penna (Fig. 12c).

The Westwood-Warrenmac ore zones hanging-wall stratigraphy consists of three rock types: 1) a calc-alkaline porphyritic rhyolite, 2) a tholeiitic to transitional basaltic andesite, and 3) a transitional to calc-alkaline rhyodacite-rhyolite. Based on the detailed work done in drillhole 1158-02 and the other drillholes studied to date, the Westwood-Warrenmac ore zones are systematically directly overlain, and even locally partly hosted by one of these three units, as the ore has been formed, at least in part, by sub-seafloor replacement.

The calc-alkaline rhyolite in the hanging wall of the Westwood-Warrenmac ore zones has exactly the same petrography and chemistry as does unit 5.3 (LaRonde Fp- and Qz-phyric rhyolite) at LaRonde Penna (Fig. 12d), with distinctive but very similar Zr/TiO_2, Zr/Y, Ti/Zr, Nb/Th, Hf/Sm, Th/Ta, and rare-earth element ratios (Table 1). Unit 5.3 is considered a key stratigraphic unit of the hanging wall at LaRonde Penna and Bousquet 2-Dumagami (Teasdale et al., 1996; Dubé et al., 2007; Mercier-Langevin et al., 2007a) and its distinctive petrography and chemistry make it a good stratigraphic marker (e.g. Mercier-Langevin et al., 2007b) that can now be traced westward, as far as Westwood. The LaRonde Fp- and Qz-phyric rhyolite has been dated at 2697.8 ± 1 Ma at LaRonde Penna (Mercier-Langevin et al., 2007a), which suggests that the Westwood-Warrenmac ore zones were formed at about 2698–2697 Ma, coeval with that of the LaRonde Penna mine 20 North lens.

The tholeiitic to transitional basaltic andesite present in the hanging wall or hosting the Westwood-Warrenmac ore zones (Fig. 7) is characterized by a very distinctive chemical signature compared to that of the other units of the Bousquet Formation upper member, with a high TiO_2 content and low Zr content and Zr/TiO_2 ratio (Table 1). The signature of this unit is very similar to that of unit 5.4 at LaRonde Penna (LaRonde basaltic andesite) as shown on a chondrite-normalized multi-element plot (Fig. 12e). The basaltic andesite at Westwood is also characterized by Zr/TiO_2, Zr/Y, Ti/Zr, Nb/Th, Hf/Sm, Th/Ta, and rare-earth element ratios very similar to those of unit 5.4 at LaRonde Penna (Table 1). This suggests that the Westwood basaltic andesite is part of unit 5.4, another key stratigraphic unit and marker at LaRonde Penna (Dubé et al., 2007, Mercier-Langevin et al., 2007a, b).

At LaRonde Penna, units 5.3 (Fp-and Qz-phyric rhyolite) and 5.4 (LaRonde basaltic andesite) were emplaced within felsic flow-breccia deposits (unit 5.5, Upper felsic unit; Mercier-Langevin et al., 2007a). A texturally and compositionally similar felsic breccia is present in the hanging wall of the Westwood-Warrenmac ore zones. The felsic breccia at Westwood is a transitional to calc-alkaline rhyodacite-rhyolite characterized by trace and rare-earth element patterns similar to those of unit 5.5 and the other felsic rocks of the Bousquet Formation upper member at LaRonde Penna (Fig. 12f), with highly similar Zr/TiO_2, Zr/Y, Ti/Zr, Nb/Th, Hf/Sm, Th/Ta, and rare-earth element ratios as well (Table 1).

The stratigraphic position of the Westwood-Warrenmac ore zones appears to be at the contact between the felsic rocks of unit 5.1a, which constitutes the lower part of the upper member of the Bousquet Formation, and units 5.3, 5.4 and 5.5, which form the upper part of the upper member of the Bousquet Formation (Fig. 13). Units 5.3 and 5.4, which are key stratigraphic markers, had not been mapped west of Bousquet 1 before the discovery of the Westwood-

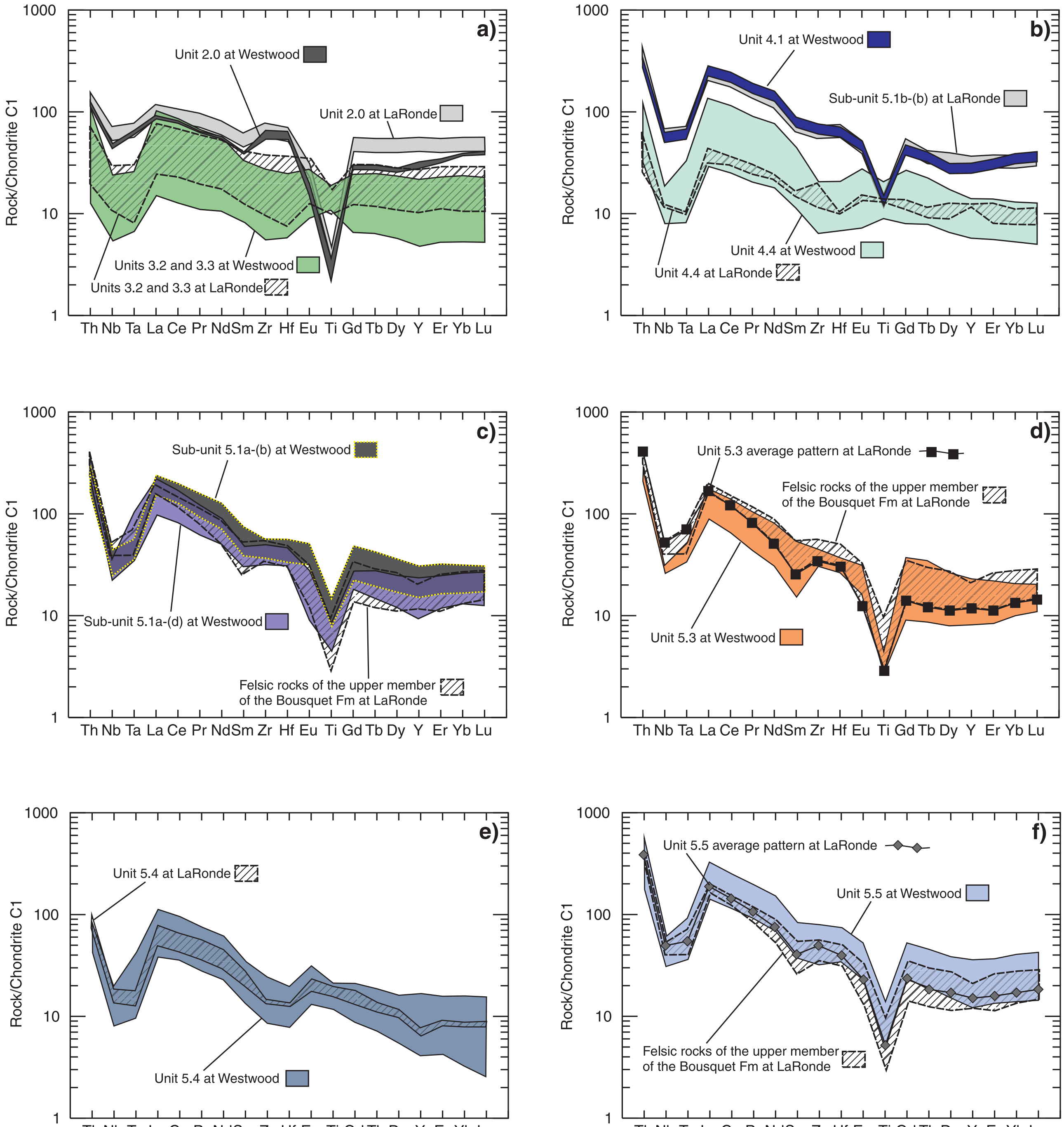

Figure 12. Geochemical comparison of the main units of the Bousquet Formation upper member sampled in drillhole 1158-02 at Westwood, which hosts the Westwood-Warrenmac ore zones, with those hosting the LaRonde Penna world-class deposit (~63 million tons) situated east of Westwood (C1 chondrite normalization values from McDonough and Sun, 1995). The data for the LaRonde Penna host rocks are from Mercier-Langevin et al. (2007b) and Mercier-Langevin et al. (2008b). **a)** Comparative profiles for units 2.0, 3.2, and 3.3. **b)** Comparative profiles for units 4.1 and 4.4, and subunit 5.1b-(b). **c)** Profile of subunits 5.1a-(b) and 5.1a-(d) at Westwood plotted against that of the felsic volcanic rocks of the upper member of the Bousquet Formation at LaRonde Penna. **d)** Profile of unit 5.3 at Westwood plotted against that of unit 5.3 at LaRonde and that of the felsic volcanic rocks of the upper member of the Bousquet Formation at LaRonde Penna. **e)** Comparative profiles for unit 5.4. **f)** Profile of unit 5.5 at Westwood plotted against that of the felsic volcanic rocks of the upper member of the Bousquet Formation at LaRonde Penna.

Table 1. Main units of the upper member of the Bousquet Formation.

	Subunit 5.1b-(d)		Subunit 5.1b-(b)		Unit 5.2b		Unit 5.3		Unit 5.4		Unit 5.5	
	Dacite-rhyodacite sub-unit		Andesite-dacite sub-unit		Rhyodacite-rhyolite		Feldspar- and quartz-phyrîc rhyolite		Basaltic andesite		Upper felsic unit	
	Westwood	LaRonde[3]	Westwood	LaRonde[3]	Westwood	LaRonde[3]	Westwood	LaRonde[3]	Westwood	LaRonde[3]	Westwood	LaRonde[3]
	n = 8	*n = 14*	*n = 8*	*n = 5*		*n = 10*	*n = 2*	*n = 5*	*n = 16*	*n = 8*	*n = 9*	*n = 5*
Zr/TiO_2	358	284	209	248	No equivalent at Westwood	393	565	615	48	46	427	488
Zr/Y	6.28	6.68	4.58	4.93		6.84	7.11	7.05	4.25	4.35	6.56	7.86
Ti/Zr	17	21	30	24		15	11	10	132	131	16	12
Nb/Th	0.9	0.9	1.3	1.3		1.0	1.0	1.1	2.2	2.0	1.1	1.1
Hf/Sm	0.74	0.61	0.51	0.61		0.66	0.85	0.82	0.48	0.48	0.72	0.69
Th/Ta	12.6	18.8	11.7	13.0		15.4	12.9	12.4	6.2	8.9	13.4	15.1
$[La/Lu]_N$[1]	7.99	9.91	7.74	6.87		11.07	8.63	11.55	8.50	6.22	9.49	10.26
$[La/Sm]_N$[1]	3.90	3.86	3.31	3.18		4.45	4.71	6.63	2.76	2.55	4.32	4.61
$[La/Yb]_N$[1]	8.16	10.22	7.83	7.14		11.66	8.95	12.49	7.87	6.28	9.64	10.96
$[Gd/Lu]_N$[1]	1.20	1.43	1.43	1.40		1.31	1.34	0.96	1.91	1.62	1.33	1.29
Eu/Eu*[2]	0.66	0.78	0.87	0.73		0.76	1.02	0.63	1.10	1.09	0.76	0.73

[1] Normalized to C1 chondrite value (McDonough and Sun, 1995)
[2] $Eu/Eu^* = [Eu]_N/([Gd]_N + [Sm]_N)^{0.5}$
[3] Data from Mercier-Langevin et al. (2007b)

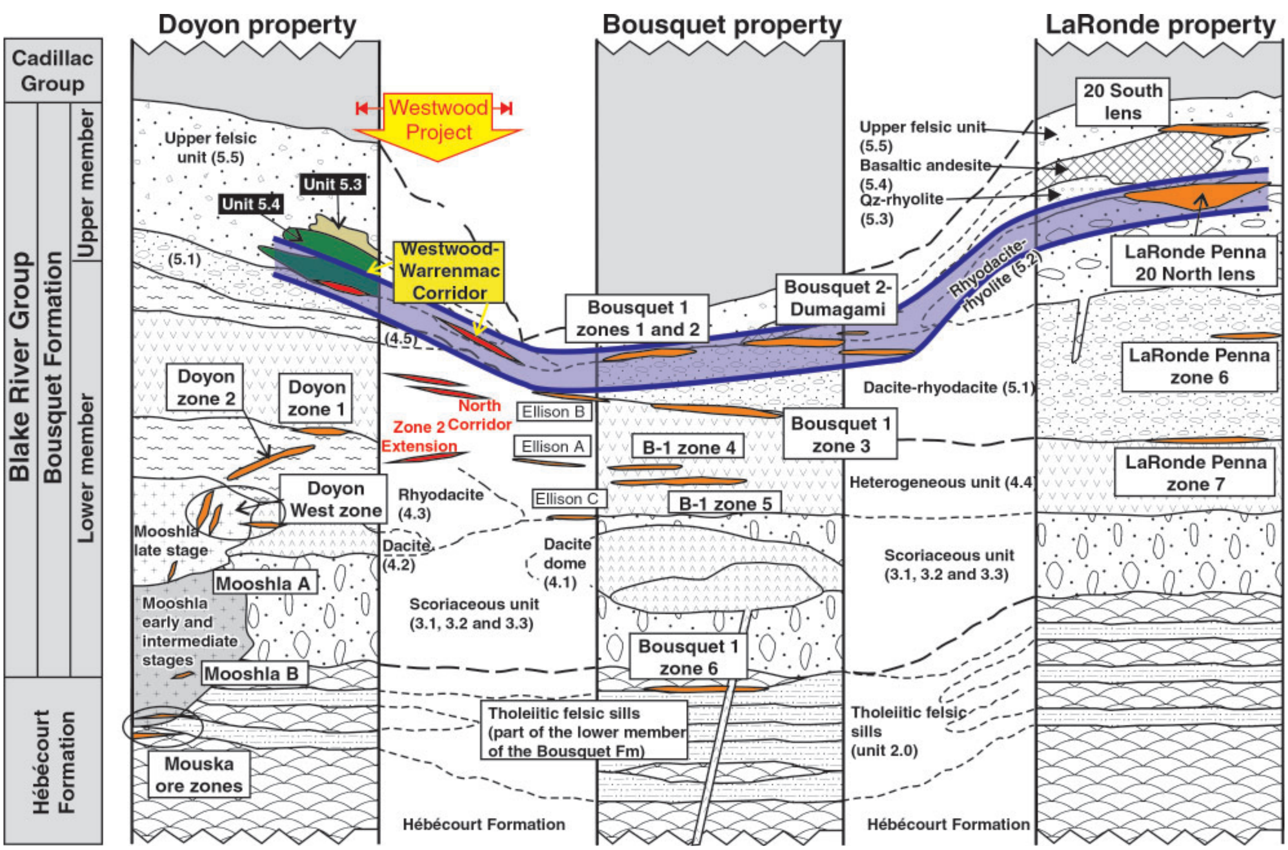

Figure 13. Simplified stratigraphic setting of the Au-rich volcanogenic massive sulphide lenses and intrusion-hosted Au-quartz veins of the Doyon-Bousquet-LaRonde mining camp, highlighting the stratigraphic location of the Westwood Project mineralizations, and especially the location of the Westwood-Warrenmac ore zones (comprising the Warrenmac lens), which were emplaced at the same stratigraphic level as were the Bousquet 1 zones 1 and 2, the Bousquet 2-Dumagami main lens, and the LaRonde Penna 20 North lens. This key stratigraphic horizon is the most prospective in the camp, with about 75 Mt of Au-rich polymetallic ore (reserves, resources, and geological mineral inventory). The ore lenses are not to scale. B-1 = Bousquet 1. (*Modified from* Lafrance et al. (2003) and Mercier-Langevin et al. (2007c).)

Warrenmac ore zones, and this contribution represents the first reported occurrence of these two units in this part of the DBL camp. The stratigraphic setting of the Westwood-Warrenmac ore zones can be compared to that of the LaRonde Penna 20 North lens and to that of the Bousquet 2-Dumagami deposit (Fig. 13), with the hanging-wall sequence composed of a calc-alkaline Fp- and Qz-phyric rhyolite, a tholeiitic to transitional basaltic andesite, and a transitional to calc-alkaline felsic breccia for each of these major ore zones (Fig. 13). The Westwood-Warrenmac ore zones are thus located stratigraphically higher than previously thought (*see* Lafrance et al., 2003; Mercier-Langevin et al., 2007c, d). The zones also demonstrate that the upper half (and perhaps most fertile part, at least in terms of Au-rich VMS lenses) of the Bousquet Formation upper member continues westward, contrary to what was previously thought. This has implications for exploration, as discussed below.

Although the hanging-wall stratigraphy is clearly the same at Westwood as at Bousquet 2-Dumagami and LaRonde Penna, there are some differences in the footwall stratigraphy. The LaRonde Penna 20 North lens is underlain by a rhyodacitic to rhyolitic dome-and-flow breccia complex (unit 5.2b, Fig. 13; Mercier-Langevin et al., 2007a). Unit 5.2b is centred at LaRonde Penna and does not extend westward; it is not present at Bousquet 2-Dumagami. The dome-and-flow breccia complex of unit 5.2b played a key role in the genesis and location of the 20 North lens at LaRonde Penna (*see* discussions by Dubé et al., 2007 and Mercier-Langevin et al., 2007a), but it does not seem to have been a key element in the genesis of the Bousquet 2-Dumagami deposit (15.5 Mt at 7.3 g/t Au; Mercier-Langevin et al., 2007a), at least not directly. To date, this unit has not been mapped at Westwood.

ECONOMIC IMPLICATIONS

The Westwood-Warrenmac ore zones of the Westwood Project were thought to be found in the lower member of the Bousquet Formation, but this study demonstrates that they are actually situated in the upper member, and that the uppermost part of the Bousquet Formation stratigraphy is present in the western part of the DBL camp. There are major potential economic implications to this, as summarized here:

1. The Westwood-Warrenmac ore zones (auriferous semi-massive and massive sulphides) are found in the same stratigraphic position as the Bousquet 2-Dumagami and LaRonde 20 North lenses, in a similar stratigraphic context, which suggests that there is a significant potential for Au-rich VMS lenses at Westwood, as well as in the western part of the DBL camp. This specific stratigraphic horizon already contains more than 75 Mt of ore (production, reserves, and resources), being the most fertile (and prospective) horizon in the camp, especially for Au-rich VMS lenses.
2. Contrary to what was previously thought, the upper half of the Bousquet Formation upper member is present west of the Bousquet 1 mine, opening the western part of the DBL camp to exploration for LaRonde Penna and Bousquet 2-Dumagami-style mineralization situated in the upper half of the Bousquet Formation upper member, in the eastern part of the DBL camp.
3. The presence of units 5.3 (LaRonde Fp- and Qz-phyric rhyolite), 5.4 (LaRonde basaltic andesite) and 5.5 (Upper felsic unit) in the hanging wall of the Westwood-Warrenmac ore zones suggests that these mineralizations are coeval with the LaRonde Penna 20 North lens at about 2698–2697 Ma. It also suggests a potential for ore lenses higher in the stratigraphy as is the case at LaRonde Penna, where the 20 South lens is found in the upper parts of units 5.3 and 5.4, near the top of the Bousquet Formation (Dubé et al., 2007; Mercier-Langevin et al., 2007a);
4. The formation of the Westwood-Warrenmac auriferous semimassive to massive ore zones adds to the already very large amounts of auriferous VMS ore associated, and coeval with, transitional to calc-alkaline magmatism and volcanism, further strengthening the fact that transitional to calc-alkaline volcanic sequences or centres can be very prospective and should definitely not be overlooked. The transitional to calc-alkaline sequences might even be associated with precious-metal-enriched VMS-forming systems (*see* Dubé et al., 2007; Galley and Lafrance, 2007; Mercier-Langevin et al., 2007a, b, c);
5. Finally, the Westwood Project recent discovery demonstrates that there is still great potential for exploration in mature mining camps, and that the use of accumulated geological knowledge is a key tool in developing successful exploration programs.

CONCLUSIONS

The Westwood Project area mineralizations consist of numerous ore lenses stacked from north to south in the Bousquet Formation, and each of these lenses are characterized by different attributes, some sharing similarities with the Doyon mine intrusion-related vein systems, some sharing analogies with the volcanogenic massive sulphides of the LaRonde Penna mine, and some showing hybrid characteristics. Preliminary results from the Westwood Project study presented here help locate the newly discovered ore zones of the Westwood-Warrenmac Corridor in the Doyon-Bousquet-LaRonde mining camp stratigraphy and suggest possible implications for exploration. However, many questions remain and more work is currently being done on the Westwood Project to better define the geological and hydrothermal context of the mineralizations of this area. Moreover, this is a key area to test the hypothesis of a genetic link between the Mooshla intrusion-hosted mineralizations and the Au-rich VMS deposits of the Doyon-Bousquet-LaRonde camp.

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