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ASSESSMENT REPORT

Ground Magnetic Survey (2012) and Structural Study (2013)

Tempest Property, Northern Ontario

Prepared By: Christine Vaillancourt, P.Geo. and Gabriela Budulan

April 25, 2014

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INTRODUCTION

This assessment report includes a ground magnetic survey carried-out in July 2012 and a structural geology study carried out in July 2013 on Northern Shield's Tempest Property (Figure 1 and Figure 2) between July 2012 and July 2013. A list of the mining claims with details for the property is presented in Appendix I.



Figure 1 - Location of the Tempest Property in Northern Ontario including access routes.

PROPERTY DESCRIPTION AND LOCATION

The Tempest Property is located in the Porcupine Mining Division of Ontario. The property includes claims in Gittins Lake Area, Dainty Lake Area and BMA 517 861 (Figure 2 and Figure 3). The first claims were staked in April 2011, with several more added in August and September 2011 and November 2012. The Tempest Property consists of 34 unpatented mining claims totaling 524 units (16 hectares per unit) covering 8,384 hectares (Figure 3).





The Tempest Property is part of Northern Shield's Storm Group of Properties. The claims for Tempest with their work requirements and expiry dates are listed in Appendix I. The claims have not been legally surveyed. All claims are currently in good standing. The Tempest Property is owned 100% by Northern Shield.

The Tempest Property is accessible by floatplane and helicopter in the summer and by plane on skies and snowmobile in the winter.





Figure 3 – Map of the Tempest Property with the location of grids and collars of all holes (black circle with red diamond center) drilled by Northern Shield on the property.

GEOLOGICAL SETTING AND MINERALIZATION

Regional Geology

The Tempest and Typhoon properties are located within the Archean Sachigo Superterrane of the Superior Structural Province of the Canadian Shield. According to recent subdivisions of the Sachigo Superterrane (Figure 4 and Figure 5, these properties are located in the Uchi domain (2.8-2.9 Ga) of the North Caribou Terrane (Stott and Rayner, 2004, Stott et al., 2007 and Stott, 2007a-b). However, the subdivisions of the North Caribou Terrane are based mostly on work carried out on the western portion of the Sachigo Superterrane and since there is very little data available in the area of the Tempest and Typhoon properties, these boundaries remain highly speculative.





Figure 4 - Terrane map of the Archean Superior Province. From Stott et al. 2010.

Property Geology

Tempest Property

No outcrops were seen on the Tempest Property or in close proximity. To date, 12 drill-holes have been completed on the Tempest Property over the course of three drill programs for an aggregate of 4,791 metres (Figure 3). The area is covered by a 10-40 m thick blanket of glacial till. Locally, a well-preserved 50 m thick, possibly Paleozoic, regolith is present directly below the overburden where the underlying bedrock was turned into red clays.



Ten holes were drilled in the Tempest 1 grid area (Figure 6). The overall geology consists of a succession of deformed, greenschist facies metavolcanic rocks. The succession is E-W trending with a well-defined S1 foliation oriented approximately E-W and dipping steeply to the south, a less well-defined S2 axial planar foliation dipping to the SW and a locally strong lineation possibly plunging steeply to the WSW. The overall stratigraphy from south to north consists of mixed mafic and felsic volcanic flows including some breccia, mafic tuff and argillaceous tuff. Silver-rich mineralization was intersected in association with stringer, semi-massive and massive sulphides dominated by pyrite and pyrrhotite, and is hosted in intensely altered felsic volcanic rocks.



Figure 5 - Terranes and domains of the Superior Province in the northern part of northwestern Ontario. From Stott et al. 2010.

EXPLORATION WORK

High Resolution Ground Magnetic Survey

The high-resolution ground magnetic geophysical survey was completed on the Tempest Property by consultants Gary Smith and Glenn O'Keefe from July 7 to July 10, 2012. The survey was conducted with a GSM-19W v7.0 Overhauser magnetometer system. Two units were used, one as a base



station and one as the survey unit, to correct for diurnal variation. Surveying was completed over the Tempest 1 grid (Figure 3 and Figure 6). A total of 11 grid lines with a spacing of 100 m were read. The resulting contoured geophysical map is presented in Figure 7.

The goal of the survey was to enhance the understanding of the geometry and location of the magnetic response from the massive sulphide body to assist in the positioning of future drilling.



Figure 6 – Tempest 1 grid covered by the ground magnetic survey and collar location and information for drill holes on that grid.





Structural Geology Study

A structural geology study was conducted on several drill holes from the Tempest 1 grid. From June 18 to June 27, 2013, ten drill holes were pulled out for observation at the Hearst Air sea base where all core from the property is stored. All holes drilled to date are located on Figure 3 and the details for the holes in the area of the Tempest 1 grid are presented on Figure 6. The structural study included additional logging, sampling and structural interpretation of holes 11TP-01, 02, 03 and 12TP-04, 07, 08, 09, 10, 11 and 12. The full description of the study and results as presented by Michael Tucker are reported in Appendix II.



DISCUSSION AND CONCLUSIONS

The ground magnetic survey completed on the Tempest 1 grid, which aimed at enhancing the precision of the magnetic anomaly underlying the Tempest 1 grid, was not particularly useful. The new data did not show much more or different information than what was already known from the airborne magnetic map produced with the VTEM survey flown in 2011. The data was used to plan follow-up drilling but provided limited additional information.

The structural study however provided a lot of important information in regards to deformation affecting the rocks at the Tempest 1 grid area of the property, which can be extended to the rest of the property and beyond. The structural study was carried-out independently of any geophysical analysis and interpretations for the region and it confirms large-scale structural features based on the magnetic patterns that were previously only speculative. The structural implications of the study will be used for the continued exploration for VMS-type mineralization and is of particular interest for gold exploration along regional structures at Tempest but also at the Wabassi Property and surrounding areas.



REFERENCES

- Ontario Geological Survey, 2003. Ontario airborne geophysical surveys, magnetic data, Attawapiskat area. Ontario Geological Survey, Geophysical Data Set 1211.
- Ontario Geological Survey 2011.1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1. ISBN 978-1-4435-5705-4
- Stott, G.M., 2007a. Precambrian geology of the Hudson Bay and James Bay lowlands region interpreted from aeromagnetic data west sheet; Ontario Geological Survey, Preliminary Map P.3597, scale 1:500 000.
- Stott, G.M., 2007b. Precambrian geology of the Hudson Bay and James Bay lowlands region interpreted from aeromagnetic data east sheet; Ontario Geological Survey, Preliminary Map P.3598, scale 1:500 000.
- Stott, G.M. and Rayner, N., 2004. Discrimination of Archean domains in the Sachigo Subprovince. *In* Summary of Field Work and Other Activities 2004, Ontario Geological Survey, Open File Report 6145, p. 10-1 to 10-8.
- Stott, G.M., Corkery, T., Leclair, A., Boily, M. and Percival, J. 2007. A revised terrane map for the Superior Province as interpreted from aeromagnetic data. *In* Woodruff, L. (ed.), Institute on Lake Superior Geology Proceedings, 53rd Annual Meeting, Lutsen, Minnesota, v.53, part 1, p.74-75.
- Stott, G.M., Corkery, M.T., Percival, J.A., Simard, M. and Goutier, J., 2010. A revised Terrane subdivision of the Superior Province. *In* Summary of Field Work and Other Activities 2010, Ontario Geological Survey, Open File Report 6260, p. 20-1 to 20-10.



APPENDIX I

Listing of Mining Claims with Expiry Dates and Work Commitment Requirements



Claim Number	Township/Area	Recording Date	Claim Due Date	Status	% Option	Work Required
4263050	GITTINS LAKE AREA	2011-Sep-07	2014-Sep-07	Active	100%	\$4,800
4264251	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264252	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264253	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264254	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264255	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264256	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264257	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264259	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4264260	GITTINS LAKE AREA	2011-Apr-11	2014-Apr-11	Active	100%	\$6,400
4267351	BMA 517 861	2011-Sep-07	2014-Sep-07	Active	100%	\$4,800
4267352	BMA 517 861	2011-Sep-07	2014-Sep-07	Active	100%	\$6,400
4267638	GITTINS LAKE AREA	2011-Sep-07	2014-Sep-07	Active	100%	\$4,000
4267639	GITTINS LAKE AREA	2011-Sep-07	2014-Sep-07	Active	100%	\$6,000
4267640	GITTINS LAKE AREA	2011-Sep-07	2014-Sep-07	Active	100%	\$6,000
4267641	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267642	DAINTY LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267643	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267644	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267645	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267646	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267647	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267648	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4267649	GITTINS LAKE AREA	2011-Aug-05	2014-Aug-05	Active	100%	\$6,400
4272172	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272173	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272174	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272175	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272176	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272177	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272178	GITTINS LAKE AREA	2012-Nov-13	2014-Nov-13	Active	100%	\$6,400
4272179	DAINTY LAKE AREA	2012-Nov-15	2014-Nov-15	Active	100%	\$4,800
4272180	DAINTY LAKE AREA	2012-Nov-15	2014-Nov-15	Active	100%	\$6,400
4272181	DAINTY LAKE AREA	2012-Nov-15	2014-Nov-15	Active	100%	\$6,400

APPENDIX II

Tempest Project, North-Central Ontario, Canada - Structural Report for Northern Shield Resources Inc. by Michael Tucker



Tempest Project

North-Central Ontario, Canada

Structural Report

Prepared for:

Northern Shield Resources Ltd.

440 - 55 Metcalfe Street Ottawa, Ontario K1P 6L5

> Tel.: 613.232.0459 Fax: 613.232.0760

> > Prepared by:

Michael J. Tucker - B.Sc. (Hons), M.Sc. Candidate

536 E 11th Ave Vancouver B.C., Canada V5T 2C9 Tel: 1-778-834-3528 E-mail: mike.tucker.geo@gmail.com

Introduction

The Tempest property is located in an unmapped greenstone belt in north-central Ontario. It is located within the James Bay drainage basin, an area of Ontario which has very limited outcrop exposure. This poses a unique challenge when exploring in this region as surficial controls on lithology and structure are not available. Geophysics is a useful tool in helping to interpret the area, though without any known surficial geology for context, its usefulness is limited. Diamond drilling in these areas is the most effective means of determining geological information in the area. Through 2011 and 2012, Northern Shield Resources Ltd. conducted diamond drilling, logging and sampling in the Tempest area to go along with geophysical surveys. A variety of lithologies were identified as well as areas of VMS style mineralization consistent with deposition in a volcano-sedimentary sequence of rocks. Further drilling led to the intersections of anomalous gold zones located within an area of intense silicification and a significant sized quartz-tourmaline vein with visible gold. Due to the structural controls on the area is crucial to better understand and target gold bearing zones. Structural information is also key in determining the orientation VMS style mineralization within deformed greenstone belts.

Structural analysis of the tempest core has revealed certain trends about the structure in the Tempest area. There are two fabrics present in the Tempest area denoted S1 and S2. These fabrics are penetrative and reasonably consistent throughout the area. The two fabrics were produced by north and northeast compression, respectively. A quartz vein set is oriented perpendicular to the S2 fabric, indicating potential synchronous development. Some evidence of shearing is present locally as evidenced by the development of crenulation fabrics. It is probable that fabrics S1 and S2 are associated with large scale folding of the stratigraphy. This adds significant complexity to the orientations of the VMS horizons discovered in the Tempest area. Understanding the overarching structure is important in determining the overall architecture of the VMS system present.

Methodology

Tempest drill holes were re-logged with emphasis on structural trends in the Tempest area. Holes 11TP-01, 02, 03 and 12TP-04, 07, 08, 09, 10, 11 and 12 were all re-logged on this basis. Due to the lack of structural data constrained on surface, all measurements recorded and interpolated were from un-oriented drill core. While it not possible to directly obtain true orientations of parallel planar structures (Foliation, cleavage, veins) from un-oriented core, it is still possible to determine orientations if the features are cored by a minimum of three non-parallel drill holes (Mead, 1921; Bucher, 1943). This technique can also be applied to a singular drill hole if there is sufficient deviation along its length and different sections along the hole can be treated as separate drill holes (Laing, 1977).

For the Tempest drill holes, planar measurements were taken at block intervals down all drill holes observed. If no planar features were observed at 3 m block intervals, a measurement was not taken. Planar features such as veins, axial planes and secondary foliation planes were measured at the depths they were observed. All measurements taken from the core were in the form on α angle, which is the acute angle the planar feature makes with the core axis. In order to obtain individual measurements for the deviation of the drill hole, linear regressions were used to estimate the drill hole orientation at every depth point down hole. All subsequent data was plotted on stereonets for analysis. A key assumption for this type of analysis to be accurate is that the planar features intersected by the various drill holes are common in orientation throughout the Tempest area, this assumption was made for the Tempest analysis.

Sources for Error

There are several sources for error involved with the measurement of planar features from drill core. The largest source of error is from the measurement of the planar feature from the core itself. Due to the curved surface of the core and the primary instrument of measurement being a protractor, there is a small error in the estimation of the linear surface of the plane in question in the protractor. The regression used to calculate the change in azimuth and dip based on the down hole reflex surveys which can vary significantly due to local magnetism. The regression does not always perfectly approximate the drift of the azimuth and dip of the hole, thus there is a small amount of error associated with the azimuth and dip drift corrections. Overall, each individual measurement error is about $\pm -2-3^{\circ}$ and the cumulative error of the method lies somewhere around $\pm -5^{\circ}$. Given that the core being analyzed is un-oriented and the measurement tools utilized for this study, this error is deemed acceptable.

Results

Feature	Azimuth	Dip
S1 Foliation	081	82
S2 Foliation Possibility #1	111	62
S2 Foliation Possibility #2	124	48
Quartz-Carbonate Veins	022	12



Figure 1: Stereonet of the Tempest planar features.

S1 Foliation

There is one pervasive fabric that is common throughout all rock types present. The minerals defining the foliation vary depending on rock type. Clastic rocks generally have foliation defined by clasts and fragments stretched along foliation. Massive rocks such as rhyolite and basaltic flows typically have foliation defined by weakly aligned biotite. Argillite and tuffaceous units often have a very well developed cleavage present. This foliation is generally consistent throughout all rock types as well as all of the holes logged. It is interpreted to be the S1 foliation.

S2 Foliation

Locally, there is a weakly developed foliation that is present at a low angle to the local S2 foliation. It is the most well developed within the argillite units and appears to be axial planar to folds that are observed throughout the argillite unit. This foliation/cleavage is often defined by

re-alignment of micaceous minerals within the argillite unit, though sometimes small fractures parallel to fold hinges help to define this fabric. This fabric is not well developed throughout all drill holes and is only observed locally.



Figure 2: Tempest hole 11TP-02, fold in VMS horizon showing fold defined by folded S1 foliation. S2 fabric is at a high angle to S1 foliation.



Figure 3: Tempest hole 12TP-11, possible S2 fabric near perpendicular to S1 foliation.



Figure 4: S1 foliation with perpendicular S2 fabric developing through alignment of micaceous minerals. Iridescent reflection of micas produces a unique color and texture.

Folds

Folds were not readily observed through the Tempest drill holes, though in a few locations some folding was visible. Folds were most often located within the argillite and sulphide beds along with other S2 fabrics. The majority of observed folds within the core were isoclinal in nature, though it should be noted that open folds would not be easily visible in core. In general, where a series of folds were intersected, the axial planes were parallel to sub-parallel indicating that they formed synchronously. Folds were also defined by a folded S1 foliation indicating that the S1 foliation predated the F2 folding. Fold axes could not be determined, however if folding is associated with the S1 and S2 foliation development, F1 and F2 fold axes would lie in some orientation along their foliation plane.



Figure 5: Tempest hole 11TP-02; open parasitic? fold indicating variation of the S1 foliation.



Figure 6: Tempest hole 11TP-02; F2 fold axis within VMS horizon, defined by folded S1 foliation.



Figure 7: Tempest hole 12TP-12; F2 fold axis within VMS horizon.



Figure 8: Tempest hole 11TP-01; F1 fold with axial planar S1 foliation.



Figure 9: Tempest hole 12TP-07; Gabbroic dyke margin folded with volcanoclastic sediments.

Crenulation cleavage

Crenulation cleavage of S1 foliation was observed in two locations in separate drill holes on the Tempest property. In both cases the crenulations had developed at \sim 30° to the existing S1 fabric. Given the angle, the crenulation could have resulted from progressive deformation and shearing/mylonite formation associated with the S1 fabric or subsequent overprinting by the S2 fabric development. Given the angle with the foliation, it is probable that this is the formation of a proto-mylonite.



Figure 10: Tempest hole 11TP-02; mylonitic zone with C and S fabric development.



Figure 11: Tempest hole 11TP-01; mylonitic zone with C and S fabric development.

Veins

There are a number of veins throughout the Tempest drill holes. For the purposes of this study, only veins that cut the pervasive S1 foliation were measured and veins that intruded along foliation were ignored. Only veins with sharp, parallel selvedges were measured. Many veins have a slight deflection in foliation near to vein selvedges, indicating extension taking place along a pre-existing kink band (Figure 13). Vein mineralogy is dominantly massive quartz and iron carbonate with variable tourmaline, actinolite, chlorite, pyrrhotite, chalcopyrite and magnetite. Iron carbonate contents increased drastically in host rocks with abundant iron carbonate. Quartz magnetite veins were found exclusively within mafic volcanic rocks. The indication is that vein mineralogy is a direct reflection of the host rock composition and much of the vein material is locally sourced. There is at least one consistent orientation to the vein sets, which is at a high angle to the local S1 foliation. Other vein orientations clearly exist, but only one consistent orientation was found.



Figure 12: Tempest hole 11TP-02; kink band in S1 foliation.



Figure 13: Tempest hole 11TP-01; Quartz-Carbonate-Chalcopyrite vein in the center of a kink band. Kink weakness was exploited to form vein in center.



Figure 14: Tempest hole 12TP-12; Quartz-Fe-Carbonate vein with trace chalcopyrite cutting near perpendicular to foliation.



Figure 15: Tempest hole 12TP-11; Quartz-Magnetite vein in mafic volcanic rock.



Figure 16: Tempest hole 12TP-10; Quartz vein saw tooth edges, vein formed from extension in a sedimentary rock with preferential slip along bedding planes.

Shear zones and faults

Shear zones and faults were not readily observed through the Tempest core, though there are a few small occurrences. A significant shear zone with silicification, sericitization and abundant arsenopyrite was encountered in 12TP-10, though it was not auriferous. An auriferous shear zone with silicification, sericitization and minor arsenopyrite was encountered in 12TP-07. It was accompanied by silica flooding and abundant quartz veining. The only faults observed were brittle in nature and late in the paragenetic sequence of the rocks. A Small fault was

observed in 11TP-01 and a much larger zone of rubble, indicative of a brittle fault zone was observed in hole 12TP-04. Ductile and older faults are not easily observed in core, further definition of the rock units and stratigraphy would be required to identify older, ductile faults and shear zones.



Figure 17: Tempest hole 12TP-08; brittle fault within sericitized rhyolite unit.

Mineralization

Gold Endowment

Significant gold values are found in 12TP-12 and 12TP-07 however, these two intersections are very different in nature. The gold intersection from 12TP-12 appears to be entirely associated with a very large, coarse grained quartz-Fe-carb-tourmaline vein with visible gold being directly associated with tourmaline bands. The intersection in 12TP-07 appears to be that of a silicified shear/vein zone with abundant small quartz veins as well as silica flooding and sericite alteration in between abundant veins and veinlets. There is also a small abundance of arsenopyrite, pyrite and pyrrhotite present within this intersection, none of which are found in the quartz-tourmaline vein from hole 12TP-12. This mineralized zone has significantly greater continuity than the aforementioned vein zone.



Figure 18: Tempest hole 12TP-07; silicified and sericitized shear zone with gold mineralization.



Figure 19: Tempest hole 12TP-02; Quartz-Fe-Carbonate-Tourmaline vein with sericite alteration halo permeating along foliation.

VMS mineralization

VMS style mineralization is observed throughout the Tempest area. Zones consist of banded and brecciated sulphide, often inter-bedded with argillite and volcano-sedimentary sequences. The most important rock type related to VMS mineralization appears to be the argillite unit, which, where found is always associated with some abundance of sulphide mineralization. Mineralogically, these zones are dominated by pyrite/pyrrhotite with lesser sphalerite and chalcopyrite. Alteration within these areas is largely silicification with some sericitization and chloritization, though it is noted that some of the abundant quartz flooding present may be from depositional chert horizons associated with the VMS system. These VMS horizons appear to have absorbed a significant amount deformation. Banding observed within these zones appears to be tectonic in origin and not primary sedimentary banding/bedding. This banding also defines F2 folds locally, indicating that these zones have experienced at least two significant episodes of deformation. While the argillite horizons appear to be traceable, it is probable that they are folded/stretched on a larger scale.



Figure 20: Cross section illustrating a potential fold in the Tempest area. Axial Plane is parallel to the S1 foliation.

Discussion

Structural History

The Tempest property has undergone a minimum of two generations of deformation. One or both of these deformation events may be associated with both large and small scale folding. It is quite evident in the argillite horizons that the units are strongly deformed and show abundant small scale folding. This is likely to be reflected on the large scale, though it manifests much easier in the non-competent argillite layers. In terms of fabrics present in the Tempest area, the dominant penetrative fabric is the S1 fabric. No primary bedding was observed in any of the units as it has been overprinted by the S1 and S2 fabrics. In clastic volcano-sedimentary rocks, clast stretching can be greater than 10:1 indicating a significant degree of flattening/stretching for the S1 event. This is also reflected in the fold architecture as all observed folds were isoclinal in nature (both limbs are parallel). A few instances of F1 folding with axial planar S1 fabric were observed locally, though the dominant fold generation observed is the F2 generation with the S2 fabric being rarely visible.

In the rocks current position and orientation, the S1 foliation development was related to a primary north directed compression, this would also relate to east/west extension of the rock packages. The S2 fabric would have been formed through a NE directed compression and resulted in extension in the WNW direction. In both of these compressional regimes, there is significant shortening to the N/S and extension is to the E/W. Any large scale folding within the Tempest area will be constrained in the plane of both the S1 and S2 foliations. The plunge of fold hinges will lie somewhere within to planes of foliation however, plunges of potential fold axes could not be determined. The vein set that was identified through the Tempest area is approximately perpendicular to the compressional stresses, specifically the S2 orientations. Given the orientations of these vein sets and their frequent occurrence cutting foliation and forming the centerline to kink bands, it is possible that these veins formed in response to the same compressional regime as the S2 foliation.

Structure and Gold mineralization

The overarching structure of the Tempest area cannot currently be linked to gold deposition. The structures which contained the anomalous gold were unable to be reconciled with identifiable structural elements. While these two occurrences are definitely related to structure, the vein controlled gold could not be linked to other veins identified. Other veins sampled, despite mineralogical similarities, do not contain anomalous gold. More vein hosted gold would need to be intercepted in order to better constrain the structural elements of vein formation. Of greater interest is the lower grade, larger intersection of gold within 12TP-07. There is greater continuity of grade through the zone with silicification and intense sericitization as indicators of increased fluid flow. There is also a greater abundance of veins throughout the zone as well as erratic foliation patterns which may be a result of shearing or a large scale fold apex. This intersection is of more economic interest than the large quartz vein with visible gold in terms of continuity and predictability however, more interceptions of this nature are required in order to understand the architecture of this gold bearing structure.

Structure and VMS mineralization

Post-depositional structure plays an important role on the architecture of the VMS horizons. While the VMS mineralization is still hosted within its depositional rock units, they have been subsequently deformed over time. It is probable that the VMS horizons have been stretched along the east/west direction. There also appears to be two stacked horizons of VMS mineralization separated by a large package of volcano-sedimentary breccia. This architecture suggests that the horizon may be the same, thus the horizon may be folded on a large scale, though there is insufficient data to support this conclusion. Of note is that all of the VMS mineralization appeared to be contained along sedimentary horizons and stratiform. It does not appear as though any feeder systems typical of VMS style mineralization were intersected and potential for greater amounts of mineralization remain the Tempest area.

Conclusions

The Tempest area has undergone at least two generations of roughly north directed compression and subsequent east-west extension. The predominant fabric in the Tempest area is steeply dipping, east-west trending S1 foliation. Stratigraphy roughly conforms to this trend, though not perfectly. A secondary fabric (S2) is present at a low angle to the S1 foliation. Small scale F2 folding is present throughout the area, but the architecture of large scale folding could not be determined. There is an abundance of veins through the Tempest area, but only one consistent shallowly dipping, north-south set could be confidently identified. VMS style mineralization is located within argillite horizons of an apparent volcano-sedimentary sequence of rocks. Two types of gold mineralization are found in the Tempest area, a quartz-tourmaline vein with visible gold and a shear zone style of gold mineralization associated with silicification and sericitization. Of these two types of gold mineralization, the shear zone hosted style is more prospective and economically significant. The Tempest area certainly has potential for greater VMS and gold mineralization to be identified however; more drilling is required in order to better locate additional areas of mineralization.

References

Bucher W.H. 1943: Dip and strike for three not parallel drill holes lacking key beds. *Economic geology*, vol 38, pp 648-657.

Laing, W.P. 1977: Structural Interpretation of drill core from folded and cleaved rocks. *Economic Geology*, vol 72, pp 671-685

Mead, W.J. 1921: Determination of the attitude of concealed bedded formations by diamond drilling. *Economic Geology*, vol 21, pp 17-47