BC Geological Survey Assessment Report 35290

NTS 082J 13E, TRIM 082J.082 LAT. 50 49' 13" N LONG. 115 40' 47" W

# GEOLOGICAL, & GEOCHEMICAL REPORT ON MINERAL TENURES 1028135, 1030823 & 1030824 ASSINIBOINE MAGNESITE MINERAL OCCURRENCES RADIUM HOT SPRINGS, B.C.

**Golden Mining Division** 

by

Andris Kikauka, P.Geo. 4199 Highway 101, Powell River, BC V8A 0C7

> GEOLOGICAL SURVEY BRANCH ASSESSMENT REPORT February 5, 2015



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TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area) Ground, mapping <u>(:</u> Photo interpretation	10,000 6 hectares	1028135	1,014.70
GEOPHYSICAL (line-kilome Ground Magnetic	itres)		
Electromagnetic induced Polarizati Radiometric	ion		· · · · · · · · · · · · · · · · · · ·
Selsmic Other Airborne			·
GEOCHEMICAL (number of samples analyse Soil Silt	ed for)		
Rock <u>6 Samples</u> Other	s Liborate fusion ME-XRF-06		1,403.12
ORILLING     (total metres; number of hel     Core     Non-com	les, size)		
RELATED TECHNICAL Sampling/assaying			
Petrographic Mineralographic Metallurgic			
PROSPECTING (scale, area)	)		
Line/grid (kilometres) _ Topographic/Photogran (scale, area)	nmetric		
Legal surveys (scale, a Road, local access (kik	ometres)/traif		
Trench (metres) Underground dev. (met Other	tres)		
		TOTAL COST:	\$2,417.82

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#### SUMMARY

The Assiniboine Creek magnesite property consists of 3 contiguous claims (1028135, 1030823, & 1030824) totalling approximately 244.98 hectares (605.3 acres) located approximately 40 km (24.1 miles) northeast of Radium Hot Springs, BC (Fig 1, 2). The mineral claims are located approximately 5 kilometers north-northeast of Mt Brussilof magnesite mine in the Mitchell River valley. MGX Minerals (CSE: XMG) has carried out geological mapping and geochemical rock chip sampling (September, 25-26, 2014.

Sparry magnesite is associated with 'paleo-reef strata' that has been replaced by coarse crystalline magnesite and dolomite. Magnesite is recognized by hardness, coarse crystalline texture, massive appearance, high density, white colour, partial reaction with dilute HCl. Magnesite, minor dolomite, occurs as lenses in upper portions of Mid Cambrian Cathedral Fm.

The Assiniboine magnesite/dolomite lenses hosted in Cathedral Formation carbonate appears to have shallow 5-15 degrees W dip (into the mountain), and are interpreted as the west limb of a gently plunging, southeast trending anticline fold axis (Fig 4). The physiography of the Cathedral Fm, near Assiniboine Ck, is characterized by dissected trellis drainage patterns, whereby side creek gullies are perpendicular to Assiniboine Creek. The Assiniboine Creek Magnesite zones are hosted by Cathedral Formation (resistive to erosion), and are located approximately 200-700 meters west-southwest of Assiniboine Creek at 1,720-1,880 m (5,641.6-6,166.4 ft) elevation. Six rock chip samples taken on the Assiniboine magnesite property were geochemically analyzed by Li Borate fusion, whole rock analysis ME-XRF-06 (XRF26), performed by ALS Minerals, North Vancouver, BC (Appendix A). Descriptions and whole rock analysis of 6 rock chip samples are summarized from claim name: Cathedral, (MTO ID # 1028135):

ID #	Easting	Northing	Elev (m)	width (m)		% MgO	% CaO	% Al2O3	% Fe2O3	% SiO2
14ASS-01	5 <b>92878</b>	5630985	1742		2	21.5	30.5	0.01	0.25	0.04
14ASS-02	593030	5630669	1751		2	23.3	28.3	0.03	0.45	0.08
14ASS-03	593000	5630684	1763		2	26.3	24.2	0.01	0.5	0.04
14ASS-04	592744	5631269	1769		2	23.4	28.6	0.02	0.21	0.03
14ASS-05	5927 <b>8</b> 6	5631265	1758		2	22.9	29.6	0.02	0.26	0.04
14ASS-06	592591	5631684	1768		2	23.6	28.9	0.01	0.22	0.02

ID #	minerals	comments	bedding strike	bedding dip
14ASS-01	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-02	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-03	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-04	magnesite, dolomite	sparry, coarse grained, pearl white to grey	147	15 SW
14ASS-05	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-06	magnesite, dolomite	sparry, coarse grained, pearl white to grey		

In 1989, Donald B Cross & Assoc Ltd mapped sections west of Assiniboine Creek valley over the area of the present claims. Their geological mapping led to an interpretation that the upper portion of Cathedral Formation may represent the updip continuation of the Baymag mineralization. According to their section stratigraphic columns, the Cathedral formation dolomite is exposed over a distance of 1.9 miles (3 kilometers) reaches a maximum thickness of 610 feet (186 meters) and contains 330 feet (101 meters) of favorable magnesite-bearing rock. A short distance to the north of this buildup the formation at 1,786.1 m, 5,860 ft elev, was sampled (top of Traverse 2) and returned a whole analysis of 43.07% MgO (Cross, 1989).

Sample 14ASS-03 has the highest proportion of magnesite (26.3% MgO) vs calcite/dolomite (24.2% CaO) of samples taken in 2014, and are considered to be Mg enriched dolomite, unlike the nearly pure magnesite (approximately values of 45-47% MgO, whereby 47.6% MgO=pure magnesite), that occurs in portions of the Mount Brussilof magnesite deposit, however the higher stratigraphy of the Cathedral Formation was not sampled in 2014 fieldwork.

Additional detailed geological mapping, and geochemical sampling of the Assiniboine claim are recommended to identify depth extension of magnesite mineralization found in the Cathedral Formation carbonate sequence at 1,786.1 m, 5,860 ft elev, that was sampled (top of Traverse 2) and returned a whole analysis of 43.07% MgO (Cross, 1989). Further geological mapping and geochemical sampling of the Assiniboine Creek claims are recommended to identify magnesite mineral zones on MTO claims 1028135, 1030823 & 1030824. Further detailed mapping may identify extensions of 43.07% MgO magnesite mineralization outlined in 1989 sampling.

#### **1.0 Introduction**

This technical report has been prepared on behalf of MGX Minerals Inc, and describes geological, and geochemical fieldwork on the Assiniboine magnesite mineral occurrences carried out in September, 25-26, 2014.

#### 2.0 Location, Access, Infrastructure, & Physiography

The Assiniboine magnesite property consists of 3 contiguous claims (1028135, 1030823, & 1030824) totalling approximately 244.98 hectares (605.3 acres) located approximately 40 km (24.1 miles) northeast of Radium Hot Springs, BC (Fig 1, 2). The mineral claims are located approximately 5 kilometers north-northeast of Mt Brussilof magnesite mining lease in the Mitchell River valley. The Assiniboine mineral property is located on NTS map sheet 082J/13E and on TRIM map sheet 082J082. The center of the magnesite showings are located at Latitude 50°49' 13.4" N and Longitude 115°40' 46.9" W. The property covers a large exposure of the Cathedral Formation located approximately 200-700 m west of Assiniboine Creeks in the Golden Mining Division of southern British Columbia, Canada. (Figure 2).

From Radium Hot Springs, the Assiniboine magnesite property can be accessed by paved Interprovincial Highway 93 N, after 20 km turn right on Settler's Road, after 11 km turn left, cross Kootenay River and proceed 19 km up Mitchell River valley. There is good infrastructure in the form of paved highways and all weather forest/mine service roads.

Magnesite, dolomite and limestone of the Cathedral Formation weathers prominently and parts of the Assiniboine coarse crystalline carbonate facies are exposed as cliff areas and isolated ridges within relatively steep mountain topography, at an elevation of 2,100 meters (6,888 feet), and along ridge in a cirque approximately 1 kilometer southeast of the summit of Assiniboine, at an elevation of 2,300 meters (7,544 feet). Numerous cliff exposures are present, with some cliff walls greater than 15 meters (50 feet) high. Topography on the claim is moderate to steep and greatly influenced by Main Ranges thrust faults 1-9 kilometers east of Assiniboine property. Slopes can be very steep where resistant crystalline dolomite, limestone, and/or magnesite locally forms steep cliffs more than 15m (50 ft) high. The Assiniboine Creek area Cathedral Formation stratigraphy (including magnesite lenses) appear to have a shallow dip. Trellis drainage patterns are developed by side creeks flowing perpendicular to the direction of Assiniboine Creek. Elevations on the claim range from 1,580 -2,040 m (5,182.4 to 6,691.2 ft).

Vegetation on the property consists mainly of Lodgepole Pine with lesser Douglas Fir and Western Yellow Larch, with minor birch and aspen. The nearest towns are Radium Hot Springs, alternately Invermere, on Highway 93/95.

#### 3.0 Property Status

The Assiniboine magnesite claims consists of two (2) contiguous mineral tenures (listed below) that are located within the Golden Mining Division (Figure 2).

Tenure	Claim Name	Issue Date	Good To Date	Area in
number				hectares
1028135	Cathedral	2014/may/07	2017/nov/01	163.33
1030823	Assiniboine North	2014/sep/07	2017/nov/01	61.23
1030824	Assiniboine West	2014/sep/07	2017/nov/01	20.42

The total area of the mineral tenures that comprise the property is 244.98 hectares (605.3 acres). Details of the status of tenure ownership for the Assiniboine property were obtained from the Mineral-Titles-Online (MTO) electronic staking system managed by the Mineral Titles Branch of the Province of British Columbia. This system is based on mineral tenures acquired electronically online using a grid cell selection system. Tenure boundaries are based on lines of latitude and longitude. There is no requirement to mark claim boundaries on the ground as these can be determined with reasonable accuracy using a GPS.

The mineral tenures comprising the Assiniboine magnesite property map shown in Figure 2 was generated from GIS spatial data downloaded from the Government of BC GeoBC website. These spatial layers are the same as those incorporated into the Mineral-Titles-Online (MTO) electronic staking system that is used to locate and record mineral tenures in British Columbia. Information

posted on the MTO website indicates that mineral tenure 1028135 are owned 100% by Jared Lazerson, and mineral tenure 1030823 & 1030824 are owned 100% by Andris Arturs Kikauka. The mineral tenures are held on behalf of MGX Minerals Inc.

There has not been any mining or other exploration related physical disturbances on the Assiniboine magnesite property that would be considered an environmental liability. The author is not aware of any environmental issues or liabilities related to historical exploration or mining activities that would have an impact on future exploration of the property.

#### 4.0 Geology and Mineralization of Mount Brussilof Magnesite Property

The Mount Brussilof deposit was discovered by the Geological Survey of Canada during regional mapping (Leech, 1965). Bayakal Minerals Ltd. and Brussilof Resources Ltd. staked and explored the deposit. In 1971, the two companies merged to form Baymag Mines Co. Ltd. Refratechnik GmbH. acquired Baymag Mines in 1979. In 1980, proven and probable geological reserves were 9.5 million tonnes grading over 95 per cent magnesia in the calcined product and 13.6 million tonnes of 93 to 95 percent magnesia in calcined product. Possible reserves were estimated at 17.6 million tonnes averaging 92.44 per cent magnesia in calcined product (Simandl, G., 1992). The Mount Brussilof deposit is hosted by rocks of the Foreland tectonostratigraphic belt and is within the "Kicking Horse Rim", and lies east of a Cambrian bathymetric feature commonly referred to as the Cathedral escarpment. Leech (1965) described the same feature in the Mount Brussilof mine area as a "faulted facies change". In any event, the carbonate rocks east of this feature, which host the magnesite mineralization, were deposited in a shallower marine environment than their stratigraphic equivalents to the west. The stratigraphic relationship between rocks east of the Cathedral escarpment, and their deeper water equivalents to the west, commonly referred to as the Chancellor Formation (Fig 3B). Known occurrences of sparry carbonate, other than veins of calcite or dolomite a few centimetres thick, are located east of the Cathedral paleo-escarpment. The formations described below are listed from oldest to youngest. The Gog Formation is a rusty, grey or buff, medium to coarse-grained, massive to thick-bedded Lower Cambrian sandstone more than 250 meters thick. The Naiset Formation comprises thinly bedded, brown and green Middle Cambrian shale overlying the Gog Formation. It is 65 to 170 metres thick, characterized by blue-green chiorite spots and by a well-developed cleavage oblique to bedding. Near the Cathedral escarpment this shale may become grey or partially converted to talc and serpentine. The Cathedra l Formation, which hosts the magnesitc deposits, is also Middle Cambrian in age. It is about 340 metres thick and consists of buff, white and grey limestones and dolomites. Laminations, ripple marks, intraformational breccias, algal mats, ooliths, pisolites, fenestrae and burrows arc well preserved. Pyrite is common either as disseminations or pods and veins. (Simandl, G., 1992).

The Stephen Formation consists of tan to grey, thinly bedded to laminated shale about 16 metres thick, with a cleavage subparallel to bedding. It is of Middle Cambrian age and contains abundant fossil fragments and locally preserved trilobites and inarticulate brachiopods. The Eldon and Pika formations cannot be subdivided in the map area. The lowermost beds of the Eldon Formation, overlying the Stephen Formation, arc black limestones approximately 50 meters thick. This basal unit is very distinctive, containing millimetre to centimeter scale argillaceous layers that weather to a rusty red colour. Elsewhere these formations can't be readily distinguished from the Cathedral Formation, except by fossil evidence. The Arctemys

Formation, also Middle Cambrian in age, is characterized by green and purple shale and siltstones interbedded with beige, fine to medium grained dolomites. Mud cracks and halite crystal prints are commonly preserved. The thickness of this formation was not determined, as the base marked the limit of mapping. All the formations are well exposed over the area, except the recessive Stephen Formation, not observed in the southern part of the map area. It is not clear if this lack of exposure is due to lack of outcrops or non-deposition (Simandl, G., 1992).

Rocks west of the Cathedral escarpment arc strongly deformed. The deformation is characterized by numerous small-scale folds with sub-horizontal fold axes oriented 160°. Minor thrust faults, and a well-developed steeply dipping cleavage striking 160' are other typical features. Along the Cathedral escarpment, cleavage is sub-vertical, closely spaced and injected by dolomite, calcite and siderite(?) veins. East of the Cathedral escarpment, cleavage is generally absent in carbonates (Cathedral, Eldon and Pika formations), well developed in the Stephen Formation and strongly developed in the Naiset Formation (Simandl, G., 1992).

Faults near the Brussilof magnesite deposit have near vertieal displacements of tens to hundreds of meters. In the northeastern comer of the study area, deformation in the Naiset Formation is similar to that of the Chancellor Formation, due to a thrust fault outcropping farther east. Sparry carbonate rocks occur within the Cathedral, Eldon and Pika Formations. They consist mainly of coarse dolomite and magnesite crystals in varying proportions. Magnesite-rich sparry carbonates are restricted to the Cathedral Formation, where they form lenses, pods and irregular masses. Barren Cathedral Formation consists mainly of fine to medium grained, massive or laminated dolomites interbedded with limestones. Parts of the Cathedral Formation are entirely altered to sparry magnesite, forming deposits of economic interest. Sparry carbonates are separated from limestone by envelopes of light grey, massive dolomite, which may contain needle-shaped quartz crystals. The contacts between sparry carbonate masses and the fine-grained dolomite are sharp and may be concord & or discordant. Magnesitic sparry carbonate is usually white or light grey in colour and buff when weathered. It consists of regularly spaced, alternating white and grey magnesite layers, randomly oriented centimetre-scale white magnesite crystals or a mixture of light grey and white magnesite crystals. Common impurities in magnesite ore are isolated rhombohedral dolomite orystals, calcite veins, pyrite veins, sub-vertical fractures filled by a mixture of beige anhydrite, calcite and chlorite, eoarse radiating or single quartz crystals and coarse pyrite pyritohedrons and octahedrons disseminated within sparry magnesite. Chalcocite, fersmite, phlogopite, talc and coarse, white, acicular palygorskite were also observed in the Mount Brussilof mine. Boulangerite, huntite and brucite were reported from laboratory analysis. Where fine-grained dolomite is not entirely converted to magnesite, replacement features such as coarse, white carbonate crystals growing perpendicular to fracture planes, or partings and lenses of fine-grained dolomite enclosed by sparry carbonates, are common. Bipolar growths of zoned magnesite crystals, magnesite pinolite, rosettes and coarse carbonate crystals having lozenge shaped cross-sections. All these features are interpreted as replacement textures. Sparry dolonrite rock consists mainly of dolomite rhombs. It forms lenses, veins or irregular masses in finegrained dolomite and occurs at same stratigraphic horizons. Dolomite veins cut magnesite ore at mine; however, magnesite veins were never observed to cut sparry dolomite (Simandl, G., 1992).

#### 5.0 General Geology

Magnesite occurs in the upper part of the Cathedral Formation. Lithological units in the area of Assiniboine are described as follows (Fig 3B):

### **LITHOLOGY LEGEND**

Pika Fm Middle Cambrian, limestone, dolomite,
cliff forming, thin bedded, shale partings
Eldon Fm Middle Cambrian, buff/white dolomite,
No fossils, cliff forming unit
Stephen Fm Middle Cambrian fine grained, crystalline
Limestone, green/grey calcareous shale
Cathedral Fm Middle Cambrian bedded, coarse grained
dolomite, thin limestone lenses, rapid &
irregular facies changes, lenses of reef-
like dolomite & magnesite
Mt Whyte Fm Middle Cambrian oolitic limestone,
Green shale, impure limestone
Gog Fm Middle Cambrian quartzite

The area of Assiniboine Creek was first mapped by Leech (1965). Sparry 'granola texture' magnesite was noted on the west side of Assiniboine Creek. Sparry magnesite deposit types are characterized by stratabound and typically stratiform, lenses of coarse-grained magnesite mainly occurring in carbonates but also observed in sandstones or other clastic sediments. Magnesite exhibits characteristic sparry texture. The Assiniboine magnesite occurrences are classified as sparry magnesite deposits (E09) by the B.C. Ministry of Energy and Mines (Simandl and Hancock, 1998). Recrystallized magnesite mineralization (approximate strike lengths of 100-1,000 meters, and 10-100 m width) occurs as replacement of porous, carbonate reef mounds in the upper portions of Middle Cambrian Cathedral Formation.

There are two preferred theories regarding the origin of sparry magnesite deposits:

1. Replacement of dolomitized, permeable carbonates by magnesite due to interaction with a metasomatic fluid.

2. Diagenetic recrystallization of a magnesia-rich protolith deposited as chemical sediments in marine or lacustrine settings. The sediments would have consisted of fine-grained magnesite, hydromagnesite, huntite or other low temperature magnesia-bearing minerals.

The main difference between these hypotheses is the source of magnesia; external for metasomatic replacement and in situ in the case of diagenetic recrystalization. Temperatures of homogenization of fluid inclusions constrain the temperature of magnesite formation or recrystalization to 110° to 240°C. In British Columbia the diagenetic recrystalization theory may best explain the stratigraphic association with gypsum and halite casts, correlation with paleotopographic highs and unconformities, and shallow marine depositional features of the deposits (Simandl and Hancock, 1998).

### 5.1 Geology and Mineralization of Sparry Magnesite Deposit Types

Capsule descriptions of geology and mineralization of sparry magnesite deposits are summarized as follows (source: Lefebure, 1996), Ministry of Energy and Mines, Mineral Deposit Models.

SYNONYMS: Veitsch-type, carbonate-hosted magnesite, crystalline magnesite.

COMMODITY: Magnesite.

EXAMPLES (British Columbia (MINFILE) - Canada/International): Mount Brussilof (082JNW001), Marysville (082GNW005), Brisco area and Driftwood Creek (082KNE068); Veitsch, Entachen Alm, Hochfilzen, Radenthein and Breitenau (Austria), Eugui (Navarra Province, Spain), deposits of Ashan area, Liaoning Province (China), Satka deposit (Russia).

### **GEOLOGICAL CHARACTERISTICS**

CAPSULE DESCRIPTION: Stratabound and typically stratiform, lens-shaped zones of coarsegrained magnesite mainly occurring in carbonates but also observed in sandstones or other clastic sediments. Magnesite exhibits characteristic sparry texture.

TECTONIC SETTING: Typically continental margin or marine platform, possibly continental settings, occur in belts.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING: The host sediments are deposited in a shallow marine environment adjacent to paleobathymetric highs or a lacustrine evaporitic environment.

AGE OF MINERALIZATION: Proterozoic or Paleozoic.

HOST/ASSOCIATED ROCK TYPES: Magnesite rock, dolostone, limestones, shales, chert. Associated with sandstone, conglomerate and volcanics and their metamorphic equivalents.

DEPOSIT FORM: Commonly strata, lenses or rarely irregular masses, typically few hundred metres to several kilometres in strike length. Shortest dimension of the orebody (metres to tens of metres) is commonly normal to the bedding planes.

TEXTURE/STRUCTURE: The magnesite-bearing rocks exhibit sparry, pinolitic, zebra-like, or xenotopic (anhedral) textures on the fresh surface. Magnesite or dolomite pseudomorphs after sulphates. "Box-textures", rosettes, monopolar and antipolar growths are locally present.

ORE MINERALOGY: Magnesite.

GANGUE MINERALOGY (Principal and *subordinate*): Dolomite  $\pm$  quartz  $\pm$  chert  $\pm$  talc  $\pm$  chlorite  $\pm$  sulphides  $\pm$  sulphosalts,  $\pm$  calcite,  $\pm$  mica,  $\pm$  palygorskite,  $\pm$  aragonite,  $\pm$  clay (as

veinlets), organic material. In highly metamorphosed terrains, metamorphic minerals derived from above precursors will be present.

ALTERATION MINERALOGY: Talc may form on quartz-magnesite boundaries due to low temperature metamorphism.

WEATHERING: Surface exposures are typically beige or pale brown and characterized by "granola-like" appearance. Most sulphides are altered into oxides in near surface environment.

ORE CONTROLS: Deposits are stratabound, commonly associated with unconformities. They are typically located in basins characterized by shallow marine depositional environments. Lenses may be located at various stratigraphic levels within magnesite-hosting formation.

GENETIC MODELS: There are two preferred theories regarding the origin of sparry magnesite deposits:

1) Replacement of dolomitized, permeable carbonates by magnesite due to interaction with a metasomatic fluid.

2) Diagenetic recrystallization of a magnesia-rich protolith deposited as chemical sediments in marine or lacustrine settings. The sediments would have consisted of fine-grained magnesite, hydromagnesite, huntite or other low temperature magnesia-bearing minerals.

The main difference between these hypotheses is the source of magnesia; external for metasomatic replacement and in situ in the case of diagenetic recrystalization. Temperatures of homogenization of fluid inclusions constrain the temperature of magnesite formation or recrystalization to 110 to 240°C. In British Columbia the diagenetic recrystalization theory may best explain the stratigraphic association with gypsum and halite casts, correlation with paleotopographic highs and unconformities, and shallow marine depositional features of the deposits. A number of recent cryptoorystalline sedimentary magnesite deposits, such as Salda Lake in Turkey and the Kunwarara deposit in Queensland, Australia, huntite-magnesite-hydromagnesite deposits of Kozani Basin, Northern Greece, and the magnesite- or hydromagnesite-bearing evaporitic occurrences from Sebkha el Melah in Tunesia may be recent analogs to the pre-diagenetic protoliths for British Columbia sparry magnesite fleposits.

ASSOCIATED DEPOSIT TYPES: Sediment-hosted talc deposits and Mississippi Valley-type deposits are geographically, but not genetically, associated with sparry magnesite in British Columbia. The magnesite appears older than cross-cutting sparry dolomite that is commonly associated with MVT deposits.

COMMENTS: Magnesite deposits can survive even in high grade metamorphic environments because of their nearly monomineralic nature.

#### **EXPLORATION GUIDES**

GEOCHEMICAL SIGNATURE: Tracing of magnesite boulders and blocks with pinolitie texture. Magnesite grains in stream sediments.

#### GEOPHYSICAL SIGNATURE: N/A.

OTHER EXPLORATION GUIDES: Surface exposures are beige, pale brown or pale gray. White fine-grained marker horizons are useful in southwest British Columbia. "Granola-like" weathering texture is a useful prospecting indicator. Magnesite may be identified in the field using heavy-liquids. In British Columbia the deposits are often associated with unconformities, paleotopographic highs within particular stratigraphic horizons.

#### ECONOMIC FACTORS

TYPICAL GRADE AND TONNAGE: Grades range from 90 to 95% MgCO<sub>3</sub> with the resources ranging from several to hundreds of million tonnes. British Columbia deposits are characterized by lower iron content than most of the European deposits.

ECONOMIC LIMITATIONS: There is large but very competitive market for magnesia-based products. China is the largest exporter of magnesite. Quality of primary raw materials, cost of energy, cost of transportation to markets, availability of existing infrastructure, and the quality of finished product are major factors achieving a successful operation.

END USES: Magnesite is used to produce magnesium metal and caustic, dead-burned and fused magnesia. Caustic magnesia, and derived tertiary products are used in chemical and industrial applications, construction, animal foodstuffs and environmental rehabilitation. Fused and deadburned magnesia are used in high-performance refractorles. Magnesium metal has wide range of end uses, mostly in the aerospace and automotive industries. The automotive market for magnesium metal is expected to expand rapidly with current efforts to reduce the weight of vehicles to improve fuel economy and reduce harmful emissions.

IMPORTANCE: Sparry magnesite deposits account for 80% of the world production. Significant quantities of magnesite are also produced from ultramafic-hosted deposits and fine grained or nodular deposits.

#### 5.2 Property Geology

The Assiniboine magnesite zones are hosted by Middle Cambrian Cathedral Formation. The Cathedral Formation consists of about 200 meter (656 feet) thick succession of mainly carbonate (dolomite, limestone and minor magnesite lenses) forming steep topography. More recessive slate, siltstone, argillite units occur above and below carbonate cliff units. Tracing carbonate reef lithology units laterally, there appears to be rapid and abrupt lithology changes between highly porous coral reef mounds and calcareous muds. Deposits of replacement texture magnesite in the Cathedral Formation are a result of either diagenetic recrystallization of sedimentary magnesite or hydrothermal origin (Simandl, 2004).

Sparry magnesite is associated with 'reef-like' mounds of coarse crystalline dolomite, recognized by its hardness, coarse crystalline texture, massive appearance, white colour, higher density and partial reaction with dilute HCl. The magnesite/dolomite occurs as lenses in the upper portions of Middle Cambrian Cathedral Formation.

#### 6.0 2014 Field Program

#### 6.1 Scope & Purpose

The 2014 geological mapping, and rock sampling was carried out in order to gather geological and geochemical data, and to make recommendations for advancing future exploration. Fieldwork was carried out on behalf of MGX Minerals Inc.

#### 6.2 Methods and Procedures

The 2014 mapping and sampling program involved a total of 6 rock chip samples taken across 2 meter intervals along exposures of bedrock with magnesite/dolomite present. Rock chip samples were taken with rock hammer and chisel and consist of acorn to walnut sized bedrock pieces for a total weight ranging from 0.94 to 1.56 kgs. Sample material was placed in marked poly ore bags and shipped to ALS Minerals Ltd, in North Vancouver, BC.

ALS Minerals Ltd crushed, split and pulverized samples using prep-31 code, crushing to better than 70% passing a 2 mm screen. A split of 250 grams is pulverized to better than 85% passing a 75 micron screen. The sample pulp is analyzed using ME-XRF-06 (XRF-26) Li borate flux major oxide whole rock geochemical analytical methods (Appendix A).

### 6.3 Property Geology & Mineralization

Sparry magnesite found on the property is associated with 'paleo-reef strata' replaced by coarse crystalline magnesite/dolomite. Magnesite is recognized by its hardness, coarse crystalline texture, massive appearance, white colour, higher density and partial reaction with dilute HCl. The magnesite/dolomite occurs as lenses in the upper portions of Middle Cambrian Cathedral Formation. The Assiniboine magnesite/dolomite lenses appear to have shallow 5-15 degrees W dip (into the mountain) and are interpreted as the west limb of a gently plunging, southeast trending anticline fold axis (Fig 4). Magnesite occurs approximately 200-700 meters west-southwest of Assiniboine Creek at 1,720-1,880 m (5,641.6-6,166.4 ft) elevation. Six rock chip samples taken on the Assiniboine magnesite property were geochemically analyzed by Li Borate fusion, whole rock analysis ME-XRF-06 (XRF26), performed by ALS Minerals, North Vancouver, BC (Appendix A). Descriptions and whole rock analysis of 6 rock chip samples from claim name: Cathedral (MTO ID # 1028135) are summarized as follows:

ID #	Easting	Northing	Elev (m)	width (m)		% MgO	% CaO	% Al2O3	% Fe2O3	% SiO2
14ASS-01	592878	5630985	1742	<b>.</b> ,	2	21.5	30.5	0.01	0.25	0.04
14ASS-02	593030	5630669	1751		2	23.3	28.3	0.03	0.45	0.08
14ASS-03	593000	5630684	1763		2	26.3	24.2	0.01	0.5	0.04
14ASS-04	592744	5631269	1769		2	23.4	28.6	0.02	0.21	0.03
14ASS-05	5927 <b>8</b> 6	5631265	1758		2	22.9	29.6	0.02	0.26	0.04
14ASS-06	592591	5631684	1768		2	23.6	28.9	0.01	0.22	0.02

ID #	minerals	comments	bedding strike	bedding dip
14ASS-01	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-02	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-03	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-04	magnesite, dolomite	sparry, coarse grained, pearl white to grey	147	15 SW
14ASS-05	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-06	magnesite, dolomite	sparry, coarse grained, pearl white to grey		

Sample 14ASSINIBOINE-03 has the highest proportion of magnesite (39.2% MgO) vs calcite/dolomite (9.04% CaO), but all samples are considered to be "MgO enriched dolomite". Results indicate MgO content ranges from 21.5 to 26.3% MgO at Assiniboine showings (1,742-1,769 m, 5,713.8-5,802.3 ft elev).

1989 geological mapping by Donald B Cross & Assoc Ltd, led to an interpretation that the upper portion of Cathedral Formation may represent the updip continuation of the Baymag mineralization. At 1,786.1 m, 5,860 ft elev, a rock chip sample taken at the top of Traverse 2 returned a whole analysis of 43.07% MgO (Cross, 1989). The extent of Assiniboine Ck magnesite is unknown, and further geological mapping and sampling is recommended.

#### 7.0 Discussion of Results

Previous rock sampling of the area west of Assiniboine Creek identified one sample with magnesium oxide content of 43.7% MgO (Cross, 1989). The MgO content approaches specifications required for producing calcined or deadburned magnesite. Impurities such as SiO2, tatc/serpentine and Fe bearing minerals (siderite, pyrite) are not present in any significant amount, however CaO impurities occur as isolated dolomite crystals, veins, and dolostone/ limestone beds. Sampling in 2014 returned geochemical analysis values with a high content of CaO. The irregular nature of facies changes in reef mound environment of deposition make it hard to predict lateral continuity of magnesite mineralization, but the Assiniboine Creek claims have good potential for the discovery an ore zone similar to the Mt Brussilof Magnesite deposit.

#### 8.0 Conclusion

Reviewing available data, the writer offers the following interpretations & conclusions:

• High purity coarsely crystalline magnesite is the main exploration target on the Assiniboine Creek claims. Mapping and sampling the extent of magnesite mineralization zones present on the property is recommended.

• Access to the property is relatively good with a reasonable access road connecting to Highway 93, Radium Hot Springs, BC. There is good infrastructure in the form of a forest/mine access roads, and paved highways.

• Additional detailed geological mapping, and geochemical sampling of the Assiniboine claim are recommended to identify depth extension of magnesite mineralization found in the Cathedral Formation carbonate sequence at 1,786.1 m, 5,860 ft elev, that was sampled (top of Traverse 2) and returned a whole analysis of 43.07% MgO (Cross, 1989). Further detailed mapping may identify extensions of magnesite mineralization outlined in 1989 sampling.

• The Assiniboine magnesite occurrences are classified as a sparry magnesite deposits that are most likely of an evaporitic origin, that are characterized by pure beds of magnesite with relatively low levels of impurities.

• The local coarse crystallinity of the magnesite is believed to be related to recrystallization as a result of replacement of dolomitized, permeable carbonates by magnesite due to interaction with a metasomatic fluid or diagenetic recrystallization of a magnesia-rich protolith deposited as chemical sediments in marine or lacustrine settings.

#### **9.0 Recommendations**

Future exploration and development of the Assiniboine magnesite property should be focused on defining magnesite mineralization hosted in Cathedral Formation located 200-700 m west of Assiniboine Creek at 1,720-1,900 m elev (Fig 4). Further geological mapping and geochemical sampling of the Assiniboine claim is recommended to identify extensions of magnesite in the upper portions of the Cathedral Formation, notably at sample taken at top of Traverse 2, 1,786.1 m, 5,860 ft elev, that returned a whole analysis of 43.07% MgO (Cross, 1989). Angular float boulders of magnesite located near the lower slopes of Assiniboine Creek should be followed up and float trains can be mapped to identify a source area.

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#### **CERTIFICATE AND DATE**

I, Andris Kikauka, of 4199 Highway, Powell River, BC am a self-employed professional geoscientist. I hereby certify that:

1. I am a graduate of Brock University, St. Catharines, Ont., with an Honours Bachelor of Science Degree in Geological Sciences, 1980.

2. I am a Fellow in good standing with the Geological Association of Canada.

3. I am registered in the Province of British Columbia as a Professional Geoscientist.

4. I have practiced my profession for twenty five years in precious and base metal exploration in the Cordillera of Western Canada, U.S.A., Mexico, Central America, and South America, as well as for three years in uranium exploration in the Canadian Shield.

5. The information, opinions, and recommendations in this report are based on fieldwork carried out in my presence on the subject property during which time a technical evaluation consisting of geological mapping, surveying, geochemical rock sampling of mineralized zones carried out Sept 25-26, 2014.

6. I have a direct interest in the Assiniboine Property and MGX Minerals Inc. The recommendations in this report cannot be used for the purpose of public financing.

7. I am not aware of any material fact or material change with respect to the subject matter of this Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

8. This technical work report supports requirements of BCEMPR for Exploration and Development Work/Expiry Date Change.

Andris Kikauka, P. Geo.,

A. Kikanka



Feb 5, 2015

### ITEMIZED COST STATEMENT-ASSINIBOINE MINERAL TENURE 1028135, 1030823, 1030824 FIELDWORK PERFORMED SEPT 25-26, 2014, WORK PERFORMED ON MINERAL TENURES 1028135 GOLDEN MINING DIVISION, NTS 82J 13E (TRIM 082J 082)

#### **FIELD CREW:**

A. Kikauka (Geologist) 2 days (surveying, mapping) \$ 1,000.00

#### FIELD COSTS:

Mob/demob/preparation	192.30
Meals and accommodations	221.00
Truck mileage & fuel	308.20
Li Borate Fusion ICP AES geochemical analysis (6 rock samples)	246.32
Report	450.00

Total= \$ 2,417.82



![](_page_21_Figure_0.jpeg)

![](_page_21_Figure_1.jpeg)

![](_page_22_Picture_0.jpeg)

![](_page_23_Picture_0.jpeg)

ţ.

#### ALS Canada Ltd.

2103 Dollarton Hwy North Vancouver BC V7H 0A7 Phone: 604 984 0221 Fax: 604 984 0218 www.alsglobal.com

#### To: KIKAUKA, ANDRIS 4199 HIGHWAY 101 POWELL RIVER BC V8A 0C7

Page: 2 - A Total # Pages: 2 (A - B) Plus Appendix Pages Finalized Date: 8-OCT-2014 Account: KIKAND

#### Project: ASS

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#### CERTIFICATE OF ANALYSIS VA14141067

Sample Description	Method	WEI-21	ME-XRF26	ME-XRF26	ME-XRF26	ME-XRF26	ME-XRF26	ME-XRF26								
	Analyte	Recvd Wt.	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	SiO2	SrO	TiO2
	Units	kg	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	LOR	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
14ASS-1		1.16	<0.01	0.03	30.5	<0.01	0.25	<0.01	21.5	0.03	0.08	<0.01	<0.01	0.04	0.01	<0.01
14ASS-2		1.56	0.03	0.02	28.3	<0.01	0.45	<0.01	23.3	0.03	0.08	<0.01	0.12	0.08	0.01	<0.01
14ASS-3		1.16	0.01	0.04	24.2	<0.01	0.50	<0.01	26.3	0.05	0.10	0.01	<0.01	0.04	<0.01	<0.01
14ASS-4		0.94	0.02	0.11	28.6	<0.01	0.21	<0.01	23.4	0.02	0.08	0.01	0.04	0.03	0.01	<0.01
14ASS-5		1.30	0.02	0.03	29.6	<0.01	0.26	<0.01	22.9	0.01	0.08	<0.01	0.01	0.04	0.01	<0.01
14ASS-6		1.00	<0.01	0.02	28.9	<0.01	0.22	<0.01	23.6	0.02	0.09	<0.01	<0.01	0.02	0.01	<0.01
			Aŗ	opendix	A Rock	Sample	Geoche	mical w	hole roc	k analys	is certifi	cate				

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![](_page_24_Picture_0.jpeg)

### WHOLE ROCK GEOCHEMISTRY

# ME- XRF06

#### SAMPLE DECOMPOSITION

50% - 50% Li, B, 0, - LiBO, (WEI- GRA06)

#### **ANALYTICAL METHOD**

#### X-Ray Fluorescence Spectroscopy (XRF)

A calcined or ignited sample (0.9 g) is added to 9.0g of Lithium Borate Flux (50 % - 50 %  $Li_2 B_4 O_7 - LiBO_2$ ), mixed well and fused in an auto fluxer between 1050 - 1100°C. A flat molten glass disc is prepared from the resulting melt. This disc is then analysed by X-ray fluorescence spectrometry.

ELEMENT	SYMBOL	UNITS	LOWER LIMIT	UPPER LIMIT
Aluminum Oxide	Al <sub>2</sub> 0 <sub>3</sub>	%	0.01	100
Barium Oxide	BaO	%	0.01	100
Calcium Oxide	CaO	%	0.01	100
Chromium Oxide	Cr <sub>2</sub> 0 <sub>3</sub>	%	0.01	100
Ferric Oxide	Fe <sub>2</sub> 0 <sub>3</sub>	%	0.01	100
Potassium Oxide	K <sub>2</sub> 0	%	0.01	100
Magnesium Oxide	MgO	%	0.01	100
Manganese Oxide	Mgo Mn O	%	0.01	100
Sodium Oxide	Na <sub>2</sub> 0	%	0.01	100
Phosphorus Oxide	P202	%	0.01	100
Silicon Oxide	SiO <sub>2</sub>	%	0.01	100
Strontium Oxide	SrO <sub>2</sub>	%	0.01	100
Titanium Oxide	TiO2	%	0.01	100
Loss On Ignition	LOI	%	0.01	100
	Total	%	0.01	101

**NOTE:** Since samples that are high in sulphides or base metals can damage Platinum crucibles, a ME- ICP06 finish method can be selected as an alternative method.

Appendix B Rock Sample Descriptions											
ID #	Easting	Northing	Elev (m)	width (m)	% MgO	% CaO	% Al2O3	% Fe2O3	SiO2		
14ASS-01	592878	5630985	1742	2	21.5	30.5	0.01	0.25	0.04		
14ASS-02	593030	5630669	1751	2	23.3	28.3	0.03	0.45	0.08		
14ASS-03	593000	5630684	1763	2	26.3	24.2	0.01	0.5	0.04		
14ASS-04	592744	5631269	1769	2	23.4	28.6	0.02	0.21	0.03		
14ASS-05	592786	5631265	1758	2	22.9	29.6	0.02	0.26	0.04		
14ASS-06	592591	5631684	1768	2	23.6	28.9	0.01	0.22	0.02		

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ID #	minerals	comments	bedding strike	bedding dip
14ASS-01	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-02	magnesite, dolomite	sparry, coarse grained, pearl white to grey	150	10 SW
14ASS-03	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-04	magnesite, dolomite	sparry, coarse grained, pearl white to grey	147	15 SW
14ASS-05	magnesite, dolomite	sparry, coarse grained, pearl white to grey		
14ASS-06	magnesite, dolomite	sparry, coarse grained, pearl white to grey		

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![](_page_26_Picture_0.jpeg)

Appendix C Photos Assiniboine Creek valley in left center of photo. Mount Eon in right center of photo.

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# Mount Assiniboine Magnesite Property Location Fig 2

![](_page_27_Figure_1.jpeg)

# Assiniboine Magnesite Property General Location Fig 1

MOUNT ASSIN BOINE 082JNW014

MOUNT BRUSSILOF X 082JNW001

LEECH 2 082JNW006

LEECH 3 082JNW012

VANO 082JNW010 MILLER PASS

ALBERT RIVER 082JNW017 082JNW002

JOFFRE 082JN

RADIUM HOT SPRINGS

ATHALMER 082KNE078

STODDART CREEK 082JNW005 HIGHMONT 082JNW015

BURNAIS 082JNW004

SWANSEA = 082JNW009 082KSE090 INVERMEREOSE 1 = 082JSW007 TOBY CREEK WINDERMERE 082JSW028

SCALE 1: 300,000

5 0 5 10 15 KILOMETERS GEOLOGICAL SURVEY BRANCH ASSESSMENT REPORT

# Mount Assiniboine Magnesite Property General Geology Fig 3

![](_page_29_Figure_1.jpeg)

# Mount Assiniboine Magnesite Property Geology & Mineralization Fig 5

NTS 082J 13/E, BCGS 082J.082, UTM Zone 11,

NAD 83 Datum, Golden Mining Division

![](_page_30_Figure_3.jpeg)

# Mount Assiniboine Magnesite Property 2014 Rock Chip Location Fig 4

NTS 082J 13/E, BCGS 082J.082, UTM Zone 11,

NAD 83 Datum, Golden Mining Division

![](_page_31_Figure_3.jpeg)