Location/Identification

MINFILE Number: 082FSW010
National Mineral Inventory Number: 082F3 WO9
Name(s): **EMERALD TUNGSTEN**
JERSEY, EMERALD

Status: Past Producer
Mining Method Underground
Regions: British Columbia
BCGS Map: 082F014
NTS Map: 082F03E
Latitude: 49 06 25 N
Longitude: 117 13 41 W
Elevation: 1190 metres
Location Accuracy: Within 500M

Mining Division: Nelson
Electoral District: Nelson-Creston
Resource District: Selkirk Natural Resource District

UTM Zone: 11 (NAD 83)
Northing: 5439369
Easting: 483355

Comments: The Emerald Tungsten deposit lies east of Emerald lead-zinc mine (082FSW310). The production is included with Jersey mine (082FSW009).

Mineral Occurrence

Commodities: Tungsten, Molybdenum, Bismuth, Gold

Minerals
Significant: Scheelite, Wolframite, Molybdenite, Pyrrhotite, Pyrite, Chalcopyrite, Bismuth, Arsenopyrite, Gold, Telluride
Significant Comments: Molybdenum is only a minor constituent of the ore.
Associated: Quartz, Apatite, Cassiterite, Vesuvianite, Fluorite, Wollastonite
Alteration: Garnet, Pyroxene, Tourmaline, Powellite, Calcite, Biotite, K-Feldspar, Sericite
Alteration Comments: Kaolinite, tremolite and silica are also reported as alteration types.
Alteration Type: Skarn, Tourmalinz'n, Oxidation, Potassic
Mineralization Age: Unknown

Deposit
Character: Disseminated, Vein
Classification: Skarn, Replacement
Type: K05: W skarn, I02: Intrusion-related Au pyrrhotite veins
Shape: Regular **Modifier:** Folded

Host Rock

Dominant Host Rock: Sedimentary

Stratigraphic Age	Group	Formation	Igneous/Metamorphic/Other
Lower Cambrian	Undefined Group	Laib	------
Jurassic	------	------	Emerald Stock

Isotopic Age	Dating Method	Material Dated
------	------	------
------	------	-

Lithology: Limestone, Argillite, Granite, Black Quartz Breccia, Dolomite
Comments: Mineralization occurs at the contact of the Reeves and Argillite members of the Laib Formation.

Geological Setting

Tectonic Belt: Omineca
Physiographic Area: Selkirk Mountains
Terrane: Quesnel, Ancestral North America

Inventory

Ore Zone: TOTAL
Year: 2021
Category: Indicated
Report On: Y
Quantity: 1,472,803 tonnes
NI 43-101: Y

Commodity	Grade
Gold	0.050 grams per tonne
Molybdenum	0.021 per cent
Tungsten	0.173 per cent

Comments: Open pit and underground mineral resource for the Jersey-Emerald project.

Reference: Moose Mountain Technical Services (2021-07-26): NI 43-101 Resource Estimate for the Jersey-Emerald Project

---

Ore Zone: TOTAL
Year: 2021
Category: Inferred
Report On: Y
Quantity: 5,128,045 tonnes
NI 43-101: Y

Commodity	Grade
Gold	0.081 grams per tonne
Molybdenum	0.026 per cent
Tungsten	0.227 per cent

Comments: Open pit and underground mineral resource for the Jersey-Emerald project.

Reference: Moose Mountain Technical Services (2021-07-26): NI 43-101 Resource Estimate for the Jersey-Emerald Project

---

Ore Zone: TOTAL
Year: 2015
Category: Inferred
Report On: Y
Quantity: 4,971,000 tonnes
NI 43-101: Y

Commodity	Grade
Tungsten	0.273 per cent

Comments: A combined resource for the Invincible, Dodger, East Emerald and Emerald mines tungsten zones of 4.971 million tonnes inferred grading 0.273 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade.

Reference: Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property

---

Ore Zone: TOTAL
Year: 2015
Category: Combined
Report On: Y
Quantity: 2,786,000 tonnes
NI 43-101: Y

Commodity	Grade
Tungsten	0.341 per cent

Comments: A combined resource for the Invincible, Dodger, East Emerald and Emerald mines tungsten zones was reported at 2.786 million tonnes measured and indicated grading 0.341 per cent tungsten tri-oxide.

Reference: Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property

---

Ore Zone: EAST
Year: 2015
Category: Indicated
Report On: Y

Quantity: 508,931 tonnes **NI 43-101:** Y

Commodity	Grade
Tungsten	0.201 per cent

Comments: Mineral resource for the East Emerald zone of 508,931 tonnes indicated grading 0.201 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade.

Reference: Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property

---

Ore Zone: EAST **Year:** 2015

Category: Inferred **Report On:** Y

Quantity: 3,230,000 tonnes **NI 43-101:** Y

Commodity	Grade
Tungsten	0.217 per cent

Comments: Inferred grading 0.217 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade.

Reference: Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property

---

Ore Zone: MINE **Year:** 2008

Category: Inferred **Report On:** N

Quantity: 112,200 tonnes **NI 43-101:** N

Commodity	Grade
Tungsten	0.28 per cent

Comments: Resource reported in Assessment Report 35243, however the main subject of the report is 2014 drilling.

Reference: Assessment Report 35243

Ore Zone: EAST **Year:** 2008

Category: Indicated **Report On:** N

Quantity: 256,000 tonnes **NI 43-101:** N

Commodity	Grade
Tungsten	0.19 per cent

Comments: Resource reported in Assessment Report 35243, however the main subject of the report is 2014 drilling.

Reference: Assessment Report 35243

Capsule Geology

The property lies on the summit between Sheep and Lost Creeks, about 13 kilometres southeast of Salmo. The early development work on the Emerald was done on a lead-zinc showing by J. Waldbesen and by Iron Mountain Ltd.; reference is made to this development in the Jersey (082FSW009).

After being inactive from about 1925 to 1940, the owners, Iron Mountain Ltd., increased their holdings from 17 to 41 claims and carried out exploration and a small amount of development for 3 years which led to the discovery of scheelite to the west of the principal lead-zinc showing early in 1942. Later in the year, scheelite ore was found on the Dodger (082FSW011) property to the east of the lead-zinc zone. At about the same time the Feeney (082FSW247) ore body, about 183 metres north of the Empire, was discovered.

In August 1942 the property was purchased by the Dominion Government who operated it through the Wartime Metals Corporation. A mill was

built beside the Nelson-Nelway Highway and put into production in August 1943 but on September 10th an order was received to close down.

Early in 1947 the property was bought by Canadian Exploration Ltd. and production was resumed in June. Exploration for additional tungsten ore was extended to a study of the Jersey (082FSW009) showing which was dominantly zinc bearing and by the end of 1948 a considerable tonnage of lead-zinc ore had been proven on the Jersey. The tungsten operation was closed down and the mill converted to a lead-zinc operation for production from the Jersey.

Early in 1951 the Canadian Government bought back from the company the known Emerald tungsten orebodies and the partly developed Dodger (082FSW011). An agreement was made for Canadian Exploration Ltd. to build a tungsten mill and to mine tungsten ore on a fee basis. A 227 tonnes mill was built near the portal of the Emerald 3,800 level and put into production in December 1951. Further diamond drilling on company ground demonstrated the existence of a large tonnage of tungsten ore so the company agreed to buy the tungsten operation from the Government. The mill operated until the end of 1958. On the Emerald claim all ore was mined from above the 3,800-level main haulageway by open pitting and underground mining. An inclined shaft was put down to the 2,730 level and 9 levels established off this, the bottom one 344 metres vertically below the 3,800 level. All ore was mined out above this lowest level. A small orebody on the Feeney claim was mined out by 1955. The mining of the Dodger zone was completed in 1957.

Diamond drilling on the Invincible claim revealed a tungsten orebody 245 to 275 metres below the surface that is estimated to contain 350,000 tonnes grading 0.83 per cent tungstic oxide. The sinking of a 275-metre vertical shaft was begun but the project was abandoned in 1958 on completion of a sales contract with the United States General Services Administration. Work was resumed on the property in 1967. A geophysical survey was made of the Invincible claim (Lot 12084) and 394 metres of diamond drilling was done in 2 holes in the Tungsten King workings (082FSW034, 321, 322).

Drilling during 1968 on the Invincible (082FSW218) showing totalled 2875 metres. Development work was begun in 1969 and production began in mid-October 1970. The Emerald tungsten mill was rehabilitated to handle about 454 tonnes per day. Ore reserves at the end of 1970 from three separate zones totalled 435,500 tonnes averaging 0.65 per cent W03. Initial production was from the rehabilitated Dodger workings since the Invincible ore zone had not been reached. The Invincible drift was advanced to 1310 metres during the year; the orebody was developed by a decline trackless haulageway. Mill capacity was increased to around 544 tonnes per day during 1971. The company name was changed in 1972 to Canex Placer Limited. Ore reserves were exhausted and the mine closed in August 1973, and in 1977, Canex's assets were acquired by Placer Development Limited. In 1979, Mentor Exploration and Development Co., Limited optioned the property from Placer. In 1980, they diamond drilled 4504 metres in 11 holes plus one wedged hole. The best intersection was 0.36 per cent W03 over 1.07 metres.

The Emerald Tungsten zone is located on the west side of the Emerald Stock granite of the Middle to Late Jurassic Nelson Intrusions. The zone occurs within the Lower Cambrian Laib Formation along the contact of the Reeves Member limestone with the Emerald Member argillite as well as on the limestone-granite contact.

The strata strike about 020 degrees and dip between 45 and 70 degrees east; many of the beds are actually overturned. The granite appears at the surface as a north trending elongate stock. West of the stock are argillite and skarn bands of the Truman Member (Laib Formation), which forms an isoclinal anticline overturned to the west. The Reeves limestone is on the west limb of this anticline, and dips 25 to 70 degrees east, terminating at depth against granite. It is succeeded on the west by the Emerald argillite that also dips east. Both the Emerald and nearby Feeney (082FSW247) ore zones are transected by the Granite fault; drilling, east and north of the fault, located the Invincible (082FSW218) tungsten zone at the same stratigraphic horizon.

Within the deposit four distinct types of mineralization can be recognized: sulphide, "greisen", skarn, and quartz ores. The sulphide-type consists of irregularly shaped "replacement" bodies in limestone and dolomite, consisting of pyrrhotite, calcite, biotite and scheelite. Locally quartz, pyrite, molybdenite and chalcopyrite may be present. The "greisen"-type of ore is in altered granite and extends as much as 12 metres into the granite from the contact with the limestone. The ore consists of potash feldspar, in some places completely kaolinized, abundant quartz, sericite, pyrite, tourmaline and scheelite. Locally, calcite or ankerite, apatite, pyrrhotite or molybdenite may be present. The skarn-type of ore, ocurring mainly at or near the contact of limestone and argillite, consists of garnet, diopside, calcite and quartz with small amounts of pyrrhotite, pyrite, scheelite and molybdenite. The quartz-type ore, which in many places grades into greisen, is silicified limestone intersected by numerous veins of quartz containing abundant ankerite, large crystals of scheelite, a few flakes of molybdenite, and orange-fluorescing crystals of apatite. Near the veins are found disseminated scheelite and pyrite with some pyrrhotite and tremolite. Also reported are native bismuth, arsenopyrite, gold, tellurides, cassiterite, vesuvianite, fluorite, and wollastonite (G. Ray, 1995).

Scheelite is the main tungsten mineral but minor powellite and wolframite have also been reported. Most of the scheelite occurs as fine, disseminated grains in lenticular skarn zones which extend an average of about 5 to 6 metres from the granite contact along the limestone-argillite contact. Grades are 0.5 to 1.5 per cent WO3.

The Emerald Tungsten mine was worked in 1943, 1947 to 1949 (inclusive) and again from 1951 to 1958 (inclusive). Production to the end of 1957 amounted to 597,100 tonnes of ore (Bulletin 41, page 119). Production for the Emerald deposit, combined with that of the Feeney (082FSW247) and Dodger (082FSW011) deposits, is recorded with the production statistics of the Jersey mine (082FSW009).

In 2005, Sultan Minerals Inc. completed 20 underground drill holes, totalling 6859.6 metres, and two surface drill holes on the Dodger Tungsten mine workings, particularly the Dodger 4200 zone. In 2006, eight diamond drill holes, totalling 1016 metres, were completed on the East Emerald Tungsten zone, also referred to as the Dodger "D" zone. In 2007, a further 19 underground drill holes, totalling 3886 metres, were completed on the East Dodger molybdenite zone and 61 surface drill holes, totalling 9147 metres, were completed on the property.

During 2008 through 2010, programs of soil sampling and airborne geophysical surveys were completed on the property. In 2008, Sultan Minerals reported a mineral resource estimate for the East Emerald and Emerald mine Tungsten zones of 232,240 tonnes indicated grading 0.19 per cent tungsten tri-oxide with an inferred resource of 1,008,800 tonnes inferred grading 0.28 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade (Giroux, G.H. (2014-03-28): Technical Report for the Jersey-Emerald Property). Also at this time a combined resource for the Invincible, Dodger, East Emerald and Emerald mines tungsten zones was reported at 2.509 million tonnes measured and indicated grading 0.36 per cent tungsten tri-oxide and 2.204 million tonnes inferred grading 0.34 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade (Giroux, G.H. (2014-03-28): Technical Report for the Jersey-Emerald Property).

During 2014, Margaux Resources Ltd. conducted a two-phase drilling program on the East Emerald target area that produced 6318.6 metres of core over 35 drill holes (Assessment Report 35243). Drilling confirmed and expanded on historic reports of contained tungsten. The tungsten-bearing zones consist of several mostly parallel skarn bands in argillite or limestone beds that dip moderately to the east.

In 2015, Margaux Resources reported a tungsten mineral resource for the East Emerald zone of 508,931 tonnes indicated grading 0.201 per cent tungsten tri-oxide and 3,230,000 tonnes inferred grading 0.217 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade (Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property). Also, at this time a combined resource for the Invincible, Dodger, East Emerald and Emerald mines tungsten zones was reported at 2.786 million tonnes measured and indicated grading 0.341 per cent tungsten tri-oxide and 4.971 million tonnes inferred grading 0.273 per cent tungsten tri-oxide, using a 0.15 per cent tungsten tri-oxide cut-off grade (Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property).

In 2016 and 2017, Margaux Resources completed programs of ground geophysical surveys and diamond drilling, totalling 1997 metres in 12 holes, on the area. Further drilling was reported to have been completed in 2018.

In July 2021, an updated openpit and underground mineral resource for the Jersey-Emerald project was reported at 1 472 803 tonnes indicated grading 0.173 per cent tungsten tri-oxide, 0.021 per cent molybdenum and 0.050 gram per tonne gold with an additional 5 128 045 tonnes inferred grading 0.227 per cent tungsten tri-oxide, 0.026 per cent molybdenum and 0.081 gram per tonne gold (Moose Mountain Technical Services [2021-07-26]: NI 43-101 Resource Estimate for the Jersey-Emerald Project).

Bibliography

EMPR AR 1908-110; 1915-162; 1917-195; 1926-278; 1929-353; 1935-G50; 1936-E46; 1937-A29; 1938-E43; 1939-A96; 1940-A81; 1941-A80; 1942-180; 1943-A79; 1944-34; 1946-147; 1947-163; 1948-135; 1949-168; 1950-126; 1951-140; 1952-147; 1953-117; 1954-126; 1955-51; 1956-80; 1957-44; 1958-38; 1959-62; 1960-69; 1961-69; 1962-75; 1963-71; 1967-246; 1968-244; 1969-319

EMPR ASS RPT 51, 8130, 8132, 23384, 23486, 23883, 24531, 24910, 25349, 30619, 31280, 31632, 35243, 37011, 37833

EMPR BULL 10 (Rev); *41, p. 119; 101, pp. 20, 60, 81, 83, 85, Appendix 3, 4F, 6; 109

EMPR EXPL 198O-53

EMPR FIELDWORK 1987, pp. 19-30; 1988, pp. 33-43; 1989, pp. 11-27; 1990, pp. 9-31; *1999, pp. 193-206,214-219

EMPR GEM 1970-442; 1969-319; 1971-401

EMPR OF 1988-1; 1989-11; 1990-8; 1990-9; 1991-2; 1991-16, 1999-3; 1998-8-M, pp. 1-74; 1999-3

EMPR P 1999-3

EMPR PF (in 082FSW011: 1:1200 Scale Plan of Dodger Mine; in 082FSW218, (1972): 1:1200 Scale Map of Underground Workings and Sample Locations, Invincible Mine; *Kierans, M.D. (1980): Interim Surface Diamond Drilling Project Report, See also 082FSW010-07 for Miscellaneous Reports; Undated and unauthored report on Emerald Tungsten Mine; Prospectors Report 1994-48 by Lloyd Addie)

EMR MP CORPFILE (The Iron Mountain Ltd.; Canadian Exploration Ltd.; Placer Development Limited)

GSC EC GEOL *17, pp. 105,108; 20, p. 299; 49, pp. 625-638

GSC MAP 1145A

GSC MEM 172, p. 54; 308

GSC OF 1195

GSC P 50-19

CIMM Vol. 56, pp. 228-236 (1953)

N MINER Dec. 9, 1996; Feb.14,21,28, Mar.13, 2000

WWW http://www.langmining.com/sultan/main.htm; http://www.infomine.com/index/properties/JERSEY_EMERALD_MINE.html

Rennie, C.C. and Smith, T.S. (1957): Lead-Zinc and Tungsten Orebordies of Canadian Exploration Ltd., Structural Geology of Canadian Ore deposits, Volume II, pp. 116-123, C.I.M.M.

Cowle, S. (2007-05-23): Technical Report on the Jersey Emerald Property, British Columbia

Giroux, G.H. (2009-01-12): Summary Report and Preliminary Resource Calculations for the East Emerald and Emerald Mine Tungsten Zone – Jersey-Emerald Property

Giroux, G.H. (2009-02-23): Summary Report and Preliminary Resource Calculations for the East Emerald and Emerald Mine Tungsten Zone – Jersey-Emerald Property
Giroux, G.H. (2010-02-2): Resource Estimation for the Jersey Lead Zinc Deposits, Jersey-Emerald Property
*Giroux, G.H. (2014-03-28): Technical Report for the Jersey-Emerald Property
*Park, V. (2015-03-15): Technical Report for the Tungsten Resource Update of the Jersey-Emerald Property
*Moose Mountain Technical Services (2021-07-26): NI 43-101 Resource Estimate for the Jersey-Emerald Project
EMPR PFD 650028, 2690, 2728, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 752460, 752461, 752462, 752463, 752464, 2729, 752465, 752466, 752467, 752468, 752729, 752730, 752731, 752732, 752733, 752794, 752795, 752796, 907239, 907380, 907629, 907632, 907697, 907775, 907845, 907846, 907949, 907981, 908058, 908317, 908318, 908429, 908473, 908474, 908666, 908751, 908974, 884412, 884413, 505734, 505742, 505743, 505841, 506968, 675543, 675544, 675545, 675546, 675547, 21451, 676607, 676608, 676621, 676622, 676623, 676625, 676626, 676627, 676628, 676629, 676630, 680135, 680157

Date Coded:	1985/07/24	**Coded By:**	BC Geological Survey (BCGS)	**Field Check:**	Y
Date Revised:	2022/04/04	**Revised By:**	Karl A. Flower (KAF)	**Field Check:**	Y