The Renison Bell deposit is located on the western side of Tasmania, Australia. It contains an estimated resource of 264 Mt of 2.25% cassiterite hosted in mineralization in Cambrian dolomites. Devonian emplacement of the Pine Hill Granite at ~2 km depth provided the tin metal, and convection of groundwater rich in reduced sulfur from the surrounding rock formations aided in leaching Sn into the ore fluid. During the period of granite emplacement and regional deformation (Upper Paleozoic), Sn-rich sulfide fluids ascended through the Federal-Bassett fault. Tin mineralization occurs in cassiterite ± tin oxide (SnO₂) ± within dolomite replacement bodies of massive pyrrhotite, quartz and talc. Other significant cassiterite-bearing ores are contained within fault tills of pyrrhotite, pyrite, quartz, and talc and breccias of arsenopyrite, pyrite and quartz. Dolomite replacement orebodies range in size from small tabular lenses of a few thousand tons, to stratal dolomite tens of meters thick spanning over several thousand square meters. Fault-till–ore bodies (breccia–replacement lodes) ~50 meters thick are scattered along the Federal-Bassett fault.

**DEPOSIT CHARACTERISTICS**

**Location:** The Renison Bell mine is located within the Dundas Trough on the east limb of a regional anticline on the west coast of Tasmania, Australia (see Fig. 1).

**Commodity:** Tin (Sn) hosted in cassiterite.

**Reserve:** Total mineral resource is 11.57 million tonnes at 1.76% Sn, containing approximately 240,000 tonnes of tin metal.

**Value:** Current tin prices of 24.67 C$/kg sets the reserves at a total value of 1,300,000,000 canadian dollars (Nov 12, 2017).

**Mining Operation:** Underground hard rock mine operating since 1968 with 23 Mt of ore already removed.

**Regional Geology**

- Globally, the Renison Bell deposit is located within the 3500 km Tasman geosynclinal belt.
- Regionally, it sits in the Dundas Trough (Cambrian) situated on the east and west by Proterozoic rocks and on the margin of the Pine Hill granite pluton.
- It is located within a large sedimentary package, with the Red Rock sequence (carbonates, cherts, conglomerates, lithic wackes) separating the west by Proterozoic rocks and on the margin of the Pine Hill granite pluton.
- During the Tabberabberan Orogeny (Devonian), a large biotite granite pluton intruded the sequence creating mineralization in the Success Creek Group and Red Rock sequence.

**Source**

- Tin deposed as cassiterite, hosted in Cambrian dolomites and associated clastic sediments.
  - Strata-bound replacement bodies in dolomite beds of Red Rock sequence and Success Creek Group.
  - Fissure-replacement lodes in major fault zones such as Bassett-Federal.
  - Minor amounts in upper parts of altered Pine Hill Granite.
  - Reaction of acidic fluid with dolomite caused an increase in pH, precipitating cassiterite, sulfides and silicates in lower dolomite beds and adjacent faults.
  - Cooling of the ore-bearing fluid also played a role in ore deposition.

**Traps**

- **Stage 1:** (~350°C) cassiterite ± sulfides (earliest stage of replacement ore formation).
- **Stage 2:** cassiterite ± pyrrhotite ± arsenopyrite ± silicates ± minor sulfides and iron oxide (main stage of mineralization).
- **Stage 3:** cassiterite ± pyrrhotite ± arsenopyrite ± silicates ± minor sulfides (form veins in major fault zones)
- **Stage 4:** (~300°C) sphalerite ± galena and quartz–calcite–fluorite veins
- **Stage 5:** (~200°C) quartz–calcite veins and vug-filling carbonates, quartz, fluorite, and sulfides (final stage of hydrothermal system).

**Transport**

- Migration and mixing of magmatic + meteoric fluid in upper parts of Pine Hill Granite caused muscovite and greisen alteration.
- The magmatic + meteoric fluid mixture transported Sn and S in low pH conditions.
- The fluid ascended through the Bassett-Federal fault zone and subsidiary faults and travelled laterally into folded and faulted dolomite beds of Success Creek Group and Red Rock sequence.

**Paragenetic Sequence**

- Fluid: Magmatic + Meteoric
  - Highly fractionated, reduced, ilmenite series, S-type granite emplaced ~2 km below surface releases brine and vapor phase.
  - Monocline fluid circulated through the upper portion of pluton, mixing with magmatic fluids.
- Sulfur: Meteoric
  - S is leached by groundwater from surrounding sedimentary and volcanic rocks (H₂S > SO₄).
- Metal: Magmatic
  - Sn is leached from granite into fluid mixture of magmatic and meteoric fluids.
  - Sn is present in the fluid as stannous chloride (SnCl₂) or stannic hydroxychloride (Sn(OH)₂Cl₂).

**References**

- Eric Driver, Kim Hatcher, Brett Pasula, Carl Ryan

**ABSTRACT**

The Renison Bell deposit located on the Western side of Tasmania, Australia contains an estimated resource of 264 Mt of 2.25% cassiterite-hosted Sn mineralization in Cambrian dolomites. Devonian emplacement of the Pine Hill Granite at ~2 km depth provided the tin metal, and convection of groundwater rich in reduced sulfur from the surrounding rock formations aided in leaching Sn into the ore fluid. During the period of granite emplacement and regional deformation (Upper Paleozoic), Sn-rich sulfide fluids ascended through the Federal-Bassett fault. Tin mineralization occurs in cassiterite ± tin oxide (SnO₂) ± within dolomite replacement bodies of massive pyrrhotite, quartz and talc. Other significant cassiterite-bearing ores are contained within fault tills of pyrrhotite, pyrite, quartz, and talc and breccias of arsenopyrite, pyrite and quartz. Dolomite replacement orebodies range in size from small tabular lenses of a few thousand tons, to stratal dolomite tens of meters thick spanning over several thousand square meters. Fault-till–ore bodies (breccia–replacement lodes) ~50 meters thick are scattered along the Federal-Bassett fault.

48 Billion Tin Cans Buried in Tasmania: The Renison Bell Sn Deposit, Tasmania, Australia

**REFERENCES**

- Eric Driver, Kim Hatcher, Brett Pasula, Carl Ryan

**PARAGENETIC SEQUENCE**

- **Stage 1:** (~350°C) cassiterite ± sulfides (early stage of replacement ore formation).
- **Stage 2:** cassiterite ± pyrrhotite ± arsenopyrite ± silicates ± minor sulfides and iron oxide (main stage of mineralization).
- **Stage 3:** cassiterite ± pyrrhotite ± arsenopyrite ± silicates ± minor sulfides (form veins in major fault zones)
- **Stage 4:** (~300°C) sphalerite ± galena and quartz–calcite–fluorite veins
- **Stage 5:** (~200°C) quartz–calcite veins and vug-filling carbonates, quartz, fluorite, and sulfides (final stage of hydrothermal system).

**AT THE SOURCE**

- **Fluid:** Magmatic + Meteoric
  - Highly fractionated, reduced, ilmenite series, S-type granite emplaced ~2 km below surface releases brine and vapor phase.
  - Monocline fluid circulated through the upper portion of pluton, mixing with magmatic fluids.
- **Sulfur:** Meteoric
  - S is leached by groundwater from surrounding sedimentary and volcanic rocks (H₂S > SO₄).
- **Metal:** Magmatic
  - Sn is leached from granite into fluid mixture of magmatic and meteoric fluids.
  - Sn is present in the fluid as stannous chloride (SnCl₂) or stannic hydroxychloride (Sn(OH)₂Cl₂).