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GENERAL INFORMATION PRODUCT 107e

**Targeted Geoscience Initiative 4  
Volcanogenic Massive Sulfide Ore  
Systems**

C.A. Hutton

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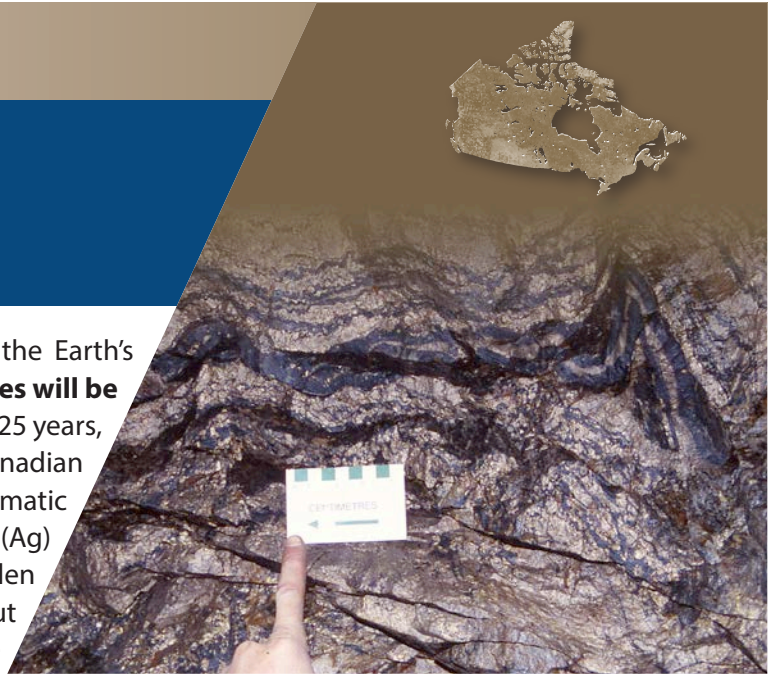
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# Targeted Geoscience Initiative 4 Volcanogenic Massive Sulfide Ore Systems

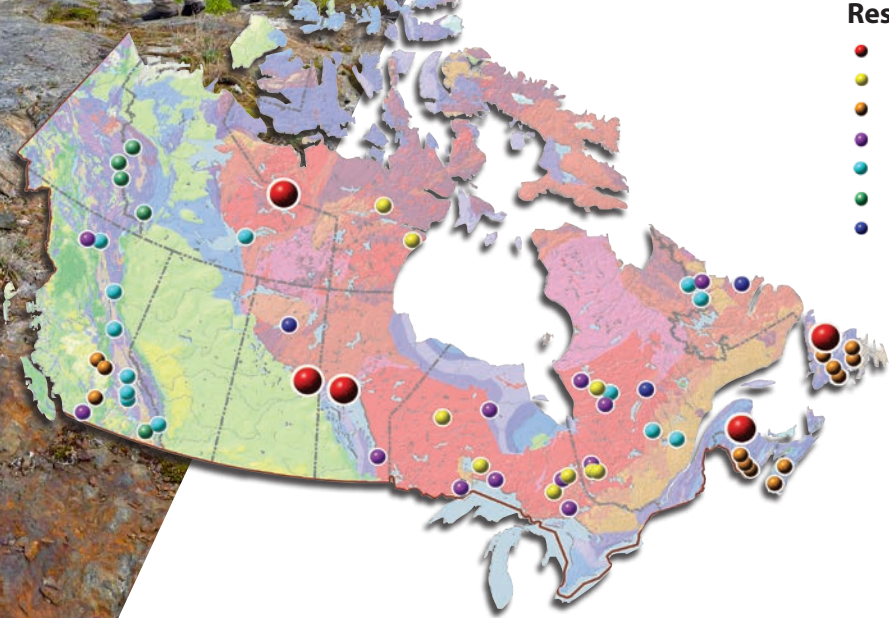
Many of Canada's metallic mineral deposits that occur at the Earth's surface have already been found, and **most future discoveries will be deeply buried**. Despite continued exploration, over the past 25 years, there has been a marked decline in proven and probable Canadian mineral reserves in all the major base metals. The most dramatic decline – 80% – has been in lead (Pb), zinc (Zn) and silver (Ag) reserves, while copper (Cu) and nickel (Ni) reserves have fallen by more than half.<sup>1</sup> Most of Canada's zinc and lead and about a quarter of its copper are mined from volcanogenic massive sulfide (VMS) deposits.



**VMS deposits** are accumulations of base (Cu, Zn, Pb) and ancillary trace precious (gold [Au] and silver [Ag]) metals and other by-product metals (e.g. cobalt [Co] or tin [Sn]) that formed on the ancient seafloor from circulating metal-bearing fluids. In 2011, Canada ranked sixth, ninth and eighth for Zn, Pb, and Cu mine production in the world, respectively, with almost all of the Zn and Pb and 23.9% of the Cu coming from VMS deposits.<sup>2,3</sup>



The Targeted Geoscience Initiative 4 (TGI-4) is a collaborative federal geoscience program that provides industry with the next generation of geoscience knowledge and innovative techniques to better understand, model and detect buried mineral deposits, reducing some of the risks of exploration.



- Research sites**
- **VMS**
  - **Lode gold**
  - **Intrusion related**
  - **Ni-Cu-PGE-Cr**
  - **Specialty metals**
  - **SEDEX**
  - **Uranium**

1 Mining Association of Canada, *Facts and Figures*, 2011  
 2 Minerals and Metals Sector, Natural Resources Canada, 2012  
 3 *The World Copper Factbook*, International Copper Study Group, 2011





**New VMS deposits will be found** in known prospective areas at depths greater than past discoveries, and in currently unrecognized prospective ones. Certain types of VMS deposits, such as gold- and/or silver-rich and the polymetallic variety (containing more than one dominant metal such as Zn-Pb-Cu-Ag-Sn) are highly prized exploration targets, as they provide a more stable economic return because they are not as sensitive to the vagaries of the price fluctuations of a single metal.

**Understanding how the deposits are formed** will allow us to lower the exploration risk inherent in searching for new deposits. For example, why are certain deposits rich in gold when nearby deposits are not?

#### **The VMS Ore Systems Project will**

- develop unconventional and innovative technologies for VMS deposit exploration
- develop new models that can identify prospective areas and locate concealed deposits
- identify the unique processes, and their geological markers, by which precious metal-rich VMS deposits form, allowing exploration methods to be tailored toward locating such deposits

**Because this is a largely field-oriented project**, the focus is on collecting and analyzing geological, geochemical, mineralogical and geophysical data. The research will take place in several key mature and nascent Canadian mining districts (e.g. Snow Lake, Manitoba; Bathurst, New Brunswick; Tally Pond and Rambler, Newfoundland and Labrador; and the slave province, in Nunavut and the Northwest Territories).



### **Targeted Geoscience Initiative 4: Increasing Deep Mineral Exploration Effectiveness**

#### **For more information about the Volcanogenic Massive Sulfide Ore Systems Project, contact**

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