Western Nunavut Uranium Properties

Overview - Fall 2013

HORNY BAY MINERAL EXPLORATION LTD.

TSX-V: HBE
Company Information

Hornby Bay Mineral Exploration Ltd. (HBME) with its head office in Toronto, Ontario is a uranium exploration and development company with all of its uranium mineral properties located in Nunavut, Canada, which is the only Canadian jurisdiction that has settled its native land claim issues.

HBME was incorporated in 1996 under the Business Corporations Act (Ontario) as a uranium exploration company. From 1996 to 1998, HBME acquired mineral claims in the Hornby Bay Basin, which is located in western Nunavut and is the least explored of the three major Proterozoic uranium basins in western Canada. Since 2003, the Company’s overall strategy has been based on the systematic acquisition of relevant geophysical datasets and ground exploration activities for the definition of key target areas on its uranium properties. The uranium models pursued by HBME on its uranium properties include high-grade unconformity deposits; large, lower-grade disseminated deposits in sandstone; basement hosted high-grade, structurally controlled deposits; and vein type deposits.

Property Information

HBME is exploring for uranium the following properties in the Hornby Bay Basin:

- The Coppermine Property, which is 100% owned by HBME and consists of 12 mineral claims and 39 mining leases covering 116,830 acres (47,279 hectares).

- The HBME / MIE Metals Corporation Joint Venture, which is a 50/50 joint venture with MIE Metals Corporation on 21 mineral claims and 1 mining lease covering 40,246 acres (16,287 hectares). HBME is the operator of 2 mineral claims of the property, covering 5,165 acres (2,090 hectares), and owns 5 mineral claims and one mining lease of the joint venture, covering 15,484 acres (6,266 hectares).

Data Integration and Processing

For the area covered by its uranium properties, HBME has built a multilayered GIS database using ESRI’s ArcMap software. The multilayered database integrates all geological, geochemical, geophysical, and drill hole information acquired by HBME, as well as relevant data from BP Minerals 1970’s to early 1980’s uranium exploration data for western Nunavut, which HBME bought in 1996. In addition, HBME uses Geosoft’s Oasis Montaj software for the imaging, analysis, processing, and modeling of geophysical data, and for the digital imaging of drill hole data in cross-section format.

Accessibility, Physiography, Climate, and Infrastructure

Access to HBME’s Western Nunavut properties is by float- or ski-equipped aircraft from Yellowknife, the capital city of the Northwest Territories, or from Kugluktuk, a town of approximately 1200 inhabitants situated on the south shore of the Coronation Gulf on the Arctic Ocean. Many of the larger lakes in the area are suitable for landing small aircraft. Crew and equipment mobilization within the project area is by helicopter from the base camp at Mouse Lake. Scheduled air service is available between Yellowknife and Kugluktuk, where there is an all-weather gravel airstrip. Kugluktuk is also connected to Hay River in the Northwest Territories by a barge service that operates from mid-July to mid-September.

The topography of the region has moderate relief with rolling hills and ridges incised by the Coppermine River and its tributaries. Locally the relief can reach variations of up to 400 meters. The Coppermine River flows through a flat valley until it spreads out to a wide plain near the Arctic Coast. Tundra uplands rise gradually from the floor of the valley, which lies at an elevation of about 275 meters, to an elevation of about 650 meters to the north of the river and to about 450 meters in the area south of the Coppermine River. In the upland areas, there are numerous lakes whose general orientation reflects the most recent ice advance in the area during the last ice age. These uplands are generally barren of trees, with only sedges, willows and occasionally stunted spruce and bushes. Ground cover consists of moss, lichens and arctic grasses. The ground is permanently frozen (permafrost) to a depth of about 300 meters, with only the first few meters thawing in the summer. Frost boils are abundant and provide an excellent soil sample medium. Fairly dense
stands of tall spruce occur in the sheltered valley of the Coppermine River, but these die out at an elevation of approximately 350 meters. As the tundra region of the Western Nunavut properties is located close to the tree line, there is a wide variety of wildlife including grizzly and black bears, wolverines, moose, musk oxen, caribou, fox, wolves, rabbits, weasels, birds, and ducks.

Precipitation falls mainly in the form of snow between September and late May. The average annual rainfall is 133.4 millimeters and the average annual snowfall is 165.7 centimeters. The lakes generally freeze in October and break up is in late June. Summers are generally clear and dry, with temperatures ranging from 8°C to 14°C. Winters are long and cold, with temperatures ranging from -20°C to -35°C. Daylight ranges from about 3 hours in mid-December to 24 hours in mid-June.

HBME operates from a 40-man base camp situated on the southern shore of Mouse Lake. The camp is located approximately 550 kilometers north of Yellowknife and about 70 kilometers south of Kugluktuk. MIE Metals Corporation has a camp at McGregor Lake, approximately 25 kilometers to the east. The Mouse Lake camp is comprised of eighteen wooden-frame tent structures that provide ample facilities for core logging, office work, storage, power generation, first aid, food preparation and sleeping. In addition, the camp is equipped with a refuse burner, helicopter pad, bermed fuel storage and refueling facilities, a retractable dock, and a small boat. Satellite communications include internet and telephone service.

Short History of Uranium Exploration in the Hornby Bay Basin Area

Exploration for uranium in the Great Bear Lake - Hornby Bay Basin region was fuelled by the discovery and commercial exploitation of pitchblende vein deposits at Port Radium on the east shore of Great Bear Lake in the 1940's. In the late 1940's and early 1950's, some work was done to the east of Great Bear Lake but without encouraging results. In the 1970's and early 1980's, there was resurgence in uranium exploration and systematic work was conducted in the Hornby Bay Basin. Companies including Acquitaine, Esso Resources, BP Minerals, Gulf Minerals, Hudson's Bay Oil and Gas, Cominco, Uranerz, Alberta Energy Corporation, CDC Oil and Gas, Union Carbide, and Phillips Petroleum Western Hemisphere were active in the Hornby Bay Basin. This work resulted in the discovery, by Esso Resources in 1976, of the Mountain Lake deposit, a small, sub-economic deposit hosted by sandstones of the Dismal Lakes Group.

By the late 1970's BP Minerals Ltd. held virtually all the prospective ground in the eastern part of the Hornby Bay Basin, in areas corresponding to several regions of HBME’s properties. The exploration activity conducted by BP Minerals Ltd. and affiliated companies terminated abruptly in the mid 1980's when the price of uranium plummeted.

The deposit model employed by BP Minerals Ltd. in the late 1970's and early 1980's was based on the Rabbit Lake uranium deposit, which is an unconformity-associated uranium deposit on the eastern margin of the Athabasca basin in Saskatchewan. Since the Rabbit Lake deposit is basement-hosted and its sandstone cover was eroded in the geologic past, the exploration approach used in the 1970's focused on structures in basement rocks peripheral to the areas of Proterozoic sandstone formations. A secondary model was based on the high-grade El Dorado uranium/silver mine on the eastern shore of Great Bear Lake, which mined a complex vein-type deposit hosted by a shear zone in Early Proterozoic gneissic rocks. The basement areas marginal to the Hornby Bay basin provided excellent geological potential for both model types.

Although numerous small occurrences of uranium were discovered in basement rocks by this early exploration effort, none of the occurrences had dimensions that approached economic potential. The work did demonstrate, however, that numerous roots of high-grade uranium mineralization are present in favorable basement rocks of the Proterozoic Hornby Bay basin.

In 1996, HBME bought the BP Minerals’ uranium exploration data for western Nunavut, which covers HBME’s Coppermine Property, and parts of the ground covered by the HBME / MIE Metals Corporation Joint Venture. The BP data includes geological, geophysical, geochemical, and drill-hole data presented in map and cross-section formats, and detailed in numerous reports.
Geological Background

The Hornby Bay Basin is one of the major Proterozoic sandstone basins of Canada with the following main characteristics:

- Same age and regional setting as the Athabasca and Thelon basins, which host major uranium deposits
- Contains the sandstone-hosted Mountain Lake deposit, a type not reported in the other two basins
- Meets all the conditions required for the existence of unconformity-associated deposits similar to those found in the Athabasca and Thelon basins
- Fertile basement, with numerous lithological units having high uranium content
- Least explored of the three major Proterozoic basins of western Canada

The Hornby Bay Basin overlies the northern part of the Early Proterozoic Wopmay Orogen. It comprises rocks of the Hornby Bay and the Dismal Lakes groups, which represent Early to Middle Proterozoic successions of terrestrial and shallow marine sedimentary rocks. The basement of the basin is formed by units of the Wopmay Orogen, a north-striking orogenic belt developed on the western margin of the Archean Slave craton between about 1.97 and 1.84 Ga. From east to west, the orogen comprises the following three main tectonic zones: Asiak Fold and Thrust Belt (passive margin shelf and slope sequences deposited on the western margin of the Slave craton, which are overlain by foredeep flysch); Hepburn Metamorphic-Plutonic Belt (represents the core zone of the orogen and comprises a rift-related sequence of immature clastic sediments and bimodal volcanic rocks, and a synorogenic suite); Great Bear Magmatic Zone (comprises volcanic and plutonic rocks formed in a magmatic arc).

During the final stage of compressional deformation, the Wopmay Orogen was extensively cut by conjugate northeast- and northwest-trending strike-slip faults. Post-orogenic extension led to dip-slip reactivation of basement conjugate wrench faults and development of north-trending normal faults in the cover rocks.

The Dismal Lakes and Hornby Bay groups, as well as the rocks of the Wopmay Orogen that form their basement were subsequently intruded by numerous north- to northeast-trending Middle Proterozoic diabase dykes. Many of these dykes belong to the Mackenzie dyke swarm, which along with the Coppermine Creek Formation basalts that overlie the Dismal Lakes Group and the Muskox intrusion, a layered mafic-ultramafic complex emplaced along a zone of weakness at the eastern margin of the Hornby Bay Group, reflect a major episode of continental basaltic magmatism that occurred at ca. 1270 Ma.
100% HBME Coppermine Property

The Coppermine Property is 100% owned by HBME and consists of 12 claims and 39 leases covering 116,830 acres.

Geology

- The Coppermine Property is located in the northern region of the Early Proterozoic Wopmay Orogen, where the units of the orogen are overlain by Middle Proterozoic sedimentary rocks of the deeper, eastern lobe of the Hornby Bay Basin. This basin is analogous to the Athabasca and the Thelon basins, known to host major unconformity uranium deposits.

- Most of the Coppermine Property is underlain by rocks of the Hornby Bay Group, which in this area comprises the Big Bear Formation (lowermost unit dominated by eolian sandstones, conglomerates, and siltstone) and the Lady Nye Formation (dominated by conglomerates and fluvial sandstones). Subordinately, deltaic and shallow marine rocks of the overlying Dismal Lakes Group (sandstone, shale, and dolostone) underlie the northern part of the property. The stratigraphic column in the area covered by the Coppermine Property has three major unconformities: 1) the basal unconformity, at the interface between the basement rocks, which are characterized by patchy regolithic development, and the Big Bear Formation; 2) the boundary between the Big Bear and Lady Nye formations, which marks a major basin re-organization and change in sediment source; and 3) the generally conformable contact between the Hornby Bay Group and the Dismal Lake Group, which reflects a gap of more than 50 million years in sedimentation and marks the transition from intra-continental deposition to marine shelf sedimentation.

- Basement units are exposed along some of the margins of the Coppermine Property. In the southwestern corner of the northern block of claims the basement rocks are felsic volcanic and volcaniclastic rocks of the Great Bear Magmatic Zone; the basement units exposed in the southern part of the northern block of claims, as well as in the southern block of claims are igneous and metamorphic rocks of the Hepburn Metamorphic-Plutonic Belt, which represents the core zone of the Wopmay Orogen. The boundary between the Great Bear Magmatic Zone and the Hepburn Metamorphic-Plutonic Belt is marked by a complex fold and fault zone (Wopmay fault) that based on geological and geophysical data appears to extend northward under the Hornby Bay Basin rocks.
• Prominent northeast- and northwest-trending faults, as well as north-trending faults occur in the area of the Coppermine Property. The basement of the basin is severely affected by faulting with significant (up to hundreds of meters) vertical displacements, which are reflected in the basement topography. Most of the basement faults were initiated during the phases of compressional deformation that affected the Wopmay Orogen, and their subsequent post-orogenic extensional reactivation led to formation of block topography of the basement surface, before deposition of the Hornby Bay sediments. The pre-existing topography of the initial depositional surface (i.e., basin unconformity) had a major influence on sedimentation patterns and, as a result, on the thickness and continuity of the lower members of the basin layers; in addition, the topography of the basin unconformity was enhanced by continued movement along the basement faults during and after sedimentation, which also caused fault propagation within the rocks of the basin.

• The rock units underlying the Coppermine Property are pervasively intruded by north-, northeast-, and northwest-trending diabase dikes, which range in thickness from a few metres to 50 metres. The large number of dikes and their prominent magnetic character precludes detailed information on the basin unconformity topography from magnetic data in most of the area covered by the Coppermine Property.

Mapping and prospecting
Since 2004, HBME has conducted intensive programs of geological/structural mapping and radiometric prospecting on the property. This work has led to the delineation of several key areas of interest, such as the Hot Creek, Contact Lake East, Wolf Creek, CM 53, CM 56, and the Alteration Zone - Bluto Lake - Bog area. In addition, all historical uranium showings have been re-evaluated.

Airborne geophysics
Airborne surveys were conducted in 1998 (GEOTEM), 2003/2004 (GEOTEM, magnetic, gravity), and 2005 (MEGATEM). The gravity data has proved particularly useful in the southern block of the property (the panhandle area), where it provided constraints on the depth and geometry of the basin. Numerous prominent basement conductors were interpreted from the MEGATEM data.

Ground geophysics
Ground follow-up of the conductors delineated from the airborne surveys has been carried out since 1998. In addition to time-domain electromagnetic surveying of grids over airborne anomalies, the ground geophysical work has included: electromagnetic soundings to predict depth to the unconformity; down-hole electromagnetic/radiometric surveys of drill holes; induced polarization surveys aimed towards finding areas of increase pyrite content or areas of silicification; and transient audio magneto-telluric surveys, which were employed to identify regions of alteration at depth and to map conductive basement structures.

Drilling
HBME has drilled 72 holes for a total of 19,577 meters. The most significant results to date include:
• Intersection of uranium mineralization in the Bog area (best intersection being 0.12% U3O8 across 9.1 meters, and highest grade being 1.25% U3O8 across 0.5 meters). The holes drilled in 2006 plus the historical drill holes of BP Minerals suggest that mineralization occurs in an area of 800 meters by 200 meters. The structural setting is similar to that of Cameco's Eagle Point deposit in the eastern margin of the Athabasca Basin.
• Intersections in the Hot Creek area of 4- to 6-meter thick intervals of radioactivity within the basal sandstone formation of the Dismal Lakes Group. Analysis of uranium mineralization from one of these intervals indicates that it formed under reducing conditions and is similar to the reduced zone mineralization in the sandstone-hosted Mountain Lake deposit. Best assay is 0.1% U3O8 across 0.7 meters.
• Intersection in the Wolf Creek area of approximately 20 meters of regolith and a 20-meter-wide zone of graphitic metapelite in the basement
• Intersection in the Contact Lake East area of multiple zones of elevated uranium pathfinder elements in the sandstone and basement. A vertical fault off-set of +100 meters in sandstone occurs in this area.
• Intersection in the southern panhandle area of multiple zones of clay alteration and bleaching capped by silica flooding and replacement. The uranium pathfinders, in particular boron, are extremely elevated in zones of shearing and alteration.
Coppermine Property – Geophysical Data and Key Target Areas

Airborne Gravity Data

Airborne Magnetic Data

Airborne Conductors

Key Target Areas
Coppermine Property – Key Target Areas and Uranium Deposit Models

Hot Creek
High potential for Mountain Lake type U deposit

- Stratigraphic setting similar to Mountain Lake deposit
- Structural setting favourable for U mineralization
- Surface U showing characterized by mineral suite formed under oxidizing conditions. This mineral suite is similar to the oxidized vein and replacement suite overlying the Mountain Lake deposit.
- Uranium mineralization was intersected at depth in two holes. This is the first time U mineralization was intersected in the lower Dismal Lakes stratigraphy outside of the immediate area of the Mountain Lake deposit, which proves the high potential of similar deposits in the northern region of the Coppermine property
- The mineral suite associated with intersected mineralization was formed under reduced conditions and is similar to Mountain Lake reduced ‘ore’ zone mineralization
- Follow-up drilling is required to define zones of economic mineralization

CM 53
Potential for sandstone-hosted U deposit

- Interpretations of Transient Audio Magnetotelluric data and Stepwise Moving Loop TEM indicate conductive zones, partly correlatable laterally.
- Modeling of TEM data suggests the presence of two vertical conductive zones extending from depths of 350 m to 700 m, one of which is correlative with the conductive zone imaged by the Transient Audio Magnetotelluric data.
- The geophysical data may be interpreted as indicative of an area of alteration within the sedimentary section, possibly related to an unconformity U deposit.
The correlation of interpretations of Transient Audio Magnetotelluric data with Step-Wise Moving Loop TEM data along line CM 56A indicates a protruding resistive feature flanked by conductive zones.

- Stepwise Moving Loop TEM data acquired 900 m to the north along line CM 56A-1 indicates the extension of the western conductor to the north.

- The geophysical data is suggestive of the presence of a prominent basement uplift that is bounded both on its east and west sides by conductive faults. This structural setting has characteristics favorable for the presence of U mineralization at the intersections of the conductive basement faults with the unconformity.

- Intersection of graphite in the basement demonstrates the presence of a redundant for localizing U mineralization.
- Strong faulting along basement conductor with high-angle offset of the unconformity is similar to structural setting of richer deposits in the Athabasca and Thelon basins.
- Sandstone is coarser and more porous as drilling proceeds towards the north, indicating increasing probability of leaching and deposition of uranium.
- Follow-up drilling is required to define zones of mineralization.
The area has two silicification zones that are similar to zones of silicification above some high-grade Athabasca basin U deposits.

Dravite was encountered at depth in the southern zone of silicification (Alteration Zone), which increases the potential for a high-grade unconformity-associated deposit at the base of the sandstone package.

The northern zone of silicification (Bluto Lake area) is coincident with a basement conductor. This setting is highly favourable for the existence of an unconformity deposit, and therefore constitutes a priority drilling target.

Surface U showings occur in basement rocks, on both sides of the elongated, fault-bounded region where the sandstone cover is preserved (panhandle zone).

Multiple high-grade pitchblende veins were intersected during drilling of exposed basement in the Bog Zone.
HBME / MIE Metals Corporation Joint Venture

The Joint Venture consists of 21 mineral claims and one mining lease. HBME is operator of the claims located to the north-west of the Coppermine Property, and MIE Metals Corporation is operator of the claims situated to the east of the Coppermine Property.

Geology
The claims to the north-west of the Coppermine Property are underlain by units of the Dismal Lakes Group. The claims to the east of the Coppermine Property are underlain by several outliers (in part fault-bounded) of Hornby Bay Group sandstone and by highly fractured and faulted basement units of the Wopmay Orogen. This area hosts several historic uranium occurrences.

Airborne geophysics
Airborne surveys were conducted in 2006 (GEOTEM electromagnetic and magnetic survey over the claims to the north-west of the Coppermine Property) and 2008 (detailed magnetic and gamma ray survey covering all the Joint Venture Property).

Ground geophysics
HBME conducted two time-domain electromagnetic – magnetic surveys as ground follow up of GEOTEM conductors. MIE Metals Corporation completed a gravity survey in the eastern block of claims.

Drilling
One drill hole with a length of 266 m was drilled by MIE Metals Corporation in the eastern block of claims to test a historical radon anomaly. A 0.8 m interval with radioactivity up to 3200 cps was intersected in graphitic basement rocks.
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