Figure 4.2-10

Bedrock Geology
of the Madrid Deposit Area

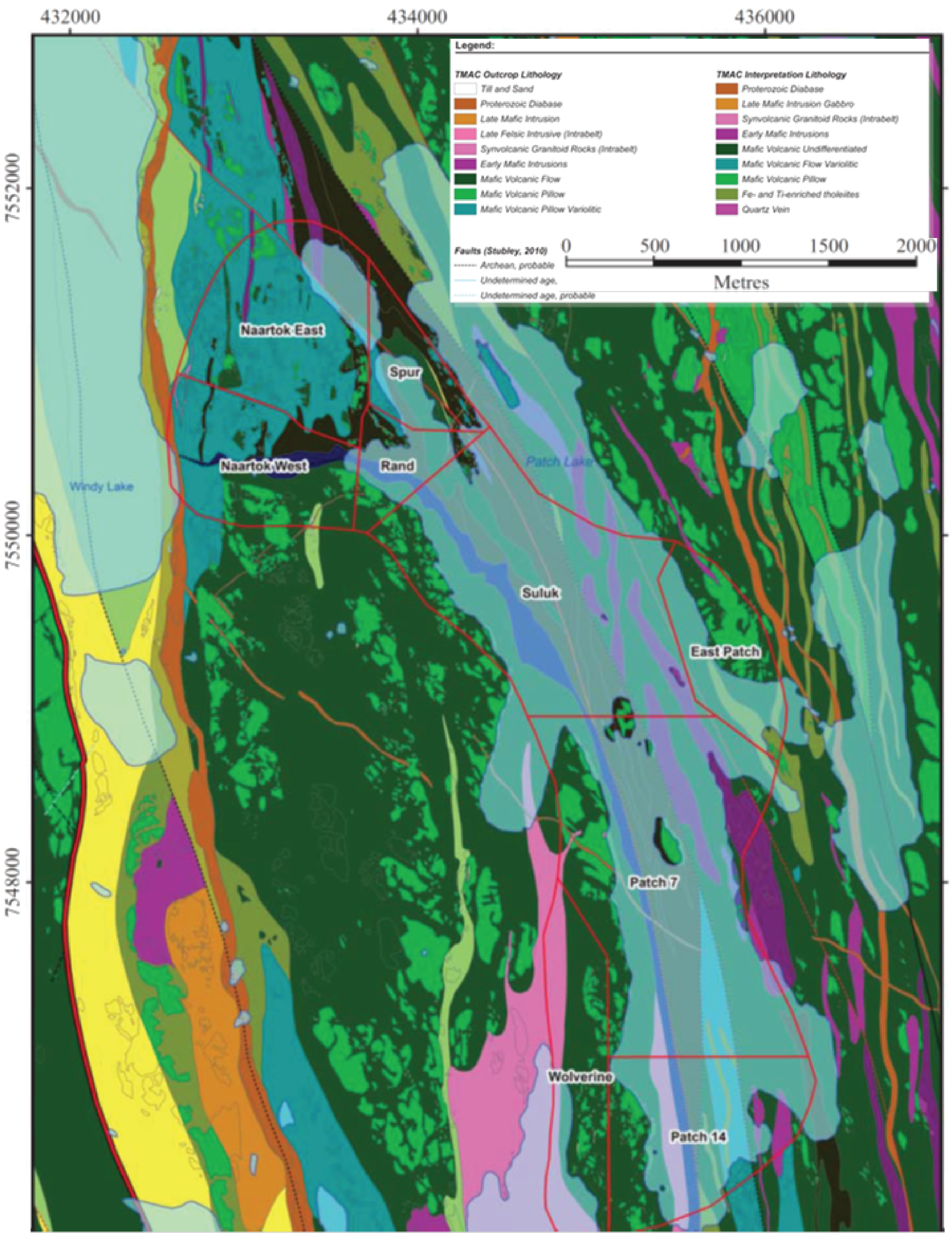
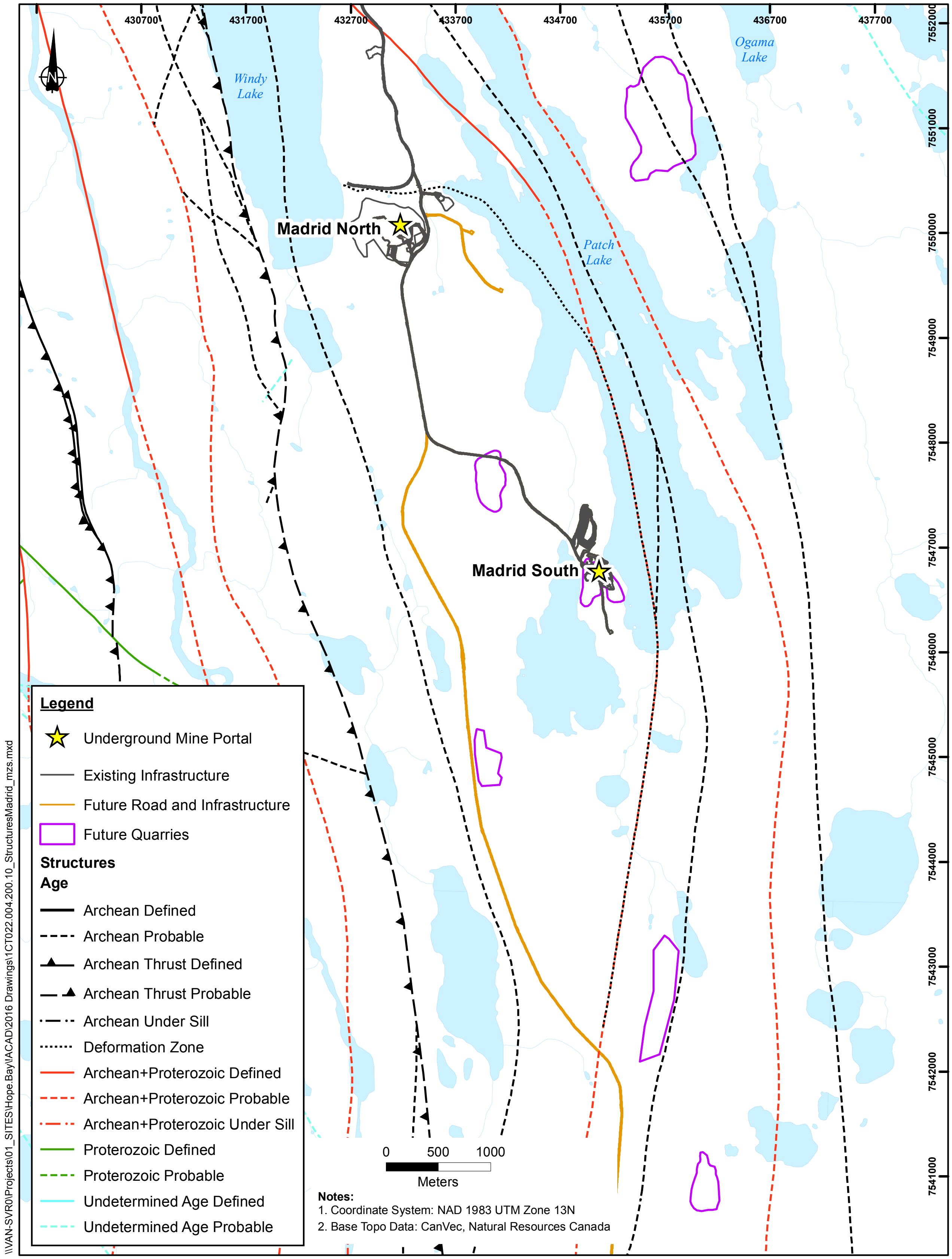


Figure 4.2-11

Fault Architecture in the Madrid Area in relation to Existing and Proposed Infrastructure



Source: SRK, 2016.

4.2.6.2 Structural Geology

Ductile strain is largely represented in the Madrid area by the main strain corridor of the Deformation Zone (DEFZ) and its associated splays, as well as within local zones of moderate to high strain (outside of the DEFZ). Intensity of the ductile strain increases towards the DEFZ where mafic volcanic rocks begin to exhibit pervasive intense foliation and locally show mylonitic textures. Splays off of the DEFZ preferentially develop along volcanic-sediment horizons, possibly related to the large competency contrast between massive flows and argillite-volcaniclastic layers. It is clear in both section and plan views that the DEFZ is not a single planar structure, but a complicated anastomosing feature with several splays and local pinch-and-swell textures.

A number of brittle faults occur in the Madrid area (Figure 4.2-11). Brittle and brittle/ductile structures are being recognised as drilling density increases in the Madrid area. Apparent discontinuities in alteration, mineralization and lithological units generally define a set of NW trending steep structures in the Naartok area and a structure partially defining the footwall contact of the Naartok East mineralised horizon. Graphitic faults with fault gouge are reported as well as healed quartz-carbonate breccias (SRK 2008).

4.2.6.3 Mineralisation

Gold mineralization is most commonly associated with high Fe-Ti tholeiites and is structurally controlled by the DEFZ and localized within the hanging wall of the zone. The DEFZ trends north-south from its southern extent at the Nexus area (south of Patch Lake) through to the northern portion of Patch Lake, where the DEFZ sharply changes orientation to an east-west trend across to Windy Lake. The style of mineralisation, which is different to that of the Boston or Doris deposits, is characterised by replacement of favourable stratigraphic units (Madsen et al. 2007) and typically include Fe-rich tholeiitic basalts. Mineralisation is associated with an early alteration assemblage of sericite and carbonate (magnesite and ankerite) with a stockwork of quartz-carbonate veinlets. Gold is associated with secondary albite and paragonite with lesser ankerite and quartz-ankerite stockwork veinlets. Higher gold tenor is associated with fine grained pyrite, intense albite flooding and hematite discolouration (Sherlock et al. 2012).

4.2.6.4 Surficial Deposits

The surficial geology for the Madrid area is consistent with the surficial geology for northern Hope Bay and the Doris area in particular (Kerr and Knight 2001). Surficial geology maps indicate the absence of glacial deposits in the area, these are considered either buried by post-glacial marine deposits or have been reworked during the marine regression. Marine sediments comprise clay, silt, sand and gravel, with relatively common marine shells. Three subdivisions are recognised: marine veneer sediments (M1), marine blanket sediments (M2) and Littoral deposits (M3). M1 sediments are no more than 2.5 m thick and comprise clay to sand matrix with pebble, cobbles and boulders that fill depressions between bedrock outcrops, and as a lag on washed bedrock and till surfaces. M2 dominates the area and comprises clay, silt and sand up to 20 m in thickness, commonly as a coarsening upward sequence. These deposits are overlain by M3 littoral deposits that comprise sand, gravel, cobbles and boulders deposited in emergent spit and beach settings during the marine regression (Kerr and Knight 2001).

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