Stream Sediment Sampling as part of the New Geoscience Initiative to Study Epithermal Gold in the Cobequid Highlands, Colchester and Cumberland Counties

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As a component of the renewed bedrock and mineral deposit research on the epithermal gold potential of the Byers Brook and Diamond Brook formations (see MacHattie, this volume), a new stream sediment program was initiated in autumn 2016. This was driven by the recognition of widespread arsenic (As), antimony (Sb), and other base metal anomalies in bedrock samples associated with known gold occurrences in the Warwick Mountain area (MacHattie, 2013; Baldwin, 2016), and widespread gold-in-stream anomalies identified from recent and historic assessment reports (e.g. Hogg, 1990). Importantly, it was observed during the 2016 field program that bedrock samples collected at or near some of the known stream sediment gold anomalies in the Diamond Brook Formation east of French River did not contain anomalous base metal concentrations (see MacHattie, this volume). This presented a geoscientific and mineral exploration problem that could not be solved strictly through further bedrock mapping and sampling. Because the known Au anomalies in this area had been found in stream sediments, both in silt fractions and heavy mineral concentrates (HMC), a silt sampling program was conducted on a high-resolution, local scale in areas with known gold in stream anomalies, but without observed bedrock geochemical anomalies.

Using the National Geochemical Reconnaissance (NGR) silt sediment sampling protocol of the Geological Survey of Canada (GSC) (cf. Day et al., 2009), silt samples were collected at 50 to 200 m spacing on streams in the Warwick Mountain and East New Annan area (Fig. 1). Samples were collected wet in paper Kraft bags, with notes on the local orthography, the hydrology of the stream, and the character of the sediment recorded on site. Sample Kraft bags were placed in individual ZipLoc bags to prevent cross contamination via ion transfer across the wet paper. These samples were dried in the Kraft bags and subsequently sieved to the <250 µm fraction, with the coarser fractions discarded. The dried and sieved material was placed in plastic sample vials, labelled and analyzed by portable X-ray Fluorescence analyzer (XRF; Olympus x5000). Although the XRF is unable to detect Au, it generates accurate data for As, Sb and other metals that appear to be meaningful tracer elements in this system (e.g. Zn, Pb, Cu, Mn, Y). In total, 153 samples were collected and analyzed in 2016. These samples show localized anomalies with dispersion tails downstream in many of the metals of interest, including As (Fig. 1). These preliminary data have already generated several new prospecting targets, and necessitate a broader sampling program in 2017.

The proposed expansion of the program will consist of collecting an additional 670 samples from streams and tributaries across the 45 km strike length of the Byers Brook-Diamond Brook volcanic belt, with these samples to be handled and analyzed by the same methods as the 2016 pilot study. Additionally, a subset of these silt samples (including from those collected in 2016) will be selected based on the presence of anomalous geochemical tracers and submitted for lab analysis by Instrumental Neutron Activation Analysis (INAA) to obtain precise data for these tracer metals, as well as Au. Afterwards, any anomalies identified by this method will be followed up with bedrock prospecting and the collection of HMC at suitable sites. The HMC program will consist of field-concentration of coarse stream sediment to obtain heavy minerals to be analyzed by INAA to

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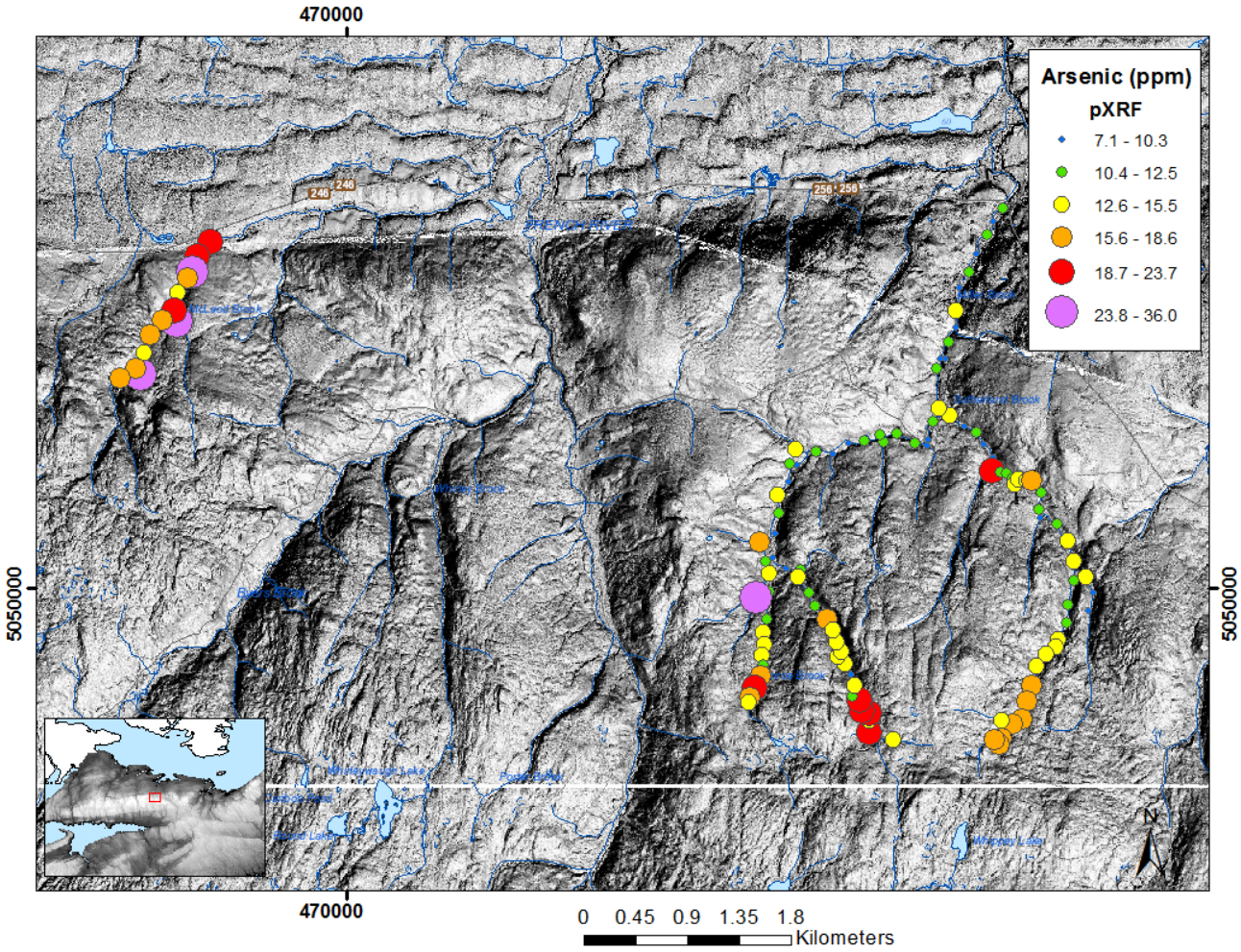

Figure 1. Bubble plot of arsenic concentrations in silt sediments in the Warwick Mountain area. Samples were analyzed by portable XRF and the sample locations overlain on a 1 m lidar digital elevation map.

determine Au content. Furthermore, it is proposed that silt samples for XRF analysis be simultaneously collected on all streams traversed as part of future field mapping programs.

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