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Development of surficial geochemical exploration methods for diamond deposits in the Attawapiskat region, James Bay Lowlands, Ontario

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A surficial geochemical study has been undertaken at the DeBeers' Attiwapiskat kimberlite field to examine anomalies over kimberlites where the ground surface is wet and/or saturated with water. Kimberlites represent ultramafic bodies that can drastically alter the chemistry of meteoric waters flowing through them. The process of low temperature sepentinization of kimberlites can result in anomalous geochemistry in kimberlite at depth and subsequent geochemical anomalies at surface in comparison to regions with host rock. Ground and surface water, dissolved gases in groundwater, peat, and spontaneous potential (SP) surveys were conducted at kimberlites near the Victor mine site. Preliminary results of surface peat water and shallow groundwater data indicate that geochemical anomalies exist where kimberlites are covered by up to 15 m of fine marine sediment and up to 3 m of peat. Surficial anomalies can be identified from simple field analysis such as pH and oxidation reduction potential (ORP). In addition, isotopes, and select metals can accurately depict the location of a kimberlite at surface. Models for transport mechanisms of ions from the kimberlite to the surface at the Attiwapiskat kimberlites have not yet been fully understood. However, hydrological data over select kimberlites indicates that physical movement of water could likely contribute to the transport of kimberlite pathfinder elements. Our data suggests that understanding of transport mechanisms, climate, host rock geology and hydrogeology are extremely important in surficial geochemical exploration.