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BCEIA CSR Committee

The Aesthetic Concerns of Dissolved Iron and Manganese
Discussion Paper Collated by Bob Symington, Chair, BCEIA Contaminated Sites Committee – September. 2007

Obtaining regulatory instruments for sites with elevated levels of dissolved iron and manganese in groundwater have become a major challenge across BC (contaminated and otherwise), particularly with the addition of manganese to the Schedule 10 CSR substances. Currently, significant time and money are being expended on investigation or remediation for these substances to obtain CSR regulatory instruments. The level of effort being expended on this issue in many cases far outweighs the environmental risk associated with the presence of these substances in groundwater.

While the consulting community recognizes that iron and manganese may be released into groundwater under reducing conditions such as those associated with some groundwater contaminant plumes, these substances also occur naturally in groundwater in all regions of British Columbia with natural concentrations ranging up to several mg/L (Well Stewardship Series, Iron and Manganese, MoE, September 2002). Compare these concentrations with the current CSR drinking water aesthetic standards of 0.3 mg/L and 0.05 mg/L for iron and manganese, respectively. These standards are protective of drinking water quality with respect to the aesthetic issues of odor and taste rather than human health. Information in Fraser Valley Groundwater Monitoring Program Final Report (MoE October 1995) indicates that between 13 per cent and 16 per cent of groundwater in BC Fraser Valley wells tested contained concentrations of iron exceeding the current CSR drinking water aesthetic standard. The same study indicates that between 23 percent and 24 percent of groundwater in tested wells contained concentrations of manganese exceeding the current CSR (aesthetic) drinking water standard.

During contaminated sites investigations, consultants routinely analyze groundwater for dissolved metals both as a screening tool and as a potential secondary contaminant related to the reducing conditions which can exist in areas of such commonly anticipated contaminant issues such as petroleum hydrocarbons. Based on the results of background sampling (MoE October 1995) these results in 15 per cent and 24% of sites being classified as contaminated sites for iron and manganese respectively and places the onus of the consultant to prove otherwise.

MoE has established procedures to address the potential for presence of naturally elevated concentrations of substances such as iron and manganese in groundwater, however, the procedures are onerous, time consuming, and expensive. These procedures include the establishment of background levels under MoE CSR Protocol 9 Determining Background Groundwater Quality, the proposed Science Advisory Board (SAB) tools Hydro geological Assessment Tools for Modeling Transport of Metals in Groundwater, February 2006 and Risk

Assessment options. Examining these options we find each have its own particular challenges.

Establishment of background levels is useful for “wide area sites” but often not applicable or practical at smaller sites. Sampling under CSR Protocol 9 can often show the complex relationships that exist within the subsurface and concentration of these substances are often seen fluctuating with factors such as precipitation rates, elevation of the water table and differences in well completion details. These factors make the statistical establishment of background levels required by MoE challenging and in many cases impossible.

The tools proposed by the SAB to address manganese and iron and other substances include the proposed modeling tools. The author of the SAB report concluded that “Due to the complexity of the issues associated with metals contaminated groundwater, and the need for geochemical interpretation, it is likely that many contaminated sites professionals would not have the background to adequately apply all of the tools described in this report.” It should also be noted that the level of site detail and data collection required for these types of models are particularly time consuming and not normally collected as part of site investigations.

This leaves us with the risk assessment option, which may soon fall under the domain of the Risk Assessment Approved Professionals. While this approach may be appropriate for some sites, it currently requires MoE submission for this type of review, with the associated costs and review times. The process of the risk assessor is to establish exposure pathways and then either eliminate or mitigate these by use of other professional such as a hydrogeologist or to offer a risk based and site specific standard for these elements. The setting of the site-specific standard will include the establishment of actual risk to human health and the setting of a maximum allowable concentration (MAC). MACs are developed based on standard risk assumptions for exposure to human for drinking water.

Jurisdictions such as New Zealand have reviewed existing MACs and are proposing MACs for both these elements in their draft drinking water guidelines. The work conducted has concluded that a MAC of 2.0 mg/L and 0.5 mg/l for iron and manganese, respectively, are adequate for the protection of human health ((Drinking-water Standards for New Zealand 2005. Wellington: Ministry of Health, Published in August 2005 by the Ministry of Health, ISBN 0-478-28392-X (Book), ISBN 0-478-28395-4 (Internet)).

Numerous land developments in BC are currently being delayed because the concentrations of iron and manganese in groundwater at these sites exceed the current CSR drinking water aesthetic standards. Consultants have to repeatedly demonstrate the well-known and proven fact that a significant percentage of groundwater in BC contains naturally elevated concentrations of these substances.

The CSR Committee of BCEIA is working in conjunction with its members and with MOE to look for a resolution to this issue. For further information please contact Mr. Bob Symington Chair of the CSR Committee.

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