CASE STUDY

Liard First Nation, Yukon

Iron and manganese well water filtration with GreensandPlus

Watson Lake, Yukon, May, 2010

The Liard First Nation lives in communities near Watson Lake along the Alaska Highway. At the design flow rate of 180 L/min (259 m3/day), the new treatment system will reduce the iron and manganese content below the recommended aesthetic levels by treating the oxidized raw well water in three parallel manganese greensand filters. The wash water produced during the greensand filter backwash operation is collected in backwash holding tanks. Disinfection of the treated water occurs by injection of a sodium hypochlorite solution.

The community celebrates the new truckfill and water treatment plant

Iron and manganese are common metallic elements found in the earth's crust. Water percolating through soil and rock can dissolve minerals containing iron and manganese and hold them in solution. Manganese is objectionable in water even when present in smaller concentrations than iron. Iron will cause reddish-brown staining of laundry and dishes. Manganese acts in a similar way but causes a brownish-black stain.

Ferrous and monogamous (+2) soluble ions are present in water and when exposed to the oxygen in air (oxidized) turn into ferric and manganese (+3) insoluble ions which will precipitate. Before iron and manganese can be filtered, they need to be oxidized to a state in which they can form insoluble complexes.

Sodium hypochlorite is the oxidant used in BI Pure Water's precipitation process. It is the preferable chemical for handling and for being widely available to remote communities. It is injected ahead of the filters at low dosage of 3 mL/min. The chemically conditioned water enters three parallel carbon steel 1234 m3 manganese greensand filters equipped with pipe headers for inlet, outlet and backwash lines. Tee and flanges are in place for installation of a

future fourth greensand filter. The filters are loaded with layers of manganese NSF-approved GreensandPlus media, anthracite and gravel. Filtration, backwash and rinsing are controlled by the PLC, operating a valve nest consisting of five electrically actuated control valves per filter. The quantity of water processed through each filter is measured and recorded by magnetic flow meters. The volume of water required for backwashing

A few mL/min of 5% potassium permanganate solution was specified by consultants to assist the sodium hypo oxidation. A static mixer is used for homogenous mixing of water and chemicals. Disinfection of the treated water is controlled by further sodium hypochlorite injection either directly in the treated water line, or in the water storage tank recirculation line. The dosing rate is controlled from a chlorine analyzer in order to maintain a safe residual chlorine level of 1.0 mg/L.

GreensandPlus is effective at higher operating temperatures and higher differential pressures than ordinary manganese greensand. Tolerance to higher differential pressure can provide for longer run times between backwashes and a greater margin of safety. In addition GreensandPlus only requires chlorine for continuous regeneration of the media. The media may never have to be replaced.

Greensand filtration vessels prepared for shipping to the Yukon, and during installation, top.

Dayton & Knight were the consulting engineers on the project and Wildstone Construction & Engineering built the new water treatment plant and a separate truckfill facility/building, connected by an insulated walkway.

BI Pure Water conducted the water treatment system engineering, manufacture, commissioning and training of operators.

BCWWA Top Small System Award

BI Pure WATER

#2 - 9790 190th Street
Surrey, BC
Tel: (604) 882-6650
Toll-free: 1 (888) 901-3111

bipurewater.com