

Comparison of Hanson Lake Silica Sand Project to the Vivian Silica Sand Project

D.M. LeNeveu, B. Sc. (hons. physics), M.Sc. (biophysics), B. Ed.

On Behalf of What the Frack Manitoba

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How does the Hanson Lake Silica Sand Project in Saskatchewan compare to Vivian Silica Sand Project in Manitoba? What can we learn from a comparison? The Environmental Impact Statement for Hanson Lake silica mine published Oct.29, 2019 was developed with guidance from the Saskatchewan Environmental Assessment and Stewardship Branch, Clifton Associates Ltd. (Clifton), Canada North Environmental Services (CanNorth), and Environmental Dynamics Inc. (EDI).¹ The Environmental Act Proposal (EAP) for the Vivian Sand Facility Project written by M. Gifford, P. Biol. R.P. Bio., AECOM Ltd., was submitted to the Manitoba Assessment and Licensing Branch public registry on July 2, 2020.²

One main difference between the projects is that even though Hanson Lake silica sand mine would extract sand from the Winnipeg Formation in Saskatchewan the depositional environment for the sand was different than in the Winnipeg Formation in Vivian Manitoba. The Hanson Lake deposit is overlain by limestone (dolomite) with no intervening shale layer. The sand layer at Hanson Lake does not contain layers of shale. The absence of shale is verified by core logs given in appendix B of the Hanson Lake EIS.¹ Since there is no sulphide bearing shale in the Hanson Lake sand acid formation will not occur.³ In the Vivian area a shale layer containing sulphide separates the limestone and aquifer and the sandstone aquifer of the Winnipeg formation.⁴ The sandstone aquifer as verified by 42 well core logs obtained from Manitoba Groundwater Section contains inter-layered sulphide bearing shale layers.⁵ The sand in the Vivian area is coated by marcasite, a form of iron sulphide.^{6,9,12,13} The sulphide in the sandstone aquifer in the Vivian area would oxidize to form acid when exposed to air. Acid formation would mobilize heavy metals.^{7,8,9,10,11,12,13}

The Hanson Lake project would transport sand to the processing plant by slurry line similar to the CanWhite Sand Corp. (CWS) Vivian Sand Facility Project. At Hanson Lake, the sand would be extracted by blasting and excavation. At Vivian, the sand would be extracted by air lift wells. The Hanson Lake mine would have more sediment and silt than at Vivian due to the surface mining operation. Both facilities would produce high purity silica sand from the Winnipeg formation. The Hanson Lake production rate is anticipated to be 2.5 million tonnes per year while Vivian the rate would be 1.36 million tonnes per year. Both facilities would have wet and dry pants for processing the sand, slurry line delivery, process water recycling, French drain type systems for collecting water under sand stockpiles, mud cakes from the clarifier tanks, fines from the baghouse, and over and undersized material stockpiles.^{1,2,14} The glaring difference between projects is the Hanson Lake project would have many waste streams for the same processes as in Vivian. In Vivian the proponent asserts no waste discharge occurs. The main differences in the processes that would generate waste streams include;

- The effluent from the Hanson Lake drain system collecting water from the sand stockpiles would be sent to settling ponds. Excess water from the ponds would be discharged upon testing to Hanson Lake. At Vivian the effluent from the French drain system for the sand stockpiles would be diverted to the recycle water loop and never discharged. A letter from What the Frack Manitoba posted on the public registry 6057.00 and an another public comment on the registry documents the absurdity of diverting, with no discharge, effluent from the French drain system to a process water loop that is already full of sand slurry water and recycled clarifier tank water^{15,16} The proponent responses about the French drain system, were meaningless statements such as; “*Wastewater and storm water collection systems will be designed in accordance with acceptable industry standards and*

specifications.” No engineering design specifications or drawings were given for the French drain system at Vivian whereas many drawings were given in the Hanson Lake EIS. ^{1,15,16,17}

- The silica fines collected from the Hanson Lake baghouse would be buried at the mine reclamation site. The baghouse silica fines from the Vivian Sand Facility would be collected and sold. ^{1,2,14}
- The mud cakes from the clarifier tank at Hanson Lake would be buried at the mine reclamation site. Mud cakes from the Vivian Facility clarifier tank would be stored in an on site building and sold. ^{1,214}
- The under and oversize sand fines and silt from Hanson Lake would be buried in the mine reclamation area. At Vivian the over and under sized material would be stockpiled and sold.
- The Hanson Lake EIS states; “*During operations, water used as part of the process will be recycled, treated as necessary to meet SEQG, and eventually discharged into Hanson Lake at a rate of up to 1,310 to 6,470 m³ /day*”. (SEQG is Saskatchewan environmental water quality guidelines). Process water in loop at Vivian is to be recycled for the projected 24 years of facility operation with no removal of accumulated dissolved contaminants such as acid from oxidization of sulphide in the sand, mobilized heavy metals, polyacrylamide and the toxic acrylamide monomer from the clarifier tank, and dissolved salts and contaminants from the French drain. ^{13,14} Environment and Climate Change Canada in the Impact Assessment Agency of Canada Analysis report on the Vivian Sand Project states, “*The Proponent does not indicate how process water would be disposed of or managed; only that water will be recycled within the system. At some point, recycled water will be laden with TSS and/or other contaminants and may require management but no management options have been described.*” This statement by government experts verifies that continuous recycling of plant and slurry water without processing and disposal is not viable. ¹⁴

The Hanson Lake Project demonstrates the necessity of disposal of baghouse silica fines, clarifier mud cakes, over and undersized particles and treated process water. The Vivian Sand Facility Project EAP and proponent responses to comments have stated with no evidence, disposal or discharge of these waste streams would not be required. The documented presence of sulphide in the sandstone aquifer and the shale aquitard overlying the aquifer in the CWS mineral claim area greatly augments the requirement for disposal streams and increases the likelihood of detriment to the aquifers and surface water.

The consequence of sulphide in a formation where cavities would be filled with aerated water after extraction is illustrated by contamination from abandoned gold mines in South Africa. Abandoned mine cavities in sulphide formations have flooded with aerated surface water in South Africa. Acid and heavy metals from oxidation of the sulphide have migrated contaminating surface waters and rivers. AECOM engineered an acid water plant to pump out, treat and discharge the contaminated mine water in South Africa. ^{19,20} The cavities in the sandstone aquifer near Vivian formed from sand extraction would be filled with aerated excess water from the CWS air-lift well extraction process. The South African acid mine drainage plant illustrates AECOM, the author of the CWS EAP, has the knowledge and experience to be aware of and mitigate the severe environmental consequence of mining in a formation containing sulphide at Vivian.

AECOM wrote the EAP for the Wanipigow Silica Sand Project. ²¹ It was only after the Technical Advisory Committee and public review comments that AECOM acknowledged the presence of sulphide in the shale layer covering the sand deposit at Wanipigow. AECOM never acknowledged the presence of marcasite (a form of iron sulphide) coating the sand grains in the Wanipigow deposit. The marcasite coating the sand grains was documented in the NI 43-101 2014 technical report for the Wanipigow silica sand deposit. ⁹ The same shale aquitard as at Wanipigow overlies the sandstone aquifer at Vivian. Certified lab tests have shown marcasite occurs in CWS extracted sand samples collected by local

residents near Vivian.^{6,13} AECOM has not acknowledged the presence of sulphide in the shale or marcasite in the sand at Vivian.

The regulatory approval process in Manitoba has allowed the omission of proper treatment of documented waste streams to go unaddressed. Absurd inadequate proponent statements such as in the proponent response to public comments for the French drain minor alteration have been allowed to stand. The Hanson Lake EIS verifies that misrepresentation of the required waste streams for the Vivian facility has occurred. The consequence of this regulatory and proponent misrepresentation is likely the destruction of the area aquifers if the Vivian Sand Project is implemented.

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