Response to Sio Silica's Denial of the Motion to delay the Hearing until completion six material actions and section 35 indigenous consultations

by
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General Considerations

Sio Silica has not addressed any of the fundamental evidence in the motions I submitted that establish significant adverse environmental and health consequences may occur from the Project. These consequences must be addressed to comply with the Manitoba Environment Act and the mandate of the Hearing. Instead Sio Silica attempts use narrow procedural arguments to dismiss the motions and delay addressing the issues documented in the motions until after the licensing phase. Sio Silica does not dispute that these issues must be addressed. Sio Silica did not assess any of the evidence on which the six material actions are based. Sio Silica claims that the delays required to address the motions would adversely affect the Project economics. Addressing the six material actions after production begins could result in significant adverse environmental consequences therefore the actions must the addressed before any revenue from production could be realized. The delays and resources to adequately address the six material actions should be substantially the same whether they are done during a Hearing delay or after the licensing unless Sio Silica does not adequately address and resource the issues after licensing. There will be no independent technical over sight or public input after the licensing to ensure that the issues are adequately addressed.

Addressing the issues embodied in the six material actions should have occurred at the Project outset before significant investor funds were expended. The issues involved are crucial and fundamental to the viability of the Project. The Sio Silica argument that "*recommendations regarding the effects of a Project are not flawed simply because insufficient evidence is available to eliminate all uncertainty*" does not apply to crucial fundamental Project issues that must be addressed to determine Project viability. The evidence in the motion for the six material actions (the Motion) establishes the following assertion statement by Sio Silica is false;

"*Sio Silica submits that the information it has submitted to date meets – and in many cases exceeds – what is required for an Environment Act proposal and allows the Commission to be able to make credible, informed decisions about what the likely environmental effects of the Project will be*."

The adverse environmental effects embodied in the evidence for the six material actions are substantial. Credible, informed Project assessment and licensing decisions cannot be made without fully addressing these issues.

The significant adverse environmental effects not adequately addressed include:

1. Acid, heavy metals, and selenium release from pyritic, silica sand, concretions and interbedded shale in the sandstone upon exposure to oxidizing conditions in the sandstone incurred from Sio Silica extraction operations,

2. Collapse of sand pillars between well clusters for the existing Sio Silica well cluster design, and subsequent collapse of the limestone aquifer,

3. Exchange of water between the carbonate and sandstone aquifers following collapse of the shale aquifer into the extraction cavities,

4. Spread of oxidizing conditions from the sandstone aquifer to the carbonate following aquitard collapse, resulting in precipitation of iron and manganese, proliferation of adverse microbial action in both aquifers and spread of aquifer contamination deteriorating water quality,

5. Injection of microbes, diesel fumes, oil breather vapours including benzene and other toxic hydrocarbons, into the sandstone aquifer and into withdrawn water to be re-injected, by the air tube of the air-lift extraction process,

6. Exposure of workers and the public to respirable silica dust from the sand drying beds required for the UV filtration system,

7. Surface contamination from accumulated toxins including acrylamide, selenium, heavy metals and acid following slurry line leakage and/or spillage during routine decoupling and movement,

8. Backflow malfunction of accumulated slurry line toxins into the re-injected aquifer water,

9. Contamination of drinking water in the Winnipeg aqueduct through slurry line leakage and by inundation from sinkholes contaminated with toxins including, acrylamide, selenium and heavy metals from the Sio Silica extraction operations,

10. Excessive Project noise from the simultaneous operation of at least six drill rigs and other extraction, bush clearing and slurry line movement equipment.

Comprehensive evidence for all these adverse effects is given in the Motion and in public comments for the extraction and processing facility Projects. Adverse effect number 5 has undoubtedly already occurred during the five or more years of air-lift silica sand extraction by Sio Silica. Benzene and other toxic organic content are never measured in extraction well water therefore manifestation of effect 5 has not been determined.

A formal complaint in February 5, 2021 concerning adverse effect 4 from Sio Silica extraction operations was registered with the Director of the Manitoba Water Science and Watershed Management Branch. Residents in and around Vivian had been experiencing increases in discolouration and iron staining of well water and foul smelling water since the onset of Sio Silica operations. The complaint was dismissed by the Director without investigation. Residents who complained were never even contacted by the Manitoba Water Branch.

In the public comments for the Vivian Sand Processing Facility, a resident near the Sio Silica Centre Line Road extraction site complained of brown well water occurring at the time of silica sand extraction operations. The resident had never experienced such brown coloured water except during the time that Sio Silica was extracting sand at Centre Line Road. This complaint was never resolved.

It is apparent from these documented complaints and the evidence for contamination of the aquifer by air injection that damage to the aquifer water has already occurred from Sio Silica operations.

Of particular concern is the lack of proper sampling and geochemical laboratory analysis of the silica sand over the entire Project area. The sand samples from a stock pile near Vivian and from samples gathered in an undocumented manner from wells Bru 121-1 and Bru 146 outside the 24 year Project area are invalid and

inadequate as documented in the Motion and in the WTFM public comments for the Project. All the sand samples were exposed to air oxidation for periods of more than six moths which is simply unacceptable. Hollander and Woodbury, independent third party technical experts, have confirmed the inadequacy of the sand sampling and the lack of adequate geochemical sampling over the entire 24 year Project area. It is beyond belief that the Project could have advanced this far without adequate and extensive sampling and geochemical analysis of the silica sand to be extracted and analysis of the pyritic concretions, oolites and interbedded shale within the sandstone. Extensive geochemical sampling and analysis over the entire 24 year Project area should have occurred at the Project outset.

Borehole data from the Mines and Minerals Branch reveal that Sio Silica did extensive expensive laboratory anlysis of core samples as early as 2016. Some of the results of this analysis were reported at the Noble Markets Investor Conference in Florida 2017. The results reported in the conference were confined to the fracking properties of the silica sand such as size distribution, crushability and acid resistance. Initially the intended use for the silica sand was for fracking as shown by the presentations at the Noble conference. In 2018, Sio Silica spent $138,244 on laboratory analysis and borehole geology/engineering for five boreholes Bru 82-1/2, Bru 82-3, Bru 82-5 and Bru 82-6 at one location, the Centre Line Road site. Figure 1 shows the borehole expense report.

HDM
HD MINERALS

REQUIRED WORK REPORT
G12504 (BRU Group 2)

6. STATEMENT OF EXPENDITURES

Group: No. G12504 (Bru Group 2)	
Statement of Expenditures	**Amount of Expenditures**
Labour & Field Supervision	$ 136,036.11
Equipment and Rentals	$ 41,559.56
All Reasonable Costs of Transportation (Supplies, Shipping, Personnel)	$ 67,374.32
Lab Analysis and Geology/Engineering	$ 138,244.04
Drilling Costs	$ 853,089.76
Land Management and Environmental	$ 56,533.90
Head office supervision and expenses	$ 3,948.75
Regulatory and Permitting	$ 5,877.84
Any other reasonable expenditures	$ 1,698.60
Total	$ 1,278,712.38

Figure 1. Expenditures for Bru Grp 2 submitted Dec.3, 2018, based on data collected from Apr.2 to Nov. 14, 2018. *The figure was reproduced from the Manitoba Mines Brach online records.*

Favourable results from the analysis of any of the properties of environmental concern such as acid generation and heavy metal content would certainly have been reported by Sio Silica in the EAP. The fact that such analysis was not reported demonstrates that the critical environmental analysis was never done at the Project outset. However substantial Project funds were allocated for analysis of the industrial properties of the silica sand as shown in figure 1.

Sio Silica has completed over 44 wells and numerous boreholes in during advanced exploration. To perform adequate environmental analysis would have been a small fraction of the amount already spent by Sio Silica on exploration drilling and the analysis of the industrial properties of the sand for fracking and later for glass making. To this day Sio Silica has avoided a credible comprehensive analysis of the properties of environmental concern for the silica sand. The future plans for geochemical analysis during the production phase given in supplementary Waste Characterization and Management Plan, conspicuously avoid any sampling and analysis of the silica sand and samples from the sandstone aquifer. It is clear Sio Silica has no intention of ever doing valid sampling and comprehensive testing of the silica sand and of concretions, oolite, and interbedded sandstone through the 24 year Project area unless compelled to do so.

The hydrogeological and geochemical analysis performed by Sio Silica in Appendix A of the extraction EAP was instigated through negotiations with the Impact Assessment Agency who was assessing the Project in the fall of 2020. The announcement of the hydrogeological and geochemical study was made on the IAAC Project website. Sio Silica did not undertake the hydrogeological and geochemical studies solely on their initiative. The hydrogeological testing and especially the geochemical analysis should have occurred at the Project outset as early as 2106 not at the behest of the IAAC in 2020. Sio Silica for the hydrogeological study managed to avoid proper comprehensive analysis of the sand samples and allowed analysis of air exposed samples. Air exposure would bias the results to under report acid generation.

The real Project viability risk is not a financial risk incurred by delay but includes a risk that the silica sand would be determined to be acid generating and to contain potentially harmful amounts of heavy metals. This is the real reason why Sio Silica has so assiduously avoided and is still avoiding proper comprehensive geochemical sampling and analysis of the silica sand and the sulphide sources within the sandstone aquifer. So far Sio Silica has been allowed to get away with inadequate geochemical, geotechnical and hydrogeological analysis, lack of adequate field testing of sand extraction and UV filtration and inadequate early Project proponent consultation with indigenous groups. What kind of credible Project approval and Hearing process would leave the potentially serious environmental effects, insufficient critical analysis and insufficient indigenous consultation as documented in the Motion unaddressed until after Project licensing, whereupon the issues would likely never be adequately addressed?

The purpose of the requirement under the Manitoba Mines and Minerals Act to complete a mine closure plan before commencement of advanced exploration is to address at the outset major environmental consequences that would affect the viability of the Project. Sio Silica withdrew at the early stages of the Project more that 500 tonnes of material for testing. Withdrawal of more than 500 tonnes of material for testing is a determining condition for advanced exploration. Sio Silica did not abide by the Act and has so far successfully avoided the necessary time and expense required to adequately address the issues embodied in the six material actions of the Motion and still refuses to file a mine closure plan in advance of the Hearing.

Recommendations by the Panel to address some of these issues may never be implemented. The only certain method to address the issues embodied in the six material actions and the serious environmental consequences listed above is for the Panel to delay the Hearing until all outstanding issues are properly addressed including completion of all six material actions. The pursuit of any of these actions after licensing would escape any form of third party technical oversight. TAC and public comments and review by the third part technical advisors commissioned for the Hearing would not be required. Simple approval by the Director of the Minister would suffice. At this stage the Director and Minister would not have the mandate or resources to pursue a proper independent technical review. The Minister has already demonstrated bias toward the Project by a blanket letter of dismissal of all appeals for the licence of the Vivian Sand Processing Facility. An identical letter was sent to all those who appealed without addressing any of the concerns

documented in the appeals. The Director ruled that the Project alteration involving installation of the French drain system for the processing plant was a minor alteration despite my and one other member of the public's, documented evidence of serious unaddressed issues including loss of water balance by the introduction of large amounts water from a large precipitation event and accumulation of toxins in the closed loop slurry line serving the facility. The last material hope for averting the environmental and health disasters listed above lies with the Panel decision on the motions.

There would be a substantial impetus after Project licensing for Sio Silica to under-resource supplementary testing and analysis, to avoid undesirable evidence, and to achieve favourable outcomes. Sio Silica is advocating delay of addressing the major issues documented here until after licensing to avoid independent technical oversight, public comments and minimize or avoid the time and expense required for proper analysis and field testing. The resources and time required for the comprehensive testing and analysis should have been expended at the Project outset and would have comprised a small fraction of initial Project expenses as documented in figure 1. Proper analysis and testing at the outset would likely have demonstrated this Project is not viable and avoided the large expenditure of investor funds that has occurred to date. The entire concept of mining in a valuable regional aquifer is madness and should have never proceeded. Would a mine completed on an island in the middle of Shoal Lake, the source of Winnipeg's drinking water, ever have been allowed? In fact initiatives to mine gold near Shoal Lake have been halted.[6]

The specific items 31 to 36 regarding the DLN motions are addressed below.

Item 31

Sio Silica states:

"*The six requested actions listed in the attachment to DLN and WTFMB's Motion are related to certain Alleged Deficiencies in the Technical Reports*"

This statement is inaccurate. The Motion contains primary analysis, references and data not found in the third party technical reports. For instance data is given from 44 well information reports, together with data of the allowable cavity span diameter given in the public version of the Stantec report submitted to the Project registry to establish that the Sio Silica well cluster design is invalid. The well information reports provide primary evidence that the sandstone aquifer contains interbedded shale layers that were not analyzed for acid generation. Literature references, not found in the third party technical reports, establish that diesel fumes, oil vapours and microbes would be introduced and already have been introduced into the sandstone aquifer from air injection during the air lift operations. Critical evidence provided in the Motion that does not appear in the third party technical reports, has been ignored by Sio Silica and has not been addressed.

Item 32

Sio Silica states with respect to process water treatment testing;

"*The process to carry out the testing requires sand and water extraction which Sio Silica is unauthorized to do without a licence*."

This statement is false. Sio Silica has withdrawn large amounts of sand to test and develop silica sand extraction methods at numerous locations since 2107 without a Project licence. Sio Silica obtained temporary authorizations to divert extracted water to the surface in all these locations. These temporary authorizations did not require a Project licence. Sio Silica obtained four injection well permits to test the re-injection of

water into the aquifer during their advanced exploration operations that did not require a Project licence. Sio Silica has completed in excess of 44 exploration and testing wells and numerous boreholes since 2016 without a Project licence. Completion of five more sand extraction wells conforming to the latest cluster design together with pilot testing of the UV filtration process and re-injection of process water into the aquifer could be done with injection well permits and temporary authorizations to divert water as have already been granted to Sio Silica numerous times.

Sio Silica maintains that

"*Testing of treatment options is typically and appropriately done after a licence is issued for a Project*."

The UV filtration methods for the fine suspended silica sand are not standard established industrial processes and require extensive research and development as documented in the Process Wastewater Treatment Options Technical Memorandum. The wastewater treatment and filtration processes are critical to the operation of the Project. Testing and development of the treatment and filtration process options will necessarily provide information that must be included in the licence. Therefore testing of the UV filtration process cannot be postponed until after licensing. Testing and demonstration that the filtration treatment process is viable, is required for Hearing to fulfil its mandate. Therefore the Hearing must be delayed until the UV filtration field testing is completed.

Item 33.

Sio Silica maintains that the UV disinfection process was identified in sections 2.1, 2.2.5 and 6.2.3 of the EAP and therefore were does not constitute a Project alteration. This statement is deliberately misleading. Only the UV disinfection process was covered in the EAP. The filtration processes required to remove suspended particulate that would render the UV disinfection ineffective, were not mentioned or considered in the EAP. The evidence for required UV filtration was provided in the public comments by WTFMB subsequent to the EAP as documented in the Project registry 6119.00. The failure of Sio Silica to address the UV filtration issue in the EAP is a major Project oversight. UV filtration methods have only been documented in the Process Wastewater Treatment Options Technical Memorandum issued after the completion of the approvals process. The public and the TAC have not had an opportunity to comment on this critical complex Project requirement. The UV filtration process involves complex clarifier methods, hydrocyclones, filtration methods, sand drying beds, and sludge removal methods. All of these methods must be developed and tested and together constitute a major Project alteration.

Sio Silica makes an inaccurate concluding statement;

"*The supplemental filing does not alter the Project description in the Application; rather, it demonstrates that there are many suitable options available to provide water treatment as described in the Application.*"

The Project description did not include any mention of the required UV filtration process and was therefore critically deficient. There has been no demonstration that the UV filtration options will be suitable. The recommendation below in the technical memorandum establishes that there is major uncertainty concerning the viability of the UV filtration process.

"*Due to uncertainty in the settling ability of the solids and unique characteristic of the wastewater it is recommended to pilot some of the recommended treatment options in order to assess the efficiency of the equipment treating the process water before proceeding with final equipment selection. It is especially recommended to pilot trial test the hydrocyclones and mobile/lamella clarifiers*."

The recommendation does not address when the pilot testing should occur as this would outside the scope of the memorandum. The recommendation does establish that wastewater is unique and the settling ability has not been established. The arguments above conclusively demonstrate that the testing of this major Project alteration must be done before commencement of the Hearing. A new Project EAP should be filed together with TAC and public review. However, according to the approvals regulations, the decision for a new EAP submission rests with the Director.

The Arcadis technical review reproduced below corroborates that the treatment options are at a preliminary conceptual stage and the topic must be addressed during the course of environmental assessment not after the assessment and Hearing are completed and a license issued.

"Arcadis Conclusion #6: Hydrogeology – Water Treatment
The design of water treatment systems to sterilize extracted groundwater prior to re-injection into the Winnipeg Sandstone aquifer remains at an early conceptual stage. As a result, there is currently insufficient information regarding the treatment requirements and process to confirm whether there are any potentially significant impacts associated with the reinjection of treated water. The topic should be pursued further during the course of the Environmental Assessment."

In summery, the UV filtration options were not documented in the Project application but in a technical memorandum issued after completion of the approvals process with no public or TAC review. The UV filtration options constitute a major Project alteration and must be field tested before commencement of the Hearing in order to fulfil the Hearing mandate. A new Project EAP filing together with TAC and public comments may be required depending on a decision by the Director.

Item 34

Sio Silica states;

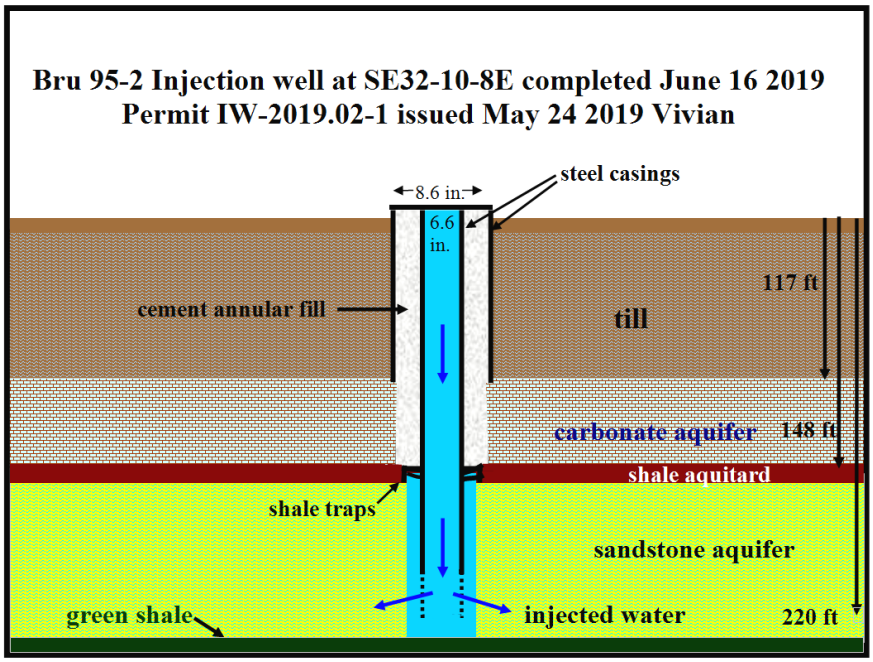
"*Sio Silica has already completed full-scale extraction tests and geotechnical modelling, as recommended in the Technical Reports*."

If Sio Silica has already completed full-scale extraction tests, they have done so without a Project licence contradicting their earlier statement that such full-scale testing requires a licence. The full-scale testing that Sio Silica has already done did not include five wells operating in the specified well cluster design. This is proven by the well information reports obtained from Manitoba Groundwater. Since Sio Silica has already completed extraction tests on isolated wells it would be feasible to complete a full-scale field test of the cluster design with five operational extraction wells. Such comprehensive field testing as described in the Motion must include extensive measurement of water and sand extraction rates, pressure in the sandstone, noise studies, analysis of the water for contaminants injected by air lifting, and measurement of the rate of re-injected water.

Such critical well cluster field testing together with comprehensive measurement and reporting of data has never been conducted by Sio Silica. Sio Silica has never reported any data or measurements from field testing of the extraction methods from isolated wells that Sio Silica has tested. Any full-scale extraction tests for single wells that Sio Silica has done have not been documented in the EAP. This is an egregious critical deficiency in the EAP.

Sio Silica has obtained only four injection well permits in their advanced exploration operations. Manitoba groundwater reported that two of the injection permits were not used leaving only two permits IW-2019.02-1 for two wells Bru 95-2 and Bru 95-3 at SE32-10-8E1 south of Vivian issued in May of 2019 and IW-2021.01-1 for two wells Bru 92-8 and Bru 92-9 at SW29-10-8E in a quarry south west of Vivian issued Aug.11, 2021. Manitoba Groundwater reported that the injection well permit for well Bru 92-9 was not implemented. For completion of full-scale extraction tests including water re-injection, injection well permits must be obtained.

Figures 2 and 3 illustrate the well configurations for the injection wells Bru 95-2 and Bru 95-3 at SE32-10-8E1 south of Vivian.



WELL INFORMATION REPORT
2022 Feb 11
Well PID: 201400
Location: SE32-10-8E
UTMX:682236.3 UTMY:5527605.9 XY Accuracy:1 EXACT [<5M] [GPS]
UTMZ:276 Z Accuracy:4 FAIR - Shuttle at Centroid
Owner: HD MINERALS
Driller: Friesen Drillers Ltd.
Well Name: BRU 95-2 / BH 7-19
Date Completed: 2019 Jun 16
Well Use: INJECTION
Well Status: SEALED Aquifer: SANDSTONE
REMARKS:
WITN:002445; OTHER SEALING AT 149FT-MECHANICAL PLUG
WELL LOG (Imperial units)

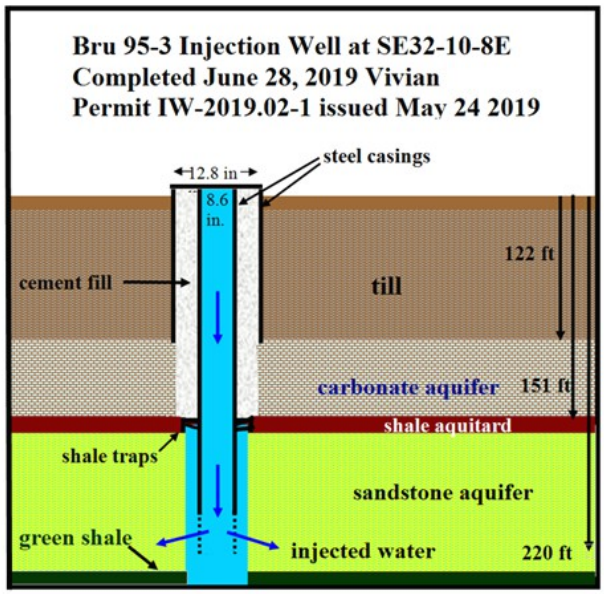
From	To(ft.)	Log
0.0	5	BLACK FILL AND PEAT MOSS
5.0	27	GREY FINE SAND
27.0	85	GREY TILL
85.0	117	GREY TILL WITH GRAVEL AND BOULDERS
117.0	148	PINK LIMESTONE
148.0	158	RED SHALE
158.0	218	WHITE SANDSTONE
218.0	226	GREEN/WHITE SHALE WITH SANDSTONE LAYERS
226.0	230	GREEN SHALE

WELL CONSTRUCTION

From	To(ft)	Const.Method	Inside Dia.(in)	Outside Dia.(in)	Type Material
0.0	122.0	CASING	8.0	8.6	WELDED STEEL
0.0	178.0	CASING	6.0	6.6	WELDED STEEL
0.0	150.0	ANNULAR FILL	6.6	8.0	CEMENT
178.0	220.0	WELL SCREEN	6.0	6.6	WELDED STEEL
122.0	230.0	OPEN HOLE	7.9		
150.0	150.0	SHALE TRAP			
155.0	155.0	SHALE TRAP			

Top of Casing: 2.5 ft above ground
WELL SEALED
Sealed Date: 2020-Aug-26
Sealed By: CANWHITE SANDS CORP

Figure 2. Bru 95-2 CWS permitted injection well south of Vivian 2019.
Illustration is by D. M. LeNeveu. Well information report was from Manitoba Groundwater.



Location: SE32-10-8E
UTMX:682214.9 UTMY:5527623 XY
Owner: HD MINERALS
Driller: Friesen Drillers Ltd.
Well Name: BRU 95-3 / BH 7-19
Date Completed: 2019 Jun 28
WITN:002447; MOC:ROTM,DROT;
Well Use: RECHARGE/RETURN
WATER USE: Other
Well Status: SEALED
WELL LOG (Imperial units)

From	To(ft.)	Log
0.0	8	BLACK FILL AND PEAT MOSS
8.0	32	GREY FINE SAND
32.0	75	GREY TILL
75.0	122	GREY TILL WITH GRAVEL AND BOULDERS
122.0	151	PINK LIMESTONE
151.0	159	RED SHALE
159.0	217	WHITE SANDSTONE
217.0	226	GREEN/WHITE SHALE WITH SANDSTONE LAYERS
226.0	230	GREEN SHALE

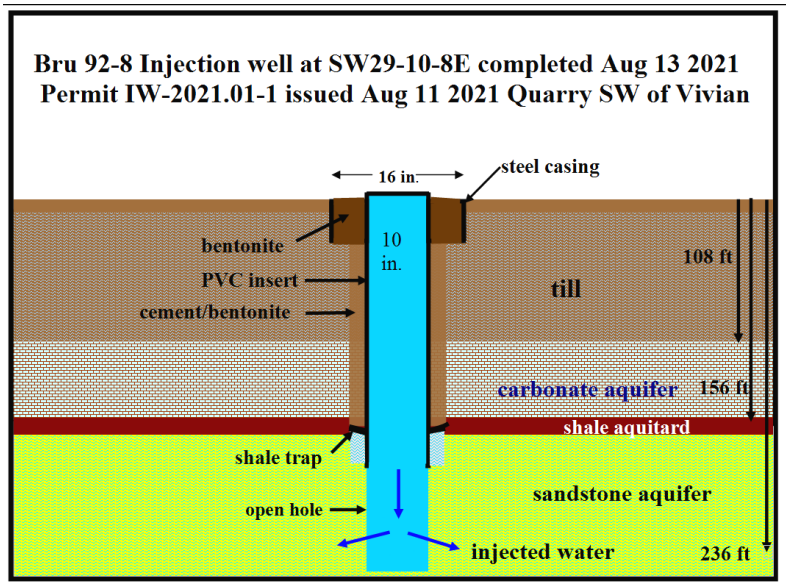
WELL CONSTRUCTION

From	To(ft)	Const.Method	Inside Dia.(in)	Outside Dia.(in)	Type Material
0.0	126.0	CASING	12.0	12.8	WELDED STEEL
0.0	178.0	CASING	8.0	8.6	WELDED STEEL
0.0	152.0	ANNULAR FILL	8.6	12.0	CEMENT
122.0	230.0	OPEN HOLE	11.8		
178.0	220.0	WELL SCREEN	8.0	8.6	WELDED STEEL
152.0	152.0	SHALE TRAP			
157.0	157.0	SHALE TRAP			

Top of Casing: 2.0 ft above ground
WELL SEALED
Sealed Date: 2020-Aug-26
Sealed By: CANWHITE SANDS CORP

Figure 3. Bru 95-3 CWS permitted injection well south of Vivian 2019.
Illustration is by D. M. LeNeveu. The well information report was from Manitoba Groundwater.

The wells Bru-95-2 and Bru 95-3 do not conform to the Sio Silica design for extraction wells given in supplementary filing of June 2, 2022, Silica Extraction Method and illustrated in figure 5. Only a single casing in Bru 95-2 and Bru 95-3 extends into the sandstone. A single casing extending into the sandstone could not have been used for simultaneous water re-injection and sand extraction. An outer casing was installed into the carbonate with the annular spacing sealed. The sealing date of the annular spacing can not be determined. Manitoba Groundwater issues one combined well information report for extraction and sealing even though for the sealing dates reported that are much later than the completion date, two reports are required. At the time of sand extraction the annulus between the inner and outer casing could have been open. In this event, according to the well design, water could have been re-injected into the carbonate formation only which is not allowed by regulations. Thus valid full-scale field tests with re-injection that conforms to the Sio Silica EAP sand extraction well design could not been performed on these two wells. This leaves only well Bru 92-8 available for full-scale filed tests with water re-injection. The design of well Bru 92-8 is illustrated in Figure 4.



2022 Feb 11
Well PID: 208473
Location: SW29-10-8E
UTMX:681631.6 UTMY:5526384.6 XY Accuracy:1 EXACT [<5M] [GPS]
UTMZ:275 Z Accuracy:4 FAIR - Shuttle at Centroid
Owner: CANWHITE SANDS
Driller: EARTH DRILLING CO. LTD.
Well Name: BRU 92-8
Date Completed: 2021 Aug 13
Well Use: INJECTION
WATER USE: Other
Well Status: ACTIVE Aquifer: SANDSTONE
WELL LOG (Imperial units)

From	To(ft.)	Log
0.0	108	GREY TILL
108.0	156	PURPLE/BEIGE LIMESTONE
156.0	166	RED/GREEN SHALE
166.0	236	WHITE SANDSTONE

WELL CONSTRUCTION

From	To(ft)	Const.Method	Inside Dia.(in)	Outside Dia.(in)	Type Material
0.0	20.0	CASING	15.0	16.0	T & C STEEL
0.0	180.0	BOREHOLE	13.8		
0.0	180.0	CASING	10.0	10.8	INSERT PVC
180.0	236.0	OPEN HOLE	9.8		
126.0	162.0	ANNULAR FILL	10.8	13.8	CEMENT/BENTONITE
0.0	126.0	SURFACE SEAL			BENTONITE
162.0	162.0	SHALE TRAP			OTHER

Top of Casing: 0.0 ft above ground

Figure 4. CWS permitted injection well Bru 92-8 at a quarry south west of Vivian 2021.
Illustration is by D. M. LeNeveu. Well information report was from Manitoba Groundwater

Well Bru 92-8 does not conform to the Sio Silica EAP sand extraction well design shown in figure 5.

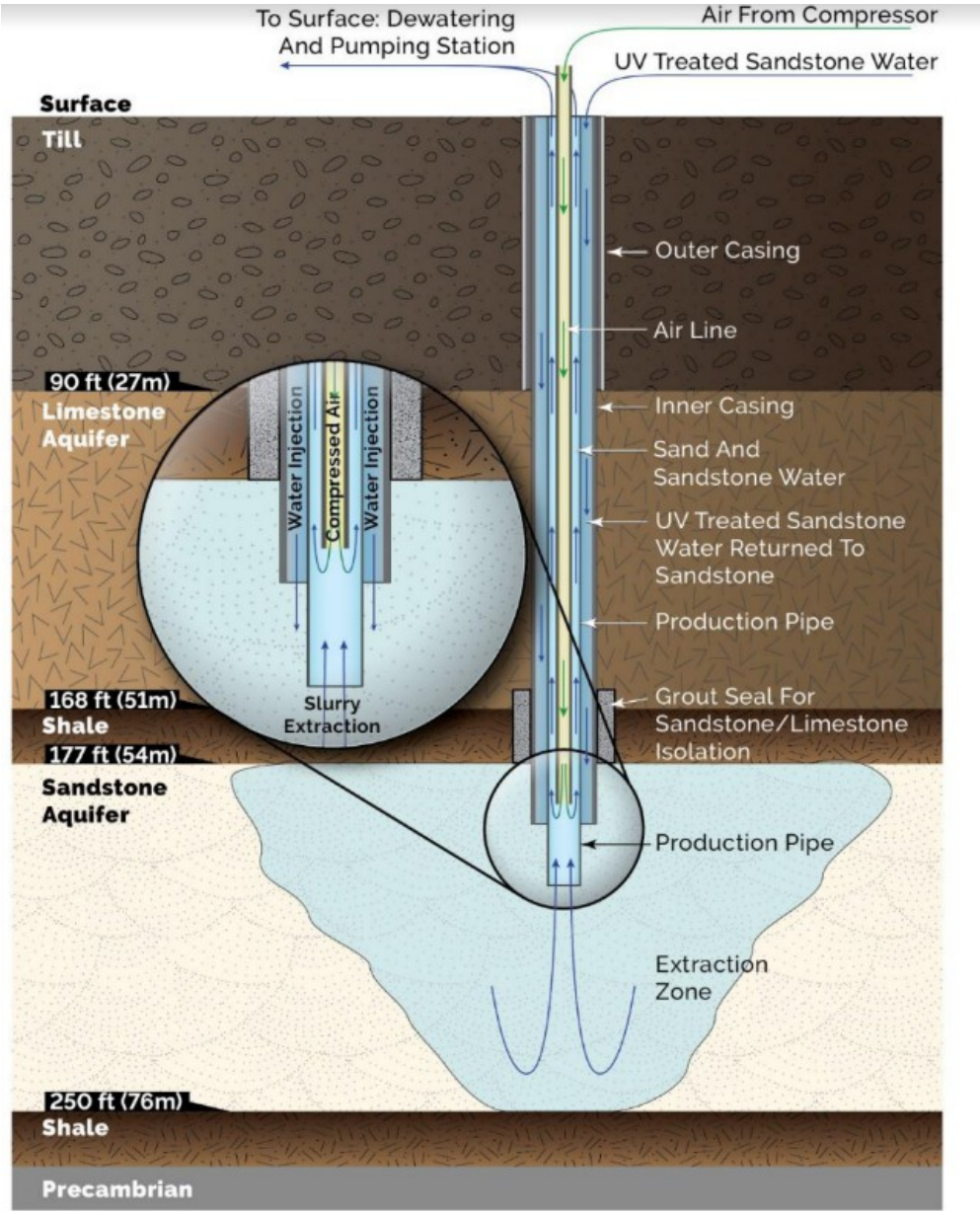


Figure 5. Sio Silica EAP well extraction design
"Reproduced from Figure 2-3 in the Sio Silica Supplementary Information – Extraction Method June 2, 2022"

There is no production casing extending into the sandstone formation for Bru 92-8. The Sio Silica design states that the production casing is removable. It is possible that the production casing was removed and therefore not shown in the well information report. In an email Manitoba Groundwater reported that the only extra casing penetrating deep into the sandstone was a casing around the well drill that was removed immediately after the well drilling was completed. The text of the email response of Sept.22, 2022 is given below.

"*Good Morning Mr. LeNeveu,*

Thank you for your inquiry regarding further information on the wells drilled for the Sio Silica Sands Project in Manitoba.

In regards to your questions about liners and the reporting of these, including the extraction method being utilized, I spoke with a company representative from Sio Sands for further information two weeks ago to clarify extraction techniques and whether there are well construction details which should be included in reporting. It was explained that there is no liner being utilized. Reportedly, when they extract the silica sand, a Dual Rotary Method is employed so the sand is removed via this dual drilling casing and upon completion, it is then removed. Therefore, this is not part of the permanent well construction material being installed so there is no requirement within our regulations for the drilling company to report this.

Specifically, regarding BRU 92-8, an injection well permit was issued for this well. Reportedly, the well was used as a test well for both injection and production and was eventually solely used as an injection well."

Therefore it appears not only was no production liner used, Bru 92-8 was eventually used solely for water re-injection. Use of an extraction well solely for re-injection does not conform to the Sio Silica extraction design and protocol. Without a production tube extending into the sandstone, process wastewater could not have been re-injected into the aquifer by gravity as per the Sio Silica well cluster extraction protocols and as shown in figure 5.

How was the process water returned to the aquifer during sand extraction? The only conceivable method would have been to store the water on surface and inject it under pressure in pulses between pulses of sand extraction. Limited storage would be available during production with five or more extraction wells operating simultaneously such that sole pressurized re-injection during production may not be feasible. Sole re-injection with no sand extraction did occur in Bru 92-8 as stated in the above email.

Pressure from sole re-injection may damage the shale aquitard and the limestone aquifer. Sio Silica has maintained that no direct pressurized re-injection of water occurs. Re-injected water according to Sio Silica design specifications is to enter the sandstone aquifer only by gravity flow aided by the negative suction pressure created by air lift. Such gravity fed re-injection has never been demonstrated and documented in field tests by Sio Silica. This is a critical feature of the sand extraction method. It is incomprehensible that the Project has progressed to this stage without documentation and proof of concept of this critical gravity fed re-injection methodology.

We must ask how the process water re-injected into Bru 92-8 was disinfected. In response to public comments for the Project Sio Silica stated

"*Not all wells were reinjected, as some well water was diverted to surface, and a permit was also issued for this. Re-injected water was treated with chlorination in accordance with CanWhite's application for the re-injection permit. Monitoring data was collected and would be made available to regulatory authorities upon their request*."

How much chorine was re-injected and how was it delivered. The well injection permits we have obtained from Manitoba Groundwater do not specify chlorine use. Is this not another instance of Sio Silica lack of credibility? Would not large amounts of chlorine injection have had a deleterious or unwanted effect on aquifer drinking water quality?

If Bru 92-8 and perhaps wells Bru 95-2 and 95-3 were the only instances of water return to the aquifer in all of numerous instances of silica sand extraction by Sio Silica over a period of five years or more, all the

excess process water was discharged to the land surface. Was all this process wastewater water diverted to the surface chlorinated? It has been established that the process wastewater carries large amounts of suspend fine sand and selenium and potentially, heavy metals and acid. The temporary authorization permits to divert water do not authorize chlorination or suspended fine sand, heavy metals acid or selenium. It is clear that the large amount of water diverted to the surface was never tested for deleterious substances; over at least five years of Sio Silica advanced exploration operations. Does this lack of testing of diverted water not destroy the credibility of Sio Silica and demonstrate that Sio Silica cannot be trusted to protect the aquifer and surface water?

If no production liner is used air must be directly injected into the sandstone aquifer during extraction. The large amount of injected air would greatly increase oxidizing conditions in the aquifers leading to a cascade of deleterious effects including iron and manganese precipitation, selenium dissolution from the aquitard, microbial proliferation, and oxidization of sulphide sources in the sandstone to acid and subsequent mobilization of heavy metals.

A video shot by a concerned citizen that is posted on an Our Line in the Sands social media site shows a pulsed extraction for well Bru 92-8. Air would be injected directly into the sandstone aquifer in a pulse and then shut off for a short time and then repeated. The injected air would then rapidly escape up the casing completed to the top of the sandstone, lifting the sand with it in a pulsed manner as shown in the video. This extraction method does not conform to the Sio Silica cluster design extraction design and methodology.

This evidence demonstrates that no full-scale Sio Silica field test of the EAP extraction design has ever been performed even for a single extraction well. The field test method implemented by Sio Silica in Bru 92-8 if used during production would seriously increase the risk of severe harm to the environment and the public.

The re-injection of process water has always been one of the major critical problems associated with the air-lift extra method. Sio Silica in its so called full-scale field test has never demonstrated and documented in the EAP the extraction method illustrated in figure 5. This fundamental operational problem of re-injection of process wastewater has never been resolved.

The only testing and data reported in the EAP Hydrogeological Report was for a meaningless draw down study from one well south of Vivian. The sampling for the geochemical analyses of the report was inadequate. Unacceptable sampling methods were used allowing samples to be exposed to air. There was no chain of custody from extraction to analysis for the silica sand samples. The samples were exposed air and to weathering. The entire Hydrogeological Report is inadequate and meaningless.

Friesen Drillers have conducted and reported on numerous drawdown studies in the Sandilands aquifer.[1,2,3] What did more we learn from the Sio Silica drawdown study? The aquifer recovers quickly from drawdown? Friesen Drillers studies have already established this.

In the Hydrogeological study there was no full-scale sand extraction and no water re-injected into the aquifer. The Hydrogeological study was not a field test of the Sio Silica extraction method. The study was deliberately misleading. The study gave no information on the full-scale Sio Silica well cluster design that has never been tested. No data has been documented in the EAP on the Sio Silica well cluster sand extraction. The Sio Silica claim that full-scale extraction testing has been completed is bogus as shown by the evidence submitted here. This critical deficiency must be addressed by full-scale field testing of the Sio Silica design including re-injection of water and testing of the UV filtration method as described in the Motion. Comprehensive measurements as described in the Motion must be performed and reported. It must be

emphasized that such critical field testing will never be performed with adequate independent technical scrutiny unless the Panel approves the Motion.

The full-scale geotechnical modeling Sio Silica refers to was documented in a Stantec report that was released in the response to public comments Jan.14, 2022, long after the filing of the EAP and the completion of TAC and public comments. Only an abbreviated public version of the Stantec report was documented on the Project registry 6119.00. The full Stantec report was available only to the third party technical advisors. Participants are required to sign a non-disclosure agreement to obtain access to the full report. Arcadis has determined that no proprietary information is contained in the report that would prevent public disclosure yet Sio Silica still refuses to publicly release the Stantec report. The Stantec analysis used the two dimensional software "FLAC." The Stantec geotechnical analysis was not for a full-scale well cluster array but only for a single extraction cavity opening. The Stantec analysis did not include the stability of the sand pillars between well clusters as is confirmed in the third party technical analysis. These are critical Project defects.

Analysis of the Stantec public version data on allowable long-term extraction cavity span using Manitoba Groundwater well information data, documented in the Motion, established that the latest Sio Silica well cluster design is invalid over the entire 24 year Project area. The well information reports show that the limestone thicknesses east to highway 302 are below the Stantec minimum limit of 15 meters therefore no extraction can occur east of highway 302. The information on the limestone thickness east of highway 302 was documented in the WTFMB public comments but these comments were ignored by Sio Silica. Sio Silica has not responded to the devastating analysis that the current well cluster design is invalid over the entire 24 year Project area.

Given the lack of credibility and lack of documentation demonstrated here it is clear that Sio Silica must have external independent monitoring and scrutiny to ensure adequate an acceptable testing and analysis is carried out. There is no post licensing mechanism to ensure such necessary independent technical oversight. We must remember what is at stake here. This is water that a large number of people drink, provide for their livestock and use for watering and irrigation. The substantial risk to the aquifer by unmonitored extraction and water re-injection cannot and must not be allowed to occur.

Item 35

Sio Silica states;

"*As noted in Section III above, it would be premature and unfair to Sio Silica for the Commission to significantly delay its review process before it has even begun in earnest, on the basis that Sio Silica needs to provide additional information which parties have the ability to request as part of the current Hearing process, and before Sio Silica has been able to test and fully respond to the technical information on which the Motion is based*."

Sio Silica has already stated that to gather the information requested in the Motion would entail a significant Project delay. The required information could certainly not be provided in the narrow time frame given to respond to IR requests. Sio Silica certainly would not have the time to test and fully respond to the technical information on which the Motion is based within the current time frame of the Hearing. Sio Silica has acknowledged that they require time to test and respond to the technical information as part of the current Hearing process. Thus the testing and responses required should not be delayed until after licensing as Sio Silica has earlier proposed. Which is it? The testing and information required will be delayed until after licensing or completed within the Hearing process?

I agree with Sio Silica that the testing and response to the technical information must be completed within the Hearing process. To fully address the information required for the Motion would require much more time than available in the current Hearing process. Therefore Sio Silica has itself established that the Hearing must be delayed until they can adequately respond to the measures and analysis prescribed in the Motion. The information, testing and analysis required in the Motion cannot be dismissed or delayed until after licensing. Sio Silica must determine the time that they would need to test and fully respond to the technical information and to complete the field testing and anlysis in the Motion and report the necessary delay time to the Hearing.

Item 36

I have already responded to the erroneous claim by Sio silica that the adequacy of Indigenous consultation should not be assessed until the government's ultimate decision on a Project, in the letter to the Hearing of Sept.6, 2022.

Chief Justice Loyal has established in his ruling on indigenous consultation for the Interlake flood mitigation Project that section 35 indigenous consultation must be held early in the Project approval process.[4]

Sio Silica has ignored my request to post on the Project registry a record of all the indigenous consultation that they have carried out. It is clear from the postings on the Project registry 6057.00 by the Métis and Brokenhead Nation that the necessary adequate proponent lead indigenous consultation has not occurred. Osler law is violating the requirement stated in their own posting in "*Doing Business in Canada*" by allowing their client to avoid proponent led consultation.[5] It would appear from the statement below in the posting that proponent led consultation is a legal requirement that cannot be ignored;

"*Despite consultation being a duty owed by government to potentially impacted indigenous communities, Project owners will be expected to carry out significant procedural aspects of consultation*."

Osler Law, to fulfil this legal obligation, should request a delay in the Hearing until the required proponent led consultation is completed.

To avoid any future legal action such as the Justice Loyal ruling, and to fulfil their mandate to provide Project comprehensive licensing recommendations, the Panel should delay the Hearing until Manitoba Natural Resources and Northern Development completes section 35 indigenous consultation.

Conclusion

The evidence submitted here and in the Motion establishes that critical Project information of significant environmental consequence is missing and must be provided to fulfil the Hearing Mandate. There is insufficient time in the current Hearing process for Sio Silica to provide the missing information and required analysis. The only means to ensure that the essential missing Project information will be provided is to delay the Hearing until the information is forthcoming. There is no means in the current process to ensure that the essential information will be provided after licensing. Licensing recommendations by the Panel are not binding and may not be implemented. There is no benefit to delaying the task required to provide the information as described in the Motion to after the licensing as the cost and time required would be substantially the same before licensing during a Hearing delay or after licensing unless inadequate or no testing and analysis is performed after licensing. The only means to ensure that the environmental and health detriments listed here would be mitigated is to require a Hearing delay until the six material actions of the Motion are completed and reviewed. In all likelihood the Project deficiencies will prove insurmountable and the Project must be abandoned before any further harm is done to the aquifer.

Osler Law, to fulfil the legal obligation for indigenous consultation in the Project planning stage, should request a delay in the Hearing until the required proponent led consultation is completed. To avoid any future legal action and to fulfil their mandate to provide Project comprehensive licensing recommendations the Panel should delay the Hearing until completion of Manitoba Natural Resources and Northern Development led section 35 indigenous consultations.

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