About Sio Silica and the Vivian Sand Project

Sio Silica Facts Matter series published January 12, 2022 in Manitoba's The Clipper Weekly

Have you met anyone from CanWhite Sands in person?

In November, we hosted an open house and invited people living close to our proposed silica sand processing facility. We were happy to meet those who came, but attendance was light. It could've been the Jets game, or possibly we didn't get the invitation into your hands. It was the first time our group got together in Anola to talk one-on-one with you about silica, and what we're doing in your neighbourhood.

The buzz in the community is mixed with some misinformation, some truth, and a lot of questions. We're aware of the concerns this ambitious silica extraction project is causing. To help dispel untruths and bring clarity, we're publishing a series of Clipper advertorial and hosting two open houses in January. For those we haven't met yet, we'd like to share a bit about our team.

Feisal Somji's (President & CEO) vision of Manitoba's potential silica sand deposit comes from his years of resource exploration. He started his career as a commercial pilot but soon discovered a desire grounded in the pursuit of responsibly transforming natural resources into everyday usable products. It may seem like Feisal has a lot going on, but his family and six-year-old twins are his priority. How he conducts business reflects on their future.

You may have met Brent Bullen and Laura Weeden in the field. Literally, in the field behind Vivian. They are CanWhite's Chief Operating Officer and VP of Operations respectively. They may reside in Alberta, but Manitoba is becoming more home-like as they spend incredible amounts of time here researching, studying, testing, and analyzing.

Brent has committed a lifetime to understand well services and mining. He's founded businesses and consulted worldwide on resource development projects. He married his middle school sweetheart and together they've raised a family. It's not lost on him the importance of commitment and doing a project of this magnitude right. The first time.

Culturally, we encourage our girls by telling them, they can be and do anything they set their minds to. Laura is a shining example of a strong young woman in the tough field of engineering. She's been winning awards for engineering excellence since 2016. She's thorough and committed to doing the best work possible. Laura has a long career in front of her and this project defines her future as well.

There are many more people that make up our team and we hope you get to meet them.

A lot has changed since 2016 when we began exploring southern Manitoba. We extracted samples from the sand formation looking for silica we already suspected existed. Honestly, at first, our idea was to harvest silica sand for the fracking industry (we'll talk more about fracking in a future advertorial).

Analysis of the core samples found the silica purity in this sand to be among the highest found anywhere in the world. We moved away from our original intent as this purity level of silica has a greater purpose. Only the purest silica can be used in technologies to create our medical glass, computer chips, cell phones, solar panels and more. Of course, these findings were exciting, but this meant a new strategy and new challenges. We began the transformation from the regional identity of CanWhite Sands to a brand design intended for the worldwide market, as Sio Silica. (Sio pronounced SEE-OH).

We were so focused on the science and figuring out an extraction process that we didn't pay much attention to how we were being perceived publicly. We have spent the last five years and millions of dollars engaging with accredited engineers,

hydrogeologists and professionals, meticulously researching and analyzing the extraction and processing of silica. It wasn't until August 2021 that we were able to provide an extensive peer-reviewed Hydrogeology and Geochemistry Assessment Report to the Province of Manitoba.

Our interest is more than this silica resource. Aside from the obvious benefits of economic development, the priority is the environment and you, the residents. The blunder we caused by clearing trees on our private land could've been handled better. We knew we wanted to commit to replanting what was removed. Unfortunately, at the time, the tree supply wasn't available. We've since ordered container-grown trees and will offer them to Anola residents this spring. With the hydrogeology and geochemistry study behind us, we're focused on our communication and community support. This past summer we made a significant investment in the Young Entrepreneurs of Springfield (YES) contest. We have given to the local food bank and we're getting involved where we can.

We don't expect these things to gloss over the real concerns of water contamination, subsidence and air quality, but to show our commitment to the community.

About Sio

〈 Interesting facts about silica

Privacy Policy

What accredited professionals say

Sio Silica Facts Matter series published January 19, 2022 in Manitoba's The Clipper Weekly

---

The proposed Vivian Sand Project is complex. Sorting through emotion, logic, unknowns, facts, controversy, and what-ifs takes serious effort. How do we trust the information we see on social media, the things we talk about over drinks, or what we read?

One way to check the integrity of information is to validate the source. When an "expert" speaks about a topic, what is their background? To what standard are they held accountable for what they say?

What does accreditation mean?

Professionals commit to supporting and upholding the standards within the industry they represent. The Engineers Geoscientists Manitoba Code of Ethics (https://www.apegm.mb.ca/ActBylawsCode.html) ensures that practitioners always apply their specialized knowledge and skill in the public interest. The health and safety of the public and protection of the environment are of utmost importance. Failure to uphold these standards has consequences. This is so we can trust accredited professional recommendations are objective and based on evidence-based knowledge, not emotion.

Let's dig a little deeper and identify the components that are driving the Vivian Sand Project initiative. These are the key stakeholders and the roles they play:

Consumers:

At its heart, this project is driven by peoples' demand for products that require silica. Lithium-ion & micro-porous batteries, special alloys, silica metals, solar cells, electronics, fibre optics, semiconductors, specialty glass, crucibles, medical and industrial research, aerospace, porcelain, cosmetics, rubber, coatings, adhesives, sealants, synthetic paper, foundation sand, investment casting, glass, recreational, water filters, energy and more...

Sio Silica:

A group of business professionals, scientists and engineers believe that Manitoba plays a key role in meeting the demand for silica. Manitoba has been a source of silica mining for over 100 years, and recent exploration has revealed a high-purity silica source. Rather than following the traditional open mining route, Sio Silica has chosen to conduct studies and design a less intrusive water well extraction method. The process is patent-pending and the development of a strategy for processing and distribution is underway.

Professionals involved - AECOM & Stantec:

Global professional consulting firms AECOM and Stantec were retained to proceed with in-depth scientific assessments of hydrogeology, geochemistry, geologic and geotechnical conditions. These accredited firms were chosen for their reputation and experience. AECOM, a trusted infrastructure consulting firm was named one of 2021 World's Most Ethical Companies for its commitment to integrity and making a positive impact by Ethisphere. Stantec is an international engineering and environmental leader who designs with communities in mind. Stantec was ranked as the No. 1 most sustainable corporation in North America by the Corporate Knights' 2021 Global 100 Most Sustainable Corporations. Stantec has also been named one of Canada's Best 50 Corporate Citizens.

Lead Scientists and Engineers:

- Marlene Gifford, M.Sc., P.Biol., R.P.Bio. Biologist, Environmental Assessor, AECOM
- Clifton Samoiloff, B.Sc., EP(CEA) Mining Market Sector Lead, Canada, AECOM
- Ryan Mills, M.Sc., P.Geo. - Senior Hydrogeologist, AECOM
- Steve Bundrock, P.Eng., Manager, Geotechnical Engineering, Stantec
- Arash Eshraghian, Ph.D, P.Eng., P.E., Senior Geotechnical Engineer, Stantec
- Wilhelm Greuer, Ph.D., Senior Geotechnical Reviewer, Stantec

- Keith Wilson, P.Eng., Manager, Mining and Geoscience, Stantec

Peer reviews:

The peer-review process subjects Sio Silica's methods and strategies to the scrutiny of experts in the same field (peers). The professionals providing the peer review are paid for their time, but this does not influence "favourable" feedback. Their reviews are conducted with a professional unbiased perspective to verify the methods and conclusions reported.

- Expert Peer Review of Draft Hydrogeological Assessment Report www.gov.mb.ca/sd/eal/registries/6119/appendix_b.pdf
- Jeff Bell, B.Sc. (G.E.), P.Eng. Hydrogeological Engineer, Friesen Drillers
- Dr. Grant Ferguson (Ph.D., Pgeo, Eng.) Centennial Enhancement Chair in Groundwater-Energy-Good Nexus; Professor; Civil, Geotechnical and Environmental Engineering; Joint Professor, School of Environment and Sustainability

Public questions and opinions:

Manitoba regulates and reviews the Environment Act Proposals. All public questions and concerns are compiled with responses. The Province then carries out its own review through a Technical Advisory Committee (TAC) which is made up of scientific and regulatory experts from government departments. TAC and public responses for the Extraction and Facility Projects:

- Extraction - www.gov.mb.ca/sd/eal/registries/6119/
- Facility - www.gov.mb.ca/sd/eal/registries/6057canwhite/

We've hosted online information sessions and in-person open-houses. We will not engage in online speculative banter. We'll provide you with all available information and resources and trust you'll form your own opinion after careful analysis of the facts presented.

Municipal, Provincial & Federal regulatory bodies:

How we interact within our environment is evolving and so are laws and regulations within our country, province and municipality. In the past, large corporations might have been able to get away with things to suit their agenda. Today, there are processes, permits, permissions and many benchmarks to reach, for an initiative like the Vivian Sand Project to pass. This is a good thing. We need to ensure the

accountability and integrity of all stakeholders to preserve our environment for generations to come.

- Environment Act License
- Extraction Project: Manitoba Conservation and Climate Environmental Approvals Branch- Facility Project: Manitoba Conservation and Climate Environmental Approvals Branch
- Clean Environment Commission hearing by Manitoba Conservation and Climate Minister
- RM of Springfield: Applicable municipal permits including building permits

To meet the public demand for silica-based products, responsibly and ethically, we're consulting with accredited professionals. They will help to authenticate findings, define or redefine processes where necessary, and to provide guidance.

About Sio

Manitoba's Formations

Interesting facts about silica

Privacy Policy

What will it be like at an extraction site?

What will life be like living near an active extraction site? The following are some questions you've asked.

Where will Sio start extracting silica?

Initial production will be on an existing aggregate site, then will expand within three miles of the proposed facility. Sites located on private land will have land access agreements with landowners. Landowners will receive financial compensation.

How much time does this take to extract the silica?

Each silica extraction site goes through three phases: well drilling, extraction, and completion. The total accumulation of days working on one well will be less than two weeks. A site is anticipated to be active from 2 - 4 weeks.

What equipment is used?

Sio uses equipment standard to the water well drilling industry. Sio is working to implement dual fuel equipment allowing the eventual switch to electric operations while extracting.

Where are the wells drilled?

Wells are not drilled next to infrastructure, structures, roadways, or utility allowances. Locations are determined in consultation with the property owner in the access agreement.

What time frame will you work?

Extraction will happen from mid-April through November weather dependant. Well drilling can happen throughout the year. Well and reservoir monitoring operations are active year-round 24 / 7.

What is the actual extraction process like?

The extraction method is similar to what is used to service your water well. A separate production pipe is placed in the well right to the top of the sand. Compressed air is introduced inside this pipe. The air rises in the production pipe creating a suction which brings the sand, water and air up to the surface. At the surface sand is separated from water and the water is filtered and sterilized using UV technology as a precaution, then the clean water is returned through the same well to where it came from.

How is the sand transported from the site to the facility?

A slurry line approx. 35 cm in diameter will carry silica sand and water to the facility. They will run along private landowners' properties with agreements and cross roadways with permission from Manitoba Infrastructure. The lines will not obstruct traffic. They'll be equipped with leak detection systems, automated shut-off valves and signalling to allow isolation in the unlikely event of a leak.

When the site operation is complete, what happens next?

Sio is committed to leaving sites in equivalent or better condition than prior to extracting. Surfaces will be revegetated with native species and monitored for regrowth. Wells will be abandoned as per government regulations.

What's not being used during extraction?

- Water. We don't need water to extract the sand. Water is a by-product of extraction, which is why it's returned to the aquifer.
- Chemicals. No chemicals are used to extract.

- Oil. There is no risk of oil contaminations as it isn't used to extract sand.

  Sand stays wet and contained the whole time. It won't float around in the air or pose a risk to people or animals.

Every update we make is designed to protect the environment and improve the experience of the people living close to an active operating site.

Processes

〈 Safe Water - Monitoring

A Year in Review and Welcome 2023! 〉

Privacy Policy

A Year in Review and Welcome 2023!

May this year bring you more opportunities, deeper understanding, and meaningful connections.

Taking the time to reflect annually on our life's journey is enlightening. It helps remind us of what's important. It highlights our accomplishments, mistakes and progress.

The Sio Silica project is an ambitious one. Reflecting on our actions and the perceptions created is how we grow. Our journey is public. It's judged on environmental, local, and worldwide stages. Every meeting, whether it's in person, over the phone, Zoom, town hall, or public hearings, is designed to inform. We're sharing the impacts and benefits Sio Silica will have on your life and on future generations.

In 2022, Sio Silica started publishing the Sio Silica Fact Matter series. It's one of the ways we chose to talk about the issues you've voiced. We met with council members from nine municipalities. We've connected with business and construction associations. We've had in-person meetings with key representatives locally, provincially, and federally.

Our processes are continually analyzed, assessed, and refined. As our procedures, technologies, and communications evolve, it safeguards the health of the water, the ground, the air, the environment and you.

To launch 2023, we invite you to subscribe to the Vivian Sand Project newsletter. We'll email you directly (it's FREE) with relevant news and activities. If you have a question or comment that needs personal attention, "Ask Brent".

You may be asking yourself, "Who's Brent?" If you haven't already met Brent Bullen or Brent Belluk this is a glimpse of their roles in Sio Silica:

Brent Bullen has served over 38 years in energy and construction projects. He's founded businesses and consulted worldwide on resource development projects. As Chief Operating Officer he knows every aspect of the operation.

Brent Belluk has come on board as General Manager in Manitoba. He's a lifetime resident of Springfield and built his career in Agribusiness and Construction industries.

About Sio

〈 What will it be like at an extraction site?

Monitoring Water 〉

Sio SILICA

Privacy Policy

Decarbonization - Net Zero

The world needs a climate solution and Manitoba silica is a key input to that solution.

The world has a net zero goal for 2050. Countries, governments, and companies are working hard to align with this initiative.

Success will be achieved through collaboration, innovation, technology, and input supply.

The world needs a climate solution and Manitoba silica is a key input to that solution.

At Sio, we have identified the resource, brought innovation and technology, and have worked to bridge collaboration for over three years to position Manitoba as a global supplier of decarbonization, e-mobility, and green energy solutions. This can be done safely while protecting the environment.

Manitoba has one of the highest purity deposits in the world. This will ultimately bring new industries to Manitoba, jobs for current and future generations, and economic growth supporting Manitobans.

Manitoba has the means and resources to advance industry aimed to resolve the climate problems identified. This is why Sio will continue to openly address the public comments from our critics

and supporters through a series of advertorials, YouTube, and website postings on www.viviansandproject.com.

Please contact us at info@viviansandproject.com with questions or for more information.

Environment & Economic Development

〈 We've heard you loud and clear.

Introduction 〉

SiO SILICA

Privacy Policy

Economic Development

Manitoba Canada is positioned to supply the worldwide demand for silica-based innovation.

Consider the cost of the silica, the cost to transport the silica and the cost to convert the silica to an end-product. Manitoba has the trifecta for environmental, economic growth:

1. Manitoba sits on one of the purest silica deposits in the world.
2. Logistically, it's situated in Canada's largest transportation hub.
3. Manitoba has access to green hydro energy for conversion.

This initiative checks the ESG boxes - Environmental, Social and Governance

Manitoba Canada has direct access to one of the largest resources to supply in-demand industries for:

- Low iron float glass
- Photovoltaic cells (Solar panels)
- Tire and rubber compounds
- Smart Glass (any touch screens like a cell phone)
- Medical glass (such as vaccines)
- Electronics
- Lithium-Ion Batteries

Manitoba Canada is positioned to supply the worldwide demand for silica-based innovation.

#viviansandproject

Be sure to watch for more information videos to come.

Please contact us at info@viviansandproject.com with questions or for more information.

Environment & Economic Development

〈 Subsidence

Springfield's Water Wells 〉

Employment

Sio Silica Facts Matter series published February 9, 2023 Manitoba's The Clipper Weekly

We want you to join our team.

Thank you for your enquiries. Sio receives enquiries daily, and we are excited to receive them. We can assure you that all enquires and resumes received through our websites are kept on file for contact and interview when employment positions open.

Sio will require team members in all the below areas;

- An Environmental Team
- Environmentalist
- Hydrogeologist
- Local Geologist
- Safety Team
- A logistics Team
- Inventory Team
- Product Q & A and testing
- Lab Manager and Support Staff
- Operations Extraction Team
- Operations Processing
- Operations Reclamation & Monitoring
- Operations Repair & Maintenance
- Administration

- Accounting
- Equipment Operators
- Heavy Equipment Operators
- Drivers
- Millwrights
- Electricians
- Mechanics
- Welders
- Drillers
- Helpers

Indirect employment and supplier partnerships will benefit from Sio's estimated supply service spend of $55 million annually to operate the Vivian Facility. The supply demand ranges from equipment maintenance, consumables, services, transportation, utilities, etc. It's estimated 250-500 jobs will be created or positively influenced through vendor associations and supply contracts to the operation.

Sio Silica is committed to jobs, education, research and discovery.

Sio Silica is an equal-opportunity employer. We are Environmental, Social, and Governance (ESG) compliant.

Contact Sio Silica if you're interested in employment.

About Sio

Extraction Demo

Privacy Policy

Interesting facts about silica

Sio Silica Facts Matter series published January 12, 2022 in Manitoba's The Clipper Weekly

Fumbling for my phone on the nightstand, I flip open the cover and 5:43 a.m. lights up the room. May the rituals of the morning begin. First stop, the bathroom. I don't often think about it, but the neighbour I knew as a kid still uses an outhouse, and the third-world places I've visited some only have a hole in the ground. My porcelain throne isn't the only thing I can't live without. The window I point my fob at to start my car this chilly morning are things I simply expect to be there. I get it, you may not have a fob, but I'll bet you have a window.

Let's talk about how silica is a key ingredient. We need it to make glass windows, house foundations, building insulation, brick siding, ceramic coffee cups, computer chips, medications, gravel roads, cell phones, kitty litter, porcelain toilets and other things we take for granted daily.

Silica is found pretty much everywhere, but not all silica is equal. Low purity forms are used in construction and higher purity is used in advanced technology. Silica sand is a naturally occurring mineral found worldwide. There are deposits of silica sand in Manitoba when processed, are up to 99.9 percent pure. This level qualifies for use in renewable energy products, high-grade glass, electronics and much, much more.

All sand contains varying levels of silica, this table illustrates the differences in the purity levels:

Regular Sand

Known as: Feldspathic, brown or construction sand.

Content: Up to 85% SiO2* and varying amounts of impurities (iron, carbonate, potassium, and other trace minerals/elements).It's impurities give it a darker colour and it's more chemically reactive.

Colour/Shape: It's impurities give it a darker colour and it's more chemically reactive.

Uses: Golf course, industrial abrasive, paint & coatings, ceramics, construction materials, fracking roads.

Silica Sand

Known as: Quartz, white or industrial sand (mostly made of silica and oxygen).

Content: The main elements are silica and oxygen. It's made up of 95% or more SiO2*.

Colour/Shape: Often white or colourless. Uniform shape and size.

Uses: Entry-level glass and industrial quartz applications.

Processed Sio Silica

Known as: Crystalline quartz

Content: Less than 0.1% total trace contaminates or elements.

Colour/Shape: Often white or colourless. Uniform shape and size.

Uses: Advanced manufacturing, electronics, decarbonized applications including, renewable energy products, high grade glass photovoltaics.

Manitoba's silica deposits were first reported in 1859, and the following deposits have been identified and explored:

- The Pleistocene Libau-East Mars Hill deposit supplied sand to an on-site glass plant for five years in Beausejour starting in 1906.
- Black Island in Lake Winnipeg, close to Hecla was claimed in 1910, and development started in 1929. Mining and silica shipments to Selkirk have been facilitated by different companies over the years. The quarry currently continues to operate during the summer months.
- Since 1936, the Swan River Formation's (Cretaceous age) silica-rich sands have been used for binding due to the clay content.
- In the 1970s Brokenhead Quarry began providing silica sand to Red River Brick and Tile in Lockport. The Manasan Quarry (close to Thompson) supplies silica flux for a smelter in Thompson and the Tanco Mine (close to Nopiming Provincial Park) produces quartz.
- The quartzite in Churchill meets specifications for silicon carbide, ferrosilicon, and various fluxes, but is not currently being sourced.
- The Winnipeg Formation (Ordovician age) contains the largest reserve of high silica material and has been studied the most.
- Springfield has Sio Silica target being the Carmen Sand Member of the upper Winnipeg Formation.

The extraction of natural resources in Canada has changed over the years. Mining companies are not allowed to take a resource and leave with no accountability. Before an operation begins, it must prove to be safe for the environment and the people in the area, and there must be an exit strategy. This means after the resource is harvested, the land (including facility locations) must be restored and reclaimed.

Sio Silica takes the responsibility of extracting silica sand seriously. We've studied and consulted with qualified professionals to develop comprehensive strategies and systems. We expect to become the world's most responsible and environmentally friendly producer of high purity silica.

Current supply chain problems show that our reliance on foreign countries means long waits and short supply of many products. Manitoba Canada is blessed to have water, agriculture, and silica resources available. To strengthen our self-reliance by manufacturing at home; we need to do it in a way we can live with and be proud of.

Sio Silica is offering transparency and we’re striving to build long-term positive relationships with you and Mother Earth.

About Sio Silica and the Vivian Silica Project

Sand & Subsidence

〈 What accredited professionals say

About Sio Silica and the Vivian Sand Project 〉

Privacy Policy

In the Community

Sio Silica is aware of the importance of their environmental footprint and the relationship with communities near

The facility is designed to operate around as quietly as possible and uses directional lighting. The sand is moved through slurry lines from the extraction area to the facility to eliminate the need for truck traffic. This method is safe, efficient and if the operation needs to stop for any reason the slurry line is designed to stop and start again without any need to discharge contents on the ground. Super sacks are used to transport the silica sand once ready for shipping. Sacks provide a way to

the facility and drill sites.

protect the environment as well as the sand from the elements.

There are strict environmental standards governing every aspect of our operation. Sio Silica continually looks for ways to exceed these standards. The requirement for reliable communication, gas, electrical and transportation infrastructure will be implemented at our cost. These resources will be available to the community through Manitoba's utility providers.

Be sure to watch for more information videos to come.

Please contact us at info@viviansandproject.com with questions or for more information.

Video ▪ Environment & Economic Development

〈 Springfield's Water Wells

Keeping the Aquifers Fresh, Clean & Safe 〉

SILICA

Introduction

An overview of what you need to know about silica and the Vivian Sand Project.

Silica is used as an everyday building block in societies around the world. Some examples:

- Renewable energy (solar panel production, rechargeable batteries)
- Electronics (cellphones, computer chips)
- Telecommunications (fibre optics)
- Medical glass

Sio Silica ranks as an Environmental, Social, Governance (ESG) company. These standards show how well a corporation performs as a steward of nature and manages its relationships.

An accredited team of engineers, hydrogeologists and professionals spent close to five years meticulously researching and analyzing the extraction of silica in Manitoba, and millions of dollars were invested. In addition, an extensive Hydrogeological & Geochemistry study was complete and submitted for peer review to a highly respected and recommended Canadian professor with a PhD in Hydrogeology as well as a successful and high regarded Manitoban Hydrogeologist.

Be sure to watch for more information videos to come.

We welcome your questions and comments at info@viviansandproject.com

Video ▪ About Sio

〈 Decarbonization - Net Zero

The Aquifer 〉

Keeping the Aquifers Fresh, Clean & Safe

Sio Silica Facts Matter series published February 9, 2022 in Manitoba's The Clipper Weekly

---

There have been many questions about how our activity will affect your water. In this advertorial, we'll explain Sio Silica's activities and why the two freshwater aquifers will continue to provide safe, clean water.

Your questions have been thorough, including concerns about the introduction of oxygen, pH levels, heavy metals, mixing of the two aquifers, water quality, chemical and microbiological contamination. For more in-depth responses to your questions please visit Environment, Climate and Parks' Public Registry (https://www.gov.mb.ca/sd/eal/registries/6119/index.html).

The process

The airlift method used to extract the sand is commonly used in water well drilling throughout the world. Our process uses a closed-loop system and is in continuous flow. This keeps extracted water and sand from exposure to contaminants such as external sources of water, organic material, or biological pathogens. As an additional step, the water returned to the aquifer goes through UV sterilization. UV systems are widely used for municipal potable water including Winnipeg. Sio Silica doesn't use any harmful chemicals during sand extraction or processing. When we're finished, we follow the provincial standards to decommission the wells and reclaim the surface by reseeding with native seed mixes and other replanting if required based on the Revegetation and Monitoring Program.

The equipment

The equipment and materials used are proven safe and are standard in the water well industry. Sio Silica's air compressors are oil-less, therefore contact with these materials will not affect water quality. The wells will be installed by licensed contractors. They are designed to prevent surface runoff into the wells and follow provincial regulations for water well construction.

Oxygen – heavy metals, pH, barium, selenium, arsenic, boron

The concern about an excess of oxygen in the water is that it can produce acid rock drainage (ARD) and leach metals from surrounding rocks (the aquitard layer).

All reinjected groundwater goes into the Sandstone aquifer and the well is sealed through the shale and Carbonate aquifer to prevent interaction between them. The water returned to the aquifer after UV treatment may contain a very small volume of dissolved oxygen, however, it will not negatively impact the groundwater quality.

Laboratory testing found sulphide minerals (i.e. pyrite) were at levels that were either very low or below the lowest concentrations that could be measured. Any changes in pH would be neutralized by the naturally occurring carbonate or silicate minerals that are present in the geological layers.

Any shale within the Sandstone aquifer or materials sensitive to oxygen if brought to the surface, will be separated, and managed in accordance with the Material Characterization and Management Plan. Thus, any trace elements (including barium, selenium, arsenic and boron) contained in the shale will not pose a risk to groundwater quality in the aquifer.

Mixing of the aquifers

There are residential wells that screen across both aquifers and have allowed for the mixing of waters. This was a historical drilling practice and common at one time. Over the last 130 years, drilling techniques have progressed where wells are now usually drilled into one or the other aquifer. Most wells around Sio's proposed project are in the Carbonate (limestone) and not the Sandstone.

It is standard industry practice when a well is installed in the Sandstone aquifer to seal it. Sio Silica extraction wells are designed to prevent aquifer interconnection, surface runoff and precipitation from entering the well. Boreholes are sealed with industry-accepted grout/cement mixture that provides both stability (from the cement) and sealing properties (from the bentonite grout) to establish a competent seal in the shale layer and up into the carbonate (limestone) that provides both structural integrity and hydraulic sealing properties.

Water quality

The concentration of dissolved solids in water determines if it is classified as “Fresh”, “Brackish”, or “Saline”. Sio Silica will be in an area where both aquifers are classified as “Fresh”. The shale aquitard and proper well construction and sealing practices prevent the upward artesian flow and the exchange of water between aquifers. Artesian conditions are not present within Sio’s focus area, therefore there is little to no driving force for the exchange of water between aquifers.

Monitoring and mitigation

Water quality in the Carbonate and Sandstone aquifers will be monitored before, during and following operations to confirm that water quantity and quality are preserved in conjunction with a Groundwater Monitoring and Impact Mitigation Plan. The results will be evaluated by a professional hydrogeologist or geochemist with experience evaluating water quality, with results provided to regulatory agencies for review.

In summary, Sio Silica will not contaminate the Carbonate and Sandstone aquifers and water quality is not anticipated to be materially affected by these operations.

Water

〈 In the Community

That “F” Word (Fracking) 〉

Manitoba's Formations

Sio Silica Facts Matter series published January 26, 2022 in Manitoba's The Clipper Weekly

---

Some have asked, "why are you here?" In a nutshell, specific formations in Manitoba contain the most pristine silica deposits in the world. More precisely, Springfield is part of the upper Winnipeg Formation which is one of the locations of this high-purity silica.

To help visualize the areas Sio Silica is interested in, this article expands on these formations and how they came to be.

At one time, Manitoba was part of an inland sea of warm water and pristine sand. This was around 480 million years ago during the Ordovician age. Dramatic climate changes and glacial events during the Quaternary period (the past two-plus million years) created the geological formations we have today:

- Quaternary till (surface boulders, sand, gravel and clay)
- Red River Carbonate Formation (limestone aquifer)
- Red River Shale aquitard (a barrier between the limestone and sandstone)
- Winnipeg Sandstone Formation (sandstone aquifer and target for Sio Silica)
- Precambrian granite (bedrock below the aquifers)

The **Red River Carbonate Formation** is limestone (sedimentary rock), and this formation is now a freshwater aquifer (body of rock that holds groundwater), covered by Quaternary till. The limestone aquifer is the most common source of drinking water in the area around Sio Silica's project activities.

The **Red River Shale Aquitard** (or the Winnipeg Shale) is a protective layer below the Red River Carbonate Formation and is a critical divide between the two freshwater aquifers: the Carbonate aquifer and the Sandstone aquifer. This aquitard varies in

colour from emerald green to dark brown or red. In the areas that Sio Silica has explored, the thickness is typically 3m, but literature reports anywhere from 1m to 24m thick.

Below the Red River limestone aquifer, and shale aquitard is the **Winnipeg Formation.** It sits above the Precambrian granite basement bedrock. This formation consists of three main members in southeastern Manitoba. The **Carman Sand Member**, the **Ice Box Member** and the **Black Island Member**. Their order is based on different geological time periods and associated rocks. (See the lithology table below.)

The **Carman Sand Member** represents an east-west trending bar-like sand body. It was deposited in a shallow marine environment during a global sea level rising event. This is where the silica sand has been found, and where Sio Silica is targeting.

The **Icebox Member** shale provides a division between the overlying Carman sand aquifer and the underlying Black Island Member.

The Black Island Member sandstone overlies the Precambrian granite basement.

EON	ERA	Period	Geologic Unit	Member	Lithology
Phanerozoic	Cenozoic	Quaternary			Diamicton
	Paleozoic	Ordovician	Red River Formation	Silkirk, Cat Head, Dog Head Members	Carbonate
			Winnipeg Formation		Shale
				Carman Sand Member	Sand
				Equive. Ice Box Member	Shale
				Black Island Member	Sand
Archean					Granitoid

This silica sand has been around for millions of years. Geologists and scientists have been exploring Manitoba for over 100 years. This is how we know so much about the locations and abundance of sand. Sio Silica is here because this is one of the rare places in the world such pure silica sand deposits have been confirmed.

Sand & Subsidence

Residential Water Wells

What accredited professionals say

Monitoring Subsidence

Monitoring Subsidence

December 2, 2022

Monitoring Subsidence

Sio Silica will anchor extensometers to the limestone and place piezometers in the till and on the surface to record 24/7 monitoring. If anything is detected, activity can be adjusted and the data is kept for long-term reference.

As a part of the Geotechnical modelling work, a 100-year long-term stability projection was incorporated to ensure no subsidence. Sio has consulted with

engineers and will install sophisticated monitoring equipment. Accuracy measurements can record 1 mm and less of movement.

Please contact us at info@viviansandproject.com with questions or for more information.

Hydrogeology and Geochemistry Assessment Report https://www.gov.mb.ca/sd/eal/registries/6119/index.html)

Sand & Subsidence

〈 Monitoring Water

Introduction to Subsidence 〉

SiO SILICA

Privacy Policy

Monitoring Water

Monitoring Water

December 6, 2022

Monitoring Water

Protecting the aquifer is at the heart of everything

Our Groundwater Monitoring and Impact Mitigation Plan will be filed with the Clean Environment Commission (CEC). To proceed, this plan MUST be approved by the Government of Manitoba.

This is just one of many processes we must follow to ensure the safety of the water and surrounding environment.

we do. That is why monitoring is at the core of all our activities.

Prior to any activity, nearby landowner wells will be surveyed by 3rd party hydrogeologists and experts. Sio will also install monitoring wells between Sio's operations and private residences so that water levels can be monitored at a distance. Monitoring wells will be used to monitor water quality 24/7 and water quality before during and after extraction in the sandstone and limestone aquifers.

Should a concern arise, a 24-hour contact number will be available. Though it's not expected to occur, if a water quality or quantity issue is detected, Sio will mitigate immediately. This may involve a short-term cease of operations, modification of extraction operations, lowering the water pump in the well affected, and/or a temporary external supply of water. It is important to note, Sio will only be active in the sandstone aquifer. Most wells in the area are in the limestone and till, with only a few in the sandstone.

When the operation is complete, each extraction well will be safely sealed and abandoned as required by provincial regulations. Some monitoring wells will remain active as part of long-term monitoring. Annual reporting will be available to the public. These reports are prepared by a 3rd party with qualifications in hydrogeology and geochemistry.

Hydrogeology and Geochemistry Assessment Report

https://www.gov.mb.ca/sd/eal/registries/6119/index.html)

Water

A Year in Review and Welcome 2023!

Monitoring Subsidence

Privacy Policy

Residential Water Wells

Brent Bullen of Sio Silica explains the different types of residential water wells and the natural fluctuation of water levels within the aquifer during

The silica sand extraction activities occur in the sandstone formation which is below the limestone (carbonate) and shale aquitard. The shale aquitard acts as a natural barrier between the limestone and sandstone aquifers.

Most residential wells in this area sit in the limestone (carbonate) which is above the shale aquitard and the sandstone aquifer where the silica sand is found. Some wells in the limestone extend deeper, into the sandstone and are actually screened across both the

wet and dry seasons.

limestone and the sandstone aquifer. Historical drilling practices and published literature (Betcher and Ferguson 2007) indicate that over 10,000 water wells in the public database have been installed across both aquifers.

Shallow wells drilled into the till rely on surface runoff and are more easily affected by the conditions of flood and drought. High rain and flooding can cause turbidity or cloudiness in the water. During extended periods of dryness, water levels may drop below where the water pump in the well is installed that brings water up to the surface and into your house. Sometimes, the way a well is installed and due to its age, it's not as simple as just moving or putting in a new pump, and this is why you hear about people having to re-drill their wells.

Groundwater naturally fluctuates throughout the seasons with up to 10 ft of fluctuation in the sandstone and 8 ft in the sandstone annually. The lowest groundwater elevations are typically observed during late winter months prior to spring snowmelt and highest in the spring after snowmelt.

#VivianSandProject

Please contact us at info@viviansandproject.com with questions or for more information.

Water

That “F” Word (Fracking)

Manitoba’s Formations

Privacy Policy

Safe Water - Monitoring

Sio Silica Facts Matter series published February 2, 2023 in Manitoba's The Clipper Weekly

---

The aquifers will be safe because of Sio Silica's,

- stringent protocols,
- advanced technology; and
- independent third-party oversite.

Sio's active monitoring of the aquifer is our commitment. Baseline and regional data will be collected and our advanced multi-data sensor monitoring equipment will track key parameters which may include the following 24/7:

- Conductivity
- Temperature
- pH
- Water level
- Pressures
- Turbidity
- Oxygen
- Flow

Data will be collected with independent third-party monitoring software including cloud backup systems. Sio will always have monitoring established between its operations and domestic wells. We'll be able to detect any problems with water quality or quantity. Though we don't expect issues, this allows us to take appropriate action before domestic wells are potentially impacted. We'll have

cellular and satellite communication with our sensors and the data and real-time alarm if there is any tampering with equipment.

In addition to the monitoring probes, there is independent third-party lab water sampling and testing. We're in negotiations to establish an independent monitoring company that will provide oversite, transparency, and authority to act on well data. In short, Sio will have independent oversite, the ability to instigate operational stop and mitigation protocols should monitoring show an issue. The monitoring program must be approved by the province prior to operation and is developed by experienced third-party entities.

Water

We've heard you loud and clear.

Will my water be safe?

"Will my water be safe?" Sio Silica is asked this question in so many ways. In-person, by email, mailers, letters to the government, social groups, you name it, everyone wants to know the answer. Yes, your water is safe.

Earlier this year we started talking about what we're doing through The Clipper, and our YouTube Channel, The Vivian Sand Project. When the Clean Environment Commission (CEC) hearings were announced, we pulled back on these communications. Doing so left a void for people to speculate. Frankly, some of the information flying around is completely false.

The CEC hearings are just around the corner, scheduled for early 2023. This forum will reveal truths and separate misinformation.

In the coming months, Sio will be focusing on providing you accurate information in a variety of ways. Our website viviansandproject.com is a portal to written information, diagrams, videos, timelines, events and more. If you are afraid of what we're doing, if you want to know what we're up to, if you are intrigued by how we can help in your day-to-day, we encourage you to subscribe.

Concerns about water safety, subsidence, monitoring along with long-term employment, supplier partnerships and community involvement are the topics you'll discover in the Facts Matter advertorials and videos. Sio Silica is an important opportunity for Manitoba. As a resident, you owe it to yourself to get the facts.

Sio Silica knows your water is safe. Let us prove it to you. Watch and read the Facts Matter pieces over the coming months so when someone asks you, "Do you think the water will be safe?" You can confidently say, "yes".

Water

Introduction to Subsidence

Decarbonization - Net Zero

Privacy Policy

The Extraction Process

Learn about the technique of drawing sand containing the silica from underground to the surface.

Inspired by the water well industry, the Sio Silica Sands team implemented this proven method of using air to lift sand to the surface, as a way to extract the silica. First, a water well is drilled to the top of the formation, then a production pipe is placed inside the well for suction. A third tube, filled with air creates a circulation that brings the sand bubbling to the surface where the water is then separated from the sand and allowed to flow back into the formation.

Please contact us at info@viviansandproject.com with questions or for more information.

Hydrogeology and Geochemistry Assessment Study https://www.gov.mb.ca/sd/eal/registries/6119/index.html)

Processes

〈 The Aquifer

Subsidence 〉

The Aquifer

The silica deposit resides in Manitoba's freshwater aquifer.

UV light treatment for cleaning water is a highly regarded technology used around the world. It can sterilize the water to a level not requiring the addition of any chemicals.

The use of monitoring wells provides an elevated standard of observation to monitor what is happening in the formation. CanWhite Sands uses scientific, proven technologies to implement robust, safe, and efficient systems for extracting silica and maintaining the integrity of the water.

Please contact us at info@viviansandproject.com with questions or for more information.

Hydrogeology and Geochemistry Assessment Report https://www.gov.mb.ca/sd/eal/registries/6119/index.html)

Water

〈 Introduction

The Extraction Process 〉

SILICA

Privacy Policy

Springfield's Water Wells

Sio Silica Facts Matter series published February 16, 2022 in Manitoba's The Clipper Weekly

As a Springfield resident, your water source depends on where you live.

Public water supplied to Dugald, Anola and Oakbank come from either the Sandstone or Moosenose Aquifer (rmofspringfield.ca/p/municipal-water-systems). Some townspeople and all rural homeowners draw water from their own private wells.

Water well drilling in Manitoba started in 1892. Years ago, wells were hand-dug or constructed by driving a pipe into the ground. Some wells still have cribbing that goes to the frost line to allow the homeowner access to the piping.

Today, most wells in the area are drilled to a depth of about 30 metres (100'). They are referred to as **surface**, **sand and gravel** or **shallow** wells if they draw water before reaching Carbonate (limestone) aquifer. Depending on the pressure in the area drilled, some wells are artesian, causing water to come to the surface. This can occur year-round, or during periods of higher water levels like the spring.

Wells drilled into the **Sandstone aquifer** have a screen to hold back sand from coming back into your well and damaging your pump. If your well is in the **Carbonate (limestone) aquifer** a screen isn't usually needed.

The natural fluctuation of water levels is lowest in late winter and highest in spring after the snowmelt. After several exceptionally dry years in Manitoba, some people experienced water shortages in the summer of 2021. Indeed, the water table dropped, and some pumps weren't deep enough to reach the water. Manitoba has been known to be on the wet side, so during years of high-water tables, shallower

wells wouldn't have been as problematic. Any well drilled into the Carbonate or Sandstone aquifer will continue to receive water, even during dry spells, so long as the pump is deep enough.

Sio Silica will be active in the Sandstone aquifer, not the Carbonate aquifer where most homeowners access their drinking water. The operating sites will have a monitoring well network measuring the activity and any changes in water levels at all times. A well located in the Sandstone within close proximity (1.5 kilometres) or in the Carbonate (within 800 metres) may experience a short-term drawdown effect (lowering of the groundwater level) up to one metre. Within two days following the completion of sand extraction, groundwater levels are anticipated to recover by 80%. Within 20 – 80 days they'll return to regular static water level conditions.

It's important to note:

- Sio's activities will be taking place when water levels are naturally higher
- Sio's well operations are only a matter of days (not an entire season)
- Only wells within close proximity of an operating site might experience drawdown effects
- Monitoring wells alert Sio to changes in water levels

We live during a time and in a place where most of us take fresh drinking water for granted. It conveniently comes through a tap or arrives by water bottle service. There is a lot more to unpack here. Part of the responsibility of "country living" is to be familiar with your private well and its maintenance needs. We are doing our part to ensure our activity in these vital water sources is environmentally responsible. We are regulated and are proactively anticipating and planning for continued clean water for generations to come.

Additional resources for you to investigate:

Environment, Climate and Parks' Public Registry
www.gov.mb.ca/sd/eal/registries/6119/index.html
#32 Mitigation measures described in the Groundwater Monitoring and Impact Mitigation Plan

RM of Springfield
rmofspringfield.ca/p/municipal-water-systems
rmofspringfield.ca/p/municipal-groundwater
rmofspringfield.ca/p/private-wells

Government of Manitoba
www.gov.mb.ca/sd/water/drinking-water/well-videos/

2021 Carillon article Are Wells Really Drying up in Southeastern Manitoba
steinbachonline.com/local/are-wells-really-drying-up-in-southeastern-manitoba

Water

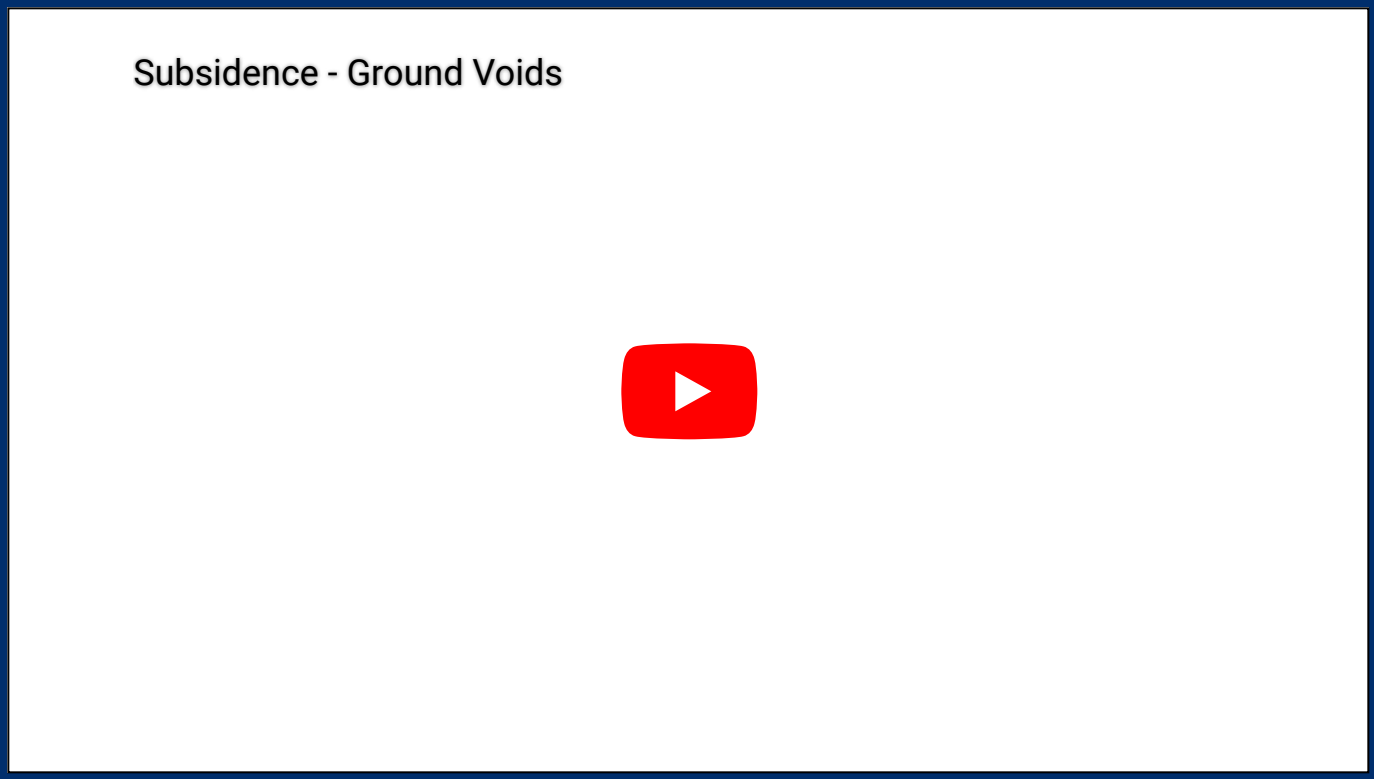
〈 Economic Development

In the Community 〉

SILICA

Privacy Policy

Subsidence



Understand the Room and Pillar method as well as ground lowering and voids, otherwise referred to as subsidence.

Brent Bullen, Chief Operations Officer, explains how world-recognized engineering firm Stantec has analyzed the science of rock mechanics, specifically in the Vivian Sand Project to provide reporting on how to do this safely and responsibly. Room and Pillar mining is the removal of underground material to create a room, then leaves surrounding material as the pillar to support the surface.

The Vivian Sand Project operates within the recommended engineering void

calculation buffers based on geotechnical modeling and extensive core logs, drilling and lab testing. Each cluster of wells can be drilled within natural clearings on the land up to 100 metres apart, which in return has a minimal effect on the surface.

We continually measure and monitor for land subsidence using Bernstein rods. Some concerns stem from the dissolution of the limestone. However, the limestone (Red River) formation was deposited in the Late Ordovician and there have been no indications of dissolution.

Be sure to watch for more information videos to come.

#viviansandproject

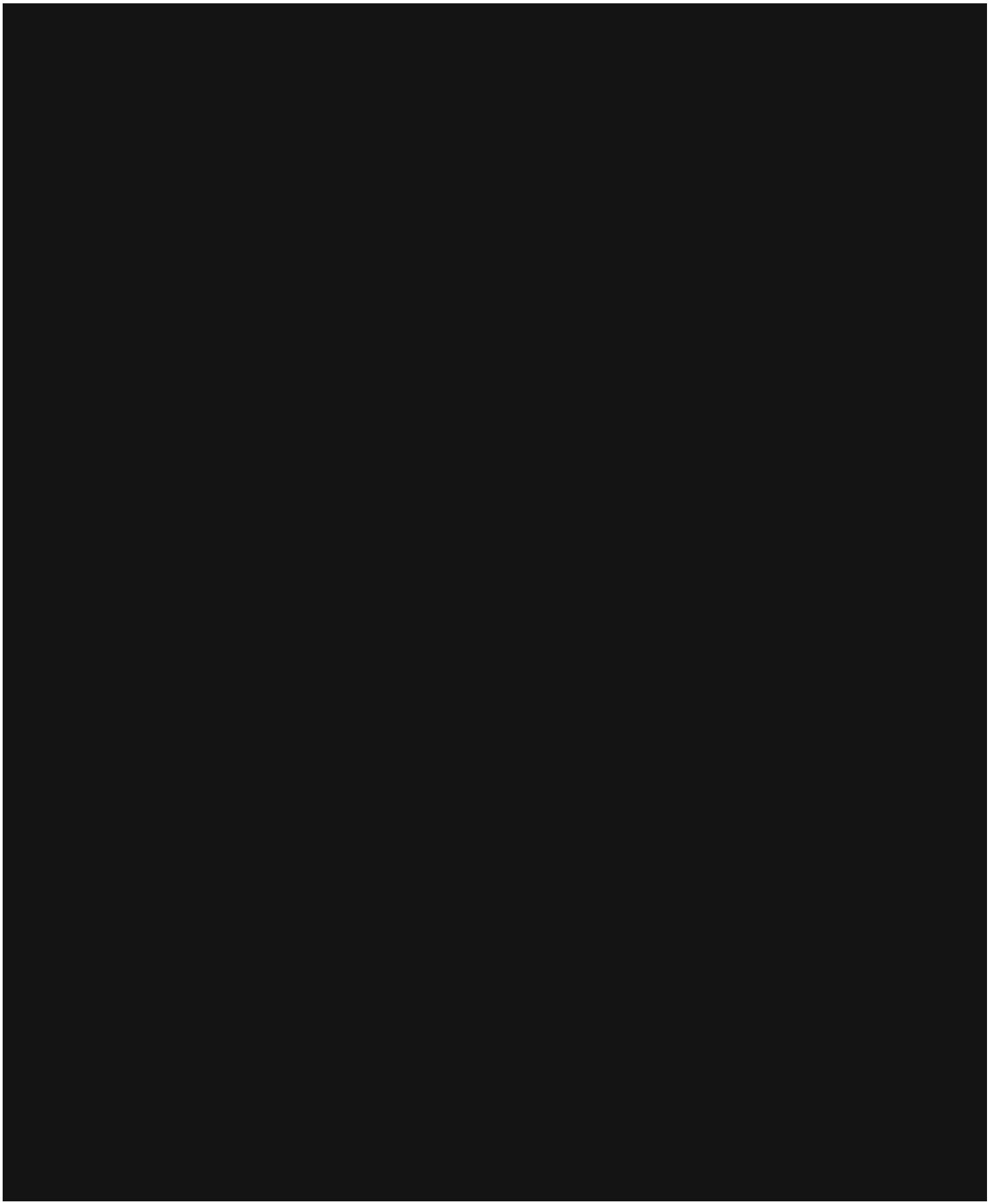
Please contact us at info@viviansandproject.com with questions or for more information.

Sand & Subsidence

‹ The Extraction Process

Economic Development ›

Privacy Policy



That "F" Word (Fracking)

Sio Silica Facts Matter series published February 2, 2022 in Manitoba's The Clipper Weekly

Let's talk about that "F" word, you know Fracking.

Hydraulic fracturing "fracking" is often misunderstood or misapplied against activities that have nothing to do with fracking. So, let's understand what fracking is and why it's not applicable to Sio Silica.

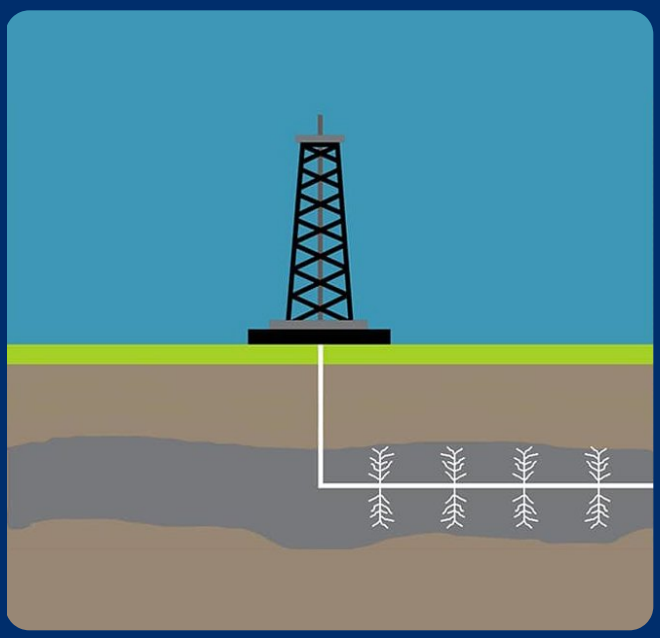
Since the 1940s, fracking has been deployed in the completion of hydrocarbon-based wells. The technique is primarily used for the development of oil and gas wells and is also used in geothermal energy and the completion of deepwater wells. Simply put, to frack means to pump a large volume of liquid, proppant (usually sand) and specialty chemicals at high pressure into a formation deep below the surface to enhance the formations' permeability.

Fracking has three main phases:

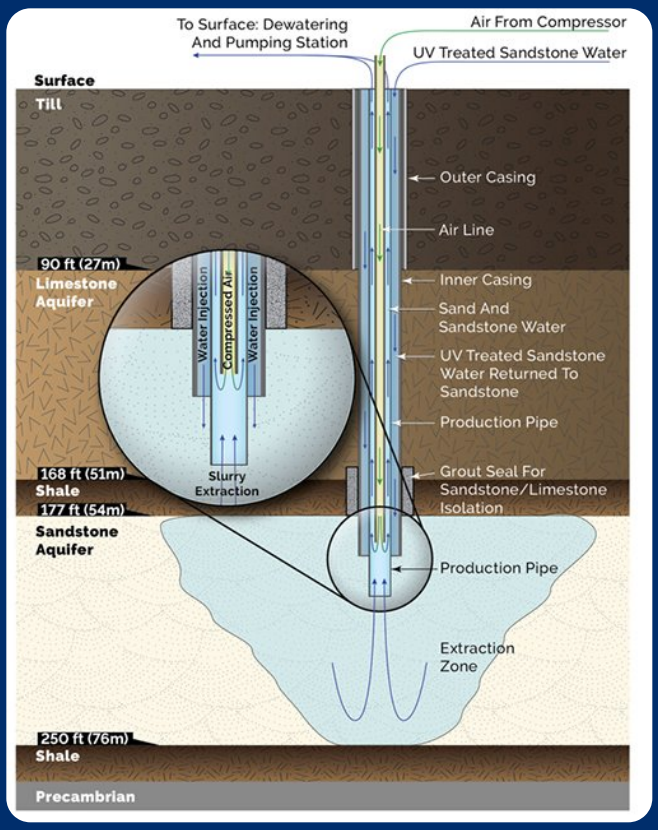
1. Fluid is pumped at a high volume and pressure from 4,500 psi (31,500 kPa) to 9,000 psi (62,000 kPa) to fracture the formation. It opens existing fractures (cracks) and creates fractures providing a path for the fluid or gas to travel.
2. Proppant is pumped in with the fluid to fill the new fractures so when the pressure created from pumping stops, the fracture can't close. The proppant essentially holds the fracture open and creates an easier more permeable pathway from the formation to the wellbore.
3. The fluid used to carry the sand and provide pressure is then disposed of.

Most wells that are fracked are typically drilled vertically one to four kilometres deep at which point drilling changes to a horizontal direction which can extend for several kilometres. This illustration shows a simple horizontal well with new fractures from fracking next to the wellbore.

Typical Fracked Well



The Sio Silica Production Process



Key differences between Sio Silica process versus fracking

Sio Silica process

1. Sio Silica is removing sand from the formation at formation pressure.
2. Sio Silica's wells are vented to atmospheric pressure allowing the

Fracking

1. Fracking injects sand into the well at higher pressures than formation.
2. A well being fracked is sealed so the formation is subjected to the pumping pressure.

formation to respond naturally.

3. Sio Silica does not use high-pressure pumping.
4. Water wells are only drilled vertically.
5. Sio Silica's wells are commonly 55 to 74 metres (180 to 240 feet) deep.
6. Sio Silica does not produce large volumes of water or waste-produced water.
7. Sio Silica uses compressed air from a dry screw compressor to lift sand and does not supplement the natural formation pressures.
8. Sio Silica uses air for production.
9. Drilling and producing a Sio Silica well involves less than a dozen trucks and with as little as a water well rig and support truck.
10. Sio Silica does not contaminate the water or formation.

3. Fracking is all high-pressure pumping.
4. Wells that are fractured are usually drilled horizontally.
5. Typical hydrocarbon wells that are fracked are one kilometre (33,280 feet) or deeper.
6. Fracking uses large volumes of water and often requires the disposal of produced water.
7. Fracking may energize the formation by pumping Nitrogen or CO2 with the frack fluid to supplement the natural formation pressures to produce back the frack fluid.
8. Fracking can use specialty chemicals.
9. Fracking a single well can involve hundreds of trucks.
10. Produced fracking fluids need to be disposed of.

Processes

〈 Keeping the Aquifers Fresh, Clean & Safe

Residential Water Wells 〉

Privacy Policy

Introduction to Subsidence

December 1, 2022

Subsidence is the occurrence of a sinkhole.

Sio will not create subsidence because of the limestone barrier below the till which acts as a beam structure also called the caprock. The limestone support capacity has been studied and tested by engineers and reviewed by provincial and federal governments as well as the Clean Environment Commission Technical Reviewers (CEC). Below the limestone, there is a shale layer which functions as an aquitard and below this, is the sandstone where Sio will remove sand. Small amounts of sand are removed leaving voids, also

known as rooms. Then there is an area of unextracted sand that acts as the support, also known as the pillar. This form of mining is traditionally called room and pillar. Sio intends to extract approximately 1.06 % of the entire sand volume that exists over the 24-year life of the project. All experts that have reviewed this plan all agree subsidence will not occur.

Please contact us at info@viviansandproject.com with questions or for more information.

Hydrogeology and Geochemistry Assessment Report https://www.gov.mb.ca/sd/eal/registries/6119/index.html)

Sand & Subsidence

〈 Monitoring Subsidence

We've heard you loud and clear. 〉

Privacy Policy