AECOM

Appendix H

Closure Plan (Draft)

Sio Silica – SiMbA Project: Closure Plan, Years 0 to 4

DRAFT

January 24, 2025

Prepared by:

Sio Silica Corp.
(f/k/a CanWhite Sands Corp.)
Suite 1930
440 – 2nd Avenue SW
Calgary, AB T2P 5E9

Supported by Stantec Consulting Ltd.

File: 111473043

This document is subject to adjustments in relation to project approvals

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Acronyms and Abbreviations

ABA	Acid Base Accounting
AP	acid potential
EAL	*Environment Act* Licence
FLAC	Fast Lagrangian Analysis of Continua
GIN	Groundwater Information Network
ha	hectare
HDPE	high-density polyethylene
km	kilometres
m	metres
masl	meters above sea level
MB CDC	The Manitoba Conservation Data Center
MB ECP	Manitoba Environment, Climate and Parks
Mine Closure Regulation	*Mines and Minerals Act* SM 1991-92, c. 9, Mine Closure Regulation 67/99
Non-PAG	non-potentially acid generating
NPR	neutralizing potential ratio
Project	The SiMbA Project (the Project)
RM	Rural Municipality
SFE	Shake Flask Extraction
TARP	Trigger Action Response Plan
UV	ultraviolet

1 Letter of Transmittal

SIO SILICA CORPORATION
Suite 1930, 440-2nd Ave SW
Calgary, Alberta T2P 5E9

January 24, 2025

Omkar Beruar, Chief Mining Engineer
Government of Manitoba
1395 Ellice Avenue
Winnipeg, MB R3G 3P2

Mr. Beruar,

Sio Silica Corporation (formerly, CanWhite Sands Corporation) is pleased to submit this Closure Plan for the SiMbA Project (Years 0 to 4). Once reviewed and confirmed, Sio Silica will provide one original signed copy and two copies of the This Closure Plan and its associated appendices constituting the entire Closure Plan being submitted for approval under Mine Closure Regulation 66/99 of the *Manitoba Mines and Minerals Act* (the Act).

Sio Silica is aware of the requirements of sections 188 (plan to be carried out), 189 (progressive rehabilitation) and 190 (annual report on rehabilitative work) of the Act. Information in this Closure Plan has been provided such that all of the requirements of the Mine Closure Regulation have been satisfied. However, consistent with the intent of the Act, Sio Silica considers this Closure Plan to be a living document. Accordingly, it is the intent of Sio Silica to review and as necessary revise the closure cost aspects on a regular basis to meet any legislated requirements. It is understood that Sio Silica is solely responsible for carrying out the proposed rehabilitation measures in accordance with the Closure Plan, including any future changes or amendments filed.

The undersigned is authorized as an agent of the SiMbA Project.

Sincerely,

Final will be signed

Feisal Somji, B.Sc., MBA

President & CEO, Sio Silica Corporation

Enclosure: Closure Plan (Years 0 to 4), Sio Silica SiMbA Project

2 Authorization

SIO SILICA CORPORATION
Suite 1930, 440-2nd Ave SW
Calgary, Alberta T2P 5E9

Brent Bullen, Chief Operating Officer is authorized by Feisal Somji, President and CEO of Sio Silica Corporation, to act on behalf of the Company with respect to the requirements of this Closure Plan.

Contact information:
Suite 1930, 440 -2nd Avenue Southwest,
Calgary, AB, T2P 5E9
Email: bbullen@siosilica.com
T: 403-540-9865

Sincerely,

Final will be signed

Feisal Somji, B.Sc., MBA
President & CEO
Sio Silica Corporation

3 Project Information

3.1 Project Overview

The SiMbA[1] Project (the Project) is located southwest of the hamlet of Vivian, Manitoba, Canada, approximately 35 kilometers (km) east of the City of Winnipeg, within the Rural Municipality of Springfield. The Project, which is being developed for the purpose of supplying high purity quartz sand for use in various markets, entails the extraction of high purity quartz sand from the Winnipeg Sandstone aquifer within the Winnipeg Sandstone geological formation.

3.1.1 Project Background

On July 23, 2021, AECOM submitted an application for an Environment Act Licence to Manitoba Environmental Approvals Branch (EAB) on behalf of Sio Silica Corporation (Sio) for the Vivian Sand Extraction Project (Manitoba Public Registry file #6119.00). Question and comments from the Manitoba Technical Advisory Committee (TAC) and public during the review period for the Environment Act Proposal (EAP) for the Vivian Sand Extraction Project were available in the public registry on November 15, 2021. That same day, Sio received a letter from the then Minister of Conservation and Climate advising that a Manitoba Clean Environment Commission (CEC) hearing would be held regarding the Vivian Sand Extraction Project. Prior to the commencement of the CEC hearing, and to address the Manitoba Technical Advisory Committee (TAC) and public review questions and comments on the Vivian Sand Extraction Project, AECOM submitted responses to TAC and public questions and comments on the EAP, which were uploaded by the EAB to the public registry in December 2021 and January 2022.

CEC Recommendations	The SiMbA Project Includes
#1 - Government Legal Opinion	N/A
#2 - Stepwise Approach	☑
#3 - Community & Indigenous Participation	☑
#4 - Monitoring & Environmental Management Plans	☑
#5 - Water Treatment Testing	☑
#6 - Engineering Standards & Limits	☑
#7 - Risk Assessments	☑
#8 - Cumulative Effects Assessment	N/A

[1] SiMbA : "Si = Silica; "Mb" = Manitoba; A = Action Plan

The CEC public hearing for the Vivian Sand Extraction Project was held over 12 days, from February 27 to March 15, 2023, in Steinbach, Anola and Beausejour (CEC 2023). A CEC report on the hearing, including conclusions and recommendations was completed on June 22, 2023 (CEC 2023). The CEC report advised that "…*significant conditions be required for the project to proceed*." (CEC 2023). The CEC's conditions were provided within eight recommendations regarding the originally proposed Vivian Sand Extraction Project (CEC 2023).

Sio has heard the questions and concerns raised by the public and the TAC on their review of the EAP for the original Vivian Sand Extraction Project (AECOM 2021), and has considered the CEC's recommendations (CEC 2023). In consideration of the concerns raised during the review of the originally proposed Vivian Sand Extraction Project, and in consideration of the CEC's recommendations (CEC 2023), Sio has substantially revised the originally proposed Vivian Sand Extraction Project. The revised new Project is proposed to proceed using a stepwise phased approach that substantially reduces the sand volumes extracted from the sandstone aquifer for the initial years of Project operation.

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

Wells will be drilled in clusters consisting of up to five wells per cluster. Wells will be sequentially developed and progressively decommissioned and rehabilitated each year. Once drilled, these wells will be producing for five to seven days. All wells within a well cluster may not be operating at the same time. The objective is to keep the slurry supply continuously moving to the Processing Facility at an optimal and manageable rate. Therefore, the maximum number of wells operating simultaneously maybe spread across adjacent well clusters (e.g., two operating wells in one cluster and one in an adjacent well cluster). Up to seven wells may be operating at any given time at full capacity in Phase 3 from year 2 onwards. The operations will move in a pattern from one well cluster to the next, with wells being progressively sealed (i.e., decommissioned) sequentially over the April to November timeframe. Disturbed areas will be rehabilitated yearly.

Using this approach while concurrently monitoring key aspects of concern regarding the environment (e.g., groundwater quality and quantity) for any changes not predicted to occur within the environmental assessment conclusions in this EAP report, Sio's new Project is expected to address concerns raised regarding the previously proposed Vivian Sand Extraction Project EAP (AECOM 2021).

3.1.2 Proponent Information

Sio Silica Corporation (Sio Silica; previously known as CanWhite Sand Corp.) is a private Alberta company registered to carry out business in Manitoba and is the legal owner of mineral claims in the 5-year life of Project.

Address of head office:
Suite 1930, 440 -2nd Avenue SW, Calgary, AB, T2P 5E9

Principal Contact Person:
Brent Bullen, Chief Operating Officer
Email: bbullen@siosilica.com

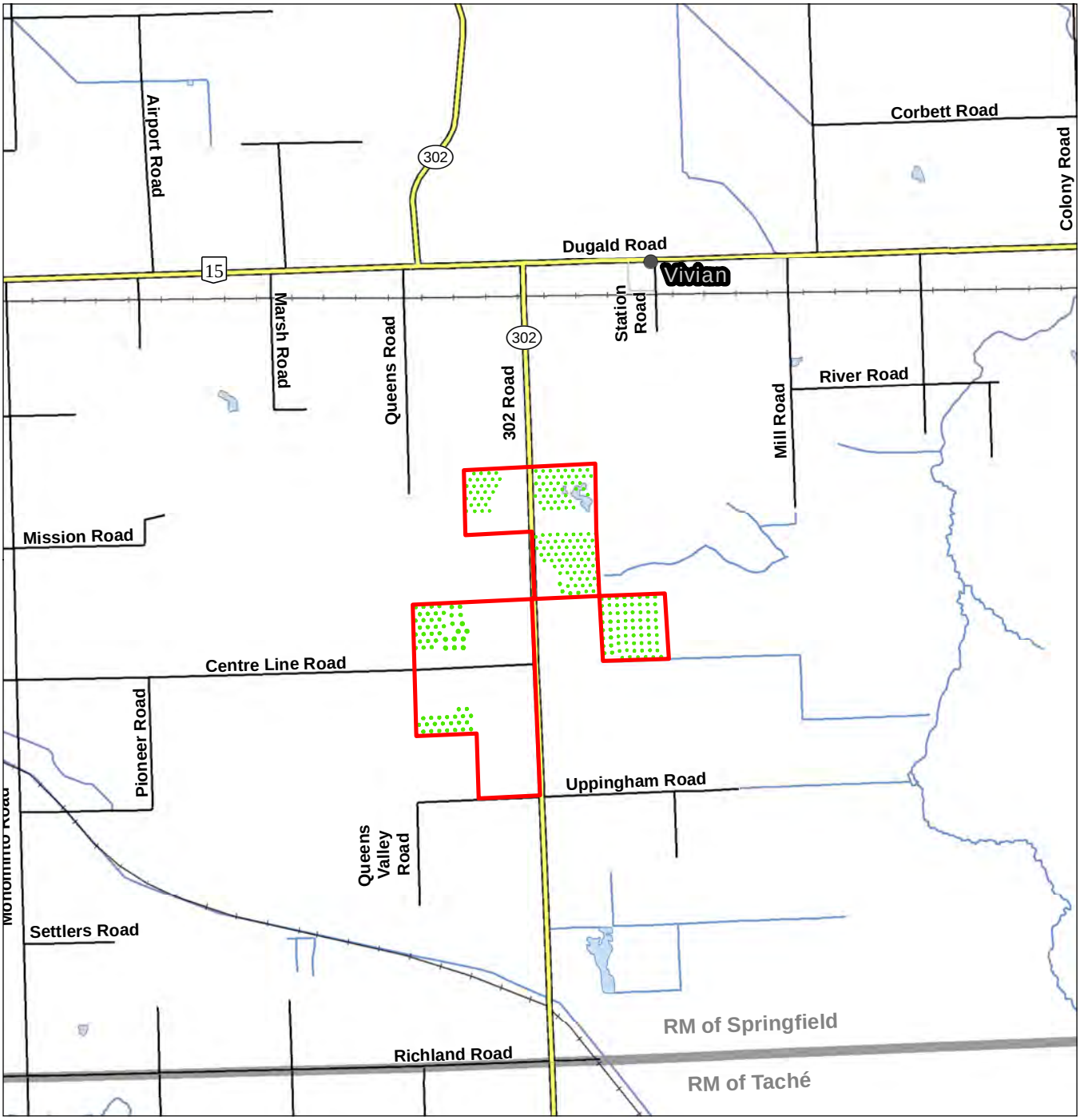
3.1.3 Site Plan

Figure 3.1 shows the site location plan. Figure 3.2 shows the location and general layout of the major Project components, including the closure plan site boundary and proposed well clusters. Project Site and land tenure for activities proposed in Years 0 to 4 (surface rights, mineral rights or mineral access rights) are provided in Table 3.1 below.

Table 3.1 Land Tenure and Activities, Years 0 to 4

Mining Claim Name	Disposition Number	Legal Land Description	Mineral Type
Bru 81	SV12664	NW Sec-18 Twp-010 Rge-08 E1	Crown
Bru 82	SV12665	SW Sec-19 Twp-010 Rge-08 E1	Crown
Bru 83	SV12666	NW Sec-20 Twp-010 Rge-08 E1	Private
Bru 84	SV12667	SE Sec-20 Twp-010 Rge-08 E1	Crown
Bru 92	SV12675	SW Sec-29 Twp-010 Rge-08 E1	Crown
Bru 93	SV12676	SE Sec-30 Twp-010 Rge-08 E1	Crown

G:_GIS_Project_Folder\111473043_SioSilica\ArcMaps\Facility_Closure_Plan\June2024_updates\111473043_3p1_SiteLocationPlan_20240617.mxd Revised: 2024-06-17 By: ACampigotto



Legend

- Extraction Project Site
- Mine Production Clusters
- Community
- Major Road
- Minor Road
- Local Road
- Railway
- Watercourse
- Waterbody
- Rural Municipality

0 0.5 1 Kilometres

(At original document size of 8.5x11)
1:75,000

N

Stantec

Project Location
RM of Springfield, Manitoba

Prepared by ACampigotto on 2024-06-17
Reviewed by KMathers on 2024-06-17

Client/Project
Sio Silica
Closure Plan

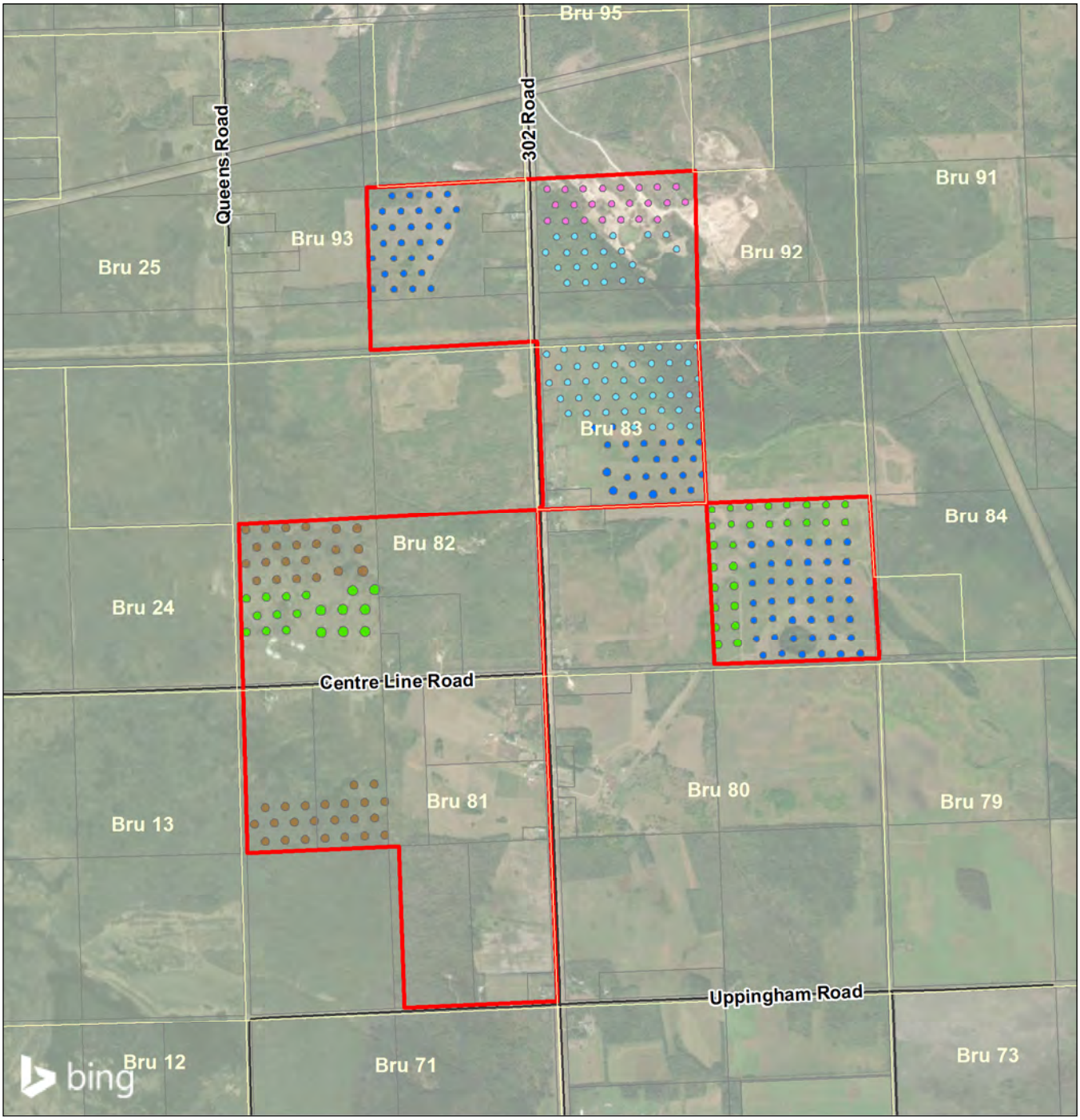
111473043

Figure No.
3.1

Title
Site Location Plan

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba

G:_GIS_Project_Folder\111473043_SioSilica\ArcMaps\Facility_Closure_Plan\June2024_updates\111473043_3p12_LandTenure_20240617.mxd Revised: 2024-06-17 By: ACampigotto



Legend

- Extraction Project Site
- Sio Mineral Claims
- Land Parcels
- Road

Production Year

- 0
- 1
- 2
- 3
- 4

0 200 400 Metres

(At original document size of 8.5x11)
1:30,000

N

Stantec

Project Location
RM of Springfield, Manitoba

Prepared by ACampigotto on 2024-06-17
Reviewed by KMathers on 2024-06-17

Client/Project
Sio Silica
Closure Plan

111473043

Figure No.
3.2

Title
Land Lenure

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba
3. Imagery Source: Microsoft product screenshot reprinted with permission from Microsoft Corporation.

3.2 Regulatory Context

This Closure Plan is being submitted to satisfy the *Mines and Minerals Act* SM 1991-92, c. 9, Mine Closure Regulation 67/99 (Mine Closure Regulation). Through provision of this Closure Plan, the clauses of section 9 and relevant information have been satisfied.

Sio Silica is filing a new EAP (AECOM 2025) for an *Environment Act* Licence (EAL) from Manitoba Environment and Climate Change (MECC) Environmental Approvals Branch for proposed sand extraction activities for Years 0 to 4. Subsequent Notices of Alteration will be filed for the approval of activities in additional years (i.e., beyond Year 4). Extraction of the sand resource is being reviewed under *The Environment Act* by MECC as a “mine”, which is a Class 2 development in section 3 of the Classes of Development Regulation under group 5 *“*Mining*”*.

4 Current Project Site Conditions

4.1 Current Land Use

The Project Site (Years 0 to 4) and the 25-Year Life of Project Area are located on private land covered under private surface rights within the Rural Municipality (RM) of Springfield, within the Sio Silica mineral claims and private mineral holdings and land parcels.

Information from the Manitoba Lands Initiative geodatabase indicates that land use within the Project Site is designated as either rural/agricultural use or quarry / mine use.

The RM of Springfield Development Plan (RM of Springfield, 2018) has designated most of the Project Site as “Agriculture Preserve Area’” (68%), with other designated land uses including “Aggregate” (19%) and “Mixed Rural and Agriculture Area” (13%).

Currently, approximately 39% of the Project Site has been developed for agriculture purposes. An additional 11% of the Project Site includes other types of land development such as quarry pits, residential lots, transmission line corridor and municipal and provincial roads (AECOM 2025).

4.2 Topography

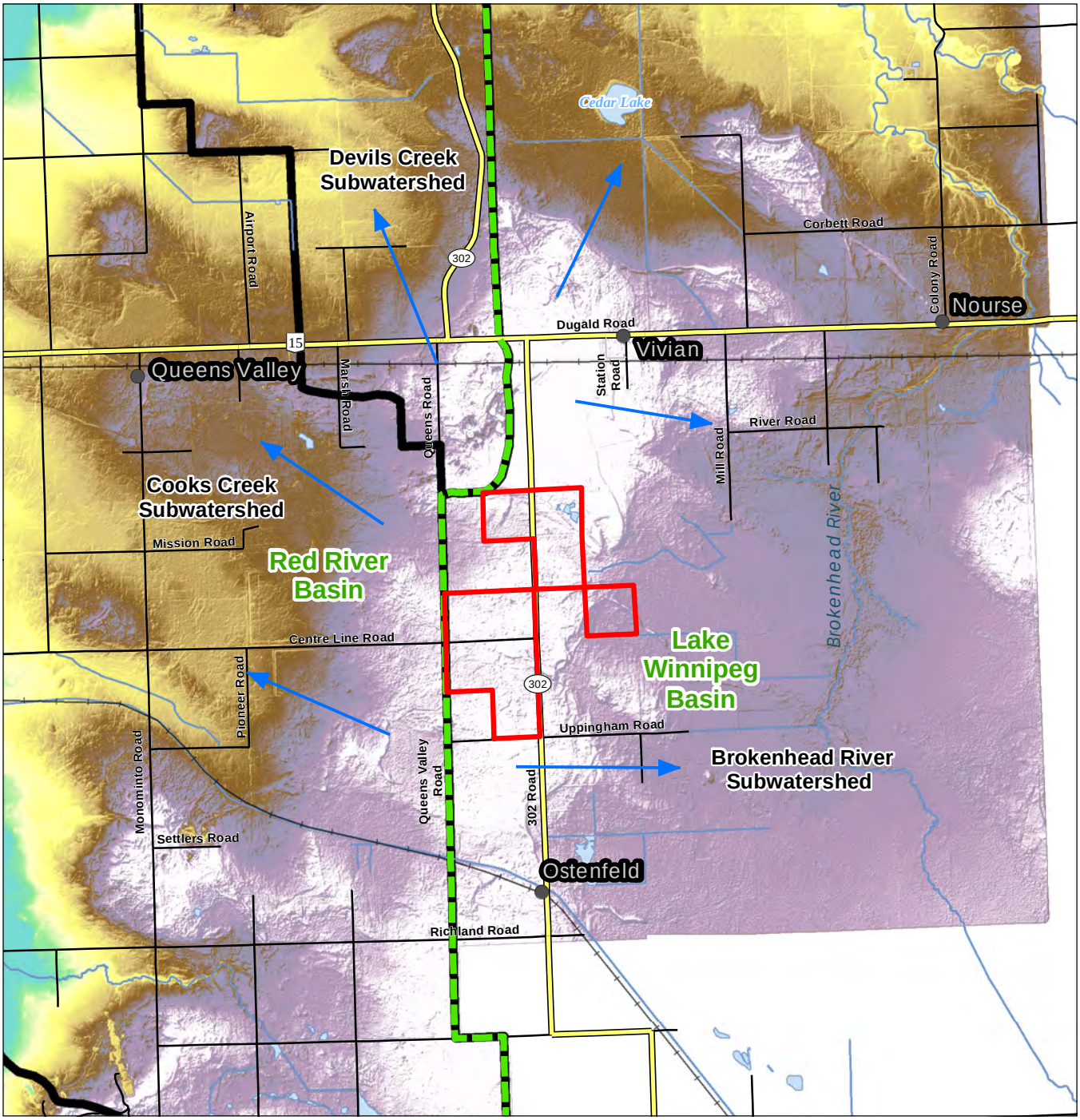
The Project Site lies within the Interlake Plain Ecoregion and the Steinbach Ecodistrict (Smith et al., 1998). The mean elevation of the Ecodistrict is 297 meters above sea level (masl), with landforms ranging from smooth, flat lying glaciolacustrine plain to gently undulating, water-worked glacial diamicton and glaciofluvial diamictons (Smith et al., 1998). Topography within the Steinbach Ecodistrict is described as having generally smooth relief with gentle slopes ranging from level to 5% at a rate of approximately 1 m/km northwestward towards the Red River (Smith et al, 1998). Within the Project Site, elevations range from 269 masl to the east to 280 masl to the northwest (Figure 4.1).

4.3 Surface Water

Figure 4.1 shows subwatersheds and ground surface elevations in the Project area and Figure 4.2 shows the regional surface water regime and surface elevations.

There are no natural lakes, rivers or streams within the Project Site. A 9.3 hectare (ha) permanent pond associated with previous quarry operations occurs mostly within the Project Site.

The on-line Atlas of Canada Toporama mapping tool (Natural Resources Canada, n.d.) indicates that surface water drainage at the Project Site occurs primarily within ditches and low drainage areas. Drainage in the eastern portion of the Project Site is generally northeast, eventually draining outside the Project Site into the Brokenhead River, which flows north for approximately 65 km until connecting to Lake Winnipeg. Surface drainage in the western and southern portions of the Project Site generally flows northwest through ditches and low drainage areas to Cooks Creek, or to Edie Creek which connects with Cooks Creek. Cooks Creek then flows northeast for approximately 42 km to connect with the Red River near Selkirk, Manitoba (Figure 4.1).



Legend

- Extraction Project Site
- Community
- Major Road
- Minor Road
- Local Road
- Railway
- Watercourse
- Waterbody
- Surface Water Flow Direction
- Major Basin
- Subwatershed
- Value
  - High : 283.514
  - Low : 252.323

0 1 2 Kilometres

(At original document size of 8.5x11)
1:100,000

N

Stantec

Project Location
RM of Springfield, Manitoba

Prepared by ACampigotto on 2024-06-17
Reviewed by KMathers on 2024-06-17

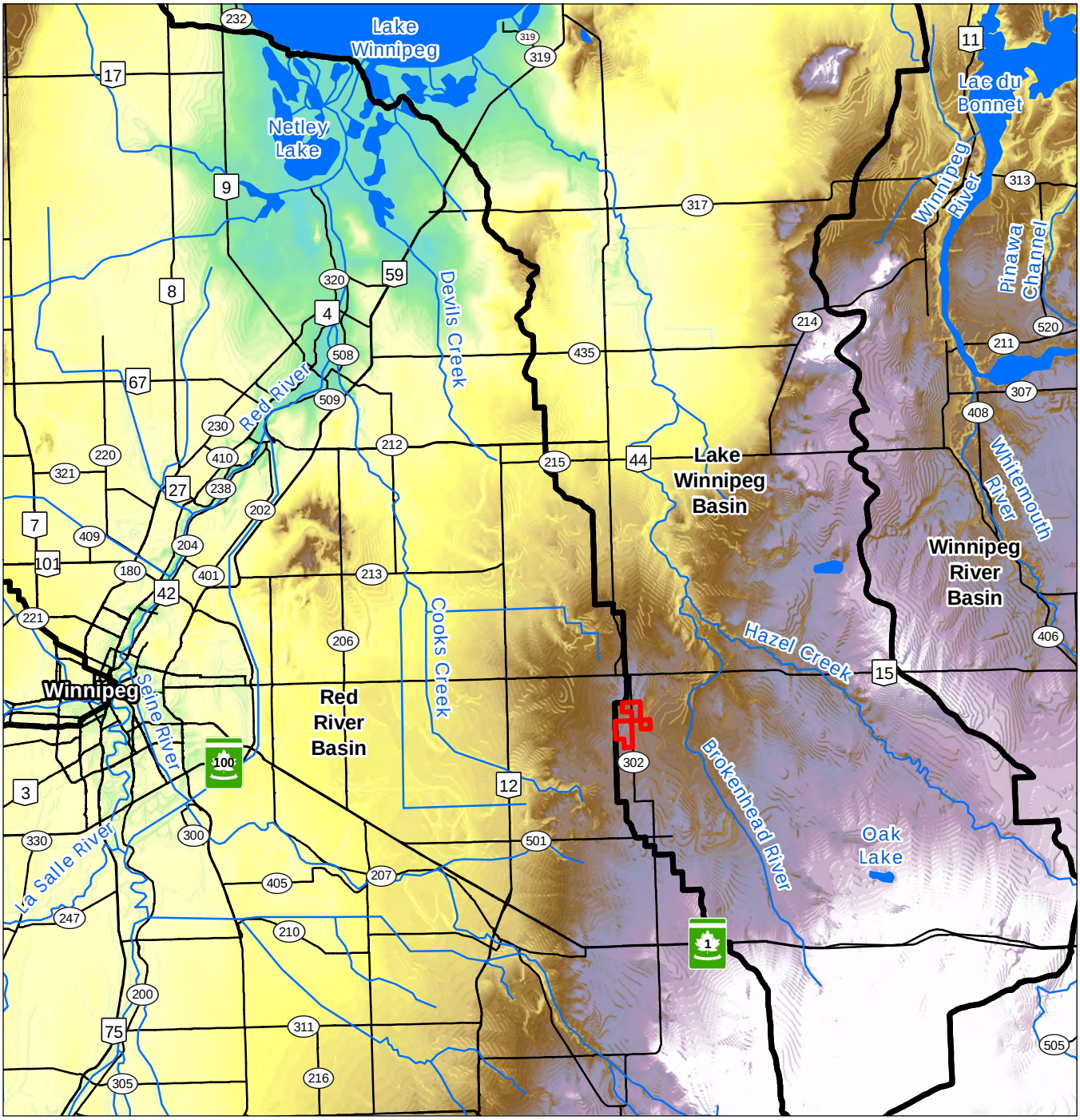
Client/Project
Sio Silica
Closure Plan

111473043

Figure No.
4.1

Title
Subwatersheds

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba



Legend

- Extraction Project Site
- Major Road
- Watercourse
- Waterbody
- Major Basin

Value

- High : 336
- Low : 215

0 5 10 Kilometres

1:550,000 (at original document size of 8.5x11)

N

Stantec

Project Location
RM of Springfield, Manitoba

111473043

Prepared by ACampigotto on 2024-06-17
Reviewed by KMathers on 2024-06-17

Client/Project
Sio Silica
Closure Plan

Figure No.
4.2

Title
Regional Surface Water

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.
3. Microsoft product screen shot reprinted with permission from Microsoft Corporation.

4.4 Groundwater

Groundwater in the vicinity of the Project Site is typically sourced from one of two targeted aquifer zones, the Red River Carbonate Formation (limestone) or Winnipeg Sandstone Formation, with some wells in the overlying till. The main source of potable water within the RM of Springfield is groundwater from the Red River Carbonate aquifer which is known to be of variable quality (Friesen Drillers 2019). It is also one of the primary sources of groundwater supply for municipal, industrial, rural residential and agricultural uses throughout a large portion of south-eastern and central Manitoba (Betcher et al. 1995). A detailed description of the hydrogeology of the area is provided in the Hydrogeology and Geochemistry Assessment (AECOM 2025).

The Winnipeg Formation Sandstone underlies the Red River Carbonate (limestone) aquifer. This aquifer is the target aquifer for Project operations. It is confined and hydraulically separated from the overlying carbonate rocks of the Red River Formation by the Winnipeg Shale that overlies the Winnipeg Sandstone aquifer (Ferguson and Grasby 2007). Both aquifers are recharged in the Sandilands area to the east of the RM of Springfield with groundwater flow from southeast to northwest. The Sandilands area is a major sand and gravel moraine series that lies directly on the bedrock subcrop of both Paleozoic sequences (Friesen Drillers 2019). Recharge occurs from snow melt and rainfall in the Sandilands area and is supplemented by distributed recharge across the region. Discharge from both aquifers occurs in the form of residential, agricultural, and industrial use and natural discharge to surface water. Natural discharge from the Red River Carbonate aquifer is primarily to the Red River, the Winnipeg Floodway and small streams and creeks. Discharge from the Winnipeg Sandstone aquifer is likely by slow seepage near or beneath Lake Winnipeg (Ferguson and Grasby 2007).

4.4.1 Groundwater Level

Within the Project Site, reported groundwater elevations are highly variable and range from 230 masl to 290 masl. Groundwater elevations are anticipated to be quite variable locally due to variability in texture and the possible presence of localized and perched aquifers.

Based on groundwater elevations reported in the Groundwater Information Network (GIN) database (GIN 2019), groundwater elevations in the Red River Carbonate aquifer range from in excess of 300 masl near the southeastern limit of the study area where the aquifer subcrops in the Sandilands Area, to less than 200 masl in the extreme northwestern portion of the study area near the Red River. Within the Project Site, reported groundwater elevations are relatively consistent and range from 260 masl to 280 masl.

Based on groundwater elevations reported in the GIN database (GIN 2019), groundwater elevations in the Winnipeg Sandstone aquifer range from over 320 masl at one location in the aquifer near the subcrop below the Sandilands Area to less than 180 masl between Anola and Winnipeg. Within the Project Site, reported groundwater elevations are highly variable and range from 240 – 280 masl, with the lowest elevations near the town of Anola where there are more municipal and domestic groundwater supply wells that may have locally lowered groundwater elevations. Groundwater elevation graphs for observation wells are provided in Appendix F within AECOM 2025.

4.4.2 Groundwater Flow Directions

Groundwater flow is primarily from southeast to northwest in all three aquifer systems with neutral to slightly downward hydraulic gradients on the Project Site indicating groundwater flow is primarily horizontal. Historical drilling and well completion methods are thought to have resulted in some communication between the Red River Carbonate and Winnipeg Sandstone aquifers. It is also possible that natural variability in the thickness/spatial extent and hydraulic properties of the Winnipeg Shale may contribute to exchange of water between the two aquifers (AECOM 2025). The Winnipeg Shale encountered during the 2020 drilling campaign was friable and deeply weathered to clay minerals in some boreholes indicating the presence of a relatively low permeability aquitard that restricts exchange between the two aquifers. Betcher and Ferguson (2003) further estimated the volumetric discharge in head between the carbonate aquifer and sandstone aquifer. Volumetric discharge was estimated to range from zero when there was no gradient between the formations and approximately 4,400 L/day (0.8 US gpm) for a head difference of six metres (m) indicating the magnitude of exchange was relatively small in the context of the overall water balance of the aquifer (AECOM 2025).

4.4.3 Groundwater Quality

The Red River Carbonate, Winnipeg Shale and Winnipeg Sandstone units exhibit water quality that is relatively good AECOM (2021a). Iron and manganese naturally exceed the Canadian Drinking Water Quality and Manitoba Water Quality Standards, Objectives, and Guidelines. These are aesthetic objectives.

Groundwater samples from the Red River Carbonate and Winnipeg Sandstone aquifers taken at the Project Site have neutralizing potential ratio (NPR) values substantially greater than 2 (classified as non-potentially acid generating; non-PAG), according to definitions in Price (2009). Two samples collected from the Winnipeg Shale had calculated NPR values below 2 (classified as uncertain acid generation potential). A third sample of Winnipeg Shale was classified as non-PAG.

Laboratory analyses indicated that the rock types on the Project Site display varied metal leaching potential. Dissolved aluminum, selenium, arsenic and uranium were identified as contaminants of potential concern; however, concentrations of these parameters in groundwater samples collected were below or close to detection limits (AECOM 2021a).

4.5 Terrestrial Plant and Animal Life

Information from the Manitoba Forest Resource Inventory, and on-site general reconnaissance in select locations within the Project Site area indicate that less than half (46%) of the Project Site is forested with agriculture fields being the next most common cover type (39%; Table 4.1). Approximately 50% of the Project site is previously disturbed landcover due to human development such as agriculture, roads and aggregate quarries (Table 4.1) (AECOM 2025, MLI 2017b) (Table 4.1).

Table 4.1 Land Cover Types on the Project Site

Cover Type	Hectares	Percent (+/-1%) of the Project Site
Forested	166	46
Agricultural	141	39
Developed	38	11
Meadow	5	1
Willow/Alder	8	2

Forested areas within the Project Site consist primarily of trembling aspen (*Populous tremuloides*; 43%), with occasional black spruce (*Picea mariana*) and tamarack (*Larix Laricina*) stands. Common understory shrub species include American hazel (*Corylus Americana*), red-osier dogwood (*Cornus sericea*), wild rose (*Rosa* spp.) and willow (*Salix* spp.). The naturally vegetated non-forested areas include meadows (1%) and wet willow and alder (*Alnus glutinosa*) dominated areas (2%;Table 4.1) (AECOM 2025).

Wildlife species expected to occur within the Project Site are those species that typically occur within the Steinbach Ecodistrict (Smith et al. 1998). Ungulate species include white-tailed deer (*Odocoileus virginianus*) and occasionally moose (*Alces alces*). Based on the landcover type, a variety of furbearer species potentially occur within the Project Site, with the most common likely being grey squirrel (*Sciurus carolinensis*), red squirrel (*Sciurus vulgaris*), snowshoe hare (*Lepus americanus*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), groundhog (*Marmota monax*) and striped skunk (*Mephitis mephitis).* The occasional presence of black bear (*Ursus americanus*) may also occur (AECOM 2021b). At least 60 bird species are likely to breed within the landcover types that occur within the Project Site, the majority of which are migratory birds protected under the federal *Migratory Birds Convention Act*, 1994 (MBBA 2018).

The Project Site has some very limited areas of dense willow and alder wet meadows. Several frogs were heard calling in this type of wetland during the May 2018 surveys (AECOM 2021b). Other common amphibians that may occur within the Project Site where suitable habitat occurs include wood frog (*Lithobates sylvaticus*), spring peeper (*Pseudacris crucifer*), Canadian toad (*Anaxyrus hemiophrys*) and American toad (*Anaxyrus americanus*) (AECOM 2021b). The red-sided garter snake may also occur in the Project Site, based on preferred habitat characteristics (iNaturalist, n.d.).

The Manitoba Conservation Data Center (MB CDC) Occurrence of Species by Ecoregion (i.e., Interlake Plain Ecoregion) was examined to determine the potential regional presence of species of concern. The species listed by the MB CDC were cross-referenced with Manitoba's *Endangered Species and Ecosystems Act* and Schedule 1 species under the Federal *Species at Risk Act* to determine listed rare or sensitive species that are known to occur within the ecoregion. Species distribution maps were then consulted where possible to determine listed species that may occur near the Project Site. Species at Risk identified, and their provincial and federal conservation status are presented in Table 4.2 below (GOC 2021; MB CDC 2017).

Table 4.2 Species at Risk Potentially Occurring on the Project Site and Preferred Habitat Characteristics

Species Name	Manitoba ESEA[1] Status	SARA[2] Status	Preferred Habitat Characteristics
Rough agalinis (*Agalinis aspera*)	Endangered	Endangered	Low, wet meadows
Gattinger's Agalinis (*Agalinis gattingeri)*	Endangered	Endangered	Moist, sparsely vegetated prairie areas with calcareous soils, and can also occur along the upper banks of roadside ditches[b].
Western silvery aster (*Symphyotrichum sericeum*)	Threatened	Threatened	Well-drained calcareous (alkaline) soils in dry prairies and fields, glacial sand and gravel deposits
Little brown myotis (*Myotis lucifugus*) and Northern myotis (*Myotis septentrionalis*)	Endangered	Endangered	Foraging occurs over water along waterways, forest edges, and in gaps in the forest
Easter whip-poor will (*Caprimulgus vociferus*	Threatened	Threatened (under consideration for status change to Special Concern)	Semi-open forests or patchy forests with clearings
Barn Swallow (*Hirundo rustica)*	Not listed	Threatened (under consideration for status change to Special Concern)	builds a mud cup nest which adheres to vertical surfaces under overhang
Bank Swallow (*Riparia*)	Not Listed	Threatened	Steep riparian banks
Golden-winged warbler (*Vermivora chrysoptera*)	Threatened	Threatened	Herbs and low shrubs, scattered trees, forested edges used for song posts and foraging
Canada warbler (*Cardellina canadensis*)	Endangered	Threatened (under consideration for status change to Special Concern)	Wet, mixed deciduous-coniferous forest with a well-developed shrub layer
Olive-sided flycatcher (*Contopus cooperi*)	Threatened	Special Concern	Open areas containing tall live trees or snags for perching
Red-headed woodpecker (*Melanerpes erythrocephalus*)	Threatened	Endangered	Grasslands, forest edges, pastures, riparian forests, and roadsides
Short-earred owl (*Asio flammeus*)	Threatened	Special Concern Special Concern (under consideration for status change to Threatened)	Grasslands, peat bogs, marshes, and old pastures
Eastern tiger salamander (*Ambystoma tigrinum*)	Not listed	Endangered	Sandy soils surrounding fishless, semi-permanent or permanent water bodies

Table 4.2 Species at Risk Potentially Occurring on the Project Site and Preferred Habitat Characteristics

Species Name	Manitoba ESEA[1] Status	SARA[2] Status	Preferred Habitat Characteristics
Monarch (butterfly) (*Danaus Plexippus)*	Not llsted	Endangered	the breeding habitat of this butterfly species is restricted to sites where milkweed grows. Milkweed is the sole food source for caterpillars of this species

Notes:
[1]*Endangered Species and Ecosystems Act* (1990)
[2]*Species at Risk Act* (2002)

4.6 Aquatic Habitat and Fisheries Resources

Waterbodies that occur within the Project Site are described in Section 4.3 and consist of isolated small ponds associated with previous quarry operations which have a low likelihood of providing suitable fish habitat.

4.7 Previous Industrial Activities and Potential Hazards

Prior to Sio Silica (CanWhite) securing the Project Site and 25-Year Life of Project Area, the mineral claims within had not been explored for minerals. There is, however, documentation that exploration for natural proppant did occur directly to the south of the 25-Year Life of Project Area in the 1960s (Underwood McLellan & Associates Limited, 1967). Several water wells have also been drilled in and around the Project Site for domestic, livestock, irrigation, industrial, municipal, air conditioning use or other (AECOM 2025). The water well data include lithology and collar information that was extracted from the GIN database (GIN 2019), as well as from the driller.

Sio Silica's previous use of the Project Site was for exploration activities under mining claim permits, borehole licences, and landowner agreements for land access. Sio Silica's drilling program within the Project Site included 33 exploration holes, of which six were completed as part of the 2017 program, ten were completed as part of the 2018-2019 program, three were completed as part of the 2019 programs, eight were completed as part of the 2020-2021 program, and six were completed as part of the 2022 program. An additional 15 extraction testing holes were also drilled from 2018 to 2021. All holes were drilled vertically. In addition to further constraining lithological depths, the main purpose of the drilling campaigns was to further develop production and supply wells, as well as to complete sand, limestone, and shale monitoring wells. Sio Silica secured land access agreements with all landowners and obtained borehole licences prior to drilling. Exploration of the Project Site has also been undertaken by others.

A summary of drilling campaign and associated rehabilitative/monitoring status is provided in Section 5-12.

5 Project Description

5.1 Project Summary

The Vivian Sand Project (the Project) is located southwest of the hamlet of Vivian, Manitoba, Canada, approximately 35 km east of the City of Winnipeg, within the Rural Municipality of Springfield.

The Project is the extraction of high purity quartz sand from the Winnipeg Sandstone aquifer (approximately 61 m below ground) within the Winnipeg Sandstone geological formation and is being developed for the purpose of supplying high purity quartz sand for use in various markets. The Project involves drilling water extraction wells (20.3-40.6 cm diameter) within the target sand deposit and using compressed air to bring the quartz sand to the surface in a sand and water slurry. Groundwater is returned to the aquifer via the sand producing well after disinfection treatment with ultraviolet light.

This Closure Plan addresses site activities spanning the initial five-year period of the overall 25-year development plan. Development beyond the first five years of proposed activities will be addressed in subsequent closure plan amendment(s).

5.2 Geology and Mineralogy

5.2.1 Regional Stratigraphy

The Winnipeg Formation was deposited in the Ordovician and is interpreted to be an erosionally isolated element of the North American cratonic platform succession that was deposited across the transcontinental Arch (Bezys and Conley 1998; Ozadetz and Haidl, 1989). The lowermost part of the Winnipeg Formation was deposited in a deltaic environment during a major transgression event (Bezys and Conley, 1998; Le Fever et al, 1987). With continued sea level rise, the deltaic deposits were overlain by marine shales and dolomitic limestone (Bezys and Conley, 1998).

The Winnipeg Formation, which in southwestern Manitoba is at the base of the Williston Basin strata, is composed of interbedded sands and shales (Lapenskie, 2016). These sediments were deposited during the Middle Ordovician, in shallow marine seas. The shales are generally light olive-grey in colour, kaolinitic, with variable sand and silt content (Bezys and Conley, 1998). The sand units, the thickest of which is the Carman Sand Member, are typically mature, well rounded, quartz dominant, and poorly-to-nonconsolidated. The Carman Sand Member is a discrete, east- west trending bar-like sand body within the upper half of the Winnipeg Formation in southern Manitoba. The Carman Sand Member is continuous and relatively uniform throughout the region, extending approximately 240 km from west of the Sandilands Provincial Forest located at Range 8 East, to Pelican Lake that is located at Range 16 West. The corridor of the Carman Sand Member varies in width from less than 25 km to greater than 95 km (Bezys and Conley, 1998).

The maximum reported thickness is 31 m (Natural Resources Canada, 2009). The Carman Sand Member occurs at depths less than 100 m along the subcrop belt, and dips towards to the west where it can be found at depths of greater than 800 m (Natural Resources Canada, 2004). The Carman Sand Member is truncated to the east by the basin edge as shown on Figure 5.1.

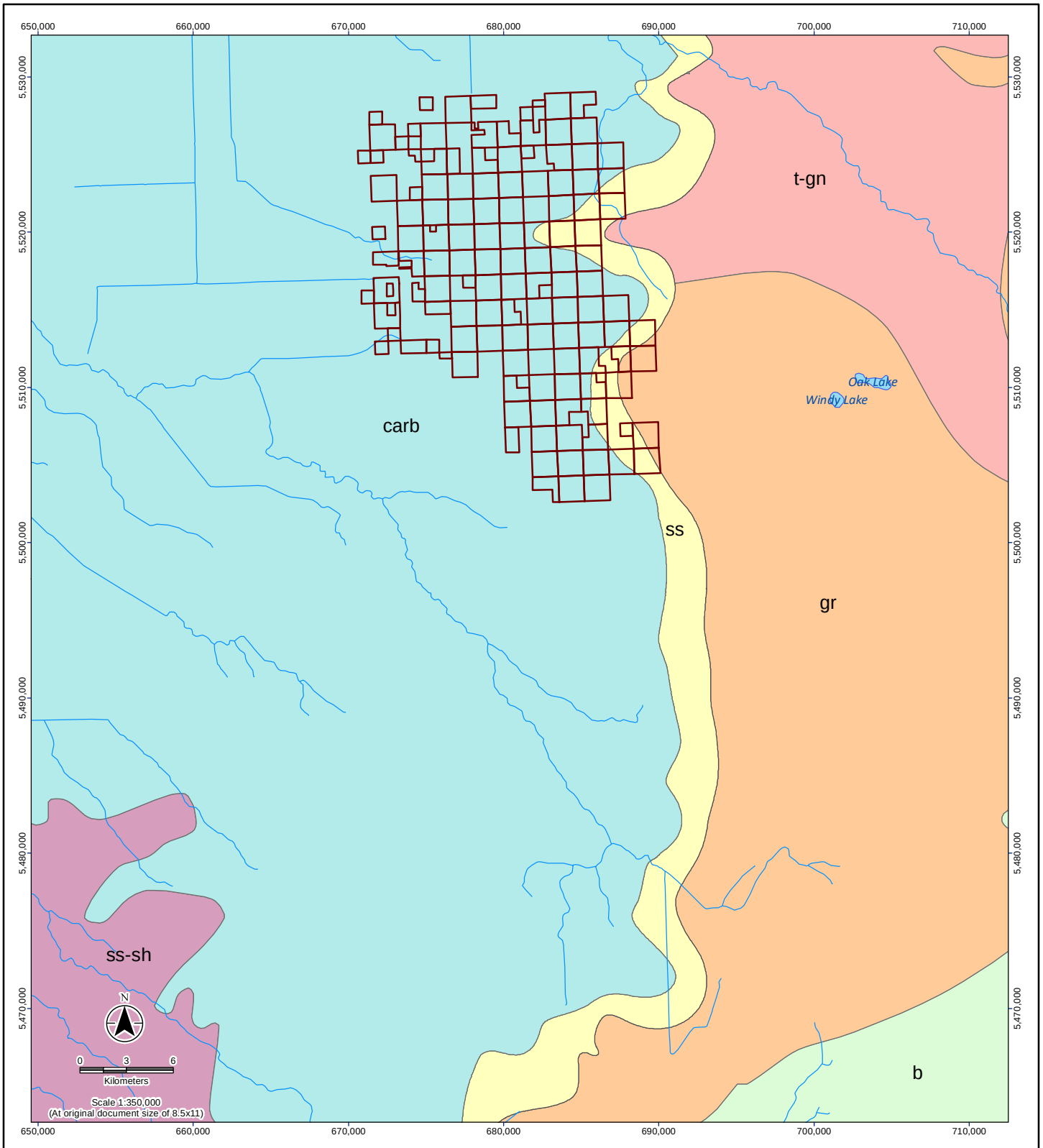
In the southwest corner of Manitoba, a thin wedge of the Deadwood Formation, which was deposited in the Cambrian Period, underlies the Winnipeg Formation (Bezys and Conley, 1998). The section of the Deadwood Formation, which is in South Dakota, is described by Butler et al. (1955) as a "*basal conglomerate and buff sandstone 9 m thick, overlain by grey-green, thin bedded shale with limestone interbeds 79 m thick and topped with red-brown, very glauconitic quartz sandstone, usually thin-bedded, with random partings of green shale and Scolithos borings 40 m thick, for a total thickness of 128 m*". The Deadwood Formation that occurs in Manitoba is measured to be up to 30 m in thickness (Natural Resources Canada, 2004). Where the Deadwood Formation is not present, the Winnipeg Formation overlays the Precambrian basement.

Conformably overlying the Winnipeg Formation is the Ordovician aged Red River Formation, which is composed of limestones and dolomites (Bezys and Conley, 1998). The thickness of the Red River Formation is up to 215 m; however, along the northeastern erosional edge the formation thickness decreases to 50 m (Natural Resources Canada, 2015). The Red River Formation outcrops in central Manitoba, where it has been subdivided into the Dog Head Member, Cat Head Member, Selkirk Member and the Fort Garry Member. The Dog Head Member is primarily a basal fossiliferous, mottled limestone that is overlain by the cherty dolomite of the Cat Head Member. Overlying the Cat Head Member is the Selkirk Member, which is composed of a second sequence of fossiliferous, mottled, dolomitic limestones. The Cat Head Member becomes more calcareous in the south end of the outcrop belt where it becomes indistinguishable from the Dog Head and Selkirk Members. The Fort Garry Member, which directly overlies the Selkirk Member, consists of finely crystalline and micritic, variable argillaceous dolomites, with a medial zone of shaly dolomite breccias (Natural Resources Canada, 2015).

Above the Red River Formation is Quaternary diamicton, which ranges in composition from silty to rocky, and is calcareous (Matile and Keller, 2004).

5.2.1.1 Structural Geology

The Ordovician strata in southwestern Manitoba generally trend east-west to slightly north-east. The Winnipeg Formation thins irregularly from approximately 68 m in thickness in southwestern Manitoba to zero at the formation's northern limit. The thinning of the Winnipeg Formation coincides with irregular lithofacies changes, as lithologies change from being shale dominant in the southern area to sand dominant in the northern area. The lithofacies changes may result in differential compaction (Bezys and Conley, 1998).



Legend

- Bru Mining Claim
- River
- Lake

PHANEROZOIC

Mesozoic

Jurrasic
- ss-sh — Sandstone, shale

Paleozoic

Ordovician
- carb — Limestone, dolomite
- ss — Sandstone

PRECAMBRIAN

Archean
- gr — Granite
- t-gn — Tonalite gneiss
- b — Mafic volcanics

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Data Sources: Geology of Manitoba - modified by Stantec

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Regional Geology Map

Figure 5.1

DRAWN BY: M.B. CHK'D BY: I.M. DATE: 9/30/2022	FILE: Fig7_1_Bru_Regional_Geology V:\1295\active\129500488\Discipline\Geology\ArcGIS\MXD

5.2.2 Property Geology

Prior to 2017, the area had undergone little drilling, most of which was limited to water wells that were drilled on behalf of third parties. The units described below are primarily based on reliable holes that were drilled in the Project area by CanWhite. In general, the stratigraphy is consistent; the major units are Quaternary sediments, carbonate and shale intervals of the Red River Formation, unconsolidated sand, sandstone, and shale of the Winnipeg Formation, and Archean-age granitoid basement. The upper unconsolidated sand interval of the Winnipeg Formation, which is known as the Carman Sand Member, is the target interval to be exploited.

Unit thickness maps are shown on Figure 5.2 and Figure 5.3 for the Red River carbonate unit and the Carman Sand Member, respectively. Structure contour maps of the basal layers of the carbonate and Carman Sand Member are shown on Figures 5.4 and 5.5, respectively. North-south and east-west cross-sections are shown on Figure 5.6 to 5.9. Table 5.1 shows the units encountered on the Property.

Table 5.1 Property Lithology

Eon	Era	Period	Geologic Unit	Member	Lithology
Phanerozoic	Cenozoic	Quaternary			Diamicton
	Paleozoic	Ordovician	Red River Formation	Selkirk, Cat Head, Dog Head Members	Carbonate
					Shale
			Winnipeg Formation	Carman Sand Member	Sand
				Equiv. Ice Box Member	Shale
				Black Island Member	Sand
Archean					Granitoid

5.2.2.1 Quaternary Sediments

The Pleistocene-aged diamicton is heterolithic, varies in material size distribution from silty to rocky, and typically has a calcareous component. In the Project area, the diamicton ranges from 5 m to 43 m in thickness.

Red River Formation

Carbonate (Selkirk, Cat Head, Dog Head Members)

The carbonate unit, which is upper Ordovician in age, is in the lower Red River Formation. In Southern Manitoba, this unit is comprised of the Dog Head, Cat Head, and Selkirk members (Natural Resources Canada, 2015). The unit varies in composition from limestone to dolostone, contains bedding-parallel fractures, and is vuggy in areas. Commonly, the bottom 1 m to 5 m interval contains shale interbeds within the carbonate unit. of an argillaceous carbonate unit occurs directly above the shale interval.

Based on reliable drill holes, the carbonate unit total thickness ranges from 0 m to 48 m in the Project area.

Shale (Selkirk, Cat Head, Dog Head Members)

A shale unit occurs directly beneath the carbonate unit. This shale unit forms the base of the Red River Formation and is proposed to be part of the Dog Head Member. This shale unit is highly fractured and friable. The colour of the shale varies through the interval, including brick red, greyish green, and bluish grey colourations. This shale interval, based on reliable historic drill holes as well as the 2017 and 2018 drill campaigns, varies in thickness from 0 m to 11 m.

Winnipeg Formation

Sand (Carman Sand Member)

The unit encountered directly beneath the base of the Red River Formation is the Carman Sand Member (Natural Resources Canada, 2009a,b). The Carman Sand Member is in the upper section of the Winnipeg Formation. The Carman Sand Member is typically uncemented, well sorted, well-rounded, and typically has a fine to medium grain size. The Carman Sand Member in the Property was measured to have thicknesses between 20 m and 23 m. A basal cemented sandstone unit that typically ranges in thickness from 0.3 m to 0.5 m, was encountered in some drill holes.

Shale (Ice Box Member Equivalent)

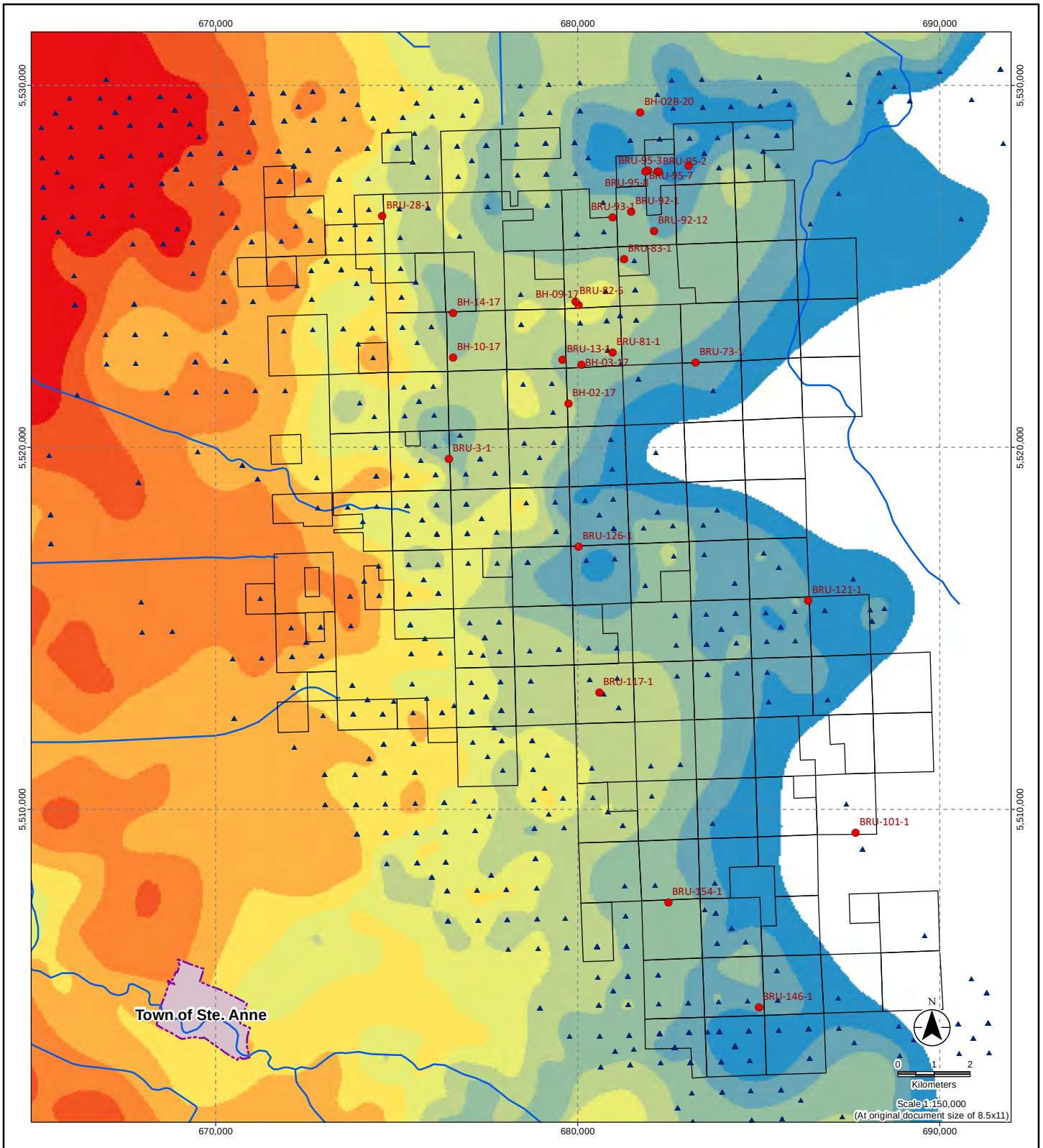
A shale unit occurs directly beneath the Carman Sand Member. This unit is proposed to be equivalent to the Ice Box Member, which occurs as the middle unit in the Winnipeg Formation in North Dakota and Saskatchewan (Natural Resources Canada, 2004). The colouration of this shale unit varies significantly, including emerald green and dark brown colouration. The drilling of this unit was slow, supporting that this shale unit is more competent than previously encountered units. The thickness of this shale interval in the Project area, based on reliable drill holes that penetrated the entire unit, varies from 1 m to 24 m in thickness.

Sand (Black Island Member)

An unconsolidated sand unit below the shale interval is proposed to be equivalent to the Black Island Member (Natural Resources Canada, 2009c). On the property, is approximately 1 m thick, and is fine-grained, well sorted, and well-rounded. Commonly a cemented sandstone unit occurs either above or below this unconsolidated sand unit. This sandstone interval, where encountered, typically ranges in thickness from 0.3 m to 0.6 m.

Granitoid

Granitoid basement, which is Archean in age, is altered and in areas contains disseminated pyrite.



Legend

- SioSilica Drill Hole
- Non SioSilica Drill Hole
- River
- Mining Claim
- City / Town

Carbonate Thickness (m):

0 - 10	30 - 35
10 - 15	35 - 40
15 - 20	40 - 45
20 - 25	45 - 50
25 - 30	> 50

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Data Sources: Government of Manitoba and CanWhite Sands Corp.

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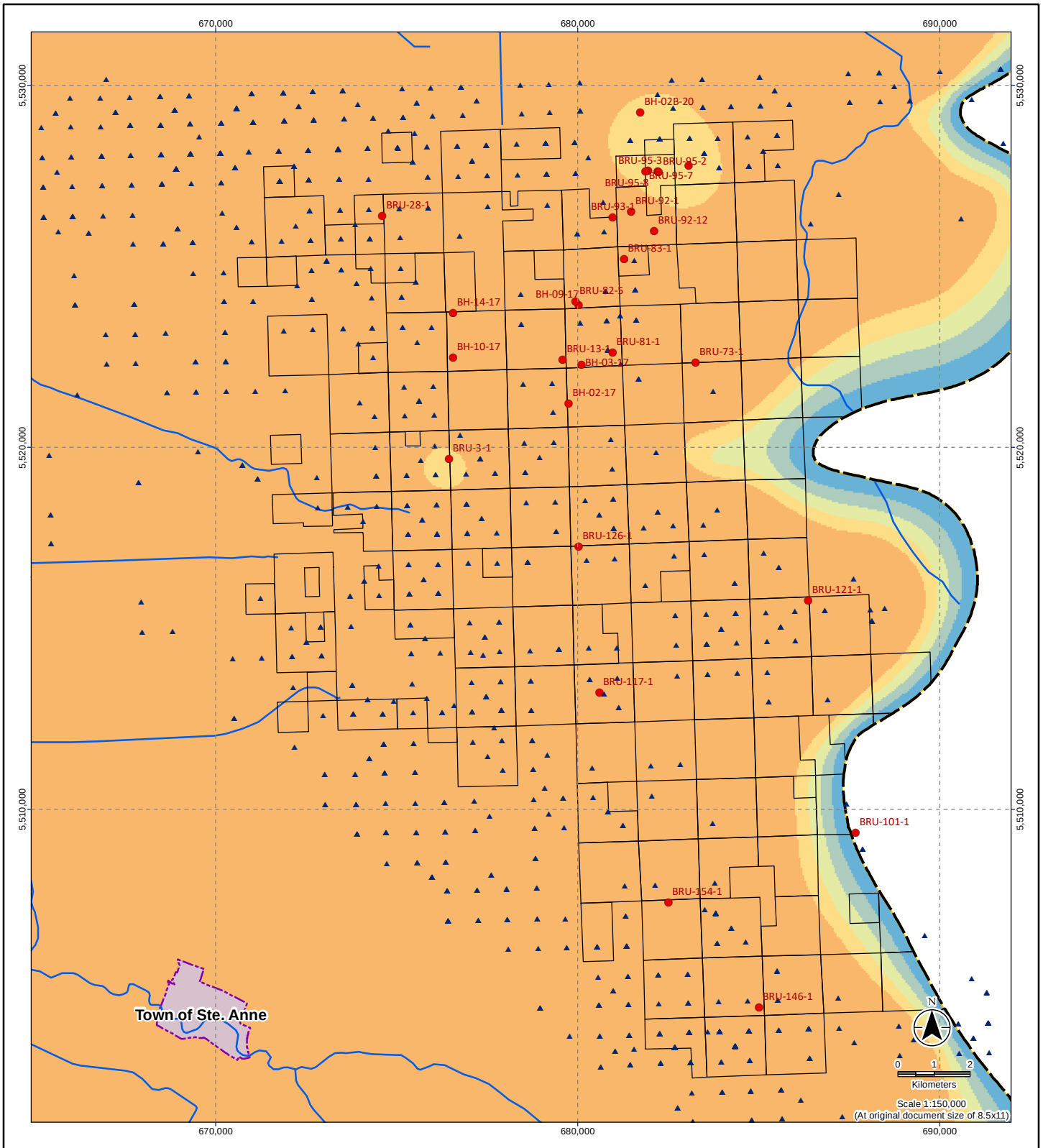
Carbonate Thickness Map

Figure 5.2

DRAWN BY: M.B. CHK'D BY: I.M. DATE: 9/30/2022	FILE: Fig7_2_Bru_Carbonate_Thickness V:\1295\active\129500488\Discipline\Geology\ArcGIS\MXD



Legend

- SioSilica Drill Hole
- Non SioSilica Drill Hole
- River
- Mining Claim
- City / Town

Sand Thickness (m):

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- >25

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Data Sources: Government of Manitoba and CanWhite Sands Corp.

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Sand Thickness Map

Figure 5.3

DRAWN BY: M.B.	FILE: Fig7_3_Bru_Sand_Thickness
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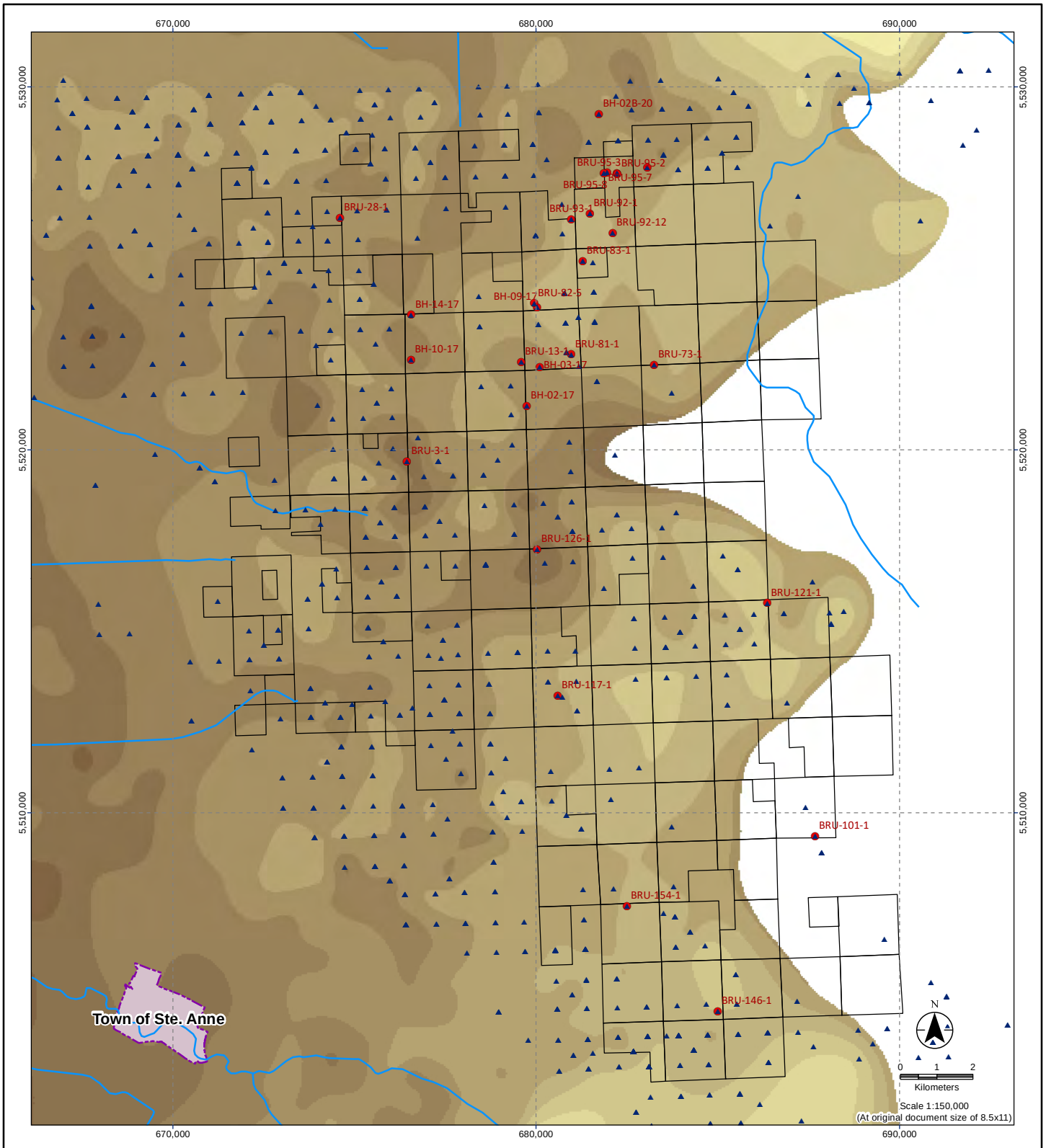
DATE: 10/26/2022	



Legend

- SioSilica Drill Hole
- Non SioSilica Drill Hole
- River
- Mining Claim
- City / Town

Top of Carbonate (m ASL):

- < 215
- 215 - 220
- 220 - 225
- 225 - 230
- 230 - 235
- 235 - 240
- 240 - 245
- 245 - 250
- 250 - 255
- 255 - 260
- > 260

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Data Sources: Government of Manitoba and CanWhite Sands Corp.

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Structure Map
Top of Carbonate

Figure 5.4

DRAWN BY: M.B.
CHK'D BY: I.M.
DATE: 10/26/2022

FILE: Fig7_5_Bru_Carbonate_TopStructure
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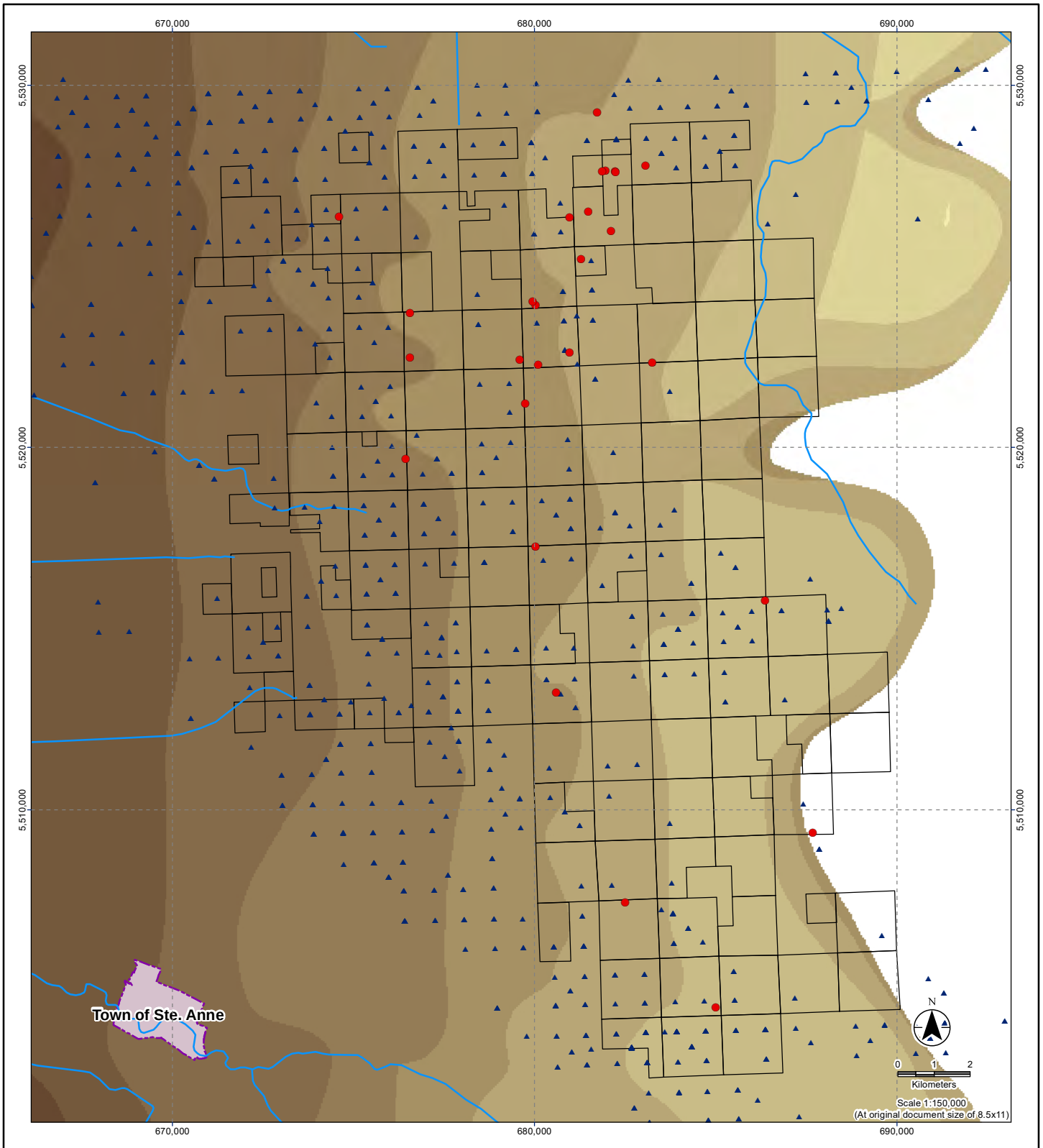

Legend

- SioSilica Drill Hole
- Non SioSilica Drill Hole
- River
- Mining Claim
- City / Town

Top of Sand (m ASL):

- ≤ 180
- 180 - 190
- 190 - 200
- 200 - 210
- 210 - 220
- 220 - 230
- 230 - 239.9
- 240 - 250
- > 250

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Data Sources: Government of Manitoba and CanWhite Sands Corp.

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Structure Map
Top of Carman Sand

Figure 5.5

DRAWN BY: M.B.
CHK'D BY: I.M.
DATE: 10/26/2022

FILE: Fig7_6_Bru_Sand_TopStructure
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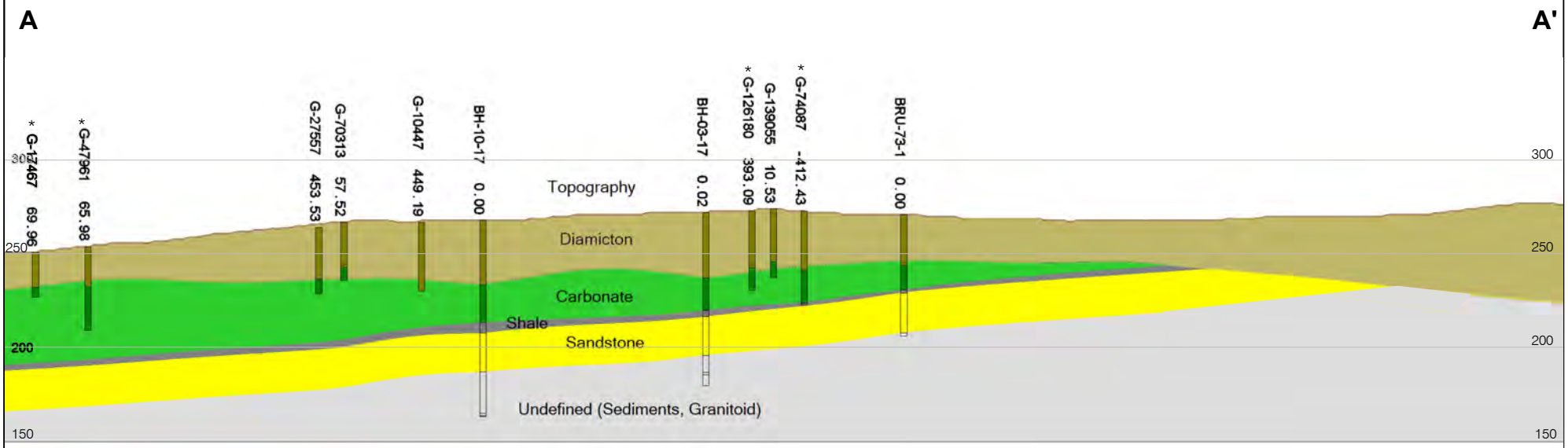
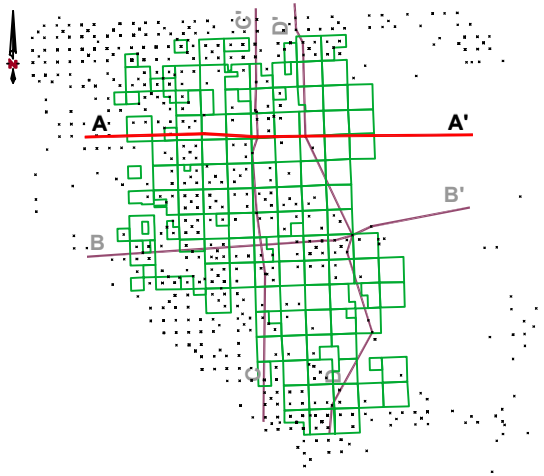


Vertical Exaggeration 1:30

0 1km



Legend:

* — Multiple drill holes at this location, only one is shown for simplicity.

BH-10-17 — Drill hole name

0.00 — Offset distance from cross-section line

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CROSS SECTION A - A'

Figure 5.6

DRAWN BY: M.B.	FILE: Fig_7_78910 _xSection_ABCD.dwg
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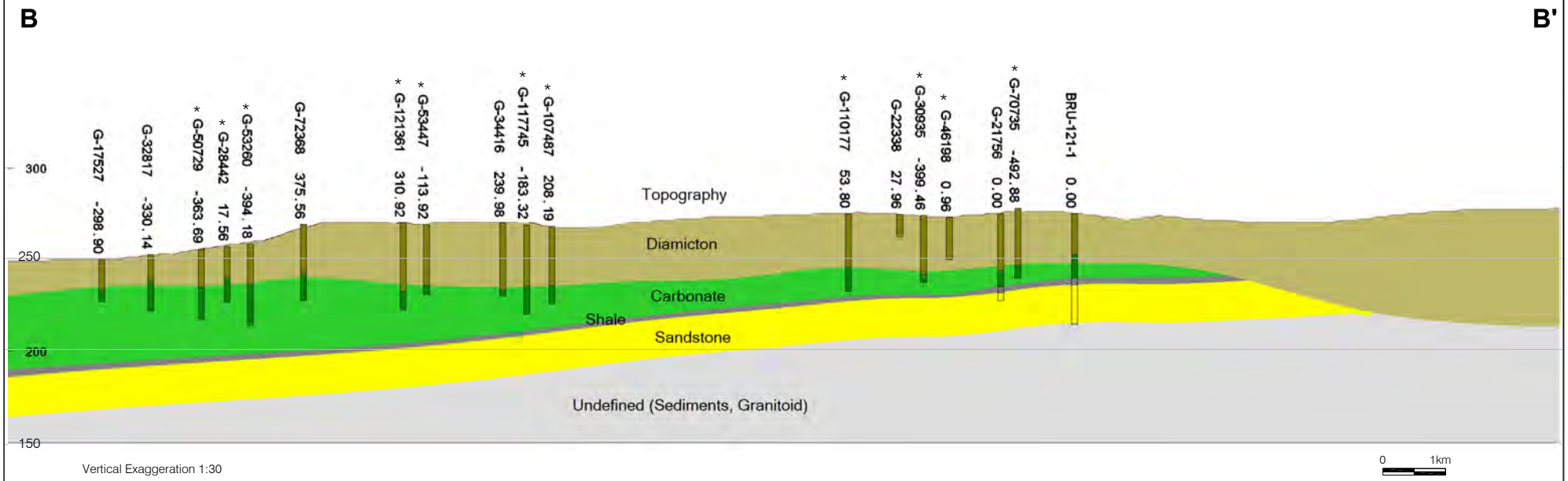
DATE: 09 27 2022	



Legend:

* — Multiple drill holes at this location, only one is shown for simplicity.

BH-10-17 — Drill hole name

0.00 — Offset distance from cross-section line

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CROSS SECTION B - B'

Figure 5.7

DRAWN BY: M.B.
CHK'D BY: I.M.
DATE: 09 27 2022

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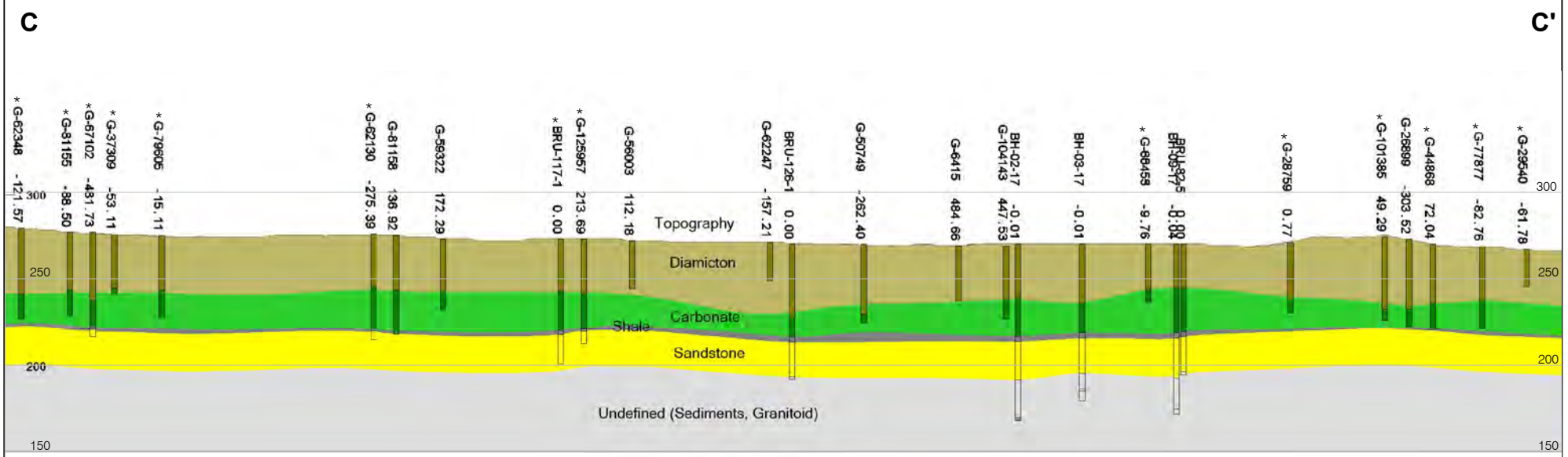

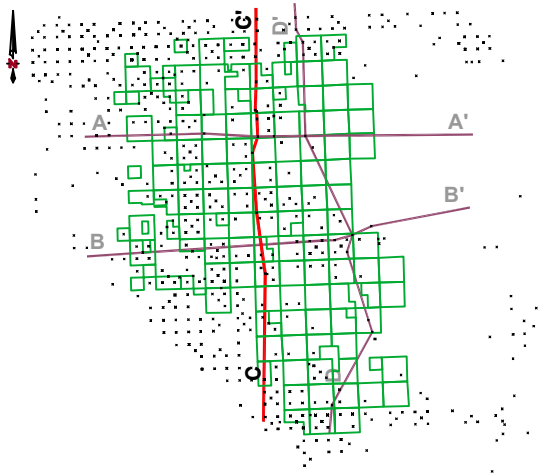

Legend:

* BH-10-17 0.00

- Multiple drill holes at this location, only one is shown for simplicity.
- Drill hole name
- Offset distance from cross-section line

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CROSS SECTION C - C'

Figure 5.8

DRAWN BY: M.B.	FILE: Fig_7_78910 _xSection_ABCD.dwg
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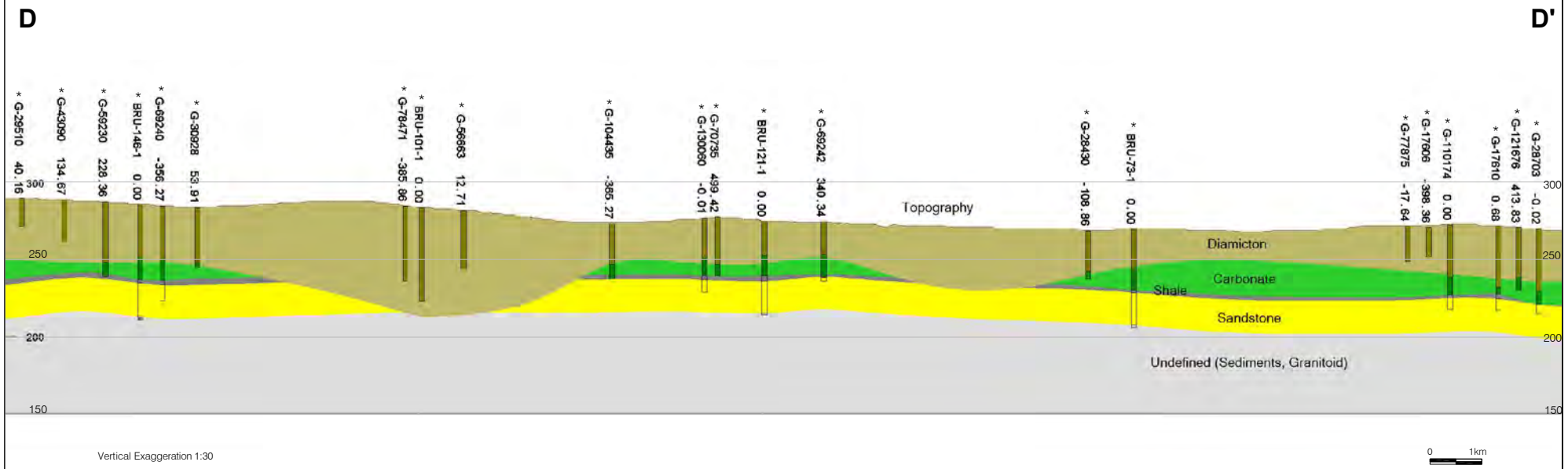

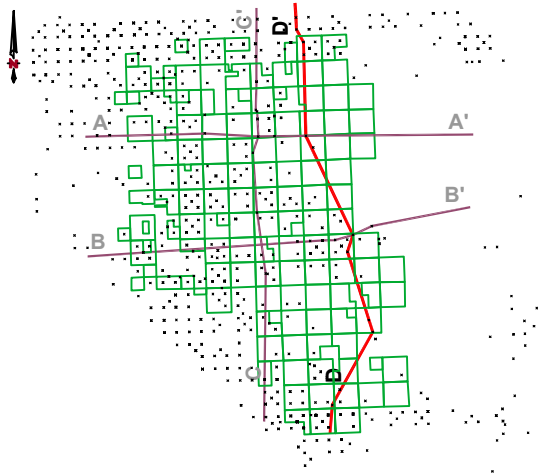

Legend:

* — Multiple drill holes at this location, only one is shown for simplicity.

BH-10-17 — Drill hole name

0.00 — Offset distance from cross-section line

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CROSS SECTION D - D'

Figure 5.9

DRAWN BY: M.B.
CHK'D BY: I.M.
DATE: 09 27 2022

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5.2.3 Mineralization

5.2.3.1 ARD/ML

Results of rock core testing for acid rock drainage/metal leaching (ARD/ML) potential are provided in Appendix E of AECOM 2025). Rock samples were collected to assess ARD/ML potential for bedrock materials present within the Project area at the locations shown on Figure 5.10. The rock types that will be disturbed during Project operations include Red River Carbonate, Winnipeg Shale and Winnipeg Sandstone from an area that hosts productive aquifers that exhibit relatively good water quality.

The risk of acid generation was determined based upon the calculated Neutralization Potential Ratio (NPR) described by MEND (2009). NPR ratio is defined by the neutralization potential (NP) divided by the acid potential (AP). MEND (2009) recommends the following classification:

- NPR > 2: Sample is considered non- PAG.
- 2 > NPR > 1: Uncertain. Test is inconclusive.
- 1 > NPR: Sample is considered potentially acid generating (PAG).

In total, nine rock samples were collected from the drill cores and included three samples each of Red River Carbonate, Winnipeg Shale and Winnipeg Sandstone at three locations (Bru 121-1, Bru 146 and Bru 95-8). All nine samples were submitted for laboratory testing to determine the types of minerals present in the samples (XRD), the concentrations of elements relative to average crustal abundance (Near-Total Recoverable Elemental Analysis), the potential for rock types to generate acid rock drainage (Acid Base Accounting (ABA)) , “whole rock” concentrations of metals (Aqua Regia Digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)) and the potential for metal leaching (dissolution) under simulated field conditions using shake flask extraction (SFE).The groundwater quality results discussed in AECOM 2025, Appendix E are representative of existing water-rock interactions in the subsurface and should be evaluated together with the solid phase data to supplement the discussion and analysis of ARD/ML testing results.

All samples of Red River Carbonate and Winnipeg Sandstone have calculated NPR values significantly greater than 2, and those samples are classified as non-potentially acid generating (non-PAG) according to definitions in MEND (2009). Two samples collected from the Winnipeg Shale had calculated NPR values below 2 (classified as uncertain acid generation potential). A third sample of Winnipeg Shale was classified as non-PAG.

Mineralogy results indicated pyrite is present in two of three samples of Winnipeg Shale, although ABA test results suggest that it is not conclusively acid generating. As discussed in AECOM 2025, Appendix E, the accuracy of the mineralogy or AP measurements should be validated through additional sampling during extraction operations. This will help address the discrepancies between mineralogy and ABA test results and confirm the quantity and behaviour of sulphide minerals in the Winnipeg Shale. Until this information is available and has been assessed, waste derived from the Winnipeg Shale should be considered PAG, managed conservatively, (i.e., blended with carbonate to increase the NPR, construct a lined waste storage facility to contain potential PAG waste materials, etc.) and disposed of in accordance with the Waste Characterization and Management Plan (Appendix E within AECOM 2025).

SFE results indicated that the rock types display varied metal leaching potential. Dissolved aluminum featured as a contaminant of potential concern in the Red River Carbonate and Winnipeg Sandstone. Selenium was identified as a contaminant of potential concern in samples of Red River Carbonate, Winnipeg Shale and one sample of Winnipeg Sandstone (perhaps due to presence of shale fragments). Arsenic and uranium were identified as contaminants of potential concern in one sample of Winnipeg Shale. However, arsenic, selenium and uranium concentrations in groundwater were below or close to detection limits. Whether mercury was a potential contaminant of concern in all samples was uncertain because most of the results exhibited concentrations below the detection limit. Until the metal leaching behaviour of selenium and other trace elements has been assessed in greater detail, waste derived from the Winnipeg Shale and Red River Carbonate should be managed conservatively in accordance with the Waste Characterization and Management Plan.

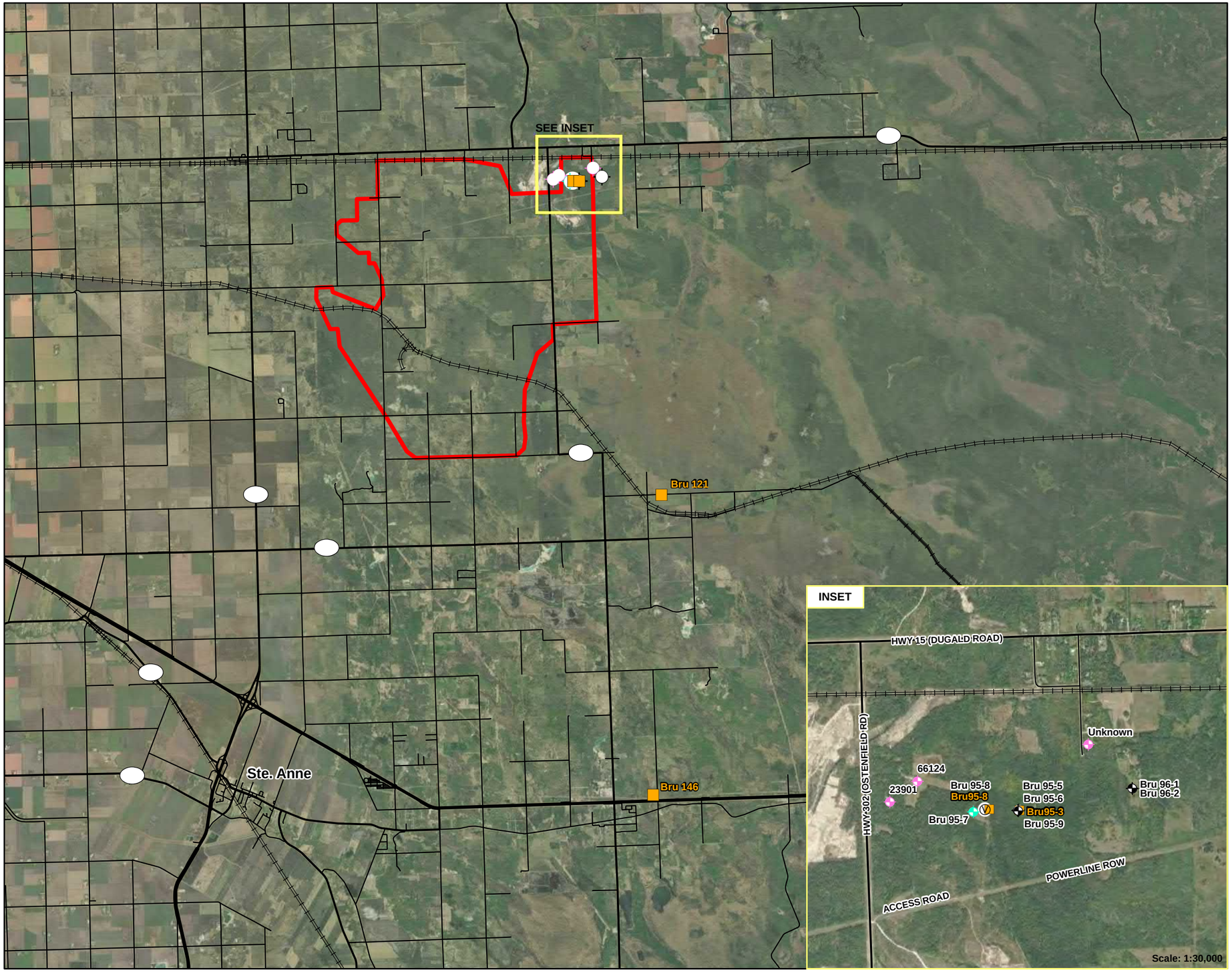
5.2.4 Deposit Types

The Carman Sand Member is dominantly an unconsolidated laterally extensive unit across the Property, as validated through previous drilling campaigns. The geological model that is applied is consistent with that of other properties having aggregate materials that are laterally extensive. The deposit appears to have limited geological variability.

The target interval is the unconsolidated Carman Sand Member. The primary objective of the program was to delineate the quality and quantity of the unconsolidated Carman Sand Member and to assess if a large enough volume of silica sand can be extracted from the Property to make it economic. The Carman Sand Member varies in thickness from 20 m to 23 m.

5.3 Mining Activities

Sio Silica anticipates extracting sand as a sand and water slurry in a phased approach starting with 23 wells in year 0; 68 wells in year 1; 132 wells in year 2 and year 3; and 137 wells in year 4; in clusters of 1 to 5 wells at an approximate depth of 61 m in Winnipeg Sandstone aquifer. The total number of wells per year may vary depending on land access, weather, and tonnages per well. Not all extraction wells will be operating simultaneously (i.e., at the same time) during each year of operations. A maximum of five extraction wells in two different areas may be operating simultaneously. The sand and water slurry will be transported directly to a sand Processing Facility via above-ground slurry lines that may be diverted underground at road crossings or hydro right of way crossings, as required. Pumping stations will be installed as necessary along the slurry line and water return line trails to facilitate transport of the sand and water slurry to the sand Processing Facility and water return from the sand Processing Facility. This method of quartz sand extraction will limit above-ground disturbance and eliminate the need for sand transportation truck traffic as well as dust related to trucking or open pit.



Legend

- Groundwater Monitoring Well (CanWhite)
- Vibrating Wire Piezometers (CanWhite)
- Geochemistry Sample Location
- Pumping Well (CanWhite)
- Surveyed Domestic Well
- Project Site

General Features

- Highway
- Road
- Railway

1:150,000
NAD 1983 UTM Zone 14N

1 0.5 0 1 2 3
km

Basemap: Canvec
Imagery: Esri World Imagery Basemap

AECOM

Figure: 5.10

SITE INVESTIGATION PLAN

VIVIAN SAND EXTRACTION PROJECT
HYDROGEOLOGY AND GEOCHEMISTRY ASSESSMENT
CANWHITE SANDS CORPORATION
Project No.: 60640258 Date: April 2021

digging. This also allows for minimal water usage as the water in the slurry loop continues to be recycled (Section 5.4).

5.4 Extraction

High purity quartz sand will be extracted from the Winnipeg Sandstone aquifer (via extraction wells) using an airlift extraction method. This method uses a compressor to circulate air into the bottom of the installed production pipe within each extraction well to extract the sand which is then placed in a slurry line for transportation directly to the sand Processing Facility. The extraction method sequence of activities is described as follows:

1. Drilling of extraction wells will occur year-round. Clusters of one to five (extraction wells will be drilled (**Section 2.2.2**) in advance of extraction activities occurring using a water well drilling rig and using standard industry practice water well drilling techniques. A maximum of seven extraction wells are expected to be operating simultaneously at full capacity operations from year 2 onwards (i.e. at the same time). These seven active extraction wells may be spread across adjacent well clusters. The number of wells in each cluster will be based on the allowable span as determined by a geotechnical analysis report for this Project as provided in AECOM 2025 Appendix C of the EAP. The geotechnical analysis report (Appendix C of the EAP) was developed for conservative maximum allowable spans of the extraction areas and spacing required according to the thickness of the limestone caprock and overburden.

    a) When each well is drilled, casing will be installed and grouted in place to isolate between the various formation layers, preventing vertical mixing of the different aquifers present. For additional details on extraction well installation, refer to Appendix B of AECOM 2025.

    b) Wells will be drilled into the sandstone over one to two days. Once a well is drilled and casing is in place with cement as per *The Groundwater and Water Well Act* requirements, wells are securely capped until sand extraction activities begin.

2. Sand extraction activities will occur 24/7 from April through November (and winter, weather dependent). Up to seven extraction wells will be operating simultaneously with active wells in the same cluster or adjacent clusters.

    a) A production pipe will be installed in the extraction well with an air line installed inside the production pipe for air to circulate and facilitate movement of sand and water to the surface. This activity is a standard water well drilling and production method. The compressor is a dry screw compressor, which is oilless, and therefore no oil is expected in the air. The compressor will be equipped with a standard intake filter which is designed to remove 99% of 5 micron or larger contaminants and 95% of 3 micron or larger contaminants.

    b) The sand and groundwater slurry brought to surface will pass through vibrating screens installed over a sump at the extraction site which will capture overs such as concretions (calcified sand) which are commonly encountered.

c) The sand and groundwater slurry will then move to a dewatering station at the extraction site where the sand will be separated from the groundwater.

d) This groundwater will then be returned to the aquifer via the sand producing extraction well after being filtered and treated with ultraviolet (UV) light, which is a water treatment technique commonly used in municipal water treatment facilities.

e) The construction method of the extraction well and surface water handling will prevent water that is returned to the sandstone from contacting any potential source of contamination.

f) The water that is returned to the sandstone aquifer comes from the sandstone aquifer and returns to the same place after filtration and UV treatment as described above.

g) The sand will then enter a movable slurry transport system via a slurry line that will transport the sand slurry to the sand Processing Facility located south of the hamlet of Vivian.

h) This slurry transport system will contain recycled water from the Processing Facility that is traveling in a continuous loop. The sand enters the loop at the extraction site, travels in the slurry line to the Processing Facility and is removed from the slurry line for washing and drying. The Vivian Sand Facility Project Environment Act Proposal (AECOM 2020), available in the Manitoba Public Registry[2], describes how the sand is processed once it arrives at the facility.

i) Once the water no longer contains sand and has been through the treatment process (as outlined in the Facility Environment Act Proposal), the water returns back to the extraction site via a dedicated water return line. This water then feeds back into the sand slurry line to move more sand back to the facility in a continuous loop process.

j) Each well will operate for five to seven days before the well is capped and equipment is moved to the next well.

k) Water well rigs that are the typical size used to install domestic water wells will be used to install the sand extraction wells.

[2] The EAP for the Vivian Sand Facility Project (AECOM 2020) is accessible at: https://www.gov.mb.ca/sd/eal/registries/6057canwhite/index.html

l) When a well is no longer producing sand, the production piping will be removed, the slurry line connection will be disconnected, and the well will be capped. All equipment will then be moved to the next well in the cluster and re-connected.

m) While this is occurring, the other wells (up to seven) will continue to operate so that the slurry loop system continues to supply sand to the facility for processing.

n) Once the production piping is removed from the extraction well, the well will be sealed (abandoned) as per *The Groundwater and Water Well Act* and *The Mines and Minerals Act* requirements to prevent movement of water vertically between the aquifers. Further detail on the well sealing procedures can be found in the Section 8.3 of AECOM, 2025.

The slurry loop system for transporting sand to the facility is designed to not require any additional water. **This allows for the majority of the water that comes from the extraction well to be returned to the aquifer within a short period of time. Therefore, very little extraction of groundwater from the aquifer is required.**

Approximately 15% moisture content will remain with the sand as it enters the slurry loop system because the dewatering system at the extraction site will not remove 100% of the water from the extracted sand. Therefore, a small amount of water (approximately 8 to 25 US gpm) will stay with the sand. For comparison, a garden hose uses approximately 12 to 13 gpm of water, and a typical fire hose uses 200 or more gpm. The sand will remain wet as it enters the slurry loop system. The other 85% of the remaining removed water will be re-injected after a filtration and UV treatment or other approved treatment method.

It should be noted that for the start-up of the extraction process each spring, a one-time water draw at the beginning of the initial extraction year is needed to prime the sand slurry transport system. After that, the initial one-time water draw remains in the slurry transport loop system while the sand enters the loop system at the extraction site and exits the loop system at the Processing Facility. In the winter months, the water in the system is stored on site in tankage to eliminate the need to draw additional water at the start of each extraction season (April). Therefore, a minimal amount of groundwater is used by sand extraction activities each year of operation.

A schematic illustrating the extraction circuit process is shown in Figure 5.11.

The Project will be developed as a sequential extraction well drilling operation with progressive annual closure/sealing/abandonment of extraction wells and progressive annual rehabilitation of temporarily disturbed areas. Temporarily disturbed areas include areas to accommodate the extraction wells, drilling rig access trails, equipment laydown areas (within well cluster areas) and trails to accommodate the slurry lines and water return lines.

5.5 Processing

The processing component of the BRU silica operation is guided by a modular and multi-stage recovery process. The four general areas are:

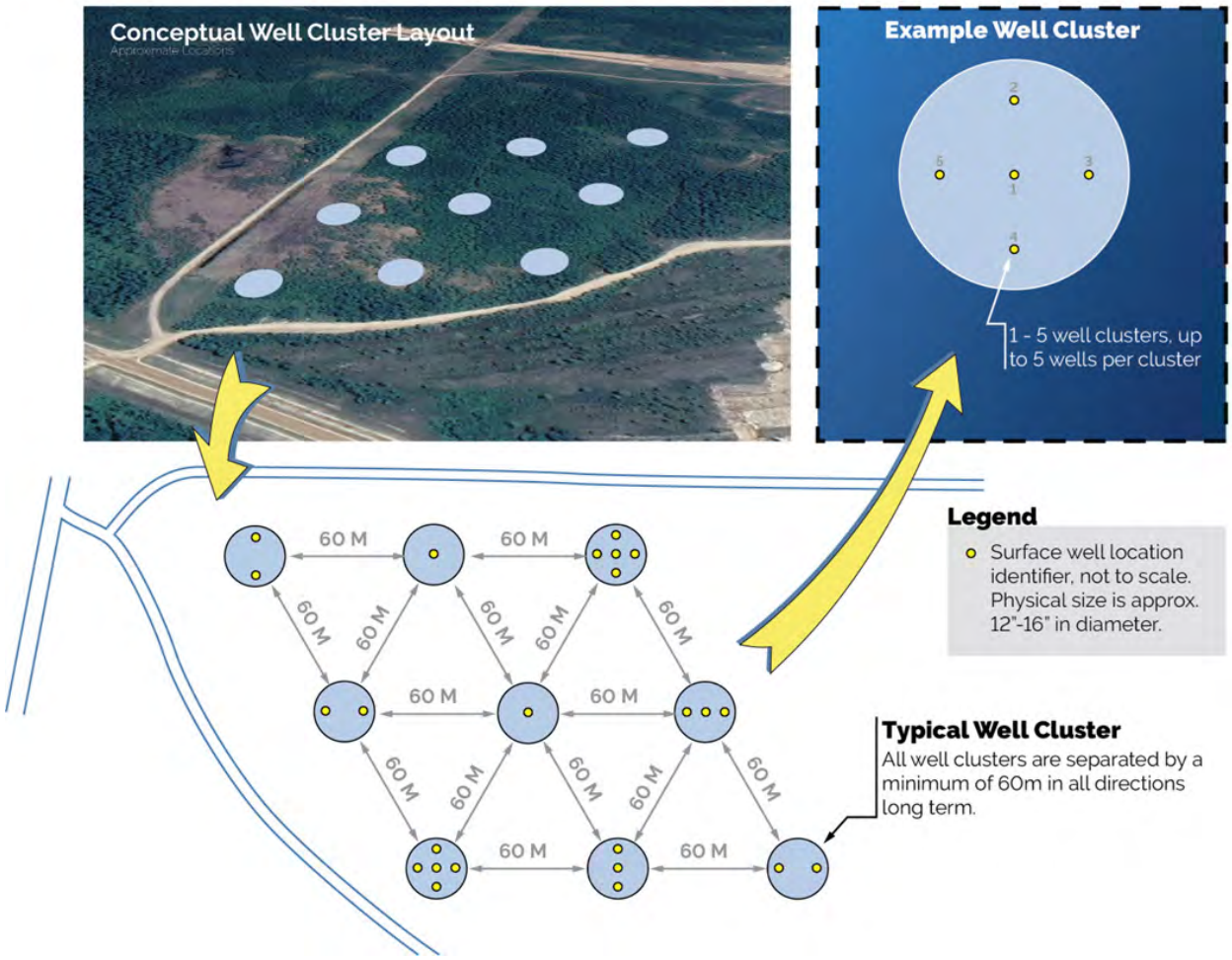
- A modular well pad screening and dewatering plant for slurry preparation in the field
- A dewatering circuit or 'wet plant' for raw sand separation at the facility
- A dry screening plant for final sizing and beneficiation at the facility
- The storage and loadout system at the facility.

Based on preliminary analyses and modeling, extraction, handling and drying losses are estimated at seven percent.

The sand and water brought to the surface from each extraction well is separated from the water at each extraction site. The water is then filtered, and UV treated before being immediately returned to the extraction well and to the sandstone aquifer the groundwater was originally extracted from (Figure 5.12) The sand enters the main slurry loop system with the recycled water (see Figure 5.12). The slurry loop system is a temporary line made of high-density polyethylene (HDPE) tubing fused together to create one continuous line that is 35.6 cm (14-inches) in diameter which transports sand to the Processing Facility site.

During the first year of extraction activities, the well clusters will be closer to the Processing Facility than subsequent years of operations. Therefore, during the first year of operations, one pumping station will be needed to move the sand slurry to the Processing Facility. When the slurry line increases in length during subsequent years of operations, additional pumping stations will need to be added along the length of slurry line.

G:_GIS_Project_Folder\111473043_SioSilica\InDesign\111473043_InDesign_Template_20240617.mxd Revised: 2024-06-17 By: ACampigotto



Stantec

Project Location
RM of Springfield, Manitoba

Prepared by ACampigotto on 2024-06-17
Reviewed by KMathers on 2024-06-17

Client/Project
Sio Silica
Closure Plan

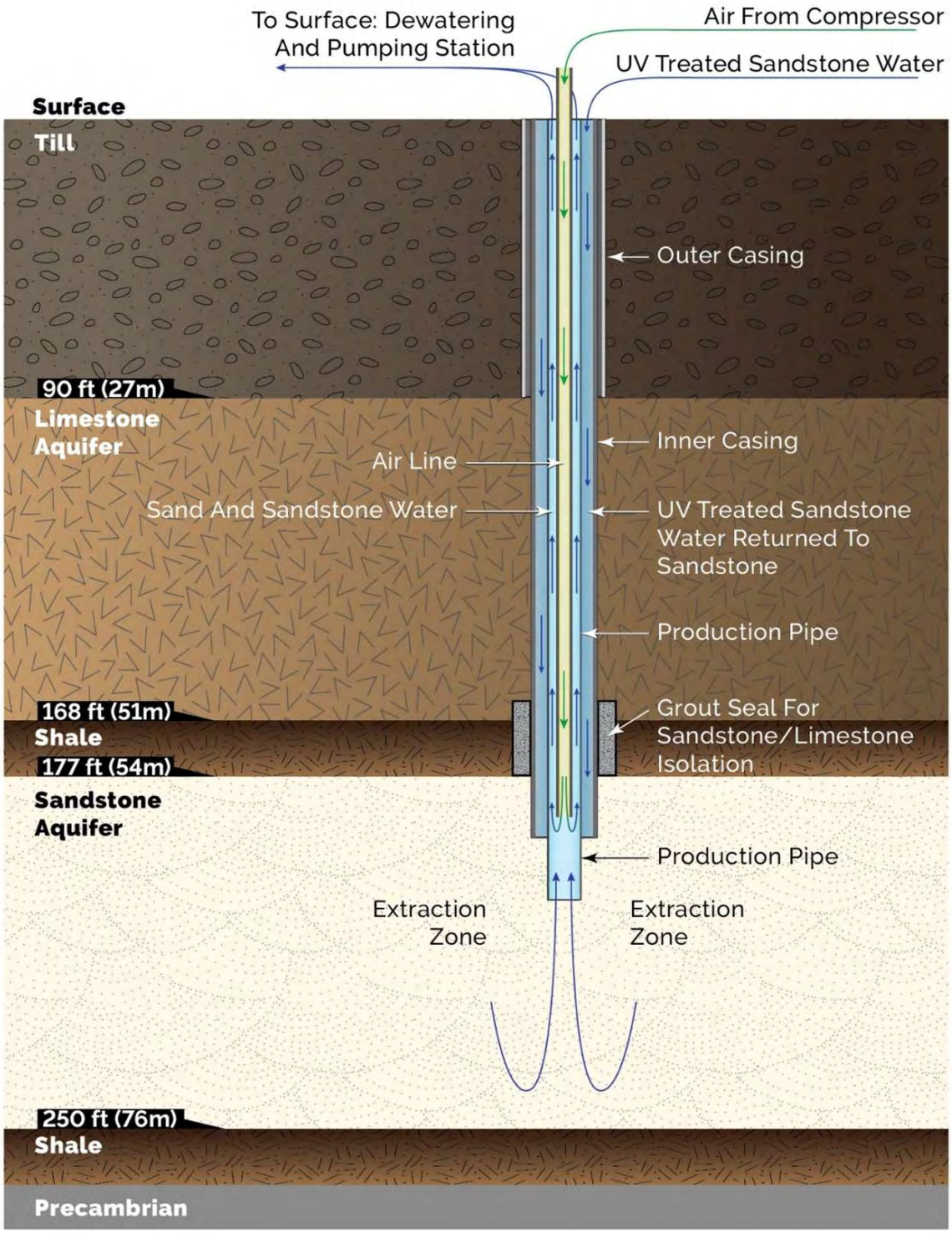
111473043

Figure No.
5.11

Title
Conceptual Extraction Well and Well Cluster Layout

Original Graphic Source:
Figure 2-3, Conceptual Extraction Well and Well Cluster Layout, courtesy of AECOM.

Figure 5.12 Silica Sand Well Extraction Method (Courtesy AECOM)



Example Only

The slurry loop will typically operate at approximately 15% sand and 85% water, with the ratio of sand and water varying by up to approximately 35%. This ratio of sand and water in the slurry loop system allows the system to be started from a complete stop by the pumping station(s), as required, and also limits the potential for the slurry system to clog and potentially break as a result. This also removes the need to potentially drain or remove sand or cut the line.

Prior to the mobile slurry lines being moved between extraction well sites, the slurry line segments are emptied via periodic access points in the slurry line to eliminate any spills or leaks of water onto the ground.

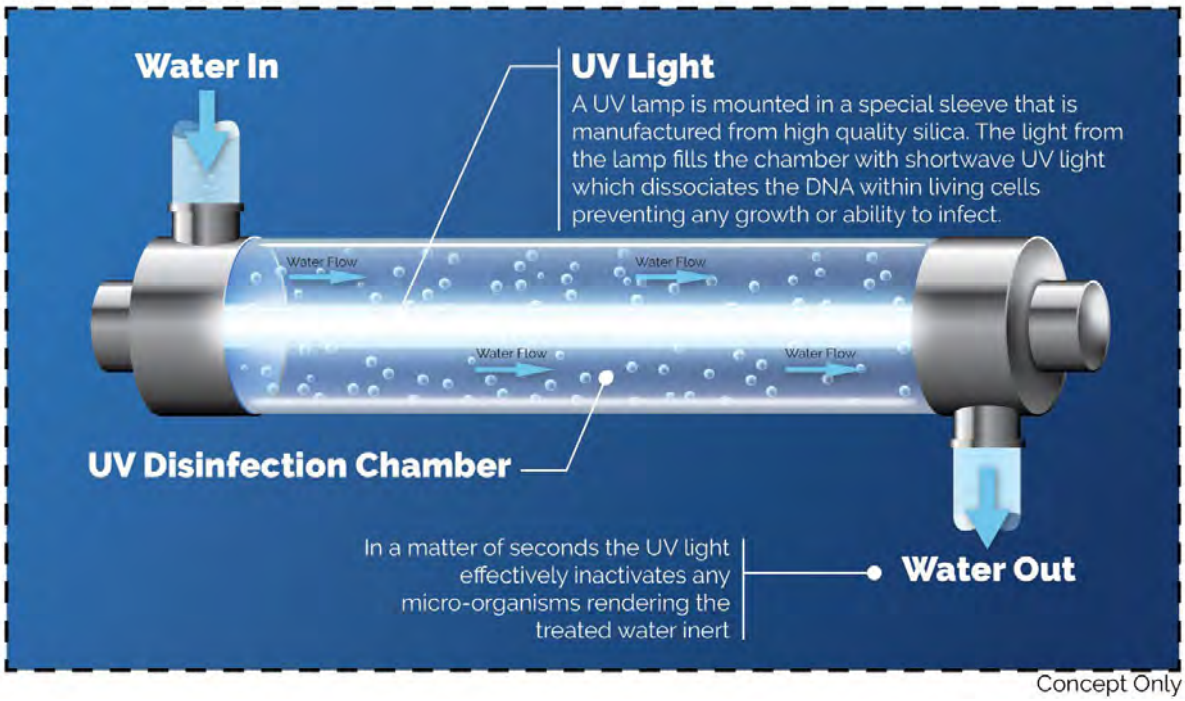
Groundwater Return to Aquifer

The groundwater removed from the extraction well by air circulation first passes through a 15 cm (6-inch) line to the dewatering station where the sand is removed at the extraction well site. The groundwater separated from the sand during dewatering then passes through a filtration system and a UV treatment system before being immediately returned to the extraction well and to the sandstone aquifer the groundwater was originally extracted from (Figure 5.13). The groundwater is not exposed to the atmosphere after the UV treatment to prevent any potential for contamination (e.g., bacteria). The UV treatment is a technique commonly used in municipal water treatment facilities, including the city of Winnipeg and is applied as a precaution, not due to any contamination source.

UV treatment uses UV light that is invisible to the human eye as a safe and environmentally friendly method to disinfect water. It does not require any chemicals or long contact time, only a few seconds of UV light exposure. UV light acts very rapidly by rendering any bacteria, viruses or protozoa that may be present inert when they are exposed to the UV light making these organisms, if present, incapable of growing or infecting the water. The process adds nothing to the water but UV light, has no impact on chemical composition or dissolved oxygen content, and does not create disinfection by-products (Trojan Technologies EBook, 2020).

The UV treatment resembles that of fluorescent lamps. The groundwater flows past a series of UV lamps that expose the water to UV light and renders all bacteria and other microorganisms inactive (Figure 5.13). The UV lamps contain ionized gas mixtures that when electrified illuminate the lamp. To protect the lamps and not compromise the light emitted from the lamps, a fused silica or quartz sleeve is used. This is because quartz is transparent to UV light. After the water flows past the UV lamps, the groundwater remains contained within the extraction process tubing to avoid the potential for contamination from the atmosphere before being immediately returned underground to the aquifer.

Water Treatment



Concept Only

Stantec

Project Location
RM of Springfield, Manitoba

Prepared by ACampigotto on 2023-02-02
Reviewed by JTheroux on 2023-02-02

Client/Project
Sio Silica
Closure Plan

111473043

Figure No.
5.13

Title
Water Treatment

Original Graphic Source:
Figure 3-1: AECOM, Appendix A, Hydrogeological Assessment Final Report Vivian Sand Extraction Project-Hydrogeology and Geochemistry Assessment Report, July 2021

5.6 Buildings and Infrastructure

No buildings will be located on the mineral tenures. The Processing Facility will not be located in the vicinity of the mineral tenures or within the drilling areas and is therefore not considered in this Closure Plan.

All equipment is movable, non-permanent and will be completely removed after Project operations are complete. Equipment includes an excavator, extraction rig, 2 to 3 water holding tanks (such as c-rings for water handling), waste material tankage (for holding drill cuttings), water truck, vacuum truck, pipe truck, employee pickup trucks, portable washroom, fuel cube (1000 L), trailer for sample processing and remote monitoring, UV water treatment trailers, slurry pumps, dewatering screens, slurry lines, waste bins, filtration system consisting of tankage, fluid lines, pumps and sand filtration, grouting system, light plants, diesel generator, compressor, and wood access mats as needed.

During the winter months all field equipment is removed, or drained and stationed at the next spring location. Water tankage will hold some of the water from the system over the winter to reuse the following season.

5.7 Tailings Management

No tailings will arise from the proposed operations.

5.8 Management of Waste Rock, Ore, and Overburden

No waste rock piles will be generated or will require management as a result of operations. Drilling will occur directly through overburden. When the extraction wells are drilled, they generate drill cuttings from the Quaternary Sediments, (till), Red River Carbonate (limestone), Red River Shale and Winnipeg Sandstone. These cuttings will be captured separately, contained and stored in covered bins or mobile tanks during drilling. As containment fills up, these cuttings will be disposed of in accordance with applicable regulations at a licensed landfill or waste facility.

For additional information on proposed waste management, please refer to the Waste Characterization and Management Plan (Appendix E, AECOM 2025).

A small amount of surface topsoil storage may be generated during operations, as a result of a small amount of excavation for soil clearing and rig placement. This topsoil will be stored on site in appropriate containment and spread over the area after during reclamation.

5.9 General Waste Management and Storage

Domestic and commercial waste will be removed from the Project Site by a licensed local contractor and disposed of at a licensed landfill. A portable toilet rented through a licensed commercial company provided at well cluster sites will be used during operations and will be removed at closure. Recyclable materials will be collected in designated recycling containers and transported to a recycling facility.

Hazardous materials such as fuel, oils and lubricants will be transported, handled, stored and disposed of in accordance with applicable federal, provincial and municipal regulations and requirements.

Sand slurry brought to surface at the extraction wells will be pre-screened to remove 'overs' such as concretions (calcified sand) which will be temporarily stockpiled in a containment tank on site before being removed off site for disposal at a licensed facility.

5.10 Water Management and Effluent Treatment

No net water will be generated, and no effluent will be discharged to surface waters as a result of Project operations. There are no watercourses in areas of well drilling.

Drainage control will occur in the form of erosion and sediment control measures. Measures will be put in place during operations to reduce the potential for entrainment of suspended solids in precipitation runoff.

5.11 Mine Openings

Stantec completed a preliminary geotechnical analysis of the sand extraction techniques impact on subsurface conditions (Stantec 2022). The results of the analysis are used to provide recommendations for borehole spacing which are intended to limit surface subsidence to an acceptable level:

Table 5.2 Allowable Extraction Disturbance Zone Dimensions

Competent Limestone Thickness (m)	Overburden Thickness (m)	Long-term Allowable Limestone Unsupported Span (Diameter) (m) (Notes 1 and 2)	Extraction Disturbance Zone Dimensions (Notes 3 and 4)	
			Top Diameter (m)	Bottom Diameter (m)
10	25	26	16	0 (Note 5)
	35	24	14	0 (Note 5)
15	25	35	25	6
	35	32	22	3
20	25	43	33	14
	35	40	30	11
25	25	50	40	21
	35	47	37	18

Based upon the geotechnical assessment of the proposed sand extraction at the BRU property, recommendations are as follows (subject to change based on project licensing process and outcome):

- Design the borehole arrangement and depth at each extraction location to limit the Carman Sand disturbance zone to the short-term extraction geometry presented in Table 5.2 of this document.
- Limit the extraction to areas with competent limestone thickness greater than 15 m. Although extraction in areas with thinner competent limestone is theoretically possible, the extraction volume and depth are not supporting a full well extraction volume. In addition, the uncertainty in the progress of the weathered zone in the limestone can cause variable competent caprock in these thinner areas that can impact caprock strength and long-term stability.
- Locate extraction wells in each group to provide at least 60 m edge to edge distance between expected long-term cavity disturbance zones (approximately 70 m for short-term cavity disturbance zones).
- Complete a full-scale extraction test to confirm expected conditions. Assess the stratigraphy and caprock conditions before start of the full-scale extraction test and use the recommended extraction design in this document. Monitor the surface and caprock settlement during extraction as well as the piezometric head change at the upper aquifer. Complete side scan sonar survey after each borehole completion and assess results against cavity extraction assumptions. Complete in-situ strength testing of the sand deposit strength prior to extraction and at adjacent boreholes after extraction. Update the FLAC model with additional data from full-scale extraction monitoring results. Use results to refine the extraction method for the remainder of full-scale extraction.
- Gather and confirm the overburden, competent limestone, shale, and Carman Sand thickness at each location before the start of extraction. Apply the relevant extraction design based on the guidance provided in Section 3.8.2 or the refined design if refinement was needed as a result of test extraction.
- Install an underground extensometer anchored to the caprock top surface, in the vicinity of the central extraction borehole (within 5 m), monitor daily and compare with the surface settlement data to detect subsidence/settlement.
- Install piezometers before extraction at extraction locations within the overburden and at the top of the caprock surface within 5 m of the center of extraction. Monitor daily during and for a period after extraction. Assess and adjust design if changes occur.
- Monitor surface settlement using securely anchored monuments. Review data daily during extraction and if settlement/subsidence is measured, clear and close the area and reassess before returning.
- Continue surface monument deformation monitoring with monthly data analysis for the first 3 months after extraction. Reduce data analysis to quarterly after 3 months from the extraction with annual data review to detect possible long-term surface settlement/subsidence.

- Continue caprock settlement (extensometer) monitoring and review with the same frequency as the surface settlement monitoring. Compare extensometer data against the surface settlement data to detect any differential settlement in the caprock surface.
- Continue daily piezometric monitoring and monthly data review for 3 months after completion of extraction.
- Develop a Trigger Action Response Plan (TARP) with defined proper series of protocols to respond to an issue such as extraction roof failure.

5.12 Project Schedule

A status summary of previous rehabilitative work is provided in Table 5.3 below

Table 5.3 Summary of Previous Drilling Campaigns Rehabilitation Status

Hole ID	Datum	Zone	Northing	Easting	Depth (m)	Well Type	Status
BH-02-17	NAD 83	14	5,521,220	679,749	103.2	Exploration	Sealed, site rehabilitated
BH-03-17	NAD 83	14	5,522,289	680,104	91.44	Exploration	Sealed, site rehabilitated
BH-09-17	NAD 83	14	5,523,942	680,026	99.36	Exploration	Sealed, site rehabilitated
BH-10-17	NAD 83	14	5,522,493	676,561	103.6	Exploration	Sealed, site rehabilitated
BH-14-17	NAD 83	14	5,523,718	676,561	78.33	Exploration	
DDH-10-17	NAD 83	14	5,522,500	676,539	58.09	Geotechnical (Core)	Sealed, site rehabilitated
Bru 101-1	NAD 83	14	5,509,374	687,675	60.96	Exploration	Sealed, site rehabilitated
Bru 117-1	NAD 83	14	5,513,229	680,596	72.8	Exploration	Sealed, site rehabilitated
Bru 121-1	NAD 83	14	5,515,784	686,371	38.1	Geotechnical (Core)	Sealed, site rehabilitated
Bru 121-1	NAD 83	14	5,515,787	686,361	60.66	Exploration	Sealed, site rehabilitated
Bru 146-1	NAD 83	14	5,504,985	684,974	50.29	Geotechnical (Core)	Sealed, site rehabilitated
Bru 146-1	NAD 83	14	5,504,541	685,004	75.29	Exploration	Sealed, site rehabilitated
Bru 28-1	NAD 83	14	5,526,383	674,603	58.22	Exploration	Sealed, site rehabilitated
Bru 73-1	NAD 83	14	5,522,332	683,251	64.01	Exploration	Sealed, site rehabilitated

Table 5.3 Summary of Previous Drilling Campaigns Rehabilitation Status

Hole ID	Datum	Zone	Northing	Easting	Depth (m)	Well Type	Status
Bru 82-3	NAD 83	14	5,523,942	680,026	76.2	Extraction	Sealed, site rehabilitated
Bru 82-5	NAD 83	14	5,524,035	679,941	76.2	Extraction	Sealed, site rehabilitated
Bru 82-6	NAD 83	14	5,524,073	679,936	77.1	Extraction	Sealed, site rehabilitated
Bru 82-7	NAD 83	14	5,524,074	679,936	35	Extraction	Sealed, site rehabilitated
Bru 82-8	NAD 83	14	5,524,079	679,917	80.2	Extraction	Sealed, site rehabilitated
Bru 82-9	NAD 83	14	5,524,067	679,908	59.44	Aquifer Monitoring	Site rehabilitated, remains on site for monitoring use.
Bru 82-10	NAD 83	14	5,524,008	679,818	71.93	Extraction	Sealed, site rehabilitated
Bru 82-11	NAD 83	14	5,524,041	679,803	67.97	Extraction	Sealed, site rehabilitated
Bru 82-14	NAD 83	14	5,524,053	679,831	66.45	Extraction	Sealed, site rehabilitated
Bru 95-1	NAD 83	14	5,527,617	682,230	69.49	Extraction	Sealed, site contains stockpile and monitoring wells.
Bru 95-2	NAD 83	14	5,527,618	682,237	70.1	Extraction	Sealed, site contains stockpile and monitoring wells.
Bru 95-3	NAD 83	14	5,527,606	682,230	70.1	Extraction	Sealed, site contains stockpile and monitoring wells.
Bru 95-4	NAD 83	14	5,527,623	682,231	54.25	Aquifer Monitoring	Sealed, site contains stockpile and monitoring wells.
Bru 95-5	NAD 83	14	5,527,628	682,211	42.06	Aquifer Monitoring	Monitoring ongoing
Bru 95-6	NAD 83	14	5,527,627	682,193	57	Aquifer Monitoring	Aquifer Monitoring
Bru 95-7	NAD 83	14	5,527,616	681,863	75	Water Production	Water Production

Table 5.3 Summary of Previous Drilling Campaigns Rehabilitation Status

Hole ID	Datum	Zone	Northing	Easting	Depth (m)	Well Type	Status
Bru 95-8	NAD 83	14	5,527,630	681,949	55.09	Aquifer Monitoring	Monitoring ongoing
Bru 95-9	NAD 83	14	5,527,622	682,208	47.24	Aquifer Monitoring	Monitoring ongoing
Bru 96-1	NAD 83	14	5,527,790	683,058	53.34	Aquifer Monitoring	Monitoring ongoing
Bru 96-2	NAD 83	14	5,527,790	683,065	41.76	Aquifer Monitoring	Monitoring ongoing
Bru 154-1	NAD 83	14	5,507,439	682,501	72.5	Extraction	Sealed, site rehabilitated
Bru 154-2	NAD 83	14	5,507,474	682,472	66.14	Aquifer Monitoring	Sealed, site rehabilitated
Bru 92-1	NAD 83	14	5,526,513	681,479	75.6	Geotechnical/Aquifer Monitoring	Monitoring ongoing.
Bru 92-2	NAD 83	14	5,526,457	681,567	57.61	Extraction	Sealed, site contains stockpile and monitoring wells.
Bru 92-3	NAD 83	14	5,526,475	681,584	57.61	Extraction	Sealed, site contains stockpile and monitoring wells.
Bru 92-4	NAD 83	14	5,526,460	681,571	52.4	Aquifer Monitoring	Sealed, site contains stockpile and monitoring wells.
Bru 92-8	NAD 83	14	5,526,383	681,632	56.69	Extraction	Monitoring ongoing, site covered contains stockpiles.
Bru 92-12	NAD 83	14	5,525,978	682,109	67.06	Aquifer Monitoring	Monitoring ongoing.
Bru 3-1	NAD 83	14	5,519,679	676,446	82.6	Exploration/Aquifer Monitoring	Monitoring ongoing.
Bru 13-1	NAD 83	14	5,522,428	679,585	79.55	Exploration/Aquifer Monitoring	Monitoring ongoing.
Bru 81-1	NAD 83	14	5,522,630	680,962	67.06	Exploration/Aquifer Monitoring	Monitoring ongoing.
Bru 83-1	NAD 83	14	5,525,191	681,277	70.41	Exploration/Aquifer Monitoring	Monitoring ongoing.

Table 5.3 Summary of Previous Drilling Campaigns Rehabilitation Status

Hole ID	Datum	Zone	Northing	Easting	Depth (m)	Well Type	Status
Bru 93-1	NAD 83	14	5,526,355	680,969	66.45	Exploration/Aquifer Monitoring	Monitoring ongoing.

Planned activities and timing are generally summarized as per Table 5.3 below (updated from AECOM 2021).

Table 5.4 Proposed Scheduling

Project Phases and Activity	Proposed Schedule (subject to results of Regulatory Review)
Construction	
Progressive, sequential extraction site preparation. Clearing vegetation to accommodate temporary drill rig access trails; well clusters; slurry line and water return line trails and placement of pumping stations. Placement/construction of slurry line and groundwater return line. Drilling of extraction wells for Phase 1 and for each subsequent extraction years after (i.e., Phases 2 and 3)	Q1 2026 for initial Phase 1 production extraction year, then April through November (and winter, weather dependant) for each extraction year thereafter (i.e., Phases 2 and 3). Activities will occur 24 hours per day, seven days/week (24/7) Necessary vegetation clearing each year will occur during winter months to the extent feasible and will be done outside of the breeding bird season (April 14 -August 24). Year-round (24/7).
Operation	
Pumping of sand and water slurry via slurry lines to the Processing Facility and return of water from the Processing Facility to the aquifer at the extraction sites.	Q2/Q3/Q4/Q4 2026 for initial Phase 1 production extraction year, then April through November (and winter, weather dependent) for each extraction year thereafter. (i.e., Phases 2 and 3). Activities will occur 24/7.
Decommissioning and Closure	Annual sequential (progressive) decommissioning of well clusters/capping of extraction wells, decommissioning of slurry line, water return line and pumping stations, rehabilitation of disturbed extraction sites and other temporarily disturbed areas (access trails, slurry line placement areas, well clusters, pumping station areas).

As indicated in **Section 3.1.1**, the following phased approach is proposed for the extraction of silica sand:

Phase 1 - Year 0 – Maximum of 100,000 tonnes

Phase 2 – Year 1 – Maximum of 300,000 tonnes

Phase 3 – Year 2 to 4 – Maximum of 500,000 tonnes annually

6 Proposed Progressive Rehabilitation

In general, progressive rehabilitation involves reclamation of a portion(s) of the Project with the aim of reducing the amount of rehabilitation required at the time of Project closure, with the potential to use the knowledge gained through progressive reclamation to improve final reclamation success. Where feasible, closure activities can be performed prior to actual mine closure, where they do not pose an impediment to daily operations or potential future operational needs and development opportunities of the site, or safety of the workforce.

Where possible, Sio Silica will implement progressive reclamation measures during mine operations. Progressive decommissioning, specifically well sealing, of annual extraction wells and well cluster areas will occur each extraction year, in addition to progressive annual rehabilitation of:

- Temporary drilling rig access trails
- Equipment laydown areas
- Slurry line trails and return water line trails.

Disturbed areas associated with each of the above will be allowed to revegetate naturally and will be augmented using an approved native seed mixture and native plantings, if required.

Closure measures that will take place after operations cease are discussed in Sections 7.0 (Suspended Operations) and 8.0 (Final Closure Measures).

7 Rehabilitation Measures – Suspended Operations

The Mine Closure Regulation considers a project suspended if:

- The proponent gives notice under section 6 of the Mine Closure Regulation.
- No activity takes place in respect of the operation of the mine.
- The provisions of the approved closure plan are continued at the site of the mine in accordance with subsection 189(1) progressive rehabilitation.

As previously noted, extraction operations will be shut down every winter (estimated period of up to 4 months). This will be a regularly scheduled occurrence and not considered a suspension of operations per the Mine Closure Regulation. If operations will suspend or close temporarily outside this regularly scheduled shut down (for not less than 90 days), then Sio Silica will give notice under section 6 a minimum of 90 days before the suspension or closure is intended to take place.

Sio Silica will submit an annual report to the director each year, as per section 190 of the Act:

> *"On or before the 60th day following the anniversary date of commencement or recommencement of a project, the proponent of the project shall each year submit to the director a report on the rehabilitation carried out on the project site in the period of 12 months ending on the anniversary date."*

The general objectives of rehabilitation during suspended operations are to prevent personal injury or property damage that is reasonably foreseeable as a result of putting the project into a state of suspended operation. The following subsections discuss the procedures and measures that will be implemented to address objectives of rehabilitation during suspended operation.

7.1 Restriction of Access and Site Security

During the suspended operation of the mine, the area of activity will be fenced to prevent inadvertent access. The area will be posted with "No Trespassing" signs. Potentially unsafe areas will also be posted with signage, as applicable.

Site personnel will carry out general site inspections on a periodic basis (at least once a month) and will maintain a record of these inspections for inclusion in the annual report.

7.2 Security of Mine Openings

As outlined in Section 5.0, wells constitute the only mine openings associated with the Project.

After initial testing is complete and the drilling equipment is removed, well(s) will be capped and locked temporarily, for safety purposes prior to proper well abandonment. Monitoring of wells and cap rock will continue as per the Groundwater Monitoring and Impact Mitigation Plan (see Appendix F in AECOM 2025).

Once operations are completed, each well will be sealed and abandoned in accordance with the Mines and Minerals Regulations Article 7b - using mechanical plugs in combination with Tremie grouting as described in a plan submitted to the Mines Branch, to permanently prevent vertical movement of aquifer fluids between permeable water bearing zones in the wellbore, or as outlined in the Borehole Licence. Further details are provided in Section 8.0.

7.3 Securing of Mechanical, Hydraulic and Electrical Systems

All mechanical, hydraulic and electrical systems will be placed in a non-energized, no-load condition.

7.4 Control of Effluents

Not applicable. There will be no effluents discharging from the Project Site.

7.5 Stabilization of Stockpiles

In the event of delays during start-up (e.g., slurry line operation) or suspended operations, any sand piled on a drilling site will not be immediately removed. It is assumed that in this scenario, sand could be piled for up to six months and would need to be secured. Measures would include one or more of the following:

- Stockpiles would be wet sand that will be covered as soon as possible, and the covering secured.
- Stockpiles would be checked/assessed for damage weekly to verify that the covering remains intact and is not torn or blown off.

These measures would be implemented within five days of the delay or suspension.

7.6 Stabilization of Impoundment Structures

Not applicable. There will be no impoundment structures on site.

Occasional small depressions may remain as a result of their use as temporary sumps. As discussed in Section 8.0, sumps will be backfilled with the material originally excavated.

7.7 Schedule of Rehabilitation Measures (Temporary Closure)

All work proposed will be completed within two months of submission of a Notice of Project Status, except as outlined above. Monitoring and inspections will be as detailed in Section 9.0.

8 Final Closure Measures

Sio Silica will give notice under section 6 of the Mine Closure Regulation if they intend to close the operation, a minimum of 90 days before the closure is intended to take place.

Sio Silica will submit an annual report to the director each year, as per section 190 of the Act:

"On or before the 60th day following the anniversary date of commencement or recommencement of a project, the proponent of the project shall each year submit to the director a report on the rehabilitation carried out on the project site in the period of 12 months ending on the anniversary date."

The general objectives of rehabilitation during Final Closure include:

- Prevent personal injury or property damage that is reasonably foreseeable as a result of closing the Project.
- To rehabilitate the Project Site area to promote endemic flora and fauna.

The following subsections discuss the procedures and measures that will be implemented to address objectives of rehabilitation during final closure.

8.1 Mine Openings/Mine Hazards

With the aim of protecting groundwater resources and meeting or exceeding industry standard practice, wells will be abandoned (also known as well sealing) in accordance with *The Groundwater and Water Well Act* and with guidance from the Construction and Sealing Wells in Manitoba – Information for Well Driller and Well Sealers document (Manitoba Government, 2018) and its supporting regulations, including the Groundwater and Water Well Regulation and the Well Standards Regulation. Well sealing measures will also meet the abandonment requirements of the Act and borehole licences issued under Part 3 of the Drilling Regulation.

The following procedures will be used to abandon or seal Project wells:

- A mechanical plug will be placed at the predetermined depth to isolate the movement of water within the already cemented casing between the sandstone and limestone aquifers. Then a bentonite plug will be placed prior to cementing with the intent of preventing cement leaking into the water and/or diluting prior to setting.
- Above this plug, a several foot-thick cement plug will be placed and allowed to set. Cement will be pumped into place using a Tremie grout system. The cement plug will be confirmed by manual contact prior to proceeding to the next step.
- Once set, layers of bentonite and pea gravel will be used, or a benitoite grout to 5 feet (1.5 m) within surface.
- Where pea gravel and bentonite are used, no more than 15 feet (4.6 m) of pea gravel will be used before another layer of bentonite. In addition, careful attention will be paid to the layering of

bentonite across any interfaces between aquifers (e.g., the limestone to the till interface) to prevent vertical mixing of the aquifers.

- A 5 feet (1.5 m) thick cement cap will be placed at the very top, allowed to set and then the topsoil/organics are replaced on top of the cement to allow for vegetation regrowth/remediation of the surface land to occur.
- Detailed logs will be kept of the well abandonment and depths of each layer, in addition to the GPS coordinates of each well.

This procedure will be used in all extraction wells and wells that exceed 2 inches (5 cm) in diameter. Where a monitoring well exists, these are often nested 5-inch (12.7 cm) and 2-inch (5 cm) PVC (polyvinyl chloride) casing sizes. As per the above referenced guidelines (Manitoba Government 2018), the 2-inch (5 cm) casing is grouted the entire length of the well as other sealing materials like bentonite chips can bridge off (expand and create a blockage) in the small diameter PVC casing.

Monitoring of wells and cap rock will continue as per the Groundwater Monitoring and Impact Mitigation Plan (Appendix F, AECOM 2025) as well as a Trigger Action Response plan for geotechnical purposed to be developed following issuance of an Environment Act Licence. For additional information on well abandonment please refer to the Well Abandonment Plan provided as Appendix K in AECOM 2025.

8.2 Buildings, Power Lines, Pipelines, and Infrastructure

No permanent buildings are located or will be constructed at well or well cluster sites. Temporary structures will be removed.

At closure, miscellaneous infrastructure (e.g., slurry and water return lines; pumping stations, generators) will be removed for appropriate disposal or repurposing.

8.3 Machinery, Equipment and Storage Tanks

Equipment may include excavator(s), extraction rig, 2-3 tanks water holding tanks such as c-rings for water handling, waste material tankage, water truck, vacuum truck, pipe truck, employee pickup trucks, portable washroom, fuel cube (1000 L), trailer for sample processing and remote monitoring, UV water treatment trailers, slurry pumps, dewatering screens, slurry lines, waste bins, filtration system consisting of tankage, fluid lines, pumps and sand filtration, grouting system, light plants, diesel generator, compressor, and wood access mats as needed to avoid rutting, should the ground be soft.

All equipment is movable, non-permanent and will be removed after the operations are complete. Surface equipment that is contractor owned will be removed by the contractor. No infrastructure is needed to set up or remove equipment.

8.4 Concrete Structures, Foundations and Slabs

Not applicable. No concrete structures, foundations and slabs are proposed.

8.5 Petroleum Products, Chemicals Waste and Explosives

All fuel, oil tanks and propane will be removed from site prior to or at closure.

8.6 Contaminated Soil

Areas of discoloured soil will be tested for petroleum hydrocarbon contamination and the contamination will be delineated, excavated and disposed of by a qualified contractor.

8.7 Tailings Management

Not applicable. No tailings will be generated or stored on site.

It is the intention of Sio Silica to keep drill cuttings separate. The Red River Carbonate and Winnipeg Shale will be stored in covered bins or mobile tanks for hauling to a licensed offsite landfill or waste facility for disposal.

Additional information can be found in the Waste Characterization and Management Plan (Appendix E in AECOM 2025).

8.8 Waste Management

Domestic and commercial waste will be removed from the Project Site by a licensed local contractor and disposed of at a licensed landfill. A portable toilet rented through a licensed commercial company provided at well cluster sites will be removed at closure. Recyclable materials will be collected in designated recycling containers and transported to a recycling facility.

Hazardous materials such as fuel, oils and lubricants will be transported, handled, stored and disposed of in accordance with applicable federal, provincial and municipal regulations and requirements.

Sand slurry brought to surface at the extraction wells will be pre-screened to remove ‘overs’ such as concretions (calcified sand), which will be temporarily stockpiled in a containment tank on site before being removed off site for disposal at a licenced facility.

8.9 Waste Rock, Overburden, Ore, and Other Stockpiles

There will be no waste rock or ore on site. Overburden removed will be replaced or the area backfilled at closure.

8.10 Breach and Stabilization of Pond Structures

Not applicable. There will be no ponds on site. Sumps will be backfilled with the material originally excavated.

8.11 Surface Water Management

Not applicable. There will be no ponds on site. Sumps will be backfilled with the material originally excavated.

8.12 Transportation Corridors

Temporary trails will be scarified and allowed to revegetate or will be actively revegetated through placement of growth medium and seed.

8.13 Revegetation Program

The Project Site locations are largely previously disturbed and include the previous operation of a gravel quarry and access road now owned by Sio Silica. As discussed in Section 4.0, areas not previously disturbed consist primarily of grassland. Areas that contain trees will be replanted, or trees moved where possible to reduce the amount of tree clearing that would need to occur.

The area occupied by Project drilling operations will be re-contoured and re-vegetated (passive and active) to restore the landscape to its native appearance, to the extent practical. The site will be re-seeded (if deemed required) with a native grass species to allow the grass to return. Re-vegetated areas will be monitored (see Section 9.0), and maintenance fertilizing and seeding will be performed where necessary to promote self-sustaining vegetation.

As observed at previous mine closures in the region, the growth of grasses and forbs is expected within the first two years following closure.

A Revegetation Monitoring Program will be implemented to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required using approved native seed mixture and native plantings. Where reseeding or replanting is required, Sio will communicate with regional MECC staff to determine strategies for potentially enhancing revegetation of disturbed areas to benefit wildlife species such as the Golden-winged Warbler which is a Species at Risk that may occur in the Regional Project Area.

The revegetation monitoring program will include monitoring during the growing season until the seedlings appear to be established. Details of the revegetation monitoring program will include but necessarily be limited to the following:

- What will be monitored (plant abundance, height, or other measures of success) and at which frequency (e.g. monthly, annually)
- Monitor qualifications, roles, and responsibilities
- Revegetation schedule, including a review of potential conflicts (e.g., migratory bird nesting season conflicts)
- Reseeding and replanting methods (appropriate seed mixes, plant species, plant source and quality control, seeding and planting methods, including rates and spacing)

- Erosion-control methods to be employed
- Use of existing infrastructure such as roads, trails or natural features
- Measures for the control of weeds and invasive plant species
- List of corrective actions in the event of poor vegetative success
- Recordkeeping and reporting requirements

8.14 Schedule of Final Closure Measures

The decommissioning activities are planned to occur according to the following schedule:

- Sealing and decommissioning of wells will be initiated within 6 weeks of cessation of extraction activities.
- Removal and disposal of surface and extraction equipment, propane/fuel/oil tanks as applicable, and removal of miscellaneous infrastructure and appurtenances will occur weekly to monthly at extraction sites. It is expected that wells will be operated over a period of 6 to 7 days and then equipment will be moved to the next well. Some equipment such as the dewatering station and filtration will move seasonally, or once operations have moved far enough away, or the need arises to cross a road. This would likely occur no more than once per extraction season (April to November) and would be avoided if possible.
- Testing of contaminated soils will occur after wells are sealed, and prior to regrading of disturbed areas. Remediation of the contaminated areas, if required, will occur as soon as is feasible.
- Regrading and vegetation of previously disturbed areas will occur next. However, regrading of non-contaminated areas may proceed concurrently or in advance of areas that require remediation. This is seasonally dependent, and if wells are abandoned after ground is frozen, or snowfall has commenced, then this may not be possible until the spring.

9 Monitoring

For additional information on monitoring and proposed well monitoring network, please refer to the Groundwater Monitoring and Impact Mitigation Plan (Appendix F in AECOM 2025). The monitoring will continue through the winter months when no extraction is occurring as well as after final mine closure for up to 5 years post operations. Monitoring includes real time and recorded water levels and water quality data, manual measurements and water samples lab tested by a third-party laboratory.

Geotechnical monitoring will also take place in accordance with an approved Trigger Action Response Plan (TARP). This plan will be developed following the issuance of an EAL. It will contain short term and long-term monitoring requirements of caprock and surface.

9.1 Physical Stability Monitoring

9.1.1 Operations

Physical stability monitoring will occur during operations, through daily observation of site features during drilling.

9.1.2 Temporary Closure

During suspended operations, inspections will occur monthly during non-frozen conditions. Wells will be monitored for integrity of abandonment measures. Overburden piles and associated sump areas will be inspected for the presence of any unsafe conditions (e.g., erosion issues, safety hazards).

9.1.3 Final Closure

Drill sites will be inspected twice per year for progression of revegetation and the presence of any unsafe conditions. Monitoring will occur until two growth seasons of revegetation are noted to be successful (i.e., growth of vegetation increases from spring to summer).

9.2 Chemical Stability Monitoring

9.2.1 Operations

As previously identified, the drilling operations and associated water will operate within a closed loop system. No effluent will be discharged from the site during operations. Site operations are not expected to affect surface water.

No rust inhibitors will be used during operations or will come in contact with water that will be re-injected into the wells. This will be done to limit potential impacts to drinking water aquifers. Samples of groundwater will be collected as per the Groundwater Monitoring and Impact Mitigation Plan (Appendix F in AECOM 2025).

9.2.2 Temporary Closure

No chemical monitoring is anticipated to be required during temporary closure as no well drilling will be occurring.

9.2.3 Final Closure

The wells will be abandoned, and well drilling operations will have ceased. No chemical monitoring is anticipated to be required and therefore none is proposed.

9.3 Biological Monitoring

9.3.1 Operations

The annual footprint area requiring clearing to accommodate other Project components will be limited and temporary, with disturbed areas allowed to revegetate naturally and augmented using an approved native seed mixture and native plantings if required. Vegetation species at risk are not expected to occur within the Project Site.

Wildlife species present in the vicinity of the Project are anticipated to be accustomed (habituated) to some level of noise due to the presence of existing developments (e.g., agriculture activities, residential areas, roads and aggregate quarries). During operations, incidental wildlife observations, including Species at Risk, will be documented.

No discharges to the environment will be occurring and no aquatic biological monitoring is proposed (fish, fish habitat, benthos).

9.3.2 Temporary Closure

During temporary closure, biological monitoring will be limited to noting natural revegetation and any wildlife species at risk occupying the Project area during inspections.

9.3.3 Final Closure

During final closure, biological monitoring will be focused on the success of revegetation of disturbed areas and will include continued documentation of any species at risk observed during inspections. The Revegetation Monitoring Program will be implemented to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required. Monitoring will occur until two growth seasons (following the first overwintering) of revegetation are noted to be successful (i.e., growth of vegetation increases from spring to summer). Should revegetation not progress at the anticipated rate, additional seeding application and/or vegetation encouragement options will be examined and potentially used.

10 Expected Site Conditions Post-Closure

10.1 Land Use

Lands will return to their rural status, upon completion of drilling and extraction activities Mineral land tenure will be retained by Sio Silica for duration of 24-year mine life.

10.2 Site Topography

No waste rock piles, tailings storage facilities or open pits will result from the Project. Disturbances to topography will be limited to shallow excavations that will serve as sumps during well drilling operations, low overburden piles resulting from excavation of the sumps, and the capped wells. Levelling and grading will occur upon Project decommissioning to return the landscape to elevations typical to the surrounding area. Well abandonment is discussed in Section 8.3 of AECOM 2025.

10.3 Local Surface Waters

No discharges to waterbodies or watercourses will occur as a result of operations or rehabilitative measures. Site operations and closure are not expected to affect surface water and therefore surface water post-closure will be consistent with and unaltered from baseline conditions.

10.4 Local Groundwater

The volume of water will be largely retained throughout operations. The potential risks to groundwater were assessed and are discussed in the EAP (AECOM 2025).

10.5 Terrestrial Plant and Wildlife Communities

10.5.1 Vegetation

It is expected that most natural vegetation (predominantly grasslands) will be well established after approximately one season, with reestablishment of trees and shrubs evident within five to 10 years following closure. Lands will return to their rural status.

10.5.2 Wildlife

The Project is not anticipated to have a measurable effect on wildlife populations, including Species at Risk, within the Interlake Plain Ecoregion. In post-closure, wildlife is expected to return to baseline conditions, consistent with the return of the rural land use.

The Interlake Plain Ecoregion, incidental impacts on wildlife (e.g., Project related traffic collisions) will be tracked as part of Sio's Environmental Management Program implemented during the construction, operation, and decommissioning phase of the Project. The Environmental Management Program will indicate how wildlife incidents will be monitored and reported, and will describe criteria for determining if

any additional impact mitigation measures will be necessary beyond those described in the EAP (AECOM 2025). Wildlife populations in Manitoba are managed by MECC, Wildlife Branch. Therefore, Sio will work cooperatively with the Wildlife Branch to determine and implement additional wildlife impact mitigation measures that maybe necessary to avoid the potential for significant adverse impacts on wildlife populations in the Regional Project Area and Interlake Plain Ecoregion.

10.6 Aquatic Habitat and Fish Communities

With no discharges to the environment and no effect to surface water, the area aquatic habitat and fish communities will remain unchanged through the Project and post closure.

11 Closure Liability (Costs) and Form of Financial Assurance

The costs associated with the proposed closure activities outlined in the preceding sections have been estimated as a total and then by year (0 through 4). Sio Silica intends to complete ongoing decommissioning of well sites and land reclamation as part of their mine development activities. Therefore, the yearly estimated closure and liability cost estimates have assumed that ongoing decommissioning of well sites and land reclamation activities will lag six months to a year behind the well development activities.

Closure cost information has been developed by a third-party estimator and will be shared in the final submission of this Closure Plan directly to the Manitoba Mines Branch (Table 11-1). Financial assurance for closure of the SiMbA Project will be provided per section 14 of the Act.

Per the Act, with the review and revision of this Closure Plan, the amount of the Financial Assurance may be increased or reduced based on such factors as the progress of the rehabilitation work compared with the schedule in this Closure Plan, the amount of pre-closure rehabilitation work completed; and/or changes in the nature or cost of work to be done pursuant to the Closure Plan.

Table 11.1 Reclamation and Closure Total Cost Estimate

Closure cost information has been developed by a third-party estimator and will be shared in the final submission of this Closure Plan directly to the Manitoba Mines Branch.

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