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December 20, 2019
File: 111474534

Attention: Director, Environmental Approvals
Manitoba Conservation and Climate
1007 Century Street
Winnipeg, MB R3H 0W4

Dear Director,

Reference: Remediation Plan for the Former Industrial Wastewater Treatment Facility at the HyLife Foods Neepawa Facility, Neepawa, Manitoba

On the behalf of HyLife Foods (HyLife) and R3 Innovations, Stantec Consulting Ltd. (Stantec) submits the following Remediation Plan in response to Warning E125 under The Environment Act, received by Hylife and R3 Innovations on September 18, 2019 from Manitoba Conservation and Climate (MCC). This submission is also made in accordance with Section 14.1(1) of The Contaminated Sites Remediation Act (C.C.S.M., c. C205; 'the CSRA') for groundwater impacts identified at the former Spring Hill Farms industrial wastewater treatment facility (IWWTF) located north of the HyLife facility in Neepawa, Manitoba (hereinafter referred to as "the Site"). The subject IWWTF is owned by the Town of Neepawa and leased to R3 Innovations. The general site location is shown on Figure 1 and monitoring well locations and wastewater cell identifications are indicated in Figure 2 attached.

The purpose of this letter is to provide MCC with information relating to the current environmental status of the Site and the proposed site management activities for remediation of the Site.

Enclosed for your review is the following report, which was prepared exclusively for HyLife by Stantec, and is being provided on a confidential basis:

- Groundwater Impacts Delineation, Former Industrial Wastewater Treatment Facility at the Hylife Foods Neepawa Facility, Neepawa, Manitoba, by Stantec dated October 21, 2019.

BACKGROUND INFORMATION

A groundwater sampling program was completed by Earth Tech in 2007 for 11 monitoring wells present at the Site (MW1 through MW11). The Earth Tech 2007 report indicated that groundwater impacts were present on the IWWTF property to the north and east of the IWWTF but appeared to remain within the property limits. The apparent direction of groundwater flow was generally towards the north. Nitrate (as N) concentrations in the groundwater exceeded the referenced Health Canada drinking water guideline (concentrations ranging from <0.1 to 53 mg/L vs a guideline of 10 mg/L); however, the nitrate+nitrite (as N) concentrations were below 100 mg/L (the Canadian Council of Ministers of the Environment [CCME] guidelines for livestock watering). In some groundwater samples, the dissolved sulphate concentrations exceeded the Health Canada aesthetic objective.

Earth Tech's 2007 report recommended the installation of additional groundwater wells north of the IWWTF to further delineate the impacts and confirm that the impacts were contained to the property. A recommendation was also made to sample existing residential supply wells to the immediate north of the property to confirm the absence of impacts and human health risk from consumption of the impacted groundwater.

Additional groundwater data collected since 2007 by HyLife (Annual data collected from 2014 through 2018 from the 11 monitoring wells) identified groundwater impacts in monitoring well MW8 near the property's northern boundary; however, analyte concentrations were not consistent. The installation of seven additional groundwater monitoring wells proceeded in 2019 to further delineate the groundwater impacts at the Site.

As part of the development of the Remediation Plan for this Site, data from the 2007 Earth Tech report and HyLife's groundwater data from 2014 to 2018 from monitoring wells MW 1 through MW11, were combined with 2019 data (which included monitoring wells MW1 through MW11 and seven new wells, MW12 through MW18). The data forms the basis upon which potential remediation options for groundwater impacts at the Site were examined.

FINDINGS OF THE 2019 GROUNDWATER DELINEATION

The 2019 Groundwater Delineation program included the advancement of seven additional boreholes, each completed with a monitoring well. Based on the results of the groundwater delineation program undertaken, and to the extent that the samples analyzed were representative of the areas investigated, Stantec concluded that:

- The concentrations of dissolved nitrite (NO_2), dissolved nitrite (as N), and nitrate+nitrite (as N) in the groundwater samples submitted for laboratory analysis were less than the applied regulatory guidelines.
- The concentrations of dissolved nitrate (NO_3) and dissolved nitrate (as N) exceeded the Health Canada Drinking Water Guidelines, Maximum Acceptable Concentration, in monitoring wells MW2, MW3, MW5, and MW7.
- The concentrations of dissolved chloride in groundwater samples MW3 (and its field duplicate QC2), MW4, MW5, MW6 and MW12 exceeded the CCME guideline.
  - As the shallow groundwater is not used as a source of irrigation water at the Site, the concentrations of chloride at the Site are not considered an environmental concern at this time.
- The concentrations of dissolved sulphate in groundwater samples MW2, MW3 (and its field duplicate QC2), MW5, MW8, and QC3 (MW13 is the parent sample) exceeded the Health Canada Drinking Water Guidelines, Aesthetic Objective. The concentrations in MW3 and its field duplicate QC2 also exceeded the CCME guideline.
  - As the shallow groundwater at the IWWTF is not used as a potable source or source of irrigation water, the concentrations of sulphate at the Site are not considered an environmental concern at this time.
- Based on the results of the groundwater delineation investigation, lateral delineation of the groundwater impacts, specifically dissolved nitrate (NO_3), has been attained to the north, east and west; however, the area to the south/southeast of the IWWTF has not been fully delineated. The dissolved nitrate

impacted groundwater (in excess of criteria) appears to be limited to the area in the vicinity of the IWWTF cells (see **Figure 3** attached).

The newly installed monitoring wells will be included in the annual groundwater monitoring program going forward as part of the requirements of Environment Act License 2870 RRR for the Site. The data from the monitoring program will be used to track changes in the identified groundwater impacts that may be associated with the former IWWTF.

As groundwater concentrations exceed the mandatory requirements under The Manitoba Contaminated Sites Remediation Act (CSRA), the 2019 Groundwater Delineation report is provided to MCC as an attachment to this submission.

REMEDIAL OBJECTIVES

The objective of this project is to address the groundwater impacts at the Site. Decommissioning/relining the cells is expected to remove the suspected source of the groundwater impacts. In the context of this remediation plan, decommissioning the cells is limited to the removal of wastewater and sludge from the subject cell. Managing the plume of nitrate-impacted groundwater through monitored natural attenuation (MNA) represents a potentially viable, effective, flexible measure to address these impacts.

Groundwater monitoring will be continued to collect data to confirm the feasibility, and demonstrate effectiveness (post cell decommissioning), of MNA as the proposed method of managing/remediating the identified nitrate-impacted groundwater plume. If the groundwater data and MNA feasibility analysis do not indicate that MNA will be effective, or removal of the source of impacts (decommissioning of the cells) does not mitigate effects, HyLife will consult with MCC to develop and implement an acceptable alternative method of addressing the impacts.

REGULATORY FRAMEWORK

The same regulatory framework that provided guidance in the determination of impacts in the prior assessment is proposed for use during future groundwater monitoring activities. More specifically, the Health Canada and CCME guidelines shown in the table below that were used during the completion of the Groundwater Impacts Delineation will be used for the target remediation criteria:

Reference: Remediation Plan for the Former Industrial Wastewater Treatment Facility at the HyLife Foods Neepawa Facility, Neepawa, Manitoba

Remediation Target Criteria

Parameter	Guideline/Standard1
Dissolved Nitrate (NO_3)	45[B]
Nitrate + Nitrite (as N)	100[D]
Dissolved Nitrite (NO_2)	3[B]/32.8[D]
Dissolved Nitrate (as N)	10[B]
Dissolved Nitrite (as N)	1[B]/10[D]
Dissolved Chloride	≤250[A]/100-700[C]
Dissolved Sulphate	≤500[A]/1000[D]

Notes:

1) All units shown are mg/L.

A) Health Canada (2019). Guidelines for Canadian Drinking Water Quality – Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives/Operational Guidelines

B) Health Canada (2019). Guidelines for Canadian Drinking Water Quality – Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentration

C) CCME Canadian Environmental Quality Guidelines, Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water Use - Irrigation Water.

D) CCME Canadian Environmental Quality Guidelines, Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water Use - Livestock Water.

REMEDIAL PLAN METHODS

The planned remediation consists of removal/isolation of the potential source(s) of groundwater impacts (IWWTF cells), a feasibility study to demonstrate effectiveness of MNA, and implementation of MNA to manage the identified groundwater impacts.

IWWTF CELL DECOMMISSIONING

HyLife has commenced work to decommission the earthen cells at the former IWWTF with plans to repair and reline the southernmost cell (Primary cell, Cell 1 on **Figure 2**, attached). Wastewater from Cell 1 will be removed to the R3 Innovations facility for treatment (if necessary) within licence limits, and discharge to the Whitemud River via the existing outfall structure. Sludge from Cell 1 will be properly disposed-of via transfer to Waste Connections of Canada for disposal, or land applied, in accordance with provincial regulations (if feasible). The Cell 1 berms will be repaired as necessary, prior to installing an approved liner system to provide for temporary future use as additional treatment capacity for the R3 Innovations IWWTF (limited to use as per Clause 33 of Environment Act Licence 2870 RRR). The re-lining and use of Cell 1 will be the subject of a future licence alteration request prior to installation of the new liner.

Decommissioning cells 2A, 2B and 3 (see **Figure 2**, attached) will involve removing and disposing of wastewater and sludge from the cells similar to Cell 1, prior to removal/capping the mechanical works (valves and piping) and regrading the berms.

Reference: Remediation Plan for the Former Industrial Wastewater Treatment Facility at the HyLife Foods Neepawa Facility, Neepawa, Manitoba

MONITORED NATURAL ATTENUATION – FEASIBILITY ASSESSMENT AND IMPLEMENTATION

The MNA Feasibility Assessment will involve the following:

- Continuation of the annual groundwater monitoring and sampling program of each of the 18 installed groundwater monitoring wells prior to the full decommissioning of the IWWTF cells (anticipated to be the end of 2020) and for an additional two years following the full decommissioning/relining of the IWWTF cells.
- Assessment of the effectiveness of the MNA approach, based on the data collected, to reduce dissolved nitrate concentrations at the site. The assessment will include time and distance and estimates of assimilative capacity, demonstrated by running a natural attenuation and screening-level transport model (i.e., Bioscreen AT).
- Preparation of a formal report outlining the findings of the MNA Feasibility Assessment. The report will include recommendations regarding continued implementation of MNA or required modifications to the program.
- As per licence requirements under clause 38 and 39 of Environment Act License 2870 RRR, annual reporting will continue to be provided to MCC with the results of the groundwater monitoring program.

SCHEDULE OF ACTIVITIES

The most recent monitoring and sampling campaign at the Site occurred in 2019. The following short-term schedule is proposed for the remedial actions identified above:

Proposed Activity	Proposed Timeline
Pre-IWWTF Cell Decommissioning Groundwater Monitoring and Sampling Program	Completed in 2020. The annual report will be provided to MCC on or before December 31, 2020.
Former IWWTF Cell Decommissioning	Completion by December 31, 2020.
Post-IWWTF Cell Decommissioning Groundwater Monitoring and Sampling Program	Completed in 2021 and 2022. Annual reports provided to MCC on or before December 31, 2021 and 2022.
Completion of the MNA Feasibility Assessment Report	MNA Feasibility Assessment report completed in conjunction with the 2022 Monitoring and Sampling Reporting and provided to MCC as a stand-alone document.

HyLife will advise MCC with additional information should significant changes to this schedule occur.

CLOSURE

This Remediation Plan is prepared for the sole benefit of Manitoba Conservation and Climate and HyLife Foods. The plan may not be relied upon by any other person or entity without the express written consent of Stantec Consulting Ltd. and HyLife Foods. Limitations appended and noted in the report provided also extend to this letter.

Reference: Remediation Plan for the Former Industrial Wastewater Treatment Facility at the HyLife Foods Neepawa Facility, Neepawa, Manitoba

Any use which a third party makes of this plan, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this plan.

We trust that the enclosed information is sufficient and request your approval of this Remediation Plan. If you have any questions or concerns, please do not hesitate to contact us.

Regards,

Stantec Consulting Ltd.

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Scott.Coughtrey@stantec.com

Stephen Biswanger P.Eng.
Senior Project Manager, Environmental Services
Phone: (204) 924-7061
Stephen Biswanger@stantec.com

Attachment: Figure 1 – Site Location Plan
Figure 2 – Monitoring Well/Cell Location Plan
Figure 3 – Nitrate (NO_3) Groundwater Analytical Results
Table 1 – Summary of Groundwater Analytical Results
Groundwater Impacts Delineation, Former Industrial Wastewater Treatment Facility at the HyLife Foods Neepawa Facility, Neepawa, Manitoba. Final Report prepared for HyLife Foods by Stantec Consulting Ltd. October 21, 2019

c. Sheldon Stott, Senior Director of Corporate Sustainability, HyLife Ltd., Colleen Synchyshyn, CAO, Town of Neepawa

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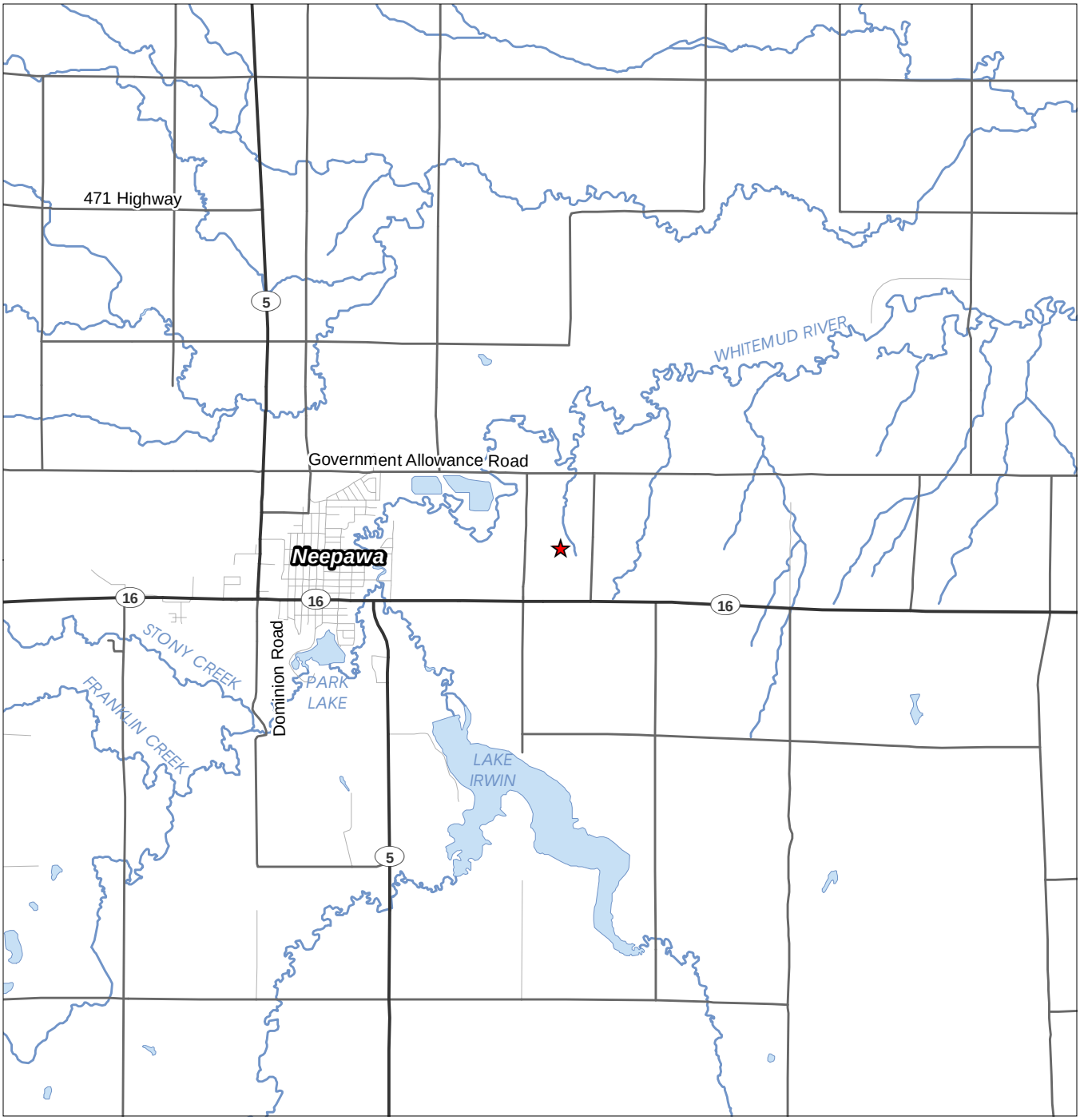
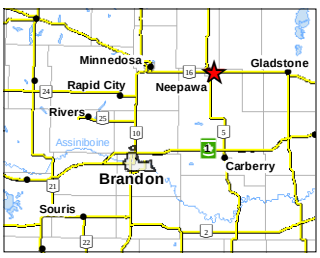
G:\ GIS Project Folder\111484501\ArcMaps\Figure1_SiteLocationPlan 20191210.mxd Revised: 2019-12-10 By: ACampigotto





Legend

- Site Location
- Major Road
- Minor Road
- Local Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres

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

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-12-10
Reviewed by SCoughtrey on 2019-12-10

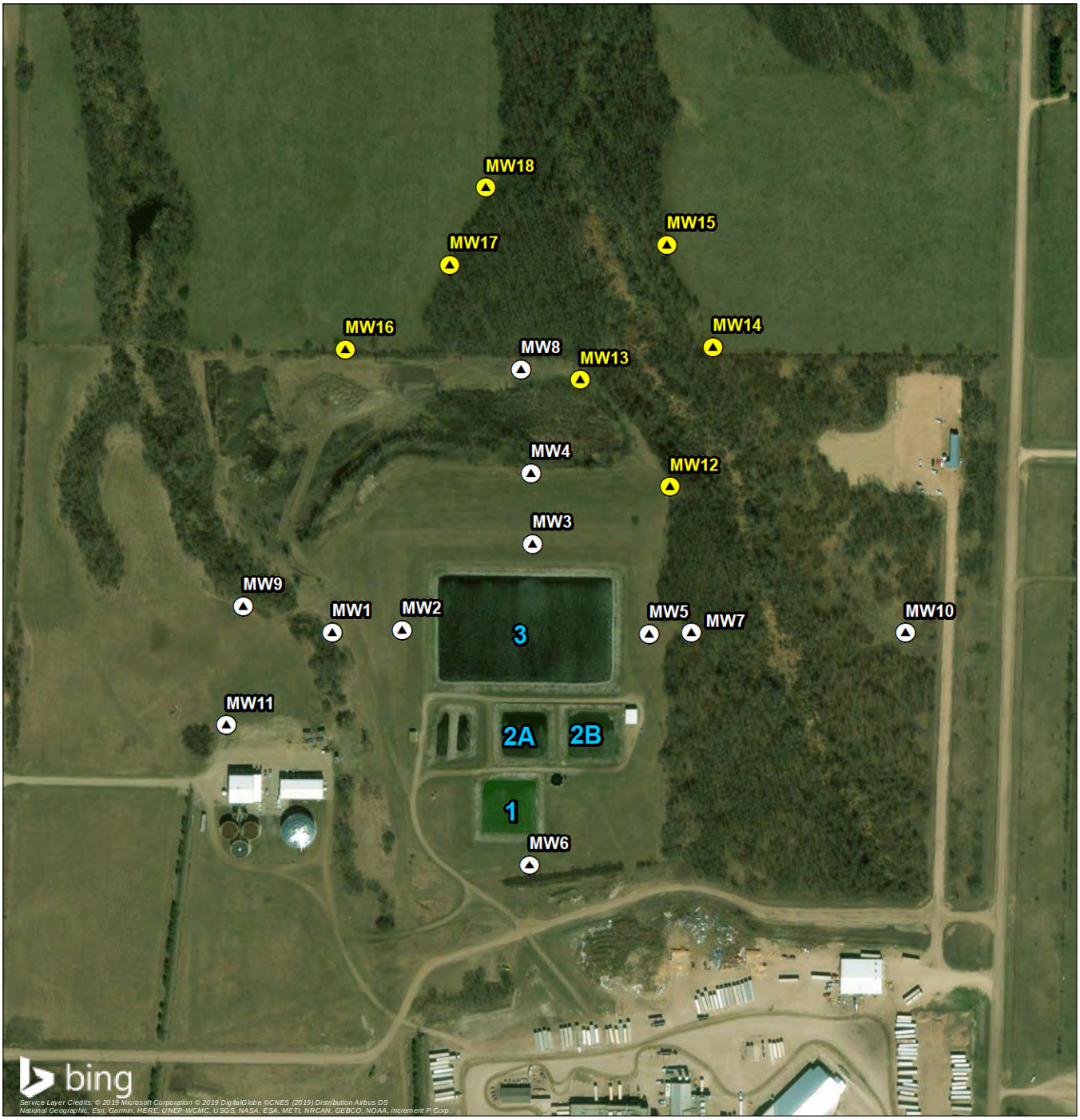
Client/Project 111474534

Remediation Plan
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility

Figure No.
1

Title
Site Location Plan

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



Legend

- Monitoring Well (Previously Installed)
- Monitoring Well (Stantec, 2019)
- 1 Cell Location

0 50 100 Metres

(At original document size of 8.5x11)
1:5,000

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-12-10
Reviewed by SCoughtrey on 2019-12-10

Client/Project 111474534

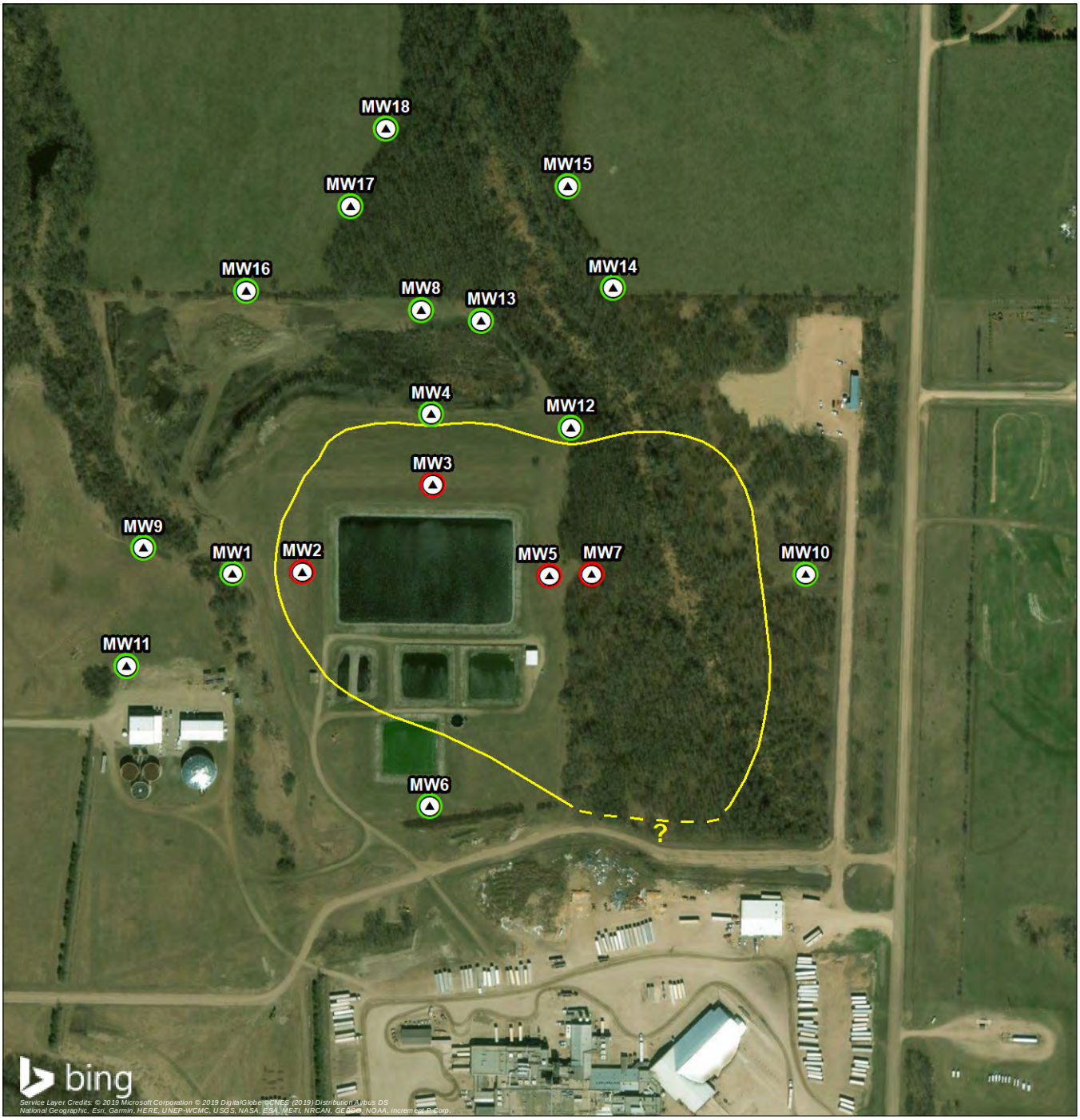
Remediation Plan
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility

Figure No.
2

Title
Monitoring Well / Cell Location Plan

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

G:_GIS_Project_Folder\111484501\ArcMaps\Figure2_MonitoringWellAndCellPlan_20191210.mxd Revised: 2019-12-10 By: ACampigotto



Legend

- Monitoring Well
- Exceeds Health Canada Maximum Allowable Concentration for Nitrate (NO3)
- Meets Health Canada Maximum Allowable Concentration for Nitrate (NO3)
- Approximate Extent of Nitrate (NO3) Groundwater Impacts

0 50 100 Metres

(At original document size of 8.5x11)
1:5,000

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-12-10
Reviewed by SCoughtrey on 2019-12-10

Client/Project 111474534
Remediation Plan
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility

Figure No.
3

Title
Nitrate (NO3) Groundwater Analytical Results

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

G:_GIS_Project_Folder\111484501\ArcMaps\Figure3_Nitrate_Groundwater_results_20191210.mxd Revised: 2019-12-10 By: ACampigotto

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				CELL 1			CELL 2A	CELL 2B	CELL 3						MW1				
Sample Date				16-Jul-19	16-Jul-19		16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	31-May-07	11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19	16-Jul-19
Sample ID				CELL 1	QC1		CELL 2A	CELL 2B	CELL 3	CELL 3 Lab-Dup	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1 Lab-Dup
Sampling Company				STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	Earth Tech	Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	STANTEC
Laboratory				BV	BV		BV	BV	BV	BV	Maxxam	Maxxam	n/a	n/a	n/a	n/a	n/a	BV	BV
Laboratory Work Order				B958618	B958618		B958618	B958618	B958618	B958618	A754992/A770318	A772710	n/a	n/a	n/a	n/a	n/a	B958618	B958618
Laboratory Sample ID				WD1272	WD1296		WD1273	WD1274	WD1275	WD1275	S66874/T36278	T46279	n/a	n/a	n/a	n/a	n/a	WD1276	WD1276
Sample Type	Units	Health Canada	CCME		Field Duplicate	RPD (%)				Lab Replicate									Lab Replicate
General Chemistry																			
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	<0.044	<0.044	nc	<0.044	<0.044	0.095	-	-	-	-	-	-	-	-	0.16	-
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	<0.014	<0.014	nc	<0.014	<0.051	0.071	-	0.7	<0.1	<0.071	0.389	5.26	55.7	<0.070	0.035	-
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	0.042	<0.033	nc	<0.033	<0.16	0.16	-	-	-	-	-	-	-	-	<0.033	-
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	<0.010	<0.010	nc	<0.010	<0.010	0.022	-	0.7	<0.1	0.064	0.364	4.77	**55.7[B]**	0.042	0.035	-
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	0.013	<0.010	nc	<0.010	<0.050 MI	0.049	-	<0.01	<0.01	<0.050	0.024	0.489	<0.050	<0.010	<0.010	-
Phosphorus, Dissolved	mg/L	n/v	n/v	32 CD	36 CD	12%	29 CD	11 CD	4.4 CD	-	0.042	-	<0.030	<0.030	<0.030	<0.050	<0.050	0.0062	-
Phosphorus, Total	mg/L	n/v	n/v	36 CD	36 CD	0%	31 CD	15 CD	4.5 CD	-	0.046	0.037	-	-	-	-	-	0.0068	0.0063
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	**180[C]**	**170[C]**	6%	**190[C]**	**180[C]**	**370[AC] CD**	**340[AC]**	6	9	5.09	5.82	**123[AC]**	93.7	38.8	46	-
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	1.1	7.1	**146%**	<1.0	8.0	41	41	45	38	33.8	39.8	239	**703[A]**	30.8	33	-

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW2												MW3				
Sample Date	Units	Health Canada	CCME	31-May-07	31-May-07	RPD	11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19	16-Jul-19	31-May-07	11-Jul-07	2014	2015	2016
Sample ID				MW2	MW2D		MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2 Lab-Dup	MW3	MW3	MW3	MW3	MW3
Sampling Company				Earth Tech	Earth Tech		Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	STANTEC	Earth Tech	Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions
Laboratory				Maxxam	Maxxam		Maxxam	n/a	n/a	n/a	n/a	n/a	BV	BV	Maxxam	Maxxam	n/a	n/a	n/a
Laboratory Work Order				A754992/A770318	A754992/A770318		A772710	n/a	n/a	n/a	n/a	n/a	B958618	B958618	A754992/A770318	A772710	n/a	n/a	n/a
Laboratory Sample ID				S66875/T36279	S66881/T36285		T46280	n/a	n/a	n/a	n/a	n/a	WD1277	WD1277	S66876/T36280	T46281	n/a	n/a	n/a
Sample Type					Field Duplicate	(%)								Lab Replicate					
General Chemistry																			
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	-	-	-	-	-	-	-	**73[B]**	-	-	-	-	-	-
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	49	48	1%	53	22.7	21.1	26.1	1.09	8.29	16	-	10	25	22.5	23	**104[D]**
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-		-	-	-	-	-	-	<0.033	-	-	-	-	-	-
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	**49[B]**	**47[B]**	4%	**53[B]**	**22.7[B]**	**21.1[B]**	**23.7[B]**	1.09	8.29	**16[B] CD**	-	10	**25[B]**	**22.5[B]**	**22.9[B]**	**94.2[B]**
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.5	0.6	nc	**1.8[B]**	<0.25	<0.020	**2.37[B]**	<0.010	<0.10	<0.010	-	<0.01	<0.01	<0.25	0.058	**9.68[B]**
Phosphorus, Dissolved	mg/L	n/v	n/v	0.019	0.013	nc	-	0.307	<0.030	<0.030	<0.050	<0.050	0.0050	0.0049	0.009	-	<0.030	<0.030	<0.030
Phosphorus, Total	mg/L	n/v	n/v	0.019	0.01	nc	0.005	-	-	-	-	-	0.0088	0.0058	0.011	0.014	-	-	-
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	85	82	1%	68	25.9	55.4	**609[AC]**	42.5	**158[AC]**	39	-	**120[AC]**	**130[AC]**	**118[AC]**	**324[AC]**	**2420[AC]**
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	**794[A]**	**784[A]**	1%	**729[A]**	**796[A]**	**540[A]**	**1180[AD]**	8.01	**583[A]**	**550[A] CD**	-	**1270[AD]**	**1170[AD]**	491	**1010[AD]**	**4710[AD]**

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW3 (Con't)					MW4									MW5			
Sample Date				2017	2018	16-Jul-19	16-Jul-19		31-May-07	11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19	31-May-07	11-Jul-07	11-Jul-07	
Sample ID				MW3	MW3	MW3	QC2		MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW5	MW5	MW55	
Sampling Company				R3 Innovattions	R3 Innovattions	STANTEC	STANTEC		Earth Tech	Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	Earth Tech	Earth Tech	Earth Tech	
Laboratory				n/a	n/a	BV	BV		Maxxam	Maxxam	n/a	n/a	n/a	n/a	n/a	BV	Maxxam	Maxxam	Maxxam	
Laboratory Work Order				n/a	n/a	B958618	B958618		A754992/A770318	A772710	n/a	n/a	n/a	n/a	n/a	B958618	A754992/A770318	A772710	A772710	
Laboratory Sample ID				n/a	n/a	WD1278	WD1297		S66877/T36281	T46282	n/a	n/a	n/a	n/a	n/a	WD1279	S66878/T36282	T46283	T46289	
Sample Type	Units	Health Canada	CCME				Field Duplicate	RPD (%)											Field Duplicate	RPD (%)
General Chemistry																				
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	**90[B]**	**57[B]**	45%	-	-	-	-	-	-	-	37	-	-	-	-
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	30.2	10.5	20	13	42%	24	48	51.6	38.3	53.2	31.7	40.6	8.4	40	49	40	20%
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-	0.055	0.057	nc	-	-	-	-	-	-	-	<0.033	-	-	-	-
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	**30.2[B]**	**10.3[B]**	**20[B] CD**	**13[B] CD**	42%	**24[B]**	**48[B]**	**51.6[B]**	**38.3[B]**	**48.3[B]**	**31.7[B]**	**40.6[B]**	8.4	**40[B]**	**49[B]**	**40[B]**	20%
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.10	0.21	0.017	0.017	nc	<0.5	<0.01	<0.25	<0.020	**4.93[B]**	<0.10	<0.20	<0.010	<0.5	<0.01	<0.01	nc
Phosphorus, Dissolved	mg/L	n/v	n/v	<0.050	1.109	<0.0030	<0.0030	nc	0.011	-	<0.030	<0.030	<0.030	<0.050	<0.050	0.0054	0.014	-	-	-
Phosphorus, Total	mg/L	n/v	n/v	-	-	0.16	0.13	21%	0.008	0.01	-	-	-	-	-	0.043	0.017	0.039	0.009	nc
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	**112[AC]**	**149[AC]**	**190[C] CD**	**190[C]**	0%	62	**210[C]**	**114[C]**	**106[C]**	**1240[AC]**	**186[C]**	**184[C]**	**150[C]**	88	96	100	4%
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	**950[A]**	**1360[AD]**	**1200[AD] CD**	**1300[AD] CD**	8%	241	134	**883[A]**	**689[A]**	**2410[AD]**	**676[A]**	**1150[AD]**	130	**1110[AD]**	**1100[AD]**	**1080[AD]**	2%

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW5 (Con't)						MW6							
Sample Date				2014	2015	2016	2017	2018	16-Jul-19	31-May-07	11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19
Sample ID				MW5	MW5	MW5	MW5	MW5	MW5	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6
Sampling Company				R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	Earth Tech	Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC
Laboratory				n/a	n/a	n/a	n/a	n/a	BV	Maxxam	Maxxam	n/a	n/a	n/a	n/a	n/a	BV
Laboratory Work Order				n/a	n/a	n/a	n/a	n/a	B958618	A754992/A770318	A772710	n/a	n/a	n/a	n/a	n/a	B958618
Laboratory Sample ID				n/a	n/a	n/a	n/a	n/a	WD1280	S66879/T36283	T46284	n/a	n/a	n/a	n/a	n/a	WD1281
Sample Type	Units	Health Canada	CCME														
General Chemistry																	
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	-	-	-	**180[B]**	-	-	-	-	-	-	-	2.2
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	34.6	17.3	<0.22	<0.070	35.7	40	3.5	2.6	1.85	1.27	<0.070	<0.070	0.972	0.50
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-	-	-	-	0.058	-	-	-	-	-	-	-	<0.033
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	**34.6[B]**	**17.3[B]**	<0.020	0.036	**35.7[B]**	**40[B] CD**	3.5	2.6	1.85	1.27	<0.020	<0.020	0.972	0.50
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.25	<0.020	<0.10	<0.010	<0.20	0.018	<0.01	<0.01	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus, Dissolved	mg/L	n/v	n/v	<0.030	<0.030	<0.030	<0.050	<0.050	0.0070	0.009	-	<0.030	<0.030	<0.030	<0.030	<0.050	<0.0030
Phosphorus, Total	mg/L	n/v	n/v	-	-	-	-	-	0.020	0.023	0.008	-	-	-	-	-	0.014
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	82.2	**275[A]**	<5.0	3.56	**157[C]**	**120[C]**	9	10	54.5	30.6	<0.50	<0.50	**105[A]**	**150[C]**
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	**809[A]**	**865[A]**	<3.0	11.5	**704[A]**	**670[A] CD**	13	14	15.6	6.47	<0.30	<0.30	8.78	13

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW7								MW8							
Sample Date				**31-May-07**	**11-Jul-07**	**2014**	**2015**	**2016**	**2017**	**2018**	**16-Jul-19**	**11-Jul-07**	**2014**	**2015**	**2016**	**2017**	**2018**	**16-Jul-19**	**16-Jul-19**
Sample ID				**MW7**	**MW7**	**MW7**	**MW7**	**MW7**	**MW7**	**MW7**	**MW7**	**MW8**	**MW8**	**MW8**	**MW8**	**MW8**	**MW8**	**MW8**	**MW8 Lab-Dup**
Sampling Company				**Earth Tech**	**Earth Tech**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**STANTEC**	**Earth Tech**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**R3 Innovattions**	**STANTEC**	**STANTEC**
Laboratory				**Maxxam**	**Maxxam**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**BV**	**Maxxam**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**BV**	**BV**
Laboratory Work Order				**A754992/A770318**	**A772710**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**B958618**	**A772710**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**B958618**	**B958618**
Laboratory Sample ID				**S66880/T36284**	**T46285**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**WD1282**	**T46286**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**WD1283**	**WD1283**
Sample Type	**Units**	**Health Canada**	**CCME**																**Lab Replicate**
General Chemistry																			
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	-	-	-	-	-	**240[B]**	-	-	-	-	-	-	37	-
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	44	29	36.5	24.9	<0.22	21.1	53.6	55	2.2	5.2	0.444	<0.45	<0.070	31	8.4	-
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-	-	-	-	-	-	<0.033	-	-	-	-	-	-	<0.033	-
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	**44[B]**	**29[B]**	**36.5[B]**	**24.9[B]**	<0.20	**21.1[B]**	**53.6[B]**	**55[B] CD**	2.2	5.2	0.444	<0.40	0.035	**31[B]**	8.4	8.4
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.5	<0.1	<0.25	<0.020	<0.10	<0.10	<0.10	<0.010	0.01	<0.25	<0.020	<0.20	<0.010	<0.20	<0.010	0.012
Phosphorus, Dissolved	mg/L	n/v	n/v	0.006	-	<0.030	<0.030	<0.030	<0.050	<0.050	0.0055	-	<0.030	<0.030	<0.030	<0.050	<0.050	0.0057	-
Phosphorus, Total	mg/L	n/v	n/v	0.013	0.005	-	-	-	-	-	0.059	0.26	-	-	-	-	-	0.12	-
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	69	35	73.2	66.7	<5.0	**154[C]**	67.8	58	78	84.2	58.6	<10	5.12	**116[C]**	100	-
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	**697[A]**	309	**638[A]**	443	<3.0	**1300[AD]**	459	360 CD	**625[A]**	**785[A]**	**539[A]**	<6.0	36.8	**970[A]**	**950[A] CD**	-

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW9							MW10						
Sample Date				11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19	11-Jul-07	2014	2015	2016	2017	2018	16-Jul-19
Sample ID				MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Sampling Company				Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	Earth Tech	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC
Laboratory				Maxxam	n/a	n/a	n/a	n/a	n/a	BV	Maxxam	n/a	n/a	n/a	n/a	n/a	BV
Laboratory Work Order				A772710	n/a	n/a	n/a	n/a	n/a	B958618	A772710	n/a	n/a	n/a	n/a	n/a	B958618
Laboratory Sample ID				T46287	n/a	n/a	n/a	n/a	n/a	WD1284	T46288	n/a	n/a	n/a	n/a	n/a	WD1285
Sample Type	Units	Health Canada	CCME														
General Chemistry																	
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	-	-	-	-	1.5	-	-	-	-	-	-	0.096
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	<0.1	<0.071	0.154	<0.070	<0.070	0.922	0.34	0.7	<0.071	<0.070	<0.070	15.7	<0.070	0.022
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-	-	-	-	-	<0.033	-	-	-	-	-	-	<0.033
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	<0.1	<0.050	0.154	<0.020	<0.020	0.906	0.34	0.7	<0.050	0.041	<0.020	**15.7**[B]	<0.020	0.022
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.01	<0.050	<0.010	<0.010	<0.010	0.017	<0.010	<0.01	<0.050	<0.010	<0.010	<0.050	<0.010	<0.010
Phosphorus, Dissolved	mg/L	n/v	n/v	-	0.04	0.043	<0.030	<0.030	0.703	<0.0030	-	<0.030	<0.030	<0.030	<0.050	0.077	0.0057
Phosphorus, Total	mg/L	n/v	n/v	0.054	-	-	-	-	-	0.80 CD	0.22	-	-	-	-	-	0.23
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	1	2.58	4.71	<0.50	<0.50	13.5	10	3	3.29	3.12	<0.50	57.8	4.17	9.9
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	36	28.9	34.8	<0.30	<0.30	45.3	40	17	19.6	14.7	<0.30	**689**[A]	12.7	15

See notes on last page

Table 1
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the HyLife Foods Neepawa Facility
HyLife Foods

Sample Location				MW11						MW12		MW13			MW14	MW15	MW16		MW17		MW18
Sample Date				2014	2015	2016	2017	2018	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19		16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19
Sample ID				MW11	MW11	MW11	MW11	MW11	MW11	MW12	MW13	QC3		MW14	MW15	MW16	MW16 Lab-Dup	MW17	MW17 Lab-Dup	MW18	
Sampling Company				R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	R3 Innovattions	STANTEC	STANTEC	STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	
Laboratory				n/a	n/a	n/a	n/a	n/a	BV	BV	BV	BV		BV	BV	BV	BV	BV	BV	BV	
Laboratory Work Order				n/a	n/a	n/a	n/a	n/a	B958618	B958618	B958618	B958618		B958618	B958618	B958618	B958618	B958618	B958618	B958618	
Laboratory Sample ID				n/a	n/a	n/a	n/a	n/a	WD1286	WD1287	WD1288	WD1298	RPD	WD1289	WD1290	WD1291	WD1291	WD1294	WD1294	WD1295	
Sample Type	Units	Health Canada	CCME									Field Duplicate	(%)				Lab Replicate		Lab Replicate		
General Chemistry																					
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	-	-	-	-	-	0.21	23	10	24	**82%**	0.25	20	<0.044	-	9.5	-	40	
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	<0.071	0.112	<0.070	0.074	<0.070	0.048	5.2	2.3	5.5	**82%**	0.057	4.6	<0.014	-	2.1	-	9.1	
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	-	-	-	-	-	<0.033	0.049	0.13	0.20	42%	<0.033	0.14	<0.033	-	<0.033	-	0.076	
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	<0.050	0.112	0.033	0.074	<0.020	0.048	5.2	2.3	5.5	**82%**	0.057	4.6	<0.010	<0.010	2.1	-	9.1	
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.039	0.059	**41%**	<0.010	0.044	<0.010	<0.010	<0.010	-	0.023	
Phosphorus, Dissolved	mg/L	n/v	n/v	0.076	<0.030	<0.030	<0.050	0.439	<0.0030	0.0096	0.0036	0.0033	nc	<0.0030	0.0060	<0.0030	-	0.0041	0.0040	0.0043	
Phosphorus, Total	mg/L	n/v	n/v	-	-	-	-	-	0.44	0.46	0.20	0.31	**43%**	0.82 CD	0.95 CD	0.70 CD	-	6.8 CD	-	0.95 CD	
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	0.63	2.96	5.29	21	4.8	5.4	**120[C]**	77	96	22%	1.5	6.1	22	-	6.5	-	5.9	
Dissolved Sulphate	mg/L	≤500[i,A]	1000[D]	2.82	20.1	44.7	38.1	42.1	49	170	490 CD	**570[A] CD**	15%	5.1	28	55	-	35	-	21	

Notes:

Health Canada	Health Canada (2019). Guidelines for Canadian Drinking Water Quality—Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, ON.
A	Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives/ Operational Guidelines
B	Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentration
CCME	Canadian Council of Ministers of the Environment
C	Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water Use - Irrigation Water
D	Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water use - Livestock Water
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
i	High levels (above 500 mg/L) can cause physiological effects such as diarrhoea or dehyrdration.
CD	Detection limits raised due to dilution to bring analyte within the calibrated range.
MI	Detection limits raised due to matrix interference.
RPD	Relative Percent Difference.
61%	RPD exceeds data quality objective of 40% (source: BV Labs QA/QC Interpretation Guide Reference COR-FCD-0097 released July 18, 2016.)
nc	RPD is not calculated if one or more values is non detect or if one or more values is less than five times the reportable detection limit.

Groundwater Impacts Delineation, Former Industrial Wastewater Treatment Facility at the Hylife Foods Neepawa Facility, Neepawa, Manitoba

FINAL REPORT

October 21, 2019

Prepared for:

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Executive Summary

Hylife Foods (Hylife) retained Stantec Consulting Ltd. (Stantec) to provide environmental services supporting the delineation of previously identified groundwater impacts in the vicinity of the former Spring Hill Farms industrial wastewater treatment facility (IWWTF) located north of the Hylife facility in Neepawa, Manitoba (hereinafter referred to as “the Site”).

The scope of work developed and implemented for the groundwater impacts delineation program consisted of the following:

- Completion of an RMS-1 (Risk Management Strategy) form identifying the potential risks associated with the site field activities (standard to all Stantec projects).
- Completion of the required utility locates through public and private locators.
- Advancement of seven boreholes with completion of each borehole as a groundwater monitoring well.
- An elevation survey of the 7 newly installed groundwater monitoring wells and re-survey of the 11 existing groundwater monitoring wells.
- Development of the seven newly installed groundwater monitoring wells with certified clean, dedicated bailers (i.e., new bailer/well).
- Purging of the 7 new and 11 previously installed groundwater monitoring wells with certified clean, dedicated bailers.
- Monitoring of the 7 newly installed groundwater monitoring wells as well as 11 previously installed monitoring wells for presence/absence of non-aqueous phase liquids (NAPL), depth to groundwater, total monitoring well depth, and field parameters including temperature, pH, conductivity, dissolved oxygen, oxidation-reduction-potential, and total dissolved solids.
- Collection of groundwater samples and submission to Bureau Veritas Laboratories (BV Labs) in Winnipeg, Manitoba, for analysis of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite.
- Hydraulic testing (i.e., slug test) at two monitoring wells (one previously installed and one newly installed).
- Monitoring field parameters and collection of surface water samples from each of the four IWWTF cells with samples submitted to BV Labs for the same analysis as the groundwater samples (total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite).

- Collection and submission of representative blind duplicates for quality assurance/quality control (QA/QC) purposes. Blind duplicates represented approximately 10% of the surface water and groundwater samples collected. Blind duplicate field samples were submitted for laboratory analysis of the same parameters as the submitted samples.

- Comparison of the received analytical results with the regulatory guidelines appropriate to the Site.

- Preparation of this report detailing the activities completed and resultant findings.

Based on the results of the groundwater delineation program undertaken, and to the extent that the samples analyzed were representative of the areas investigated, Stantec concludes that:

- The concentrations of dissolved and total phosphorus, dissolved nitrite (NO_2) and dissolved nitrite (as N), nitrate+nitrite, in the surface and groundwater samples submitted for laboratory analysis were less than the applied regulatory guidelines.

- The concentrations of dissolved nitrate (NO_3) and dissolved nitrate (as N) exceeded the Health Canada Drinking Water Guidelines, Maximum Acceptable Concentration, in monitoring wells MW2, MW3, MW5, and MW7.

- The concentrations of dissolved chloride in surface water samples collected from Cell 1, Cell 2A, Cell 2B and Cell 3 and groundwater samples MW3 (and its field duplicate QC2), MW4, MW5, MW6 and MW12 exceeded the Canadian Council of Minsters of the Environment (CCME) guidelines. The concentration in surface water sample Cell 3 also exceeded the Health Canada Drinking Water Guidelines, Aesthetic Objective.

    - As the water from the IWWTF cells is not used as a potable source, the concentrations in the surface water are not considered an environmental concern at this time. In addition, as the surface water is not being applied to the land and the groundwater is not used as a source of irrigation water at the Site, the concentrations of chloride at the Site are not considered an environmental concern at this time.

- The concentrations of dissolved sulphate in groundwater samples MW2, MW3 (and its field duplicate QC2), MW5, MW8, and QC 3 (MW13 is the parent sample) exceeded the Health Canada Drinking Water Guidelines, Aesthetic Objective. The concentrations in MW3 and its field duplicate QC2 also exceeded the CCME guideline.

    - As the shallow groundwater at the IWWTF is not used as a potable source or source of irrigation water, the concentrations of sulphate at the Site are not considered an environmental concern at this time.

- Based on the results of the groundwater delineation investigation, the lateral delineation of the groundwater impacts, specifically dissolved nitrate (NO_3) appear to have been attained to the north, east and west; however, the area to the south/southeast of the IWWTF has not been fully delineated. The dissolved nitrate impacted groundwater appeared to be limited to the area in the vicinity of the IWWTF cells.

Stantec recommends including the newly installed monitoring wells in the groundwater monitoring program going forward as part of the Environment Act License 1102 RRR for the Site. The purpose of the monitoring program would be to track identified groundwater impacts that may be associated with the IWWTF.

The Manitoba Contaminated Sites Remediation Act (CSRA) and Contaminated Sites Remediation Regulation (CSRR) came into effect on April 1, 2014, and include mandatory reporting of identified exceedances of generic (most stringent) guidelines within soil and groundwater at sites in Manitoba. Section 3.1 of the CSRA states that the owner or occupier of a site must notify Manitoba Sustainable Development in writing when he or she becomes aware of information that indicates that the site has been contaminated at a level that exceeds a standard established or adopted by regulation (CSRR); and must provide Manitoba Sustainable Development with all reports and any other documentation in his or her possession respecting the contamination at the site. Accordingly, as groundwater concentrations exceed the mandatory requirements under the CSRA, this report should be provided to Manitoba Sustainable Development for review.

The statements made in this Executive Summary are subject to the same limitations included in Section 8.0 and are to be read in conjunction with the remainder of this report.

1.0 INTRODUCTION

Hylife Foods (Hylife) retained Stantec Consulting Ltd. (Stantec) to provide environmental services supporting the delineation of previously identified groundwater impacts in the vicinity of the former Spring Hill Farms industrial wastewater treatment facility (IWWTF) located north of the Hylife facility in Neepawa, Manitoba (hereinafter referred to as "the Site"). Figures are presented in **Appendix A**. The general site location is shown on **Figure 1**. Photographs are provided in **Appendix B**.

1.1 BACKGROUND INFORMATION

Stantec was provided with a report detailing a groundwater sampling program completed by Earth Tech in 2007. The Earth Tech 2007 report indicated that groundwater impacts were present on the IWWTF property to the north and east of the IWWTF but appeared to remain within the property limits. The apparent direction of groundwater flow was generally towards the north. Nitrate concentrations in the groundwater exceeded the referenced Health Canada drinking water guidelines (concentrations ranging from <0.1 to 53 mg/L vs a guideline of 10 mg/L); however, the nitrate+nitrite concentrations were below 100 mg/L (the Canadian Council of Ministers of the Environment [CCME] guidelines for livestock watering). In some groundwater samples, the dissolved sulphate concentrations exceeded the Health Canada aesthetic objective.

Earth Tech's 2007 report recommended the installation of additional groundwater wells north of the IWWTF to further delineate the impacts and confirm that the impacts were contained to the property. A recommendation was also made to sample existing residential supply wells to the immediate north of the property as well to confirm the absence of impacts and human health risk from consumption of the impacted groundwater.

Additional groundwater data collected since 2007 by Hylife identified groundwater impacts in monitoring well MW8 near the property's northern boundary; however, analyte concentrations have not been consistent and data on the timing, sampling methods, and groundwater elevation at the time of sampling were not available.

Based on the above information, Stantec recommended the installation of seven additional groundwater monitoring wells to further delineate the groundwater impacts at the Site.

1.2 SITE DESCRIPTION

1.2.1 Subject Property

The Site is located approximately 2.5 km east of the Town of Neepawa, Manitoba. The Site is bounded by forest and agricultural land to the north and east, agricultural land and a golf course to the west, and the Neepawa Hylife Foods facility to the south.

1.2.2 Topography and Drainage

The Site is generally flat and at grade with the adjacent properties and roadways to the east, west, and south, except for a coulee on the eastern portion of the Site, east of the IWWTF, that run south to north, discharging into the Whitemud River. To the north, the topography slopes down steeply (approximately 20m) into the Whitemud River valley.

Based on an available topographic map (Toporama, 2019), the observed site topography, and Earth Tech's 2007 report, regional surface drainage (anticipated shallow groundwater flow direction) appears to be to the north, towards the Whitemud River, located approximately 800 m from the Site.

It should be noted that the direction of the shallow groundwater flow in limited areas can also be influenced by the presence of underground utility corridors and is not necessarily a reflection of regional or local groundwater flow or a replica of the Site or area topography.

1.2.3 Geologic Setting

Based on the Reconnaissance Soil Survey Report (No. 7) of the Carberry Map Sheet Area (Ehrlich et. al., 1957), at a scale of 1:126,720, the native surficial soils of the Site are described as Stockton fine sandy loams. The soil surface texture varies from loamy sand to very fine sandy loam, and drainage is good.

The Site occurs over an area with underlying geologic deposits of the Favel Formation; calcareous speckled shale (second Specks), minor limestone, bentonite and oil shale of the Mesozoic period. The Favel Formation is a stratigraphical unit of Upper Cretaceous age in the Western Canadian Sedimentary Basin. The thickness of the Favel Formation varies from 15 to 45 m (Manitoba Geological Survey, 2006).

2.0 SCOPE OF WORK

The scope of work developed and implemented for the groundwater impacts delineation program consisted of the following:

- Completion of an RMS-1 (Risk Management Strategy) form identifying the potential risks associated with the site field activities (standard to all Stantec projects).
- Completion of the required utility locates through public and private locators.
- Advancement of seven boreholes with completion of each borehole as a groundwater monitoring well.
- An elevation survey of the 7 newly installed groundwater monitoring wells and re-survey of the 11 existing groundwater monitoring wells.
- Development of the seven newly installed groundwater monitoring wells with certified clean, dedicated bailers (i.e., new bailer/well).
- Purging of the 7 new and 11 previously installed groundwater monitoring wells with certified clean, dedicated bailers.
- Monitoring of the 7 newly installed groundwater monitoring wells as well as 11 previously installed monitoring wells for presence/absence of non-aqueous phase liquids (NAPL), depth to groundwater, total monitoring well depth, and field parameters including temperature, pH, conductivity, dissolved oxygen, oxidation-reduction-potential, and total dissolved solids.
- Collection of groundwater samples and submission to Bureau Veritas Laboratories (BV Labs) in Winnipeg, Manitoba, for analysis of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite.
- Hydraulic testing (i.e., slug test) at two monitoring wells (one previously installed and one newly installed).
- Monitoring field parameters and collection of surface water samples from each of the four IWWTF cells with samples submitted to BV Labs for the same analysis as the groundwater samples (total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite).
- Collection and submission of representative blind duplicates for quality assurance/quality control (QA/QC) purposes. Blind duplicates represented approximately 10% of the surface water and groundwater samples collected. Blind duplicate field samples were submitted for laboratory analysis of the same parameters as the submitted samples.

- Comparison of the received analytical results with the regulatory guidelines appropriate to the Site.

- Preparation of this report detailing the activities completed and resultant findings.

3.0 METHODS

3.1 SAFETY PROCEDURES

Stantec staff associated with the well installations, groundwater monitoring and sampling, and surface water monitoring and sampling wore the following personal protective equipment during the fieldwork:

- Hardhat
- Safety glasses
- Safety vest
- Steel toe boots
- Nitrile and/or work gloves

An RMS-1 (Risk Management Strategy) form identifying potential health and safety risks relating to the site work was completed prior to any field activities. Prior to commencing the site work, a safety meeting was held between Stantec staff and the contracted driller. The safety meeting covered job safety planning checklists, equipment checklists, emergency information, and work site hazards outlined in the site-specific RMS-1 developed for the well installations, groundwater monitoring and sampling, and surface water monitoring and sampling.

3.2 GROUNDWATER INVESTIGATION

During the week of July 8 to 12, 2019, Stantec personnel attended the Site to supervise the groundwater monitoring well installations; develop and purge the new and previously installed monitoring wells; and complete a monitoring well elevation survey. Stantec personnel returned to the Site on July 15 and 16, 2019, to complete hydraulic conductivity testing and to collect the surface water and groundwater samples.

3.2.1 Site Preparation

Underground utilities were located by their respective proprietors prior to ground disturbance (i.e., drilling). Additional location by a third-party contractor (Structure Scan Inc.) was also conducted to locate residual private utilities before ground disturbance commenced.

Maple Leaf Drilling Ltd. (Maple Leaf) was commissioned by Stantec to complete the drilling activities on the Site.

3.2.2 Groundwater Investigation

On July 10 and 11, 2019, seven boreholes were advanced at pre-determined points at the Site. The boreholes were drilled to a maximum depth of between approximately 6.0 and 7.5 metres below ground surface (m BGS) using a Geoprobe® 7822DT track-mounted drill rig.

The encountered subsurface conditions were logged at the time of the field program. Detailed soil descriptions (including lithology, colour, relative moisture content, and visual or olfactory evidence of odour or staining) were recorded in borehole logs. The information was then translated onto the respective log for that borehole as presented in **Appendix C**.

Each of the seven boreholes were completed as groundwater monitoring wells, labelled MW12 through MW18. Each of the newly installed wells was constructed of portions of 50 millimetre (mm) inside diameter (ID) Schedule 40 polyvinyl chloride (PVC) screened and unscreened/solid piping to facilitate groundwater monitoring and sampling. The monitoring well construction details are noted on the borehole logs provided in **Appendix C**.

Sand was added within the annular space around the piping to a height of approximately 0.5 m above the screened PVC portion; followed by bentonite pellets, which were placed on top of the sand, around the solid PVC portion, to create a seal in each well. Stick-up steel casings were then installed for ease of identification and to protect the wells from tampering.

The groundwater levels in the previously installed monitoring wells were recorded between July 8 and July 11, 2019. The groundwater levels in the newly installed monitoring wells were established on July 12, 2019. Each of the newly installed wells was developed (i.e., purged of 10 well volumes of water) on July 12, 2019, except for MW16, MW17, and MW18, which were purged dry three times. The previously installed wells were purged of three well volumes between July 8 and July 11, 2019. The newly installed wells were purged of three well volumes on July 15, 2019, except for MW16, MW17, and MW18 which were purged dry. The wells were all left to recharge prior to sampling on July 16, 2019. Additional details on the purging and sampling activities are provided in Section 3.2.7 and the recorded water-level measurements are noted in **Table 1** provided in **Appendix D.**

3.2.3 Groundwater Monitoring

Monitoring data was collected at the 18 site monitoring wells between July 8 and July 16, 2019 (see **Figure 2** in **Appendix A** for well locations). Depth to groundwater, total monitoring well depth, temperature, pH, conductivity, dissolved oxygen, oxidation-reduction-potential, and turbidity for each well was recorded. Monitoring results are discussed in Section 5.3.

3.2.4 Elevation Survey

The ground surface elevation and top of pipe (TOP) elevation at each of the groundwater monitoring wells was recorded with a Trimble R10 Rover on July 12, 2019. The well elevations, groundwater elevations,

and coordinates are recorded in **Table 1** in **Appendix D**. The groundwater elevations were used to map the groundwater flow direction shown on **Figure 3** in **Appendix A.**

3.2.5 Hydraulic Conductivity

Single well response hydraulic conductivity testing (slug tests) was completed at two monitoring wells to allow for an evaluation of the site-specific hydraulic conductivity within the saturated soils beneath the Site. Rising and falling head hydraulic conductivity tests involve the instantaneous displacement of the water column in a monitoring well using a solid slug with a known volume. Falling and rising head conductivity tests measure the period of time required for the water level to recover to static level, which determines a hydraulic conductivity value (K-value). The sensitive water level changes were measured using an electronic Schlumberger Model No. DI501 mini-diver water level logger. The barometric pressure was measured with a Van Essen Baro-Diver (DI500).

Rising and falling head hydraulic conductivity tests were performed at monitoring wells MW8 and MW13 located on the northern portion of the Site (see **Figure 2** in **Appendix A**) on July 15, 2019.

Water from the monitoring well was displaced using a solid 0.04 m diameter slug with a measured volume of 0.0011 m^3 and a known displacement of 0.579 m in a 2-inch diameter monitoring well. Following the completion of the falling head hydraulic conductivity testing, the slug was removed, and the rising head data was recorded. Data were recorded with a level logger and downloaded after each testing location. Water levels were recorded electronically and manually throughout the duration of the test. The results of the hydraulic conductivity testing are discussed in Section 5.4 and provided in **Appendix E**.

3.2.6 Groundwater Sampling

During the groundwater monitoring between July 8 and 11, 2019, the 11 previously existing monitoring wells were purged prior to sampling using a certified clean dedicated bailer (i.e., new bailer/well). On July 12, 2019, the seven newly installed monitoring wells were developed. On July 15, 2019, they were purged prior to sampling using a certified clean dedicated bailer (i.e., new bailer/well).

Groundwater samples were then collected on July 16, 2019, once sufficient recharge was measured in the monitoring wells. The sampling methodology employed was in accordance with Stantec Standard Operating Procedures. A new pair of disposable nitrile gloves was worn for each sample collection and the samples were collected with certified clean, dedicated sampling bailers. The samples were stored in a cooler containing ice immediately following collection. Stantec maintained custody of the samples until delivery to BV Labs in Winnipeg, Manitoba. Groundwater samples were submitted to BV Labs for laboratory analysis of the following: of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite.

The analytical results received are discussed in Section 5.5.

3.3 SURFACE WATER INVESTIGATION

Surface water samples were collected from the four IWWTF cells (Cell 1, Cell 2A, Cell 2B, and Cell 3) on July 16, 2019. Prior to sampling, monitoring data including temperature, pH, conductivity, dissolved oxygen, oxidation-reduction-potential, and turbidity was collected.

The sampling methodology employed was similar to that used during the groundwater sampling. A new pair of disposable nitrile gloves was worn for each sample collection and samples were collected directly into laboratory supplied sample bottles. The samples were stored in a cooler containing ice immediately following collection. Stantec maintained custody of the samples until delivery to BV Labs in Winnipeg, Manitoba. Surface water samples were submitted to BV Labs for laboratory analysis of the following: total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite.

The analytical results received are discussed in Section 5.5.

3.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Stantec executed Quality Assurance and Quality Control (QA/QC) procedures during the field program to collect data that was reproducible, complete, suitable for comparison with the guidelines/standards, and considered representative of soil and groundwater conditions at the Site. BV Labs also implements individual QA/QC procedures and policies for accurate analysis.

During the surface water and groundwater monitoring and sampling field activities completed on July 16, 2019, one surface water field duplicate sample and two groundwater field duplicate samples, representing more than 10% of the total number of samples collected, were recovered from Cell 1 (QC1), MW3 (QC2), and MW13 (QC3).

The field duplicates were submitted with the other samples to BV Labs for analyses of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite (the same as the parent samples). The duplicates were used to evaluate both laboratory precision and the implemented field sampling and handling procedures. Like the original samples, the field duplicates were stored in a cooler containing ice immediately following collection and were delivered to BV Labs with the other samples. The Relative Percent Difference (RPD) for the field duplicate samples is calculated in a similar manner as the laboratory duplicates.

The RPD is calculated for the results of the pair of samples. However, RPDs are only calculated if both the measured values in the parent sample and the lab/field duplicate are greater than five times the laboratory reporting limit (RL) because the results are less reliable the closer the measured values are to the RL. RPD is calculated as follows:

$$RPD(\%) = \left|\frac{C1 - C2}{(C1 + C2)/2}\right| \times 100$$

Where: C1 = Concentration in parent sample and C2 = Concentration in duplicate sample

The RPD is used to evaluate the precision of the laboratory analysis. As part of laboratory QA/QC procedures, BV Labs completed in-house duplicate analysis on submitted samples or within a batch of samples that include the submitted samples. The results of the RPD calculations completed by the laboratory are shown in the received laboratory certificates. If the results were greater than the laboratory's acceptance criteria, the results were noted in the attached laboratory certificates.

The RPDs calculated for the field duplicates are discussed as part of the QA/QC program in Section 5.6.

4.0 REGULATORY FRAMEWORK

As in previous investigations, the regulatory framework that provided guidance in the assessment of groundwater at the Site consisted of:

- Health Canada. 2019. Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. June 2019. The document is available at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

- Canadian Council of Ministers of the Environment (CCME). *Canadian Environmental Quality Guidelines (CEQG) Water Quality Guidelines for the Protection of Agriculture*. On-line summary table.

5.0 FINDINGS

5.1 STRATIGRAPHY

Near surface geology is presented on the borehole records in **Appendix C**. As indicated, the stratigraphic profile observed during the investigation generally consisted of sand to the extent drilled.

5.2 WELL INVENTORY

The eleven previously installed on-Site monitoring wells (labelled MW1 through MW11) were located between July 8 and 11, 2019 (see **Figure 2** in **Appendix A** and photographic representation in **Appendix C**). Each of the monitoring wells was an aboveground monitoring well. The 11 monitored wells were observed to be in serviceable condition.

Each of the seven new monitoring wells were labelled and protected with aboveground steel casings.

5.3 GROUNDWATER MONITORING

The previously installed monitoring wells were monitored for depth to groundwater and the presence/absence of NAPL between July 8 and 11, 2019. The newly installed monitoring wells were monitored for depth to groundwater and the presence/absence of NAPL on July 12, 2019. No NAPL was observed in any of the monitoring wells.

Field measurements of parameters including temperature, conductivity, total dissolved solids, dissolved oxygen, pH, and oxidation-reduction potential obtained during the field program are summarized on **Table 1** in **Appendix D**.

5.4 GROUNDWATER FLOW

On July 12, 2019, a groundwater elevation survey of the new and previously installed groundwater monitoring wells was completed. **Table 1** in **Appendix D** summarizes the elevation survey measurements. The groundwater level varied from 356.70 m above sea level (m AMSL) in MW18 to 362.91 m AMSL in MW6. Based on the results of the groundwater elevation survey, the groundwater flow direction appears to be to the northeast (see **Figure 3** in **Appendix A**). The groundwater flow direction was based groundwater elevations in the seven newly installed and eleven existing groundwater monitoring wells.

Hydraulic conductivity results for the testing completed in July 2019 are displayed in **Table i** below and depicted in **Appendix E**.

Table i: Summary of 2019 Hydraulic Conductivity Values

Monitoring Well ID.	Hydraulic Conductivity (m/day)		
	Falling Head Estimated Value	Rising Head Estimated Value	Data Analysis Method
MW8	3.152	3.187	Bouwer - Rice, 1976
MW13	2.909	3.409	Bouwer - Rice, 1976

Notes: All analysis were conducted using Aqtesolv version 4.50.002

The groundwater velocities were calculated using Darcy's Equation:

$$Groundwater\ Velocity\ (V) = \frac{K * i}{n}$$

Where: K = Hydraulic Conductivity, i = Hydraulic Gradient and n = Effective Porosity. The inputs into this equation and results of the calculation are shown in **Table ii** below.

Table ii: Inputs and Results of Groundwater Velocity Calculations

Parameter, units	Stantec 2019	
	MW8	MW13
Hydraulic Conductivity, m/day	3.169(1)	3.149(1)
Hydraulic Gradient, m/m	0.01	0.01
Effective Porosity[1]	0.35	0.35
Groundwater Velocity, m/day	1.05 x10^{-6}	1.04 x10^{-6}
Groundwater Velocity, m/y	33.05	32.84

Notes:

1- The hydraulic conductivity value is calculated from the geometric mean of the falling and rising head hydraulic conductivity values for the Site determined from testing completed in July 2019.

Based on the measured hydraulic conductivity and hydraulic gradient, the calculated velocity beneath the Site ranged from approximately 1.04 x10^{-6}m/s (32.84 m/yr) to 1.05 x10^{-6}m/s (33.05 m/yr) in July 2019.

5.5 LABORATORY ANALYTICAL RESULTS

The laboratory results for the analysis of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite parameters in the submitted surface water and groundwater samples (including field duplicate), along with the generic Health Canada and CCME

[1] Freeze, R. Allan, and John A. Cherry. 1979. Groundwater. Englewood Cliffs, N.J.: Prentice-Hall.

guidelines are summarized in **Table 2** in **Appendix D**. Copies of the final original Certificates of Analysis (and QA/QC documentation) sent from the laboratory are provided in **Appendix F**.

Based on the results of the groundwater and surface water sampling program, the following parameters exceeded the one or more of the Health Canada (Aesthetic Objective or Maximum Acceptable Concentration) and/or the CCME guidelines:

- Dissolved chloride (based on the CCME guideline 100 – 700 mg/L):
    - Cell 1 with a concentration of 180 mg/L and its field duplicate QC1 with a concentration of 170 mg/L.
    - Cell 2A with a concentration of 190 mg/L.
    - Cell 2B with a concentration of 180 mg/L.
    - Cell 3 with a concentration of 370 mg/L, which also exceeded the Aesthetic Objective of the Health Canada Guidelines (≤250 mg/L).
    - MW3 with a concentration of 190 mg/L and its field duplicate QC2 with a concentration of 190 mg/L.
    - MW4 with a concentration of 150 mg/L.
    - MW5 with a concentration of 120 mg/L.
    - MW6 with a concentration of 150 mg/L.
    - MW12 with a concentration of 120 mg/L.

- Dissolved sulphate (based on the Aesthetic Objective of the Health Canada Guidelines ≤500 mg/L):
    - MW2 with a concentration of 550 mg/L.
    - MW3 with a concentration of 1,200 mg/L and its field duplicate QC2 with a concentration of 1,300 mg/L which also exceeded the CCME guideline (100-700 mg/L).
    - MW5 with a concentration of 670 mg/L.
    - MW8 with a concentration of 950 mg/L.
    - Field duplicate QC 3 (MW13 is the parent sample) with a concentration of 570 mg/L.

- Dissolve nitrate (NO_3), (based on the Maximum Acceptable Concentration of 45 mg/L):
    - MW2 with a concentration of 73 mg/L.
    - MW3 with a concentration of 90 mg/L and its field duplicate QC2 with a concentration of 57 mg/L.
    - MW5 with a concentration of 180 mg/L.
    - MW7 with a concentration of 240 mg/L.

- Dissolved nitrate (as N), (based on the Maximum Acceptable Concentration of 10 mg/L):
    - MW2 with a concentration of 16 mg/L.
    - MW3 with a concentration of 20 mg/L and its field duplicate QC2 with a concentration of 13 mg/L.
    - MW5 with a concentration of 40 mg/L.
    - MW7 with a concentration of 55 mg/L.

5.6 QA/QC PROGRAM RESULTS

The field and laboratory QA/QC program is described in Section 3.4. Review of sample hold times indicated that the samples were submitted and analyzed within the recommended hold times.

The results of the RPD calculations completed by the laboratory are shown in the attached laboratory certificates. If the results were greater than the laboratory's acceptance criteria, the results were noted in the attached laboratory certificates. BV Labs noted the following:

- The detection limits were raised due to dilution to bring the analyte within the calibrated range for the following:
    - Dissolved phosphorus and total phosphorus in surface water samples Cell 1 (and its field duplicate QC1), Cell 2A, Cell 2B, and Cell 3.
    - Total phosphorus in groundwater samples MW9, MW14, MW15, MW16, MW17 and MW18.
    - Dissolved chloride in surface water sample Cell 3 and groundwater sample MW3.
    - Dissolved nitrate (as N) in groundwater samples MW2, MW3 (and its field duplicate QC2), MW5, and MW7.
    - Dissolved sulphate in groundwater samples MW2, MW3 (and its field duplicate QC2), MW5, MW7, MW8, and MW13 (and its field duplicate QC3).
- For dissolved nitrite (as N) in Cell 2B, the detection limit was raised due to matrix interference.

BV Labs indicated that laboratory surrogate standard recoveries were within acceptable limits for the other parameters analyzed. Laboratory quality control certificates are provided in **Appendix F**.

One surface water field duplicate sample was recovered: QC1, a duplicate of sample Cell 1 and two groundwater field duplicate samples were recovered: QC2, duplicate of MW3 and QC3, duplicate of MW13. The samples were submitted for analysis of total and dissolved phosphorus, dissolved sulphate, dissolved chloride, dissolved nitrate, dissolved nitrite, and nitrate+nitrite. The RPDs for the parameters in the surface and groundwater samples and their field duplicate were calculated and ranged from 0% to 146%. Based on the BV Labs CCME QA/QC guide, the RPD for groundwater should be less than 40%. Therefore, as a measure of conservatism, the higher concentration between the parent sample and its duplicate was used for comparison with the appropriate guidelines. It is noted that the RPDs for some of the parameters were not calculated as they were not detected at concentrations greater than the laboratory's RLs or both measured values in the parent sample and the field duplicate were less than five times the RL.

The analytical results of the parent samples and field duplicates are presented in **Table 2** in **Appendix D**. Laboratory quality control certificates are provided in **Appendix F**.

Based on the results of the QA/QC Program, the field and laboratory QA/QC indicates that the laboratory results were generally representative of the groundwater conditions within the submitted samples.

5.7 DISCUSSION

With the exception of surface water collected from the northernmost cell (Cell 3) of the IWWTF, the chloride concentrations that exceeded the CCME guideline were below the Health Canada drinking water Aesthetic Objectives guideline, which is based on aesthetic effects such as taste, odour, and colour considerations. As the water from the IWWTF cells is not used as a potable source, the concentrations in the surface water are not considered an environmental concern at this time. The chloride concentrations in surface water samples Cell 1, Cell 2A, and Cell 2B collected from the southern three cells of the IWWTF, and groundwater samples, MW3 (and its field duplicate QC2), MW4, MW5, MW6, and MW12 exceeded the CCME guideline for the protection of agriculture which ranges from 100 to 700 mg/L and is protective of irrigation water. As the surface water is not being applied to the land and the groundwater is not used as a source of irrigation water at the Site, the concentrations of chloride at the Site are not considered an environmental concern at this time.

The sulphate concentrations in groundwater samples collected from MW2, MW3 (and its field duplicate QC2), MW5, MW8, and QC3 (MW13 field duplicate) exceeded the Health Canada drinking water guidelines Aesthetic Objective guideline. Sulphate concentrations in MW3 and its field duplicate QC2 also exceeded the CCME guideline for the protection of agriculture, which for sulphate is protective of livestock. As the shallow groundwater at the IWWTF is not used as a potable source or source of irrigation water, the concentrations of sulphate at the Site are not considered an environmental concern at this time.

Based on the results of the groundwater delineation investigation, the lateral delineation of the groundwater impacts, specifically dissolved nitrate (NO_3) appear to have been attained to the north, east and west; however, the area to the south/southeast of the IWWTF has not been fully delineated. The dissolved nitrate impacted groundwater appeared to be limited to the area in the vicinity of the IWWTF cells (as shown in **Figure 4** in **Appendix A**). The areal extent of dissolved nitrate (NO_3) impacted groundwater was defined using the dissolved nitrate (NO_3) concentrations at each of the monitoring wells and comparing to 45 mg/L, the Health Canada Maximum Acceptable Concentration guideline for dissolved nitrate (NO_3).

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Based on the results of the groundwater delineation program undertaken, and to the extent that the samples analyzed were representative of the areas investigated, Stantec concludes that:

- The concentrations of dissolved and total phosphorus, dissolved nitrite (NO_2) and dissolved nitrite (as N), nitrate+nitrite, in the surface and groundwater samples submitted for laboratory analysis were less than the applied regulatory guidelines.
- The concentrations of dissolved nitrate (NO_3) and dissolved nitrate (as N) exceeded the Health Canada Drinking Water Guidelines, Maximum Acceptable Concentration, in monitoring wells MW2, MW3, MW5, and MW7.
- The concentrations of dissolved chloride in surface water samples collected from Cell 1, Cell 2A, Cell 2B and Cell 3 and groundwater samples MW3 (and its field duplicated QC2), MW4, MW5, MW6 and MW12 exceeded the CCME guidelines. The concentration in surface water sample Cell 3 also exceeded the Health Canada Drinking Water Guidelines, Aesthetic Objective.
    - As the water from the IWWTF cells is not used as a potable source, the concentrations in the surface water are not considered an environmental concern at this time. In addition, as the surface water is not being applied to the land and the groundwater is not used as a source of irrigation water at the Site, the concentrations of chloride at the Site are not considered an environmental concern at this time.
- The concentrations of dissolved sulphate in groundwater samples MW2, MW3 (and its field duplicate QC2), MW5, MW8, and QC 3 (MW13 is the parent sample) exceeded the Health Canada Drinking Water Guidelines, Aesthetic Objective. The concentrations in MW3 and its field duplicate QC2 also exceeded the CCME guideline.
    - As the shallow groundwater at the IWWTF is not used as a potable source or source of irrigation water, the concentrations of sulphate at the Site are not considered an environmental concern at this time.
- Based on the results of the groundwater delineation investigation, the lateral delineation of the groundwater impacts, specifically dissolved nitrate (NO_3) appear to have been attained to the north, east and west; however, the area to the south/southeast of the IWWTF has not been fully delineated. The dissolved nitrate impacted groundwater appeared to be limited to the area in the vicinity of the IWWTF cells.

6.2 RECOMMENDATIONS

Stantec recommends including the newly installed monitoring wells in the groundwater monitoring program going forward as part of the Environment Act License 1102 RRR for the Site. The purpose of the monitoring program would be to track identified groundwater impacts that may be associated with the IWWTF.

The Manitoba Contaminated Sites Remediation Act (CSRA) and Contaminated Sites Remediation Regulation (CSRR) came into effect on April 1, 2014, and include mandatory reporting of identified exceedances of generic (most stringent) guidelines within soil and groundwater at sites in Manitoba. Section 3.1 of the CSRA states that the owner or occupier of a site must notify Manitoba Sustainable Development in writing when he or she becomes aware of information that indicates that the site has been contaminated at a level that exceeds a standard established or adopted by regulation (CSRR); and must provide Manitoba Sustainable Development with all reports and any other documentation in his or her possession respecting the contamination at the site. Accordingly, as groundwater concentrations exceed the mandatory requirements under the CSRA, this report should be provided to Manitoba Sustainable Development for review.

7.0 REFERENCES

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Bureau Veritas Laboratories. 2016. Environmental QA/QC Interpretation Guide.

Earth Tech (Canada) Inc., May and July 2007 Groundwater Sampling Program – Neepawa, Manitoba, dated August 13, 2007.

Ehrlich, W. A., E. A. Poyser, L. E. Pratt, 1957. “Report of Reconnaissance Soil Survey of Carberry Map Sheet Area”. Manitoba Soil Survey.

Freeze, R. Allan, and John A. Cherry. 1979. Groundwater. Englewood Cliffs, N.J.: Prentice-Hall.

Fetter, C. (1994). Applied Hydrogeology. New York: Macmillan.

Manitoba Geological Survey. 2006. Geological Map of Manitoba, Scale 1:1,000,000, Map 79-2.

Natural Resources Canada, 2019. The Atlas of Canada – Toporama, viewed September 13, 2019 < https://atlas.gc.ca/toporama/en/index.html>

Schwartz F.W., and Zhang H., 2003. Fundamentals of Ground Water. Table 3.1 Range in Values of Porosity. John Wiley & Sons, Inc., 583p.

8.0 LIMITATIONS

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities, or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

1. Sampling was limited to specific areas.
2. The analytical program was limited to the determination of the specific suite of parameters indicated.
3. Stantec can only comment on the condition of the sampling program at the time of completion and within the areas sampled.
4. Stantec can only make findings or draw conclusions regarding the laboratory analysis completed on the groundwater samples.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-

surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

9.0 STANTEC QUALITY MANAGEMENT PROGRAM

This report, entitled **Groundwater Impacts Delineation, Former Industrial Wastewater Treatment Facility at the Hylife Foods Neepawa Facility, Neepawa, Manitoba** prepared for Hylife Foods, dated October 21, 2019, and was produced by Stantec Consulting Ltd.

This report was written by the following individuals:

Joshua Markham, B.Sc.
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Signature

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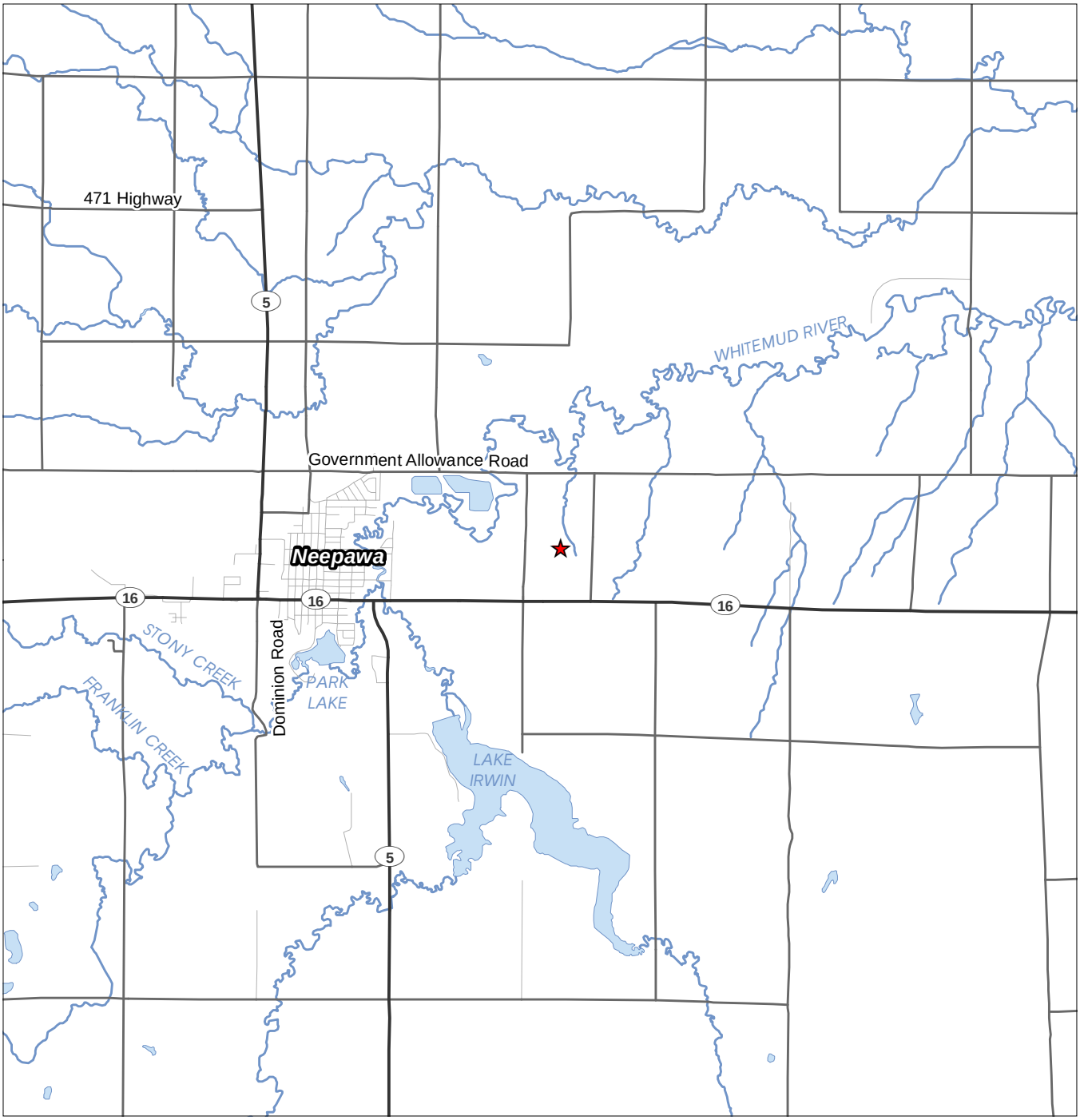
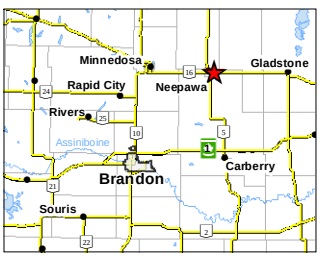
Jane Yaraskavitch, M.Eng., P.Eng. (ON & YK)
Senior Associate – Environmental Services

Signature

Appendix A FIGURES

\\Ca0045-pbag101\gis_GIS Project Folder\111484591\ArcMaps\Figure1 Sitelocation 20191002.mxd Revised: 2019-10-02 By: ACampigotto





Legend

- Site Location
- Major Road
- Minor Road
- Local Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres

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

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-10-02
Reviewed by SCoughtrey on 2019-10-02

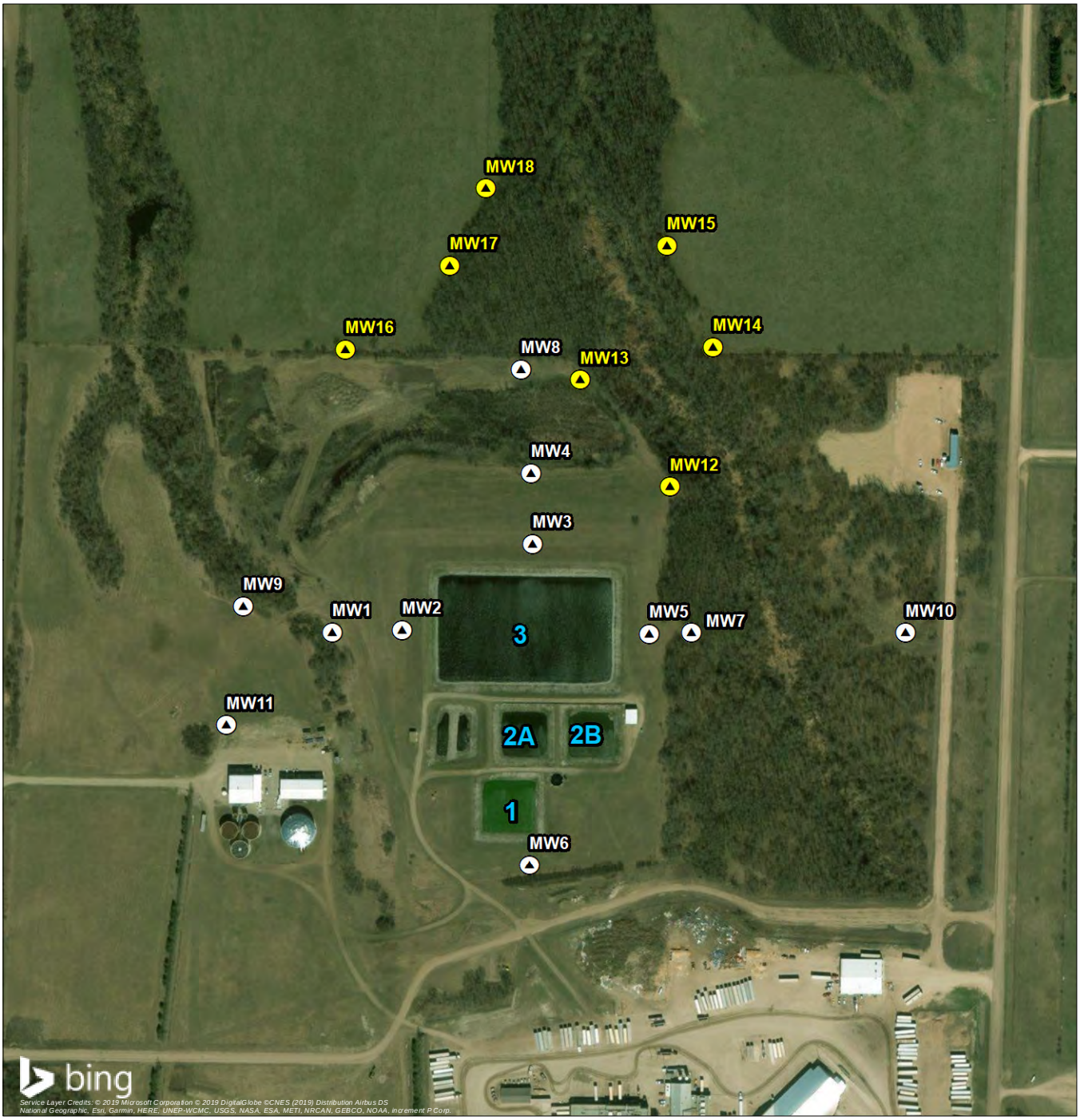
Client/Project 111474534

HYLIFE FOODS
Groundwater Impacts Delineation,
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility

Figure No.
1

Title
Site Location

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



Legend

- Monitoring Well (Previously Installed)
- Monitoring Well (Stantec, 2019)
- 1 Cell Location

0 50 100 Metres

(At original document size of 8.5x11)
1:5,000

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-10-02
Reviewed by SCoughtrey on 2019-10-02

Client/Project 111474534

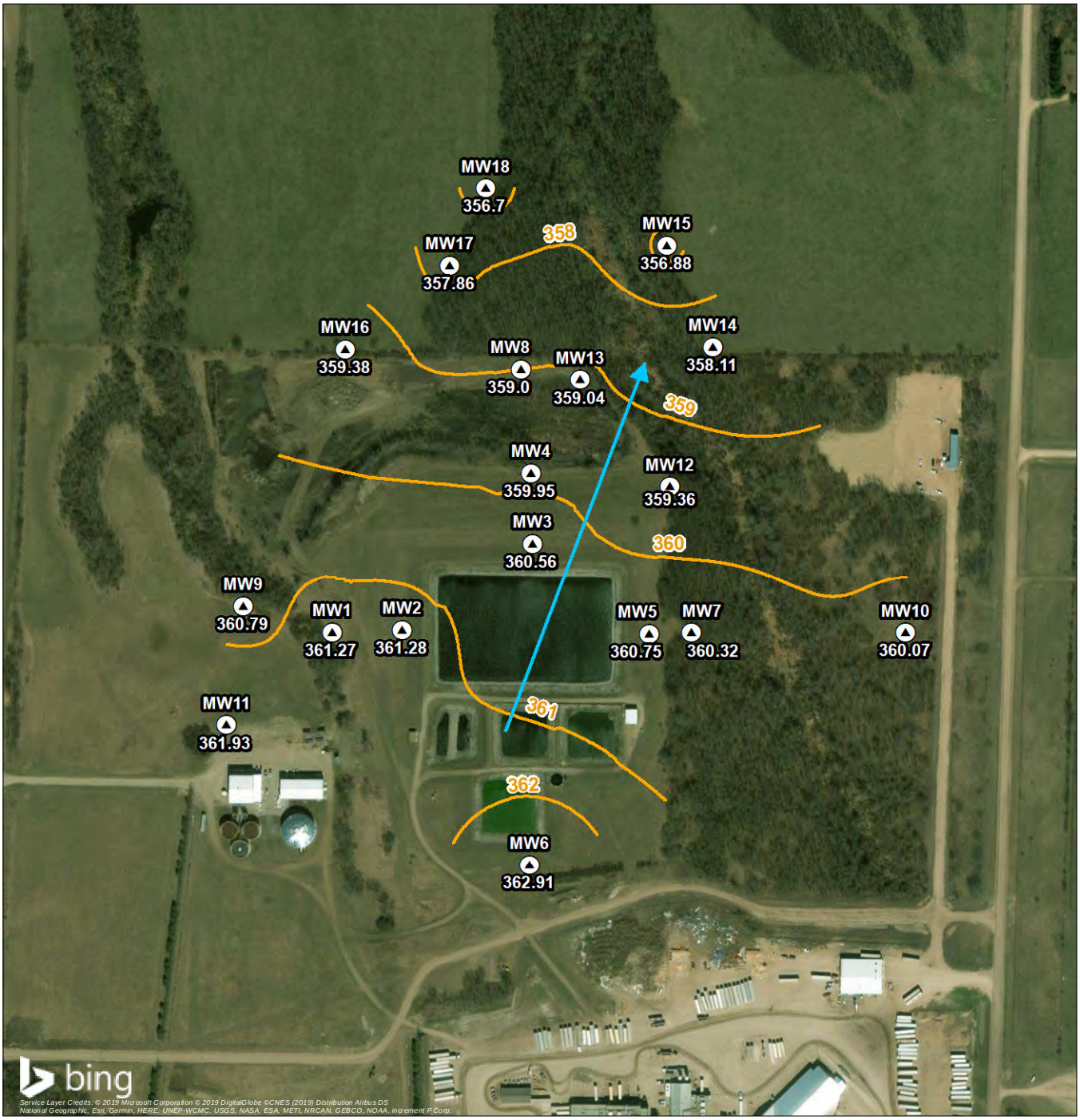
HYLIFE FOODS
Groundwater Impacts Delineation,
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility

Figure No.
2

Title
Monitoring Well / Cell Location Plan

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

G:_GIS_Project_Folder\111484501\ArcMaps\Figure2_MonitoringWellPlan_20191002.mxd Revised: 2019-10-17 By: ACampigotto



Legend

- Monitoring Well with Measured Depth to Groundwater (masl)
- Groundwater Elevation Contours (masl)
- Groundwater Flow Direction

0 50 100 Metres

(At original document size of 8.5x11)
1:5,000

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-10-02
Reviewed by SCoughtrey on 2019-10-02

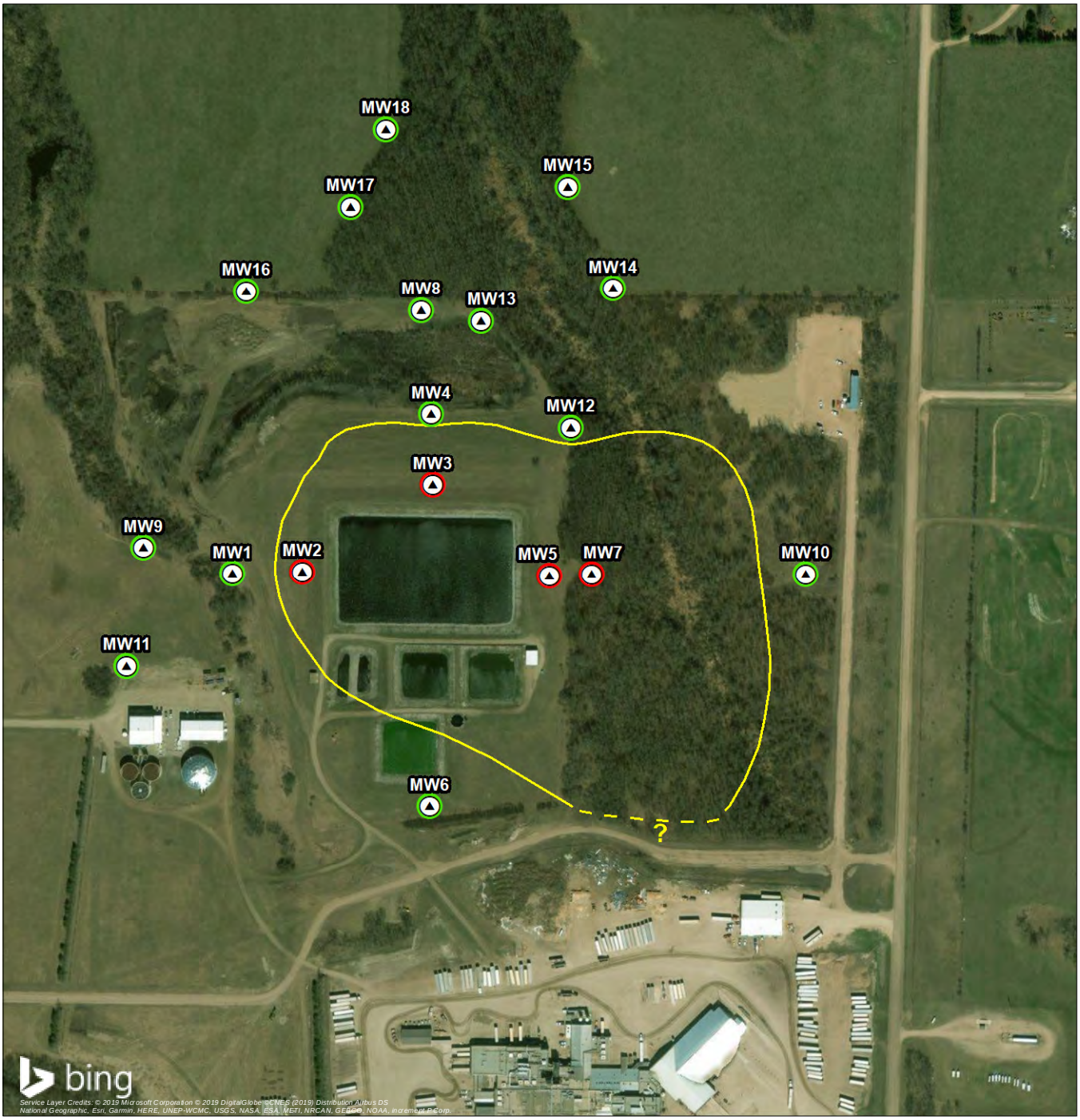
Client/Project 111474534
HYLIFE FOODS
Groundwater Impacts Delineation,
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility

Figure No.
3

Title
Groundwater Flow Direction (July 16, 2019)

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

G:_GIS_Project_Folder\111484501\ArcMaps\Figure3_GroundwaterFlowJuly2019_20191002.mxd Revised: 2019-10-17 By: ACampigotto



Legend

- Monitoring Well
- Exceeds Health Canada Maximum Allowable Concentration for Nitrate (NO3)
- Meets Health Canada Maximum Allowable Concentration for Nitrate (NO3)
- Approximate Extent of Nitrate (NO3) Groundwater Impacts

0 50 100 Metres

(At original document size of 8.5x11)
1:5,000

N

Stantec

Project Location
Neepawa,
Manitoba

Prepared by ACampigotto on 2019-10-15
Reviewed by SCoughtrey on 2019-10-15

Client/Project 111474534
HYLIFE FOODS
Groundwater Impacts Delineation,
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility

Figure No.
4

Title
Nitrate (NO3) Groundwater Analytical Results

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

G:_GIS_Project_Folder\111484501\ArcMaps\Figure4_NitrateAnalyticalResults_20191011.mxd Revised: 2019-10-15 By: ACampigotto

Appendix B SELECTED PHOTOGRAPHS

View looking west of monitoring well MW13 being advanced to the north of the IWWTF.

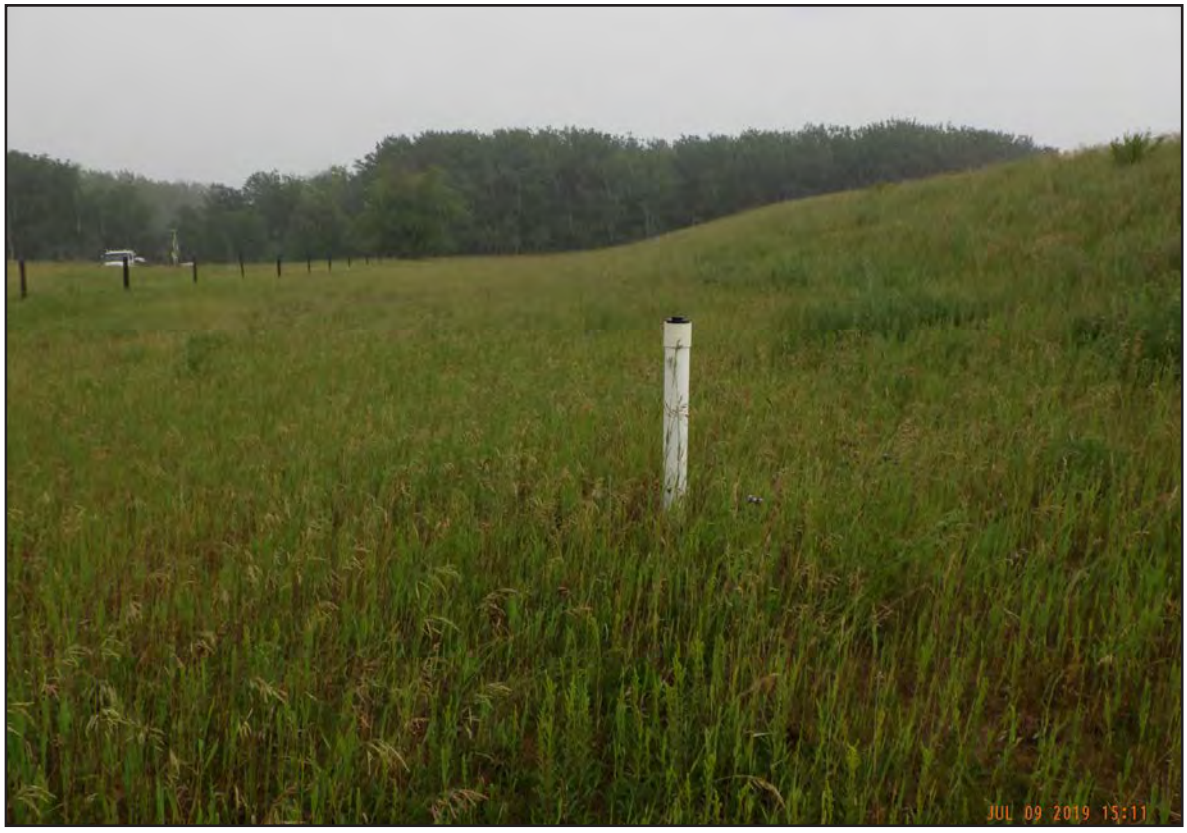
View looking south of monitoring well MW14 being advanced to the northeast of IWWTF.

View looking south of monitoring well MW15 located off-site to the northeast of the IWWTF.

View looking west of monitoring well MW16 being advanced to the northwest of the IWWTF.

View looking north of monitoring well MW18 being advanced off-site to the north of the IWWTF.

View looking north of monitoring well MW2 located immediately west of the IWWTF.



View looking east of monitoring well MW3 located immediately north of the IWWTF.

View looking north of monitoring well MW5 located immediately east of the IWWTF.

View looking east of monitoring well MW6 located immediately south of the IWWTF.

View looking south of monitoring well MW8 located north of the IWWTF.

Appendix C MONITORING WELL LOGS

Monitoring Well: MW12

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	09-Jul-2019 / 10-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	361.79 m AMSL
Number:	111474534	**Top of casing elevation:**	362.56 m AMSL
Field investigator:	AR	**Easting:**	469786.369
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564581.011

SUBSURFACE PROFILE					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				362.89		
-3	-1.0					
-2	-0.5					aboveground riser and protective monument casing
-1			Ground Surface	361.79		
0	0.0		Sand grey/light brown, dry, very fine, some silt	0.00 361.49		
1			Sand brown, fine, moist	0.30		
2	0.5					50 mm PVC pipe with bentonite backfill
3	1.0					
4				360.29		
5	1.5		Sand brown, dry, coarse	1.50 359.89		
6			Sand brown, saturated, fine	1.90		
7	2.0					
8	2.5					Groundwater Level: 2.43 m BGS 12-Jul-19
9						
10	3.0					
11						
12	3.5					
13	4.0					
14						
15	4.5					50 mm slotted PVC pipe with silica sand backfill
16						
17	5.0					
18	5.5					
19						
20	6.0					
21						
22	6.5					
23	7.0					
24				354.29		
25	7.5		End of Borehole	7.50		end cap

Screen Interval: 1.50 - 7.45 m BGS
Sand Pack Interval: 1.20 - 7.45 m BGS
Well Seal Interval: 0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

Monitoring Well: MW13

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	10-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	360.59 m AMSL
Number:	111474534	**Top of casing elevation:**	361.52 m AMSL
Field investigator:	AR	**Easting:**	469712.535
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564667.965

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				361.69		
			Ground Surface	360.59		aboveground riser and protective monument casing
			Sand brown/black, moist, organics	0.00 360.49		
			Sand brown, moist with saturation at 1.0 m, fine	0.10		50 mm PVC pipe with bentonite backfill
				359.09		
			Sand brown, saturated, very fine, oxidation from 1.5 to 4.5 m	1.50		Groundwater Level: 1.55 m BGS 12-Jul-19
						50 mm slotted PVC pipe with silica sand backfill
				354.59		end cap
			End of Borehole	6.00		

Screen Interval: 1.50 - 5.95 m BGS
Sand Pack Interval: 1.20 - 5.95 m BGS
Well Seal Interval: 0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

Monitoring Well: MW14

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	10-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	361.21 m AMSL
Number:	111474534	**Top of casing elevation:**	362.21 m AMSL
Field investigator:	AR	**Easting:**	469822.117
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564695.371

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				362.31		
			Ground Surface	361.21		aboveground riser and protective monument casing
			Sand black, moist, some topsoil with organics	0.00 360.87		
			Sand brown, turning grey with oxidation at 2.2 m, grey/brown from 3.0 to 4.3 m, moist with saturation at 2.0 m	0.34		50 mm PVC pipe with bentonite backfill
						Groundwater Level: 3.11 m BGS 12-Jul-19
						50 mm slotted PVC pipe with silica sand backfill
				356.91		
			Sand grey, saturated, very fine, silty	4.30 356.71		
			Sand brown/grey, saturated, very fine	4.50		
				355.21		end cap
			End of Borehole	6.00		

-3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

-1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0

Screen Interval:	1.50 - 5.95 m BGS
Sand Pack Interval:	1.20 - 5.95 m BGS
Well Seal Interval:	0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

STANTEC BOREHOLE AND WELL V2 HYLIFE GINT LOGS_18JULY2019.GPJ STANTEC - DATA TEMPLATE.GDT 10/16/19 SCOUGHTREY

Monitoring Well: MW15

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	10-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	359.73 m AMSL
Number:	111474534	**Top of casing elevation:**	360.59 m AMSL
Field investigator:	AR	**Easting:**	469784.091
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564780.247

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				360.83		
			Ground Surface	359.73		aboveground riser and protective monument casing
			Sand black/brown, moist, very fine, organics	0.00 359.63		
			Sand brown, moist, fine	0.10		50 mm PVC pipe with bentonite backfill
				358.23		
			Sand grey/white, saturated, very fine, some sandy clay loam	1.50 1.60		Groundwater Level: 2.85 m BGS 12-Jul-19
			Sand brown, brown/grey from 4.5 to 6.0 m, moist, becoming saturated at 3.0 m, very fine sand, some oxidation			50 mm slotted PVC pipe with silica sand backfill
				353.73		end cap
			End of Borehole	6.00		

-3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 (ft)
-1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 (m)

Screen Interval: 1.50 - 5.95 m BGS
Sand Pack Interval: 1.20 - 5.95 m BGS
Well Seal Interval: 0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

STANTEC BOREHOLE AND WELL V2 HYLIFE GINT LOGS_18JULY2019.GPJ STANTEC - DATA TEMPLATE.GDT 10/16/19 SCOUGHTREY

Monitoring Well: MW16

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	10-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	363.11 m AMSL
Number:	111474534	**Top of casing elevation:**	363.84 m AMSL
Field investigator:	AR	**Easting:**	469518.437
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564693.731

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				364.21		
			Ground Surface	363.11		aboveground riser and protective monument casing
0	0.0		Sand brown/grey, moist, fine, silty with organics	0.00 363.01		
1	0.5		Sand brown, moist, dry from 1.5 to 3.0 m, fine, grey fine silty sand lense at 1.4 m	0.10		50 mm PVC pipe with bentonite backfill
5	1.5		Sand grey, turning brown at 3.1 m, grey from 5.1 to 6.0 m, brown from 6.0 to 6.5 m, moist with saturation starting at 4.5 m, very fine, refusal at 6.5 m	1.50		
10	3.0			360.11		
13	4.0					Groundwater Level: 3.72 m BGS 12-Jul-19 50 mm slotted PVC pipe with silica sand backfill
21	6.5		End of Borehole	356.61 6.50		end cap

Screen Interval: 1.50 - 6.45 m BGS
Sand Pack Interval: 1.20 - 6.45 m BGS
Well Seal Interval: 0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

Monitoring Well: MW17

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	11-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	360.46 m AMSL
Number:	111474534	**Top of casing elevation:**	361.36 m AMSL
Field investigator:	AR	**Easting:**	469604.872
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564763.723

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				361.56		
			Ground Surface	360.46		aboveground riser and protective monument casing
			Sand dark brown, moist, fine, silty with organics	0.00 360.36		
			Sand brown, turning grey at 1.5, moist, fine	0.10		50 mm PVC pipe with bentonite backfill
				358.66		
			Sand grey/brown, turning brown at 3.0 m, grey/brown from 4.1 to 6.0 m, oxidation from 1.8 to 3.0 m, very fine	1.80		Groundwater Level: 2.60 m BGS 12-Jul-19
						50 mm slotted PVC pipe with silica sand backfill
				354.46		end cap
			End of Borehole	6.00		

Screen Interval: 1.65 - 5.95 m BGS
Sand Pack Interval: 1.35 - 5.95 m BGS
Well Seal Interval: 0.00 - 1.35 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

Monitoring Well: MW18

Project:	Groundwater Impacts Delineation	**Drilling method:**	Direct Push
Client:	Hylife Foods LP	**Date started/completed:**	11-Jul-2019
Location:	Former Industrial Wastewater Treatment Facility, Neepawa, MB	**Ground surface elevation:**	359.91 m AMSL
Number:	111474534	**Top of casing elevation:**	360.84 m AMSL
Field investigator:	AR	**Easting:**	469634.507
Contractor:	Maple Leaf Drilling Ltd.	**Northing:**	5564827.634

SUBSURFACE PROFILE | INSTALLATION DETAILS

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram	Description
				361.01		
			Ground Surface	359.91		aboveground riser and protective monument casing
			Sand brown, dry, organics	0.00 359.80		
			Sand brown, dry, turning moist at 1.5 m, saturated starting at 1.8 m, fine	0.11		50 mm PVC pipe with bentonite backfill
				356.91		
			Sand grey/brown, grey from 5.0 to 5.5 m, saturated, moist from 4.2 to 4.5 m and 5.0 to 5.5 m, oxidation from 3.0 to 4.5 m, very fine	3.00		Groundwater Level: 3.20 m BGS 12-Jul-19 50 mm slotted PVC pipe with silica sand backfill
				354.41		
			Clay grey, moist, low plasticity	5.50		
				353.91		end cap
			End of Borehole	6.00		

-3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

-1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0

Screen Interval: 1.50 - 5.95 m BGS
Sand Pack Interval: 1.20 - 5.95 m BGS
Well Seal Interval: 0.00 - 1.20 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

Stantec

Drawn By/Checked By: AR/SC

STANTEC BOREHOLE AND WELL V2 HYLIFE GINT LOGS_18JULY2019.GPJ STANTEC - DATA TEMPLATE.GDT 10/16/19 SCOUGHTREY

Appendix D SUMMARY TABLES

Table 1
Groundwater Field Summary
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods

Well Identification	Northing (m)	Easting (m)	Top of Pipe (TOP) Elevation (m AMSL)	Ground Surface Elevation Elevation (m AMSL)	Height of Well Above Grade (m)	Depth to Water (m) TOP[A]	Depth to Water (m BGS)[A]	Depth to Bottom of Well (m) TOP[A]	Groundwater Elevation (m AMSL)	Temperature (°C)	Conductivity (µS/cm)	pH (Std. Units)	Oxidation/ Reduction Potential [ORP] (mV)	Dissolved Oxygen [DO] (mg/L)	Total Disolved Solids (mg/L)	Apparent LNAPL Thickness (m)
MW1	5564459.59	469507.03	363.63	362.63	1.00	2.36	1.36	7.38	361.27	8.1	504	7.47	124.9	2.20	425.15	0
MW2	5564461.25	469565.03	365.37	364.37	1.00	4.09	3.09	8.99	361.28	7.8	1059	7.30	114.3	12.96	1027.00	0
MW3	5564533.10	469672.69	366.07	365.06	1.01	5.51	4.50	8.97	360.56	8.5	2377	6.79	122.7	3.96	2255.50	0
MW4	5564591.66	469671.35	364.82	363.75	1.07	4.88	3.80	9.14	359.95	7.5	760	7.60	97.1	18.62	734.50	0
MW5	5564458.09	469769.08	365.62	364.54	1.08	4.87	3.79	9.15	360.75	8.7	1521	6.87	76.2	8.60	1436.50	0
MW6	5564267.20	469670.43	367.08	366.29	0.79	4.17	3.38	6.20	362.91	13.6	680	7.84	43.9	7.86	565.50	0
MW7	5564459.08	469804.23	365.26	364.28	0.98	4.94	3.96	9.23	360.32	6.8	1205	7.07	93.4	5.11	1189.50	0
MW8	5564677.45	469663.41	363.45	362.42	1.03	4.45	3.42	5.96	359.00	7.4	1846	6.99	178.1	4.01	1774.50	0
MW9	5564481.07	469433.46	363.27	362.26	1.01	2.48	1.48	6.90	360.79	10.1	425.6	7.80	125.7	3.63	382.20	0
MW10	5564459.22	469981.47	365.65	364.61	1.05	5.59	4.54	7.50	360.07	8.4	427.7	7.61	136.7	4.89	395.20	0
MW11	5564382.89	469419.46	364.71	363.78	0.93	2.77	1.84	6.11	361.93	11.8	4707	7.63	131.8	4.16	405.60	0
MW12	5564580.55	469786.83	362.56	361.79	0.77	3.20	2.43	6.89	359.36	9.2	835	7.45	95.6	10.24	767.00	0
MW13	5564668.67	469712.47	361.52	360.59	0.93	2.48	1.55	6.63	359.04	10.2	1314	6.91	87.1	4.73	1085.50	0
MW14	5564695.64	469821.97	362.21	361.21	0.99	4.10	3.10	6.22	358.11	8.8	315.7	7.83	-48.3	4.19	286.65	0
MW15	5564780.05	469784.14	360.59	359.73	0.86	3.71	2.85	5.90	356.88	8.5	331.2	7.77	-21	4.70	307.45	0
MW16	5564693.65	469518.14	363.84	363.11	0.73	4.45	3.72	6.46	359.38	8.3	454.6	7.64	-38.1	10.17	427.05	0
MW17	5564763.52	469604.58	361.36	360.46	0.90	3.50	2.59	4.22	357.86	8.6	33.4	7.68	97.1	10.86	319.80	0
MW18	5564827.52	469634.02	360.84	359.91	0.93	4.13	3.20	6.88	356.70	9.4	396.1	7.75	140.1	9.01	341.90	0

Notes

LNAPL	Light Non-Aqueous Phase Liquid
m AMSL	Metres Above Mean Sea Level
A	Water monitoring data collected July 16, 2019
TOP	Measured from top of pipe

Table 2
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods

Sample Location				CELL 1			CELL 2A	CELL 2B	CELL 3		MW1		MW2		MW3		
Sample Date				16-Jul-19	16-Jul-19		16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	
Sample ID				CELL 1	QC1		CELL 2A	CELL 2B	CELL 3	CELL 3 Lab-Dup	MW1	MW1 Lab-Dup	MW2	MW2 Lab-Dup	MW3	QC2	
Sampling Company				STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	
Laboratory				BV	BV		BV	BV	BV	BV	BV	BV	BV	BV	BV	BV	
Laboratory Work Order				B958618	B958618		B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	
Laboratory Sample ID				WD1272	WD1296		WD1273	WD1274	WD1275	WD1275	WD1276	WD1276	WD1277	WD1277	WD1278	WD1297	
Sample Type	Units	Health Canada	CCME		Field Duplicate	RPD (%)				Lab Replicate		Lab Replicate		Lab Replicate		Field Duplicate	RPD (%)
General Chemistry																	
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	<0.044	<0.044	nc	<0.044	<0.044	0.095	-	0.16	-	**73[B]**	-	**90[B]**	**57[B]**	**45%**
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	<0.014	<0.014	nc	<0.014	<0.051	0.071	-	0.035	-	16	-	20	13	**42%**
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	0.042	<0.033	nc	<0.033	<0.16	0.16	-	<0.033	-	<0.033	-	0.055	0.057	nc
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	<0.010	<0.010	nc	<0.010	<0.010	0.022	-	0.035	-	**16[B] CD**	-	**20[B] CD**	**13[B] CD**	**42%**
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	0.013	<0.010	nc	<0.010	<0.050 MI	0.049	-	<0.010	-	<0.010	-	0.017	0.017	nc
Phosphorus, Dissolved	mg/L	n/v	n/v	32 CD	36 CD	12%	29 CD	11 CD	4.4 CD	-	0.0062	-	0.0050	0.0049	<0.0030	<0.0030	nc
Phosphorus, Total	mg/L	n/v	n/v	36 CD	36 CD	0%	31 CD	15 CD	4.5 CD	-	0.0068	0.0063	0.0088	0.0058	0.16	0.13	21%
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	**180[C]**	**170[C]**	6%	**190[C]**	**180[C]**	**370[AC] CD**	**340[AC]**	46	-	39	-	**190[C] CD**	**190[C]**	0%
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	1.1	7.1	**146%**	<1.0	8.0	41	41	33	-	**550[A] CD**	-	**1200[AD] CD**	**1300[AD] CD**	8%

See notes on last page

Table 2
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods

Sample Location				MW4	MW5	MW6	MW7	MW8		MW9	MW10	MW11	MW12		MW13	
Sample Date				16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	
Sample ID				MW4	MW5	MW6	MW7	MW8	MW8 Lab-Dup	MW9	MW10	MW11	MW12	MW13	QC3	
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	
Laboratory				BV	BV	BV	BV	BV	BV	BV	BV	BV	BV	BV	BV	
Laboratory Work Order				B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	B958618	
Laboratory Sample ID				WD1279	WD1280	WD1281	WD1282	WD1283	WD1283	WD1284	WD1285	WD1286	WD1287	WD1288	WD1298	
Sample Type	Units	Health Canada	CCME						Lab Replicate						Field Duplicate	RPD (%)
General Chemistry																
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	37	**180[B]**	2.2	**240[B]**	37	-	1.5	0.096	0.21	23	10	24	**82%**
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	8.4	40	0.50	55	8.4	-	0.34	0.022	0.048	5.2	2.3	5.5	**82%**
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	<0.033	0.058	<0.033	<0.033	<0.033	-	<0.033	<0.033	<0.033	0.049	0.13	0.20	42%
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	8.4	**40[B] CD**	0.50	**55[B] CD**	8.4	8.4	0.34	0.022	0.048	5.2	2.3	5.5	**82%**
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.010	0.018	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	0.015	0.039	0.059	**41%**
Phosphorus, Dissolved	mg/L	n/v	n/v	0.0054	0.0070	<0.0030	0.0055	0.0057	-	<0.0030	0.0057	<0.0030	0.0096	0.0036	0.0033	nc
Phosphorus, Total	mg/L	n/v	n/v	0.043	0.020	0.014	0.059	0.12	-	0.80 CD	0.23	0.44	0.46	0.20	0.31	**43%**
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	**150[C]**	**120[C]**	**150[C]**	58	100	-	10	9.9	5.4	**120[C]**	77	96	22%
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	130	**670[A] CD**	13	360 CD	**950[A] CD**	-	40	15	49	170	490 CD	**570[A] CD**	15%

See notes on last page

Table 2
Summary of Groundwater Analytical Results
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods

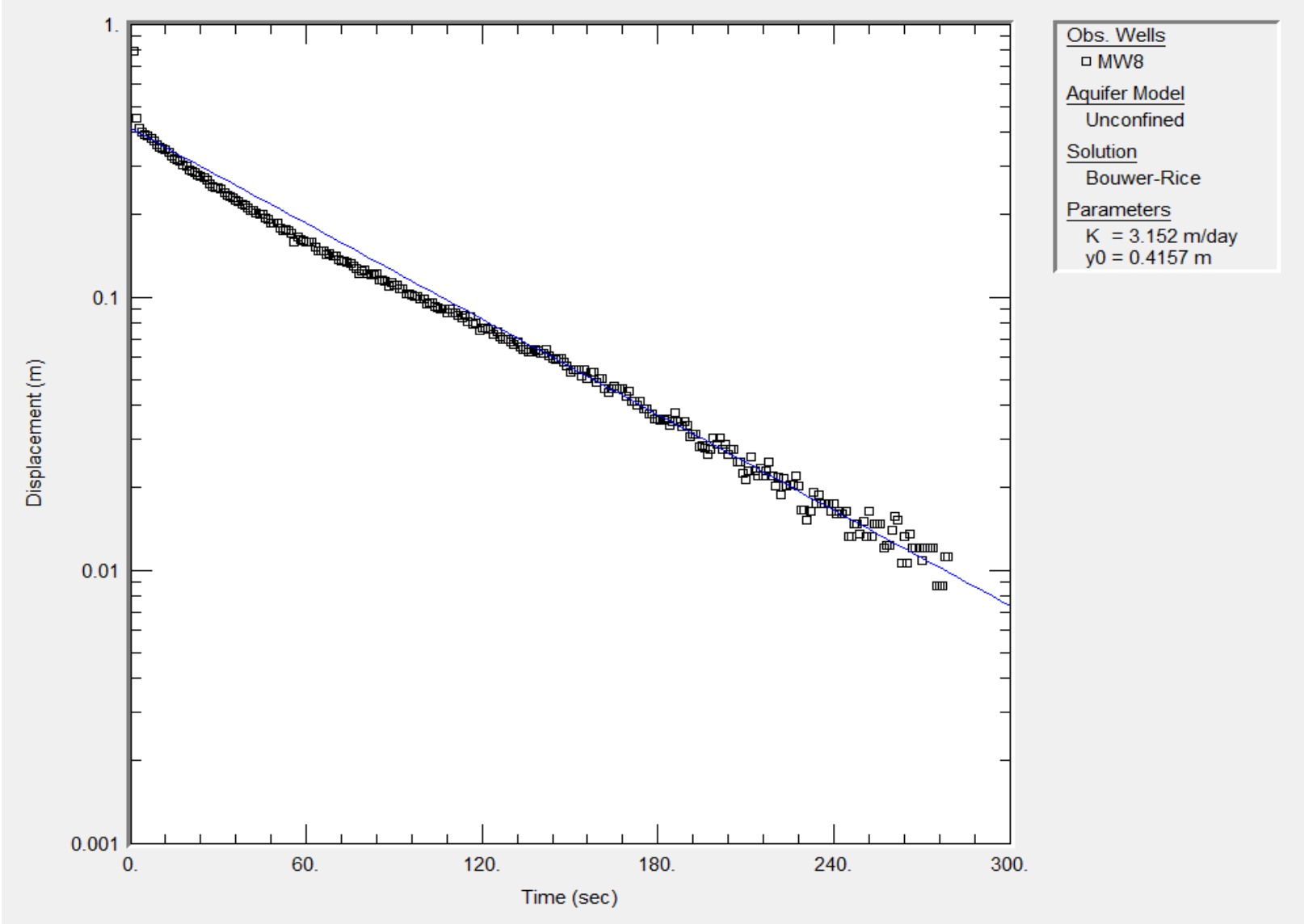
Sample Location				MW14	MW15	MW16		MW17		MW18
Sample Date				16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19	16-Jul-19
Sample ID				MW14	MW15	MW16	MW16 Lab-Dup	MW17	MW17 Lab-Dup	MW18
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				BV	BV	BV	BV	BV	BV	BV
Laboratory Work Order				B958618	B958618	B958618	B958618	B958618	B958618	B958618
Laboratory Sample ID				WD1289	WD1290	WD1291	WD1291 Lab Replicate	WD1294	WD1294 Lab Replicate	WD1295
Sample Type	Units	Health Canada	CCME							
General Chemistry										
Dissolved Nitrate (NO3)	mg/L	45[B]	n/v	0.25	20	<0.044	-	9.5	-	40
Nitrate + Nitrite (as N)	mg/L	n/v	100[D]	0.057	4.6	<0.014	-	2.1	-	9.1
Dissolved Nitrite (NO2)	mg/L	3[B]	32.8[D]	<0.033	0.14	<0.033	-	<0.033	-	0.076
Dissolved Nitrate (as N)	mg/L	10[B]	n/v	0.057	4.6	<0.010	<0.010	2.1	-	9.1
Dissolved Nitrite (as N)	mg/L	1[B]	10[D]	<0.010	0.044	<0.010	<0.010	<0.010	-	0.023
Phosphorus, Dissolved	mg/L	n/v	n/v	<0.0030	0.0060	<0.0030	-	0.0041	0.0040	0.0043
Phosphorus, Total	mg/L	n/v	n/v	0.82 CD	0.95 CD	0.70 CD	-	6.8 CD	-	0.95 CD
Dissolved Chloride	mg/L	≤250[A]	100-700[C]	1.5	6.1	22	-	6.5	-	5.9
Dissolved Sulphate	mg/L	≤500[A]	1000[D]	5.1	28	55	-	35	-	21

Notes:

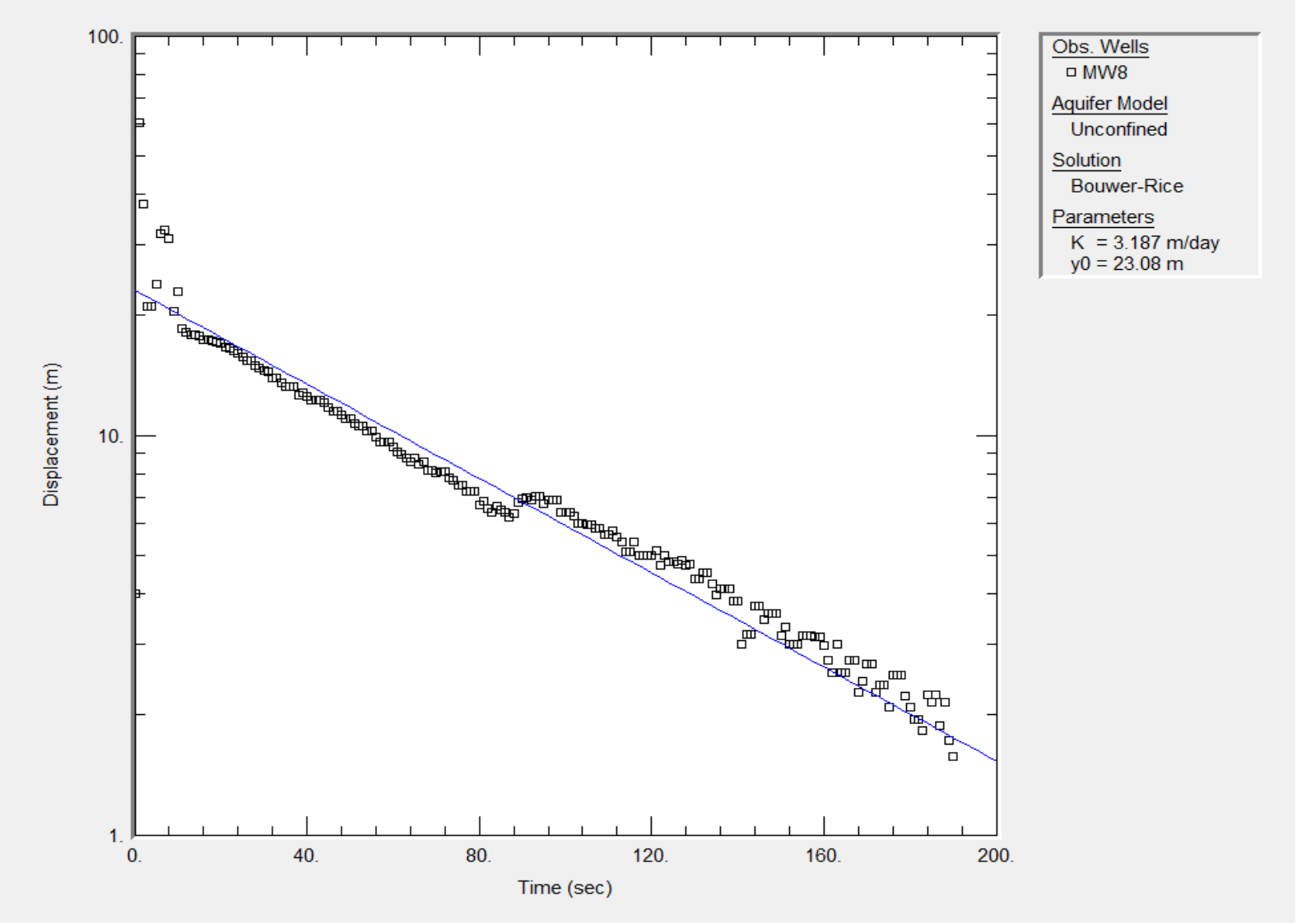
Health Canada	Health Canada (2019). Guidelines for Canadian Drinking Water Quality—Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, ON.
A	Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives/ Operational Guidelines
B	Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentration
CCME	Canadian Council of Ministers of the Environment
C	Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water Use - Irrigation Water
D	Canadian Drinking Water Quality Guidelines for the Protection of Agricultural Water use - Livestock Water
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
i	High levels (above 500 mg/L) can cause physiological effects such as diarrhoea or dehyrdration.
CD	Detection limits raised due to dilution to bring analyte within the calibrated range.
MI	Detection limits raised due to matrix interference.
RPD	Relative Percent Difference.
61%	RPD exceeds data quality objective of 40% (source: BV Labs QA/QC Interpretation Guide Reference COR-FCD-0097 released July 18, 2016.)
nc	RPD is not calculated if one or more values is non detect or if one or more values is less than five times the reportable detection limit.

Appendix E HYDRAULIC CONDUCTIVITY RESULTS

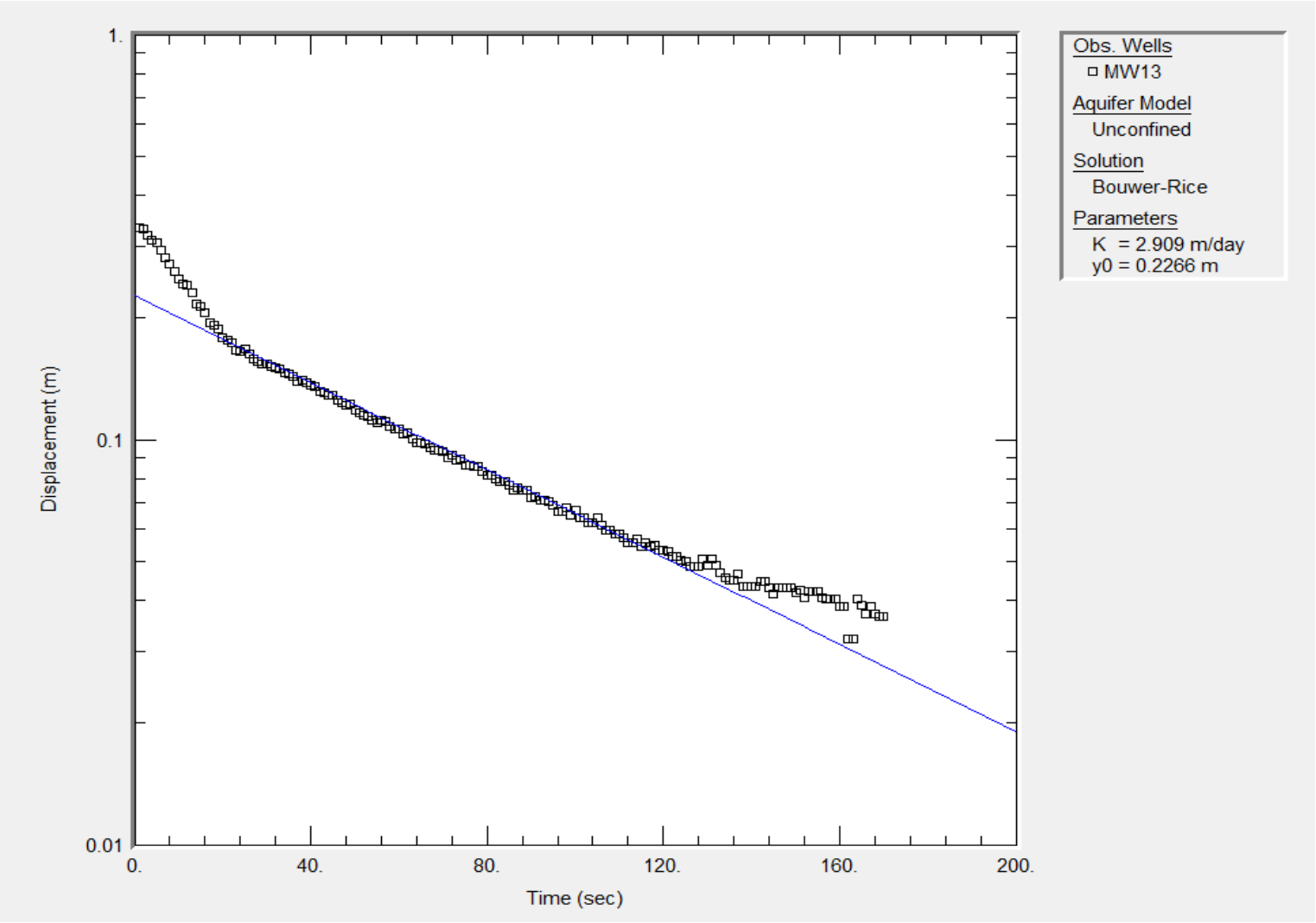
MW8 Falling Head
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods



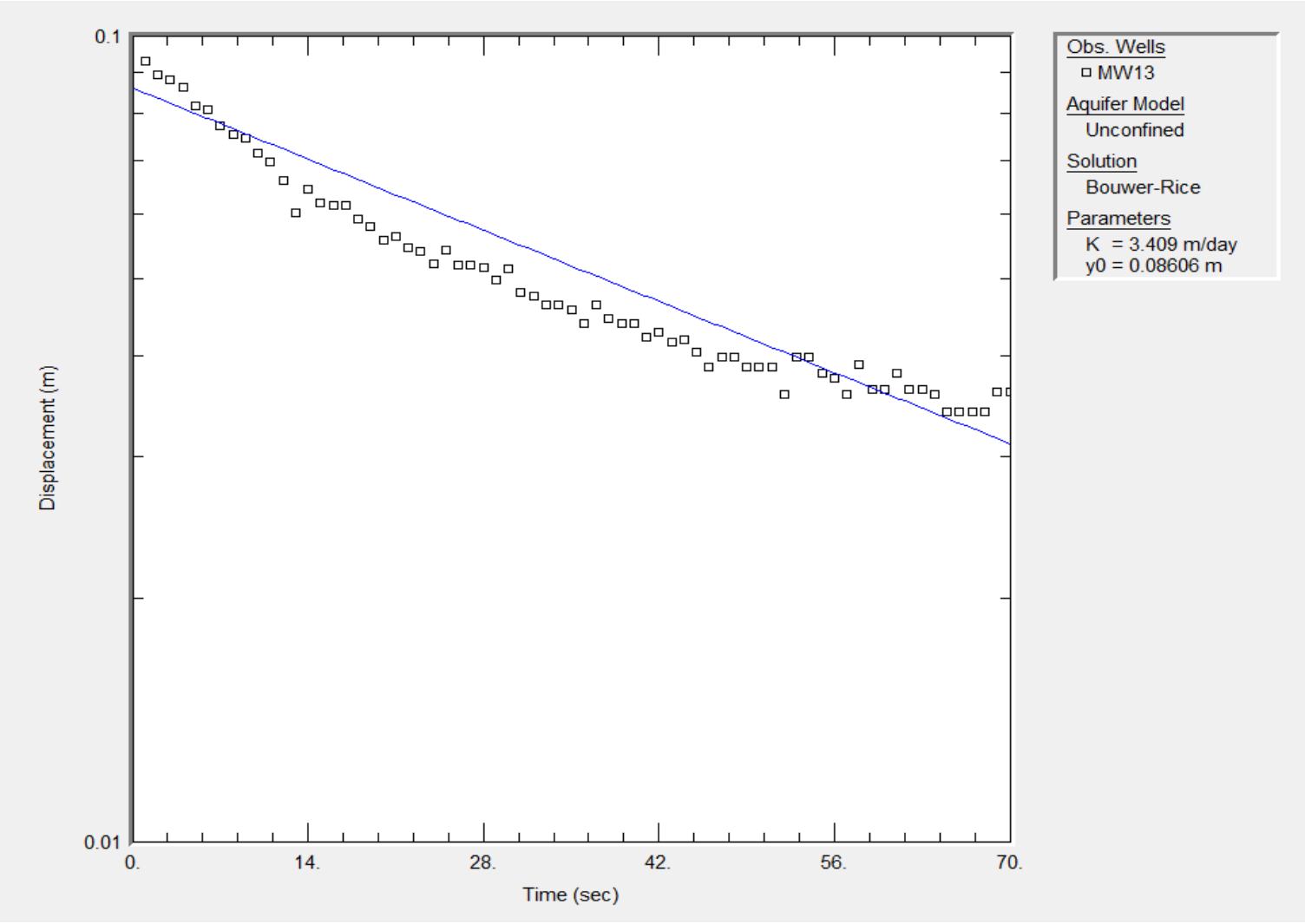
MW8 Rising Head
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods



MW13 Falling Head
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods



MW13 Rising Head
Former Industrial Wastewater Treatment Facility
at the Hylife Foods Neepawa Facility
Hylife Foods



Appendix F COPIES OF CHAIN OF CUSTODY, ORIGINAL LAB RESULTS, QA/QC DOCUMENTATION

Your Project #: 111474534

Attention: SCOTT COUGHTREY

STANTEC CONSULTING LTD
500-311 PORTAGE AVENUE
WINNIPEG, MB
CANADA R3B 2B9

Your C.O.C. #: 588457-01-01, 588457-02-01, 588457-03-01

Report Date: 2019/07/24
Report #: R2757325
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B958618
Received: 2019/07/17, 08:00

Sample Matrix: Water
Samples Received: 25

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chloride/Sulphate by Auto Colourimetry (1)	25	N/A	2019/07/23	AB SOP-00020 / AB SOP-00018	SM23-4500-Cl/SO4-E m
Nitrate and Nitrite (1)	25	N/A	2019/07/23		Auto Calc
Nitrate + Nitrite-N (calculated) (1)	25	N/A	2019/07/23		Auto Calc
Nitrogen (Nitrite - Nitrate) by IC (1)	17	N/A	2019/07/20	AB SOP-00023	SM 23 4110 B m
Nitrogen (Nitrite - Nitrate) by IC (1)	7	N/A	2019/07/21	AB SOP-00023	SM 23 4110 B m
Nitrogen (Nitrite - Nitrate) by IC (1)	1	N/A	2019/07/22	AB SOP-00023	SM 23 4110 B m
Phosphorus -P (Total, Dissolved) (2, 3)	17	2019/07/23	2019/07/23	AB SOP-00024	SM 23 4500-P A,B,F m
Phosphorus -P (Total, Dissolved) (2, 3)	8	2019/07/23	2019/07/24	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus (2)	15	2019/07/23	2019/07/23	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus (2)	10	2019/07/23	2019/07/24	AB SOP-00024	SM 23 4500-P A,B,F m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Your Project #: 111474534

Attention: SCOTT COUGHTREY

STANTEC CONSULTING LTD
500-311 PORTAGE AVENUE
WINNIPEG, MB
CANADA R3B 2B9

Your C.O.C. #: 588457-01-01, 588457-02-01, 588457-03-01

Report Date: 2019/07/24
Report #: R2757325
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B958618
Received: 2019/07/17, 08:00

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by BV Labs Calgary Environmental
(2) This test was performed by BV Labs Edmonton Environmental
(3) Dissolved Phosphorus > Total Phosphorus Imbalance: When applicable, Dissolved Phosphorus and Total Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Geraldlyn Gouthro, Key Account Specialist
Email: GGouthro@bvlabs.com
Phone# (403)735-2230

==========

This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B958618
Report Date: 2019/07/24

STANTEC CONSULTING LTD
Client Project #: 111474534
Sampler Initials: AR

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD1272	WD1273		WD1274			WD1275		
Sampling Date		2019/07/16 08:35	2019/07/16 09:22		2019/07/16 09:46			2019/07/16 10:03		
COC Number		588457-01-01	588457-01-01		588457-01-01			588457-01-01		
	UNITS	CELL 1	CELL 2A	RDL	CELL 2B	RDL	QC Batch	CELL 3	RDL	QC Batch
Calculated Parameters										
Dissolved Nitrate (NO3)	mg/L	<0.044	<0.044	0.044	<0.044	0.044	9513937	0.095	0.044	9513937
Nitrate plus Nitrite (N)	mg/L	<0.014	<0.014	0.014	<0.051	0.051	9513938	0.071	0.014	9513938
Dissolved Nitrite (NO2)	mg/L	0.042	<0.033	0.033	<0.16	0.16	9513937	0.16	0.033	9513937
Anions										
Dissolved Chloride (Cl)	mg/L	180	190	1.0	180	1.0	9518632	370 (1)	5.0	9518632
Dissolved Sulphate (SO4)	mg/L	1.1	<1.0	1.0	8.0	1.0	9518632	41	1.0	9518632
Nutrients										
Dissolved Phosphorus (P)	mg/L	32 (1)	29 (1)	0.75	11 (1)	0.15	9518974	4.4 (1)	0.030	9518482
Total Phosphorus (P)	mg/L	36 (1)	31 (1)	0.75	15 (1)	0.15	9519507	4.5 (1)	0.030	9518465
Dissolved Nitrite (N)	mg/L	0.013	<0.010	0.010	<0.050 (2)	0.050	9515980	0.049	0.010	9515975
Dissolved Nitrate (N)	mg/L	<0.010	<0.010	0.010	<0.010	0.010	9515980	0.022	0.010	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.

BV Labs ID		WD1275			WD1276	WD1276		
Sampling Date		2019/07/16 10:03			2019/07/16 13:55	2019/07/16 13:55		
COC Number		588457-01-01			588457-01-01	588457-01-01		
	UNITS	CELL 3 Lab-Dup	RDL	QC Batch	MW1	MW1 Lab-Dup	RDL	QC Batch
Calculated Parameters								
Dissolved Nitrate (NO3)	mg/L	N/A	0.044	9513937	0.16	N/A	0.044	9513937
Nitrate plus Nitrite (N)	mg/L	N/A	0.014	9513938	0.035	N/A	0.014	9513938
Dissolved Nitrite (NO2)	mg/L	N/A	0.033	9513937	<0.033	N/A	0.033	9513937
Anions								
Dissolved Chloride (Cl)	mg/L	340	5.0	9518632	46	N/A	1.0	9518632
Dissolved Sulphate (SO4)	mg/L	41	1.0	9518632	33	N/A	1.0	9518632
Nutrients								
Dissolved Phosphorus (P)	mg/L	N/A	0.030	9518482	0.0062	N/A	0.0030	9518482
Total Phosphorus (P)	mg/L	N/A	0.030	9518465	0.0068	0.0063	0.0030	9519507
Dissolved Nitrite (N)	mg/L	N/A	0.010	9515975	<0.010	N/A	0.010	9515975
Dissolved Nitrate (N)	mg/L	N/A	0.010	9515975	0.035	N/A	0.010	9515975

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B958618
Report Date: 2019/07/24

STANTEC CONSULTING LTD
Client Project #: 111474534
Sampler Initials: AR

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD1277	WD1277			WD1278		
Sampling Date		2019/07/16 11:56	2019/07/16 11:56			2019/07/16 11:34		
COC Number		588457-01-01	588457-01-01			588457-01-01		
	UNITS	MW2	MW2 Lab-Dup	RDL	QC Batch	MW3	RDL	QC Batch
Calculated Parameters								
Dissolved Nitrate (NO3)	mg/L	73	N/A	0.22	9513937	90	0.22	9513937
Nitrate plus Nitrite (N)	mg/L	16	N/A	0.051	9513938	20	0.051	9513938
Dissolved Nitrite (NO2)	mg/L	<0.033	N/A	0.033	9513937	0.055	0.033	9513937
Anions								
Dissolved Chloride (Cl)	mg/L	39	N/A	1.0	9518632	190 (1)	2.0	9518620
Dissolved Sulphate (SO4)	mg/L	550 (1)	N/A	5.0	9518632	1200 (1)	10	9518620
Nutrients								
Dissolved Phosphorus (P)	mg/L	0.0050	0.0049	0.0030	9518482	<0.0030	0.0030	9518482
Total Phosphorus (P)	mg/L	0.0088	0.0058	0.0030	9518465	0.16	0.0030	9518465
Dissolved Nitrite (N)	mg/L	<0.010	N/A	0.010	9515977	0.017	0.010	9515975
Dissolved Nitrate (N)	mg/L	16 (1)	N/A	0.050	9515977	20 (1)	0.050	9515975

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

BV Labs ID		WD1279			WD1280			WD1281		
Sampling Date		2019/07/16 12:52			2019/07/16 10:55			2019/07/16 10:34		
COC Number		588457-01-01			588457-01-01			588457-01-01		
	UNITS	MW4	RDL	QC Batch	MW5	RDL	QC Batch	MW6	RDL	QC Batch
Calculated Parameters										
Dissolved Nitrate (NO3)	mg/L	37	0.044	9513937	180	0.22	9513937	2.2	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	8.4	0.014	9513938	40	0.051	9513938	0.50	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	<0.033	0.033	9513937	0.058	0.033	9513937	<0.033	0.033	9515004
Anions										
Dissolved Chloride (Cl)	mg/L	150	1.0	9518632	120	1.0	9518632	150	1.0	9518632
Dissolved Sulphate (SO4)	mg/L	130	1.0	9518632	670 (1)	5.0	9518632	13	1.0	9518632
Nutrients										
Dissolved Phosphorus (P)	mg/L	0.0054	0.0030	9518482	0.0070	0.0030	9518482	<0.0030	0.0030	9518482
Total Phosphorus (P)	mg/L	0.043	0.0030	9519507	0.020	0.0030	9518465	0.014	0.0030	9518465
Dissolved Nitrite (N)	mg/L	<0.010	0.010	9515975	0.018	0.010	9515975	<0.010	0.010	9515975
Dissolved Nitrate (N)	mg/L	8.4	0.010	9515975	40 (1)	0.050	9515975	0.50	0.010	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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BV Labs Job #: B958618
Report Date: 2019/07/24

STANTEC CONSULTING LTD
Client Project #: 111474534
Sampler Initials: AR

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD1282			WD1283	WD1283		
Sampling Date		2019/07/16 11:12			2019/07/16 13:36	2019/07/16 13:36		
COC Number		588457-02-01			588457-02-01	588457-02-01		
	UNITS	MW7	RDL	QC Batch	MW8	MW8 Lab-Dup	RDL	QC Batch
Calculated Parameters								
Dissolved Nitrate (NO3)	mg/L	240	0.44	9515004	37	N/A	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	55	0.10	9515006	8.4	N/A	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	<0.033	0.033	9515004	<0.033	N/A	0.033	9515004
Anions								
Dissolved Chloride (Cl)	mg/L	58	1.0	9518620	100	N/A	1.0	9518620
Dissolved Sulphate (SO4)	mg/L	360 (1)	2.0	9518620	950 (1)	N/A	10	9518620
Nutrients								
Dissolved Phosphorus (P)	mg/L	0.0055	0.0030	9518482	0.0057	N/A	0.0030	9518482
Total Phosphorus (P)	mg/L	0.059	0.0030	9518465	0.12	N/A	0.0030	9518465
Dissolved Nitrite (N)	mg/L	<0.010	0.010	9515975	<0.010	0.012	0.010	9515977
Dissolved Nitrate (N)	mg/L	55 (1)	0.10	9515975	8.4	8.4	0.010	9515977

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

BV Labs ID		WD1284			WD1285	WD1286	WD1287		
Sampling Date		2019/07/16 14:10			2019/07/16 14:58	2019/07/16 14:34	2019/07/16 12:35		
COC Number		588457-02-01			588457-02-01	588457-02-01	588457-02-01		
	UNITS	MW9	RDL	QC Batch	MW10	MW11	MW12	RDL	QC Batch
Calculated Parameters									
Dissolved Nitrate (NO3)	mg/L	1.5	0.044	9515004	0.096	0.21	23	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	0.34	0.014	9515006	0.022	0.048	5.2	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	<0.033	0.033	9515004	<0.033	<0.033	0.049	0.033	9515004
Anions									
Dissolved Chloride (Cl)	mg/L	10	1.0	9518632	9.9	5.4	120	1.0	9518632
Dissolved Sulphate (SO4)	mg/L	40	1.0	9518632	15	49	170	1.0	9518632
Nutrients									
Dissolved Phosphorus (P)	mg/L	<0.0030	0.0030	9518482	0.0057	<0.0030	0.0096	0.0030	9518482
Total Phosphorus (P)	mg/L	0.80 (1)	0.015	9519507	0.23	0.44	0.46	0.0030	9518465
Dissolved Nitrite (N)	mg/L	<0.010	0.010	9515975	<0.010	<0.010	0.015	0.010	9515975
Dissolved Nitrate (N)	mg/L	0.34	0.010	9515975	0.022	0.048	5.2	0.010	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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BV Labs Job #: B958618
Report Date: 2019/07/24

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Client Project #: 111474534
Sampler Initials: AR

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD1288			WD1289	WD1290		WD1291		
Sampling Date		2019/07/16 13:10			2019/07/16 15:19	2019/07/16 15:37		2019/07/16 16:08		
COC Number		588457-02-01			588457-02-01	588457-02-01		588457-02-01		
	UNITS	MW13	RDL	QC Batch	MW14	MW15	QC Batch	MW16	RDL	QC Batch
Calculated Parameters										
Dissolved Nitrate (NO3)	mg/L	10	0.044	9515004	0.25	20	9515004	<0.044	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	2.3	0.014	9515006	0.057	4.6	9515006	<0.014	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	0.13	0.033	9515004	<0.033	0.14	9515004	<0.033	0.033	9515004
Anions										
Dissolved Chloride (Cl)	mg/L	77	1.0	9518632	1.5	6.1	9518632	22	1.0	9518620
Dissolved Sulphate (SO4)	mg/L	490 (1)	5.0	9518632	5.1	28	9518632	55	1.0	9518620
Nutrients										
Dissolved Phosphorus (P)	mg/L	0.0036	0.0030	9518482	<0.0030	0.0060	9518482	<0.0030	0.0030	9518482
Total Phosphorus (P)	mg/L	0.20	0.0030	9519507	0.82 (1)	0.95 (1)	9518465	0.70 (1)	0.015	9518465
Dissolved Nitrite (N)	mg/L	0.039	0.010	9515975	<0.010	0.044	9515975	<0.010	0.010	9515975
Dissolved Nitrate (N)	mg/L	2.3	0.010	9515975	0.057	4.6	9515975	<0.010	0.010	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

BV Labs ID		WD1291			WD1294	WD1294		
Sampling Date		2019/07/16 16:08			2019/07/16 16:28	2019/07/16 16:28		
COC Number		588457-02-01			588457-03-01	588457-03-01		
	UNITS	MW16 Lab-Dup	RDL	QC Batch	MW17	MW17 Lab-Dup	RDL	QC Batch
Calculated Parameters								
Dissolved Nitrate (NO3)	mg/L	N/A	0.044	9515004	9.5	N/A	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	N/A	0.014	9515006	2.1	N/A	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	N/A	0.033	9515004	<0.033	N/A	0.033	9515004
Anions								
Dissolved Chloride (Cl)	mg/L	N/A	1.0	9518620	6.5	N/A	1.0	9518620
Dissolved Sulphate (SO4)	mg/L	N/A	1.0	9518620	35	N/A	1.0	9518620
Nutrients								
Dissolved Phosphorus (P)	mg/L	N/A	0.0030	9518482	0.0041	0.0040	0.0030	9518974
Total Phosphorus (P)	mg/L	N/A	0.015	9518465	6.8 (1)	N/A	0.060	9519507
Dissolved Nitrite (N)	mg/L	<0.010	0.010	9515975	<0.010	N/A	0.010	9515977
Dissolved Nitrate (N)	mg/L	<0.010	0.010	9515975	2.1	N/A	0.010	9515977

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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BV Labs Job #: B958618
Report Date: 2019/07/24

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Client Project #: 111474534
Sampler Initials: AR

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD1295			WD1296			WD1297		
Sampling Date		2019/07/16 16:55			2019/07/16 08:35			2019/07/16 11:34		
COC Number		588457-03-01			588457-03-01			588457-03-01		
	UNITS	MW18	RDL	QC Batch	QC1	RDL	QC Batch	QC2	RDL	QC Batch
Calculated Parameters										
Dissolved Nitrate (NO3)	mg/L	40	0.044	9515004	<0.044	0.044	9515004	57	0.089	9515004
Nitrate plus Nitrite (N)	mg/L	9.1	0.014	9515006	<0.014	0.014	9515006	13	0.022	9515006
Dissolved Nitrite (NO2)	mg/L	0.076	0.033	9515004	<0.033	0.033	9515004	0.057	0.033	9515004
Anions										
Dissolved Chloride (Cl)	mg/L	5.9	1.0	9518620	170	1.0	9518620	190	1.0	9518632
Dissolved Sulphate (SO4)	mg/L	21	1.0	9518620	7.1	1.0	9518620	1300 (1)	10	9518632
Nutrients										
Dissolved Phosphorus (P)	mg/L	0.0043	0.0030	9518974	36 (1)	0.75	9518974	<0.0030	0.0030	9518974
Total Phosphorus (P)	mg/L	0.95 (1)	0.015	9518465	36 (1)	0.75	9519507	0.13	0.0030	9518465
Dissolved Nitrite (N)	mg/L	0.023	0.010	9515975	<0.010	0.010	9515975	0.017	0.010	9515975
Dissolved Nitrate (N)	mg/L	9.1	0.010	9515975	<0.010	0.010	9515975	13 (1)	0.020	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

BV Labs ID		WD1298		
Sampling Date		2019/07/16 13:10		
COC Number		588457-03-01		
	UNITS	QC3	RDL	QC Batch
Calculated Parameters				
Dissolved Nitrate (NO3)	mg/L	24	0.044	9515004
Nitrate plus Nitrite (N)	mg/L	5.5	0.014	9515006
Dissolved Nitrite (NO2)	mg/L	0.20	0.033	9515004
Anions				
Dissolved Chloride (Cl)	mg/L	96	1.0	9518632
Dissolved Sulphate (SO4)	mg/L	570 (1)	5.0	9518632
Nutrients				
Dissolved Phosphorus (P)	mg/L	0.0033	0.0030	9518974
Total Phosphorus (P)	mg/L	0.31	0.0030	9519507
Dissolved Nitrite (N)	mg/L	0.059	0.010	9515975
Dissolved Nitrate (N)	mg/L	5.5	0.010	9515975

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.1°C
Package 2	5.4°C

Sample WD1272 [CELL 1] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1273 [CELL 2A] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1274 [CELL 2B] : Sample was analyzed past method specified hold time for Nitrogen (Nitrite - Nitrate) by IC. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample WD1275 [CELL 3] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1276 [MW1] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1277 [MW2] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1278 [MW3] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1279 [MW4] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1280 [MW5] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1281 [MW6] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1282 [MW7] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1283 [MW8] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1284 [MW9] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1285 [MW10] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1286 [MW11] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1287 [MW12] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1288 [MW13] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

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Sample WD1289 [MW14] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1290 [MW15] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1291 [MW16] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1294 [MW17] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1295 [MW18] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1296 [QC1] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1297 [QC2] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD1298 [QC3] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9515975	KD9	Matrix Spike [WD1291-01]	Dissolved Nitrite (N)	2019/07/20		101	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		102	%	80 - 120
9515975	KD9	Spiked Blank	Dissolved Nitrite (N)	2019/07/20		100	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		100	%	80 - 120
9515975	KD9	Method Blank	Dissolved Nitrite (N)	2019/07/20	<0.010		mg/L	
			Dissolved Nitrate (N)	2019/07/20	<0.010		mg/L	
9515975	KD9	RPD [WD1291-01]	Dissolved Nitrite (N)	2019/07/20	NC		%	20
			Dissolved Nitrate (N)	2019/07/20	NC		%	20
9515977	KD9	Matrix Spike [WD1283-01]	Dissolved Nitrite (N)	2019/07/20		101	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		NC	%	80 - 120
9515977	KD9	Spiked Blank	Dissolved Nitrite (N)	2019/07/20		100	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		101	%	80 - 120
9515977	KD9	Method Blank	Dissolved Nitrite (N)	2019/07/20	<0.010		mg/L	
			Dissolved Nitrate (N)	2019/07/20	<0.010		mg/L	
9515977	KD9	RPD [WD1283-01]	Dissolved Nitrite (N)	2019/07/20	NC		%	20
			Dissolved Nitrate (N)	2019/07/20	0.25		%	20
9515980	KD9	Matrix Spike	Dissolved Nitrite (N)	2019/07/20		102	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		102	%	80 - 120
9515980	KD9	Spiked Blank	Dissolved Nitrite (N)	2019/07/20		101	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		102	%	80 - 120
9515980	KD9	Method Blank	Dissolved Nitrite (N)	2019/07/20	<0.010		mg/L	
			Dissolved Nitrate (N)	2019/07/20	<0.010		mg/L	
9515980	KD9	RPD	Dissolved Nitrite (N)	2019/07/20	NC		%	20
			Dissolved Nitrate (N)	2019/07/20	2.5		%	20
9518465	AL2	Matrix Spike [WD1277-02]	Total Phosphorus (P)	2019/07/23		104	%	80 - 120
9518465	AL2	QC Standard	Total Phosphorus (P)	2019/07/23		93	%	80 - 120
9518465	AL2	Spiked Blank	Total Phosphorus (P)	2019/07/23		97	%	80 - 120
9518465	AL2	Method Blank	Total Phosphorus (P)	2019/07/23	<0.0030		mg/L	
9518465	AL2	RPD [WD1277-02]	Total Phosphorus (P)	2019/07/23	NC		%	20
9518482	AL2	Matrix Spike [WD1277-03]	Dissolved Phosphorus (P)	2019/07/23		99	%	80 - 120
9518482	AL2	QC Standard	Dissolved Phosphorus (P)	2019/07/23		90	%	80 - 120
9518482	AL2	Spiked Blank	Dissolved Phosphorus (P)	2019/07/23		105	%	80 - 120
9518482	AL2	Method Blank	Dissolved Phosphorus (P)	2019/07/23	<0.0030		mg/L	
9518482	AL2	RPD [WD1277-03]	Dissolved Phosphorus (P)	2019/07/23	1.2		%	20
9518620	STI	Matrix Spike	Dissolved Chloride (Cl)	2019/07/23		NC	%	80 - 120
			Dissolved Sulphate (SO4)	2019/07/23		108	%	80 - 120
9518620	STI	Spiked Blank	Dissolved Chloride (Cl)	2019/07/23		105	%	80 - 120
			Dissolved Sulphate (SO4)	2019/07/23		98	%	80 - 120
9518620	STI	Method Blank	Dissolved Chloride (Cl)	2019/07/23	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2019/07/23	<1.0		mg/L	
9518620	STI	RPD	Dissolved Chloride (Cl)	2019/07/23	0.60		%	20
			Dissolved Sulphate (SO4)	2019/07/23	0.19		%	20
9518632	STI	Matrix Spike [WD1275-01]	Dissolved Chloride (Cl)	2019/07/23		NC	%	80 - 120
			Dissolved Sulphate (SO4)	2019/07/23		NC	%	80 - 120
9518632	STI	Spiked Blank	Dissolved Chloride (Cl)	2019/07/23		104	%	80 - 120
			Dissolved Sulphate (SO4)	2019/07/23		97	%	80 - 120
9518632	STI	Method Blank	Dissolved Chloride (Cl)	2019/07/23	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2019/07/23	<1.0		mg/L	
9518632	STI	RPD [WD1275-01]	Dissolved Chloride (Cl)	2019/07/23	8.4		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Sulphate (SO4)	2019/07/23	0.040		%	20
9518974	AL2	Matrix Spike [WD1294-03]	Dissolved Phosphorus (P)	2019/07/24		100	%	80 - 120
9518974	AL2	QC Standard	Dissolved Phosphorus (P)	2019/07/24		93	%	80 - 120
9518974	AL2	Spiked Blank	Dissolved Phosphorus (P)	2019/07/24		102	%	80 - 120
9518974	AL2	Method Blank	Dissolved Phosphorus (P)	2019/07/24	<0.0030		mg/L	
9518974	AL2	RPD [WD1294-03]	Dissolved Phosphorus (P)	2019/07/24	1.2		%	20
9519507	AL2	Matrix Spike [WD1276-02]	Total Phosphorus (P)	2019/07/24		99	%	80 - 120
9519507	AL2	QC Standard	Total Phosphorus (P)	2019/07/24		94	%	80 - 120
9519507	AL2	Spiked Blank	Total Phosphorus (P)	2019/07/24		103	%	80 - 120
9519507	AL2	Method Blank	Total Phosphorus (P)	2019/07/24	<0.0030		mg/L	
9519507	AL2	RPD [WD1276-02]	Total Phosphorus (P)	2019/07/24	7.8		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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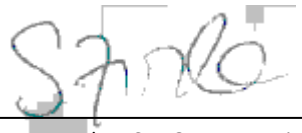
VALIDATION SIGNATURE PAGE

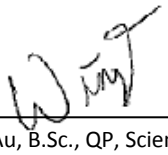
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Harry (Peng) Liang, Senior Analyst



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst



Winnie Au, B.Sc., QP, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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17-Jul-19 08:00

Page 1 of 3

Geraldlyn Gouthro

B958618

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:			
Company Name:	#4222 STANTEC CONSULTING LTD	Company Name:		Quotation #:	B71721		Bottle Order #:
Attention:	SCOTT COUGHTREY C/O AP	Attention:		P.O. #:			586457
Address:	500-311 PORTAGE AVENUE WINNIPEG MB R3B 2B9	Address:		Project:	111474534	AN0 INS-0232	Project Manager:
Tel:	(204) 928-7612 Fax:	Tel:	Fax:	Project Name:	Hylife		Geraldlyn Gouthro
Email:	SAPinvoices@stantec.com	Email:		Site #:		C#586457-01-01	
				Sampled By:	Adam Ruckwell		

Regulatory Criteria:
- [ ] ATI
- [x] CCME
- [ ] Other

Special Instructions: Dissolved phosphorus field filtered (pages 1-3) all samples

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Total Phosphorus	Phosphorus -P (Total, Dissolved)	Sulphate by Automated Colourimetry	Chloride by Automated Colourimetry	Nitrogen (Nitrite + Nitrate) by IC	# of Bottles	Comments
1		CELL 1	07/16/2019	08:35	W		X	X	X	X	X	3	
2		CELL 2A		09 22	W		X	X	X	X	X	3	
3		CELL 2B		09:46	W		X	X	X	X	X	3	
4		CELL 3		10.03	W		X	X	X	X	X	3	
5		MW 1		13:55	W		X	X	X	X	X	3	
6		MW 2		11:56	W		X	X	X	X	X	3	
7		MW 3		11:34	W		X	X	X	X	X	3	
8		MW 4		12:52	W		X	X	X	X	X	3	
9		MW 5		10:55	W		X	X	X	X	X	3	
10		MW 6		10.34	W		X	X	X	X	X	3	

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [x]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests are > 5 days - contact your Project Manager for details

Job Specific Rush TAT (if applies to entire submission) [ ]
Date Required:
Rush Confirmation Number: (call lab for #)

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Adam Ruckwell / Adam Ruckwell	19/07/16	19:15	Amanda	2019/07/17	0850	8
			BOL Jordan Bruk	2019/07/18	0830	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
[ ]	1.2/3.2/5.0 ice present	[ ] Yes [ ] No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.
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** ALL SAMPLES ARE HELD FOR 60 DAYS AFTER SAMPLE RECEIPT. FOR SPECIAL REQUESTS CONTACT YOUR PROJECT MANAGER

White: BV Labs Yellow: Client

7/7/10 ice cs-4
8/7/18

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17-Jul-19 08:00

Geraldlyn Gouthro

B958618

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		
Company Name:	#4222 STANTEC CONSULTING LTD	Company Name:		Quotation #:	B71721	Bottle Order #:
Attention:	SCOTT COUGHTREY C/O AP	Attention:		P.O. #:		588457
Address:	500-311 PORTAGE AVENUE WINNIPEG MB R3B 2B9	Address:		Project:	111474534 AN0 INS-0232	Project Manager:
Tel:	(204) 928-7612 Fax:	Tel:	Fax:	Project Name:	Hylife	Geraldlyn Gouthro
Email:	SAPinvoices@stantec.com	Email:		Site #:		
				Sampled By:	Adam Ruchkall	C#588457-02-01

Regulatory Criteria:
- [ ] ATI
- [x] CCME
- [ ] Other

Special Instructions:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [x]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests are > 5 days - contact your Project Manager for details

Job Specific Rush TAT (if applies to entire submission) [ ]
Date Required:
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Total Phosphorus	Phosphorus -P (Total, Dissolved)	Sulphate by Automated Colourimetry	Chloride by Automated Colourimetry	Nitrogen (Nitrite - Nitrate) by IC	# of Bottles	Comments
1		MW7	07/16/2019	11:12	W		X	X	X	X	X	3	
2		MW8		13:36	W		X	X	X	X	X	3	
3		MW9		14:10	W		X	X	X	X	X	3	
4		MW10		14:58	W		X	X	X	X	X	3	
5		MW11		14:34	W		X	X	X	X	X	3	
6		MW12		12:35	W		X	X	X	X	X	3	
7		MW13		13:10	W		X	X	X	X	X	3	
8		MW14		15:19	W		X	X	X	X	X	3	
9		MW15		15:37	W		X	X	X	X	X	3	
10		MW16	↓	16:08	W		X	X	X	X	X	3	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
Adam Ruchkall	19/07/16	19:15	Amanda	19/07/17	0800	0	[ ]	1.2/3.2/5.0	[ ] Yes [ ] No
			Jordan Bath	2019/07/18	08:30				

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** ALL SAMPLES ARE HELD FOR 60 DAYS AFTER SAMPLE RECEIPT, FOR SPECIAL REQUESTS CONTACT YOUR PROJECT MANAGER

White: BV Labs Yellow: Client

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CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#4222 STANTEC CONSULTING LTD	Company Name:		Quotation #:	B71721	BV Labs Job #: B958618	Bottle Order #: 588457
Attention:	SCOTT COUGHTREY C/O AP	Attention:		P.O. #:			
Address:	500-311 PORTAGE AVENUE WINNIPEG MB R3B 2B9	Address:		Project:	111474534	COC #: C#588457-03-01	Project Manager: Geraldlyn Gouthro
Tel:	(204) 928-7612 Fax:	Tel:	Fax:	Project Name:	Hylife		
Email:	SAPinvoices@stantec.com	Email:		Site #:			
				Sampled By:	Adam Ruchkall		

Regulatory Criteria:
- [ ] ATI
- [x] CCME
- [ ] Other

Special Instructions:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: [x]
(will be applied if Rush TAT is not specified)
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Job Specific Rush TAT (if applies to entire submission) [ ]
Date Required:
Rush Confirmation Number: *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Total Phosphorus	Phosphorus -P (Total, Dissolved)	Sulphate by Automated Colourimetry	Chloride by Automated Colourimetry	Nitrogen (Nitrite + Nitrate) by IC	# of Bottles	Comments
1		MW17	07/16/2019	16:28	W		X	X	X	X	X	3	
2		MW18		16:55	W		X	X	X	X	X	3	
3		QC1		08:35	W		X	X	X	X	X	3	
4		QC2		11:34	W		X	X	X	X	X	3	
5		QC3		13:10	W		X	X	X	X	X	3	
6					W								
7					W								
8					W								
9													
10													

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
Adam Ruchkall	19/07/16	19:15	Amanda	19/07/17	0800	0	[ ]	1.2/3.2/5.0	[ ] Yes [ ] No
			Jordan B-L	2019/07/18	08:30				

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